Program Structure

BTech (Artificial Intelligence)

IV Year (I & II Semesters)

BTech (AI) IV YEAR I SEMESTER

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1	A57061	PCC	Natural Language Processing	3	0	0	3
2	A57056	PCC	Deep Learning	3	1	0	4
3	A57068	PEC-III	1. Big Data	3	0	0	3
	A57069		2. Fuzzy Logic				
	A57070		3. Speech Processing				
4	A57071	*PEC-IV	**1.** Cloud Computing	3	0	0	3
	A57072		2. Embedded Robotics				
	A57073		3. Design Patterns				
	A57074		4. Blockchain Technology				
	A57075		5. Cyber Security				
	A57063		6. Cyber Forensics				
	A57076		7. Applications of AI in e-Governance* ***Any two of the above courses can be chosen against PEC-IV and PEC-V respectively**				
5		*PEC-V		3	0	0	3
6	A57215	PCC Lab	Natural Language Processing Lab	0	0	4	2
7	A57216	PCC Lab	Deep Learning Lab	0	0	4	2
8	A57230	PROJ	Industry Oriented Mini Project	0	0	4	2
			TOTAL	**15**	**1**	**12**	**22**

BTech (AI) IV YEAR II SEMESTER

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1	A58001	OEC-II	1. Technical and Business Communication Skills	2	1	0	3
	A58019		2. Digital Media Literacy				
	A58022		3. Managerial Economics and Financial Analysis				
2	A58005	OEC-III	1. Negotiation Skills	2	1	0	3
	A58008		2. Project Management				
	A58010		3. Value Engineering				
3	A58201	PROJ	Seminar	0	0	4	2
4	A58202	PROJ	Comprehensive Viva-Voce	0	0	0	2
5	A58203	PROJ	Project Work	0	0	20	10
			TOTAL	**4**	**2**	**24**	**20**

*** L – Lecture, T – Tutorial, P – Practical**

Program Structure

BTech (Artificial Intelligence & Machine Learning)

IV Year (I & II Semesters)

BTech (AIML) IV YEAR I SEMESTER

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1	A57068	PCC	Big Data	3	0	0	3
2	A57056	PCC	Deep Learning	3	1	0	4
3	A57061	PEC-III	1.Natural Language Processing	3	0	0	3
	A57069		2.Fuzzy Logic				
	A57070		3.Speech Processing				
4	A57071	*PEC-IV	1.Cloud Computing	3	0	0	3
	A57072		2.Embedded Robotics				
	A57073		3.Design Patterns				
	A57074		4.Blockchain Technology				
	A57075		5.Cyber Security				
	A57063		6.Cyber Forensics				
	A57076		7.Applications of AI in e-Governance*				
5		*PEC-V	***Any two of the above courses can be chosen against PEC-IV and PEC-V respectively**	3	0	0	3
6	A57216	PCC Lab	Big Data Lab	0	0	4	2
7	A57210	PCC Lab	Deep Learning Lab	0	0	4	2
8	A57230	PROJ	Industry Oriented Mini Project	0	0	4	2
			TOTAL	**15**	**1**	**12**	**22**

BTech (AIML) IV YEAR II SEMESTER

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1	A58001	OEC-II	1. Technical and Business Communication Skills	2	1	0	3
	A58019		2. Digital Media Literacy				
	A58022		3. Managerial Economics and Financial Analysis				
2	A58005	OEC-III	1. Negotiation Skills	2	1	0	3
	A58008		2. Project Management				
	A58010		3. Value Engineering				
3	A58201	PROJ	Seminar	0	0	4	2
4	A58202	PROJ	Comprehensive Viva-Voce	0	0	0	2
5	A58203	PROJ	Project Work	0	0	20	10
			TOTAL	**4**	**2**	**24**	**20**

*** L – Lecture, T – Tutorial, P – Practical**

Appendix B

NATURAL LANGUAGE PROCESSING

BTech (AI) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57061	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. To learn the fundamentals of Natural Language Processing
2. To understand the semantic aspects and similarity measures
3. To understand the aspects of context-free grammar and perform parsing
4. To understand and identify different word senses and find their relationship
5. To apply the NLP techniques in understanding discourses

Course Outcomes

At the end of this course, students will be able to:

1. Solve problems involving regular expressions and N grams
2. Evaluate Vector models
3. Perform parsing operations
4. Build and analyze applications with semantic roles involving selectional restrictions
5. Utilize NLP learning algorithms in understanding a discourse

UNIT-I

Regular Expressions: Regular Expressions, Corpora, Text Normalization, Minimum Edit Distance

Ngram Models: Ngrams, Evaluating Language models, Generalization, Smoothing

UNIT-II

Lexical Semantics, Vector semantics, Words and Vectors, Cosine for measuring similarity, TF-IDF, PMI

Visualizing Embeddings, Semantic Properties of Embeddings, Bias and Embeddings

UNIT-III

Constituency Grammar: Constituency, Context free grammar, Grammar Rules for English, Treebanks, Grammar Equivalence and Normal Form, Lexicalized Grammar

Parsing: Ambiguity, CKY Parsing

UNIT-IV

Word senses, Relation between senses, WordNet, Word Sense Disambiguation
Semantic Roles, Diathesis alternations, Problems with thematic roles, Proposition Bank, FrameNet, Semantic Role Labelling, Selectional Restrictions

UNIT-V

Coreference Resolution: Coreference Phenomena, coreference Tasks and datasets, Architecture of coreference algorithm, Gender bias in coreference

Discourse Coherence: Coherence Relation, Discourse Structure Parsing, Centering and Entity based Coherence, Representation model for local coherence, Global coherence

Text Books

1. Daniel Jurafsky, James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech", Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, "Natural Language Processing with Python", First Edition, OReilly Media, 2009

References

1 James Allen, "Natural Language Understanding", 2nd Edition, Benjamin, Cummings publishing company, 1995.
2 Rajesh Arumugam, Rajalingappaa Shanmugamani, "Hands-On Natural Language Processing with Python", Packt Publishing Ltd., 2018
3 Deepti Chopra, Nisheeth Joshi, Iti Mathur "Mastering Natural Language Processing with Python" First Edition, Packt Publishing, 2016

DEEP LEARNING

BTech (AI) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57056	PCC	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

1. To advance in training techniques for neural networks
2. To understand various CNN Architectures
3. To understand various RNN Methodologies
4. To custom train Autoencoder Models and implement them.
5. To apply Transfer Learning to solve problems

Course Outcomes

At the end of this course, students will be able to:

1. Have a good understanding of the fundamental issues and basics of deep learning
2. Understand the concept of CNN to apply it in the Image classification problems
3. Learning and understanding the working of various RNN methods
4. Learning and understanding the working of various Autoencoders methods
5. Use Transfer Learning to solve problems with high dimensional data including image and speech

UNIT-I

Deep Learning: Fundamentals, Introduction, Building Block of Neural Networks, Layers, MLPs, Forward pass, backward pass, class, trainer and optimizer, The Vanishing and Exploding Gradient Problems, Difficulties in Convergence, Local and Spurious Optima, Preprocessing, Momentum, learning rate Decay, Weight Initialization, Regularization, Dropout, SoftMax, Cross Entropy loss function, Activation Functions.

UNIT-II

CNN: Introduction, striding and padding, pooling layers, structure, operations and prediction of CNN with layers, CNN -Case study with MNIST, CNN VS Fully Connected

UNIT-III

RNN: Handling Branches, Layers, Nodes, Essential Elements-Vanilla RNNs, GRUs, LSTM

UNIT-IV

Autoencoders: Denoising Autoencoders, Sparse Autoencoders, Deep Autoencoders, Variational Autoencoders, GANS

UNIT-V

Transfer Learning: Types, Methodologies, Diving into Transfer Learning, Challenges

Text Books

1. Seth Weidman, “Deep Learning from Scratch”, O'Reilly Media, Inc., 2019
2. Ian Goodfellow, Yoshua Bengio and Aaron Courville, “Deep Learning”, MIT Press, 2015
3. Dipanjan Sarkar, Raghav Bali, “Transfer Learning in Action”, Manning Publications, 2021

References

1. Giancarlo Zaccone, Md. Rezaul Karim, Ahmed Menshawy "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017.
2. Antonio Gulli, Sujit Pal, "Deep Learning with Keras", Packt Publishers, 2017.
3. Francois Chollet, "Deep Learning with Python", Manning Publications, 2017.

BIG DATA

BTech (AI) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57068	PEC-III	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. To understand the concepts of big data and hadoop
2. To understand mapreduce concepts
3. To perform data analysis with pig tool and to perform high volume ingestion into Hadoop of event-based data
4. To create and load data into HIVE tables
5. To create Resilient distributed datasets

Course Outcomes

At the end of this course, students will be able to:

1. Work with hadoop distributed file system
2. Develop map reduce based applications
3. Perform data analysis using pig tool
4. To use hive tool for data analysis
5. Big Data processing using SPARK

UNIT-I

Big Data: characteristics of big data, Applications of Big Data, comparison with other systems, data analysis with Hadoop, scaling out, data flow, combiner functions, Hadoop streaming. HDFS, Design of HDFS, HDFS concepts-blocks, name node and data node, clock caching, HDFS federation, HDFS high availability, failover and fencing, the command line interface, Basic file system operations, Hadoop filesystems, Data flow, Anatomy of a file write, Parallel Copying with distcp, Keeping an HDFS Cluster Balanced

UNIT-II

YARN: Anatomy of a YARN Application Run, resource requests, application lifespan, YARN Compared to MapReduce 1, Scheduling in YARN, scheduler options, Anatomy of a MapReduce Job Run.

UNIT-III

Pig: Comparison with Databases, Pig Latin-Structure, Statements, Expressions, Types, Schemas, Functions, Macros, User-Defined Functions- A Filter UDF, An Eval UDF, A Load UDF; Data Processing Operators- Loading and Storing Data, Filtering Data, Grouping and Joining Data, Sorting Data, Combining and Splitting Data, Pig in Practice Parallelism, Anonymous Relations, Parameter Substitution

Flume: working with flume, Transactions and Reliability, The HDFS Sink, Fan Out, Distribution

UNIT-IV

Hive: HiveQL- Data Types, Operators and Functions, Tables-Managed Tables and External Tables, Partitions and Buckets, Storage Formats, Importing Data, Altering Tables, Dropping Tables, Querying Data- Sorting and Aggregating, MapReduce Scripts, Joins, Sub queries, Views User-Defined Functions, Partitioning -static and dynamic

Sqoop: Sqoop Connectors, import, generated code, Working with Imported Data, Exports

UNIT-V

Spark: Resilient Distributed Datasets- Creation, Transformations and Actions, Persistence, Serialization, Shared Variables, Anatomy of a Spark Job Run--Job Submission, DAG Construction, Task Scheduling, Task Execution; Executors and Cluster Managers

HBase: HBasics, Concepts, HBase Versus RDBMS, Building an Online Query Application

Text Book

1. Tom White, “Hadoop: The Definitive Guide: Storage and Analysis at Internet Scale”, 4/e, O'Reilly

References

1. Seema Acharya, Subhashini Chellappan, “Big Data and Analytics”, Wiley India Pvt. Ltd

FUZZY LOGIC

BTech (AI) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57069	PEC-III	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. To develop the fundamental concepts such as fuzzy sets, operations and fuzzy relations.
2. To lean about fuzzification of scalar variables and defuzzification of membership functions.
3. To learn three different inference methods for designing fuzzy rule-based systems.
4. To develop fuzzy decision making by introducing some concepts and also Bayesian decision methods
5. To learn different fuzzy classification methods.

Course Outcomes

At the end of this course, students will be able to:

1. Understand the basic ideas of fuzzy sets, operations and properties of fuzzy sets and also about fuzzy relations.
2. Understand the basic features of membership functions and perform fuzzification and defuzzification
3. Design a fuzzy rule-based system.
4. Combining fuzzy set theory with probability for handling random and non-random uncertainty and the decision-making process.
5. Solve real world problems using fuzzy C-Means clustering.

UNIT-I

Classical sets: Operations and properties of classical sets, Mapping of classical sets to the functions. Fuzzy sets - Membership functions, Fuzzy set operations, Properties of fuzzy sets.

Classical and Fuzzy relations: Cartesian product, crisp relations-cardinality, operations and properties of crisp relations. Fuzzy relations-cardinality, operations, properties of fuzzy relations, fuzzy Cartesian product and composition, Fuzzy tolerance and equivalence relations, value assignments and other formats of the composition operation.

UNIT-II

Fuzzification and Defuzzification: Features of the membership functions, various forms, fuzzification, defuzzification to crisp sets, l- cuts for fuzzy relations, Defuzzification to scalars. Fuzzy logic and approximate reasoning, other forms of the implication operation

UNIT-III

Fuzzy Systems: Natural language, Linguistic hedges, Fuzzy (Rule based) System, Aggregation of fuzzy rules, Graphical techniques of inference, Membership value assignments: Intuition, Inference, rank ordering, Fuzzy Associative memories

UNIT-IV

Fuzzy decision making: Fuzzy synthetic evaluation, Fuzzy ordering, Preference and consensus, Multi objective decision making, Fuzzy Bayesian, Decision method, Decision making under Fuzzy states and fuzzy actions, Intuitionistic Fuzzy sets, Interval Valued and Applications

UNIT-V

Fuzzy Classification: Classification by equivalence relations-crisp relations, Fuzzy relations, Cluster analysis, Cluster validity, C-Means clustering, Hard C-Means clustering, Fuzzy C-Means algorithm, Classification metric, Hardening the Fuzzy C-Partition

Text Book

1. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", 3rd edition, Wiley,2010.
2. Krassimir T. Atanassov, "Intuitionistic Fuzzy Sets - Theory and Applications", Physica Verlag - Springer, 1999
3. George J.KlirBo Yuan, "Fuzzy sets and Fuzzy logic theory and Applications", PHI, New Delhi,1995.

References

1. D.K. Prathihar, "Soft Computing Fundamentals and Applications", 2007
2. S.N. Sivanandam, S.N. Deepa, "Principles of Soft Computing", 3rd Edition, Wiley Publications, 2013.
3. S. Rajasekaran, G. A. Vijayalakshmi – "Neural Networks and Fuzzy logic and Genetic Algorithms, Synthesis and Applications", PHI, New Delhi,2003.

SPEECH PROCESSING

BTech (AI) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57070	PEC-III	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

The students will be able to

1. To learn about the source of sound and its Production process
2. To understand the Signal Processing and Analysis
3. To have an insight on the steps involved in Speech Recognition System Design
4. To learn about models and its implementation
5. To learn about Connected Word Models

Course Outcomes

After the completion of the course, the students will be able to

1. Understand the basic concepts of speech and fundamental signal processing approaches.
2. Analyze various methods of Speech Recognition
3. Understand the coding techniques and Performance Analysis in speech Recognition
4. Apply statistical modeling techniques.
5. Understand the various models of continuous speech recognition system.

UNIT-I

Fundamentals of Speech:

Introduction, Speech Production Process, Representing speech in the Time and Frequency domains, Speech sounds and features, Approaches to Automatic Speech Recognition by Machine.

UNIT-II

Signal Processing and Analysis Methods for Speech Recognition:

Introduction, The Bank of Filters Front End Processor, Linear Predictive Coding Model

for Speech Recognition, Vector Quantization, Auditory-Based Spectral Analysis

Models, Encoder Decoder Model- Encoder Decoder Model with RNN.

UNIT-III

Speech Recognition System Design and Implementation:

Introduction, Applications of Source Coding Techniques, Template Training Methods, Performance Analysis and Recognition Enhancements, Template Adaptation to New Talkers, Discriminative Methods in Speech Recognition.

UNIT-IV

Implementation Hidden Markov Models:

Introduction, Discrete-Time Markov Processes, Extension to HMMs, The Three Basic Problems for HMMs, Types of HMMs, Comparisons of HMMs, Model Clustering and Splitting

UNIT-V

Speech Recognition Based on Connected Word Models:

Introduction, General Notation for the Connected Word Recognition problem, The Two-level Dynamic Programming Algorithm, Level Building Algorithm-Computation of the level Building Algorithm, One-Pass Algorithm, Segmental K-means Training Procedure.

Text Book

1. Lawrence Rabiner, Biing-Hwang Juang, "Fundamentals of Speech Recognition", Pearson Education
2. Daniel Jurafsky, James H Martin, "Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Pearson Education

References

1. Thomas F Quatieri, "Discrete-Time Speech Signal Processing – Principles and Practice", Pearson Education.
2. Claudio Becchetti, Lucio PrinaRicotti, "Speech Recognition", John Wiley and Sons

CLOUD COMPUTING

BTech (AI) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57071	PEC-IV/V	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. This course provides an insight into cloud computing

Course Outcomes

After the completion of the course, the students will be able to,

1. Understand different Computing Paradigms.
2. Learn the fundamentals of Cloud Computing.
3. Understand various service delivery models of a cloud computing architecture.
4. Demonstrate the ways in which the cloud can be programmed and deployed
5. Identify applications that can deploy on a Cloud environment.

UNIT-I

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

UNIT-II

Cloud Computing Fundamentals: Motivation for Cloud Computing, Defining Cloud Computing, 5-4-3 Principles of Cloud computing, Cloud Ecosystem, Requirements for Cloud Services.

UNIT-III

Cloud Computing Architecture and Management: Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications on the Cloud, Managing the Cloud, Migrating Application to Cloud.

UNIT-IV

Cloud Deployment Models: Private cloud, Public Cloud, Community Cloud, Hybrid Cloud.

Cloud Service Models: Infrastructure as a Service, Platform as a Service, Software as a Service.

UNIT-V

Cloud Service Providers: EMC, Google, Amazon Web Services, Microsoft, Windows Azure, IBM, Cloud Models, IBM, Sales force.

Open-Source Support for Cloud: Open-Source Tools for IaaS, Open-Source Tools for PaaS, Open-Source Tools for SaaS.

Text Book

1. K. Chandrasekhran, "Essentials of cloud Computing", CRC press, 2014

References

1. Sandeep Bhowmik, "Cloud Computing", Cambridge University Press; First edition,2017
2. Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, "Cloud Computing: Principles and Paradigms", Wiley, 2011.
3. Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, "Distributed and Cloud Computing", Elsevier, 2012.
4. Tim Mather, Subra Kumaraswamy, Shahed Latif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance", O'Reilly, SPD, rp 2011.

EMBEDDED ROBOTICS

BTech (AI) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57072	PEC-IV/V	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. To understand the different robotic modules.
2. To learn various sensors in robotic engineering.
3. To understand the different actuators and control units of robot.
4. To study and understand the different type of robots.
5. To analyze the localization and navigation of robotic systems.

Course Outcomes

At the end of this course, students will be able to:

1. analyze different robotics, robotic applications and their usage.
2. learn various sensors used in robotic technology.
3. identify and understand the characteristics of different actuators in robotics.
4. identify and understand the characteristics of different robotics.
5. analyze localization and navigation of robotic systems.

UNIT-I

Robots and Controllers: Introduction to robotics, types, applications, Mobile Robots, embedded Controllers, Interfaces, Operating System, central Processing Unit, Logic Gates, Function Units, Registers and Memory.

UNIT-II

Sensors: Definition, Sensor Categories, Binary Sensor, Analog versus Digital Sensors, Shaft Encoder, A/D Converter, Position Sensitive Device, Compass, Digital Camera.

UNIT-III

Actuators and Control: DC Motors, H-Bridge, Pulse Width Modulation, Stepper Motors, Servos, On-Off Control, PID Control, Velocity Control and Position Control.

UNIT-IV

Classification of robots: Single Wheel Drive, Differential Drive, track robot, Omni-Directional Drive, Inverted Pendulum Robot, Double Inverted Pendulum, Walking Robots.

UNIT-V

Localization and Navigation: Localization, Probabilistic Localization, Coordinate Systems, Environment Representation, Visibility Graph, Voronoi Diagram, Potential Field Method.

Text Book

1. Thomas Braunl, "Embedded Robotics: Mobile Robot Design and Applications with Embedded Systems", 3rd edition, Springer publications, 2008

References

1. Saeed Niku, "An Introduction to Robotics Analysis, Control, Applications", 2 edition, John Wiley and Sons, Inc., 2011.
2. "Industrial Robotics -Technology, Programming and Applications (SIE)" | 2nd Edition, McGraw Hill Education,2007.
3. James G. Keramas, "Robot Technology Fundamentals", Cengage Publications, 2009.

DESIGN PATTERNS

BTech (AI) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57073	PEC-IV/V	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. To Apply the suitable design patterns to refine the basic design for given context.

Course Outcomes

At the end of this course, students will be able to:

1. Identify the appropriate design patterns to solve object-oriented design problems.
2. Develop design solutions using creational patterns.
3. Apply structural patterns to solve design problems.
4. Construct design solutions by using behavioral patterns.

UNIT-I

Introduction: What Is a Design Pattern? Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

UNIT-II

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

Structural Pattern Part-I: Adapter, Bridge and Composite

UNIT-III

Structural Pattern Part-II: Decorator, Facade, Flyweight, Proxy

Behavioral Patterns Part-I: Chain of Responsibility, Command, Interpreter, and Iterator.

UNIT-IV

Behavioral Patterns Part-II: Mediator, Memento, Observer.

Behavioral Patterns Part-III: State, Strategy, Template Method, Visitor, and Discussion of Behavioral Patterns.

UNIT-V

A Case Study: Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary.

Text Book

1. Gamma, Helm, Johnson, and Vlissides. “Design Patterns: Elements of Reusable Object-Oriented Software”, Addison-Wesley,1994

References

1. Eric Freeman, Bert Bates. “Head First Design Patterns (A Brain Friendly Guide)”, O’Reilly; 1st edition,2004
2. Mark Grand, “Patterns in JAVA”, Vol-I, Wiley DreamTech,2002.
3. Mark Grand, “Patterns in JAVA”, Vol-II, Wiley DreamTech,1999.
4. Mark Grand, “JAVA Enterprise Design Patterns”, Vol-III, Wiley DreamTech,2001.

BLOCKCHAIN TECHNOLOGY

BTech (AI) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57074	PEC-IV/V	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. To provide conceptual understanding of the function of Blockchain as a method of securing distributed ledgers.
2. To understand the structure of a Blockchain and why/when it is better than a simple distributed database.

Course Outcomes

At the end of this course, students will be able to:

1. Explain the fundamentals of Blockchain.
2. Understand Public Blockchain System.
3. Interpret Private Blockchain System.
4. Learn Smart Contracts.
5. Understand Application and Limitation of Blockchain.

UNIT-I

Fundamentals of Blockchain: Origin of Blockchain, Blockchain Solution, Components of Blockchain, Block in a Blockchain, The Technology and the Future.

Blockchain Types and Consensus Mechanism: Decentralization and Distribution, Types of Blockchain, Consensus Protocol.

UNIT-II

Cryptocurrency: Bitcoin and the Cryptocurrency, Cryptocurrency Basics, Types of Cryptocurrencies, Cryptocurrency Usage.

Public Blockchain System: Public Blockchain, Popular Public Blockchains, The Bitcoin Blockchain, Ethereum Blockchain

UNIT-III

Private Blockchain System: Key Characteristics of Private Blockchain, Why We Need Private Blockchain, Private Blockchain Examples, Private Blockchain and Open Source, E-commerce Site Example, Various Commands (Instructions) in E-commerce Blockchain, Smart Contract in Private Environment, State Machine, Different Algorithms of Permissioned Blockchain, Byzantine Fault, Multichain.

UNIT-IV

Smart Contracts: Smart Contract, Characteristics of a Smart Contract, Types of Smart Contracts, Types of Oracles, Smart Contracts in Ethereum, Smart Contracts in Industry.

Consortium Blockchain: Key Characteristics of Consortium Blockchain, Why We Need Consortium Blockchain, Hyperledger Platform, Overview of Ripple, Overview of Corda.

UNIT-V

Application of Blockchain: Blockchain in Banking and Finance, Blockchain in Education, Blockchain in Energy, Blockchain in Healthcare, Blockchain in Real-estate, Blockchain in Supply Chain, The Blockchain and IoT.

Limitations and Challenges of Blockchain: Blockchain Implementation – Limitations, Blockchain Implementation – Challenges

Text Book

1. Chandramouli Subramanian, Asha A George, Abhilash K A and Meena Karthikeyan, "Blockchain Technology", Universities Press,2020.

References

1. Andreas Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly,2014.
2. Melanie Swan, "Blockchain Blueprint for a New Economy", O'Reilly, 2015.
3. Andreas, "Mastering Bitcoin: Programming the Open Blockchain, Antonopoulos", M. O'Reilly, 2017.

CYBER SECURITY

BTech (AI) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57075	PEC-IV/V	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. Analyze Cryptography, DNS and Windows security principles.
2. Analyze different attacking techniques of intruder.
3. Apply different exploitation techniques to gain access.
4. Interpret web exploitation tools and attacks.
5. Summarize defense mechanisms and forensics

Course Outcomes

At the end of this course, students will be able to:

1. Learn the fundamentals of cyber security.
2. Identify different types of attacks and motives of attack
3. Learn different exploitation methods to gain access
4. Understand web exploit tools, statistics and social Engineering attacks
5. Understand different defense and Analysis techniques

UNIT-I

Cyber security Fundamentals: Information Assurance Fundamentals, Basic Cryptography, Symmetric Encryption, Public Key Encryption, The Domain Name System (DNS), Firewalls. AI for cybersecurity and cybersecurity for AI .AI systems' support to cybersecurity .AI malicious uses

UNIT-II

Attacker Techniques and Motivations: How Hackers Cover Their Track, Tunneling Techniques, Fraud Techniques: Phishing, Smishing, Vishing, and Mobile Malicious Code, Rogue Antivirus, Click Fraud. Threat Infrastructure: Botnets, Fast-Flux, Advanced Fast-Flux.

UNIT-III

Exploitation: Techniques to Gain a Foothold: Stack-Based Buffer Overflows, Stacks upon Stacks, Crossing the Line, Protecting against Stack-Based Buffer Overflows.

SQL Injection: Protecting against SQL Injection, Conclusion.

Malicious PDF Files: PDF File Format, Creating Malicious PDF Files, Reducing the Risks of Malicious PDF File

UNIT-IV

Web Exploit Tools: Features for Hiding, Commercial Web Exploit Tools and Services Updates, Statistics, and Administration, Proliferation of Web Exploit Tools Despite Protections, DoS Conditions, Brute Force and Dictionary Attacks, Cross-Site Scripting (XSS)

UNIT-V

Defense and Analysis Techniques: Memory Forensics, Honeypots, Malicious Code Naming, Automated Malicious Code Analysis Systems: Passive Analysis, Active Analysis, Physical or Virtual Machines. Intrusion Detection Systems

Text Books

1. James Graham, Richard Howard, Ryan Olson "Cyber Security Essentials", Taylor and Francis Group, LLC,2011
2. Lorenzo Pupillo Stefano Fantin Afonso Ferreira Carolina Polito, "Artificial Intelligence and Cybersecurity", CEPS,2021

References

1. Thomas A. Johnson, "Cyber Security", Taylor & Francis Group, LLC,2015
2. Marjie T. Britz, "Computer Forensics and Cyber Crime - An Introduction", third edition, Pearson Education,2013

CYBER FORENSICS

BTech (AI) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57063	PEC-IV/V	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. Create a document review, retention, and destruction policy.
2. Write an acceptable use policy and employer privacy statement.
3. List and describe the generally accepted computer forensic procedures.
4. Explain and list the various legislation and regulations that impact technology.
5. Analyze forensic analysis reports

Course Outcomes

At the end of this course, students will be able to:

1. Perform a forensic investigation by following guidelines to secure the crime or corporate scene.
2. Learn what legal issues are involved and what rights the person of interest has.
3. Perform digitally and court approved images of evidence to be used in a court of law.
4. Learn how to document and store evidence.
5. Learn how to analyze evidence using commercial forensic software and also how to create a report of the said evidence.

UNIT-I

Computer Forensics and Investigations: What is computer Forensics? Use of computer forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceeding, Computer Forensics services, Benefits of Professional Forensics Methodology, Steps taken by Computer Forensics Specialists.

Types of Computer Forensics Technology: Types of Military Computer Forensic Technology, Types of law Enforcement-Computer forensic Technology.

UNIT-II

Computer Forensics Evidence and capture: Data Recovery Defined Data Backup and Recovery, The Role of Back-up in Data Recovery, The Data Recovery Solution

Evidence Collection and Data Seizure: Why Collection Evidence? Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, General Procedure, Collection and Archiving, Methods of Collection, Artifacts, Collection Steps.

UNIT-III

Controlling Communication: The Chain of Custody duplication and Preservation of Digital Evidence, Preserving the Digital Crime Scene, Computer Evidence Processing Steps, Legal Aspects of Collection and Preserving Computer Forensics Evidence.

Computer Image Verification and Authentication: Special Needs of Evidential Authentication

Computer Forensics analysis and validation: Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions

UNIT-IV

Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics using network tools.

Processing Crime and Incident Scenes: Identifying Digital Evidence, Collecting the Evidence in Private-Sector Incident Scenes, Processing law Enforcement Crime Scenes,

Preparing for a Search, securing a Computer Incident or Crime Scene, Storing Digital evidence, obtaining a Digital Hash.

UNIT-V

E-mail Investigations: Exploring the Role of E-mail in Investigations, Exploring the Role of Client and Server in E-mail, Investigating Email Crimes and Violations, Understanding Email Servers, Using Specialized Email Forensics Tools,

Mobile Device Forensics: Understanding Mobile Device Forensics, Understanding Acquisition Procedure for Cell Phones and Mobile Devices

Text Books

1. John R. Vacca, “Computer Forensics, Computer Crime Investigation, firewall Media”, New Delhi,2005
2. Nelson, Phillips Enfinger, Steuart, “Computer Forensics and Investigations”, Cengage Learning.2009

References

1. Keith J. Jones, Richard Bejthich, Curtis W Rose, “Real Digital Forensics”, Addison Wesley Pearson Education.2006
2. Tony Sammes and Bairn Jenkinson, “Forensic Compiling A Practitioner’s Guide”,

Springer International edition.2013

3. Christopher L. T. Brown, “Computer Evidence Collection & Presentation, Firewall Media”. 2005

NATURAL LANGUAGE PROCESSING LAB

<table>
<tr><td colspan="3">BTech (AI) IV Year I Semester</td><td colspan="4">Dept. of Artificial Intelligence</td></tr>
<tr><th>Code</th><th>Category</th><th>Hours / Week</th><th>Credits</th><th colspan="3">Marks</th></tr>
<tr><td rowspan="2">A57215</td><td rowspan="2">PCC Lab</td><td>L | T | P</td><td>C</td><td>CIE</td><td>SEE</td><td>Total</td></tr>
<tr><td>0 | 0 | 4</td><td>2</td><td>50</td><td>50</td><td>100</td></tr>
</table>

List of Programs

1. Python program for splitting a sentence into words and count the number of times a word is repeated
2. Write a Python Program to demonstrate match (), search () and sub () functions of Regular Expressions.
3. Perform morphological analysis of given text using python, identify and remove the stopwords.
4. Implement N gram language model.
5. Write a Python program to search a Treebank to find sentential components.
6. Write a Python program to extract features from text.
7. Write a Python program to write a context-free grammar for a small fragment of English and test the grammar using a CFG parser.
8. Write a Python program that accepts as input two or three different sentences (each sentence having a different connotation) and perform word sense disambiguation.
9. Write a Python program to specify a feature structure and identify the semantic roles.
10. Write a Python program to translate predictive argument formulae.
11. Write a Python program to perform selectional restrictions on a feature structure.

DEEP LEARNING LAB

BTech (AI) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57216	PCC-Lab	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

List of Programs

1. Implementation of Linear Regression
2. Deep learning Packages Basics: TensorFlow, Keras and PyTorch
3. Implementation of Neural network
4. Face recognition using CNN
5. Sentiment Analysis using LSTM
6. Language Modeling using RNN
7. Sentiment Analysis using GRU
8. Image Classification with Transfer Learning

TECHNICAL AND BUSINESS COMMUNICATION SKILLS

BTech (AI) IV Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58001	OEC-II	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Introduction

The course is intended to expose the students to learn and practice the five communication skills: thinking, listening, speaking, reading, and writing in English, the global language of communication. It reflects some of the approaches in English language teaching and learning currently in practice around the world.

Course Objectives

To help the students to develop effective communication skills in all communicative contexts for professional advancement

Course Outcomes

At the end of this course, students will be able to:

1. communicate technical and business correspondence
2. reflect on the themes discussed
3. recognize ethical implications of technical communication in professional contexts
4. identify the contemporary issues in engineering from environmental, societal, economic, and global perspectives
5. demonstrate ethical decisions in complex situations

UNIT-I

E-World & E-Communication

E-language, E-governance, E-commerce/E-business, E-banking, E-waste

UNIT-II

Business Establishment & Infrastructure Development

Power Supply, Industrial Park, Business Correspondence, Follow-up letters, Acceptance & Rejections, Persuasive letters, Resignation letters

UNIT-III

Technology and Society

Robot Soldiers, For a Snapshot of a Web, Placing an order, Proposal Writing, Patents & Rights (National & International), Intellectual Property, Nanotechnology

UNIT-IV

Ethics in Business Communication

Ethical issues involved in Business Communication, Ethical dilemmas facing managers, Ethical Code & Communication, Standards in Daily Life, Total Quality Management, World University Ranking

UNIT-V

Management Information System

Corporate Governance, Business Process Outsourcing, Project Management Communication, Marketing Communication

Text Book

1. S P Dhanavel, "English and Communication Skills for Students of Science and Engineering", Orient Black Swan. 2009.

References

1. Meenakshi Raman & Prakash Singh, "Business Communication", (Second Edition), Oxford University Press. 2012.
2. Sanjay Kumar & Pushp Lata, "Language and Communication skills for Engineers", Oxford University Press. 2018.
3. Anjali Kalkar, et.al., "Business Communication", Orient Black Swan. 2010.
4. Paul V. Anderson, "Technical Communication", Cengage. 2014.
5. Charles W. Knisely & Karin I. Knisely, "Engineering Communication", Cengage. 2015.

DIGITAL MEDIA LITERACY

BTech (AI) IV Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58019	OEC-II	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

1. prepare the students to use media source and its content
2. train the students become media literate
3. provide practical tips for incorporating media literacy into the traditional curriculum

Course Outcomes

At the end of the course the student will be able to:

1. use media as a learning tool
2. share knowledge in digital media
3. apply the use of persuasive language
4. exhibit copy writing skills
5. contribute their ideas through blogs

UNIT-I

Introduction, Diversity and Media:

Bias in the Media, Peer Driven Social Learning Communities, Social Learning Spaces,

Mirrored Learning Words, Online Events, The Nitty, Gritties

UNIT-II

Digital Literacy in Action:

Internet Safety and Filtering, Establish Proficiency of Tagging

UNIT-III

Blogging:

Basics of Blog Writing, Foundations of Blogging, Blogs as Professional Development Tool, Blogs as a Learning Tool, Creating Knowledge Habitats

UNIT-IV

The Classroom:

A Market place for Learning, Build an Electronic Calendar-Paper less News Paper, Marketing through social media, Writing Techniques

UNIT-V

Gaming as a Literacy:

How Video games promote Learning? Participatory Culture and Engagement, Collaboration and Cooperation, Motivation

Text Book

1. Jacobs, Hayes Heidi. “Media Literacy”, Solution Tree Press: USA.

References

1. Hobbs Renee R.Create, “To Learn: Introduction To Digital Literacy”, Wiley-Blackwell
2. Publications.
3. Frank, W. Baker. “Media Literacy in the K-12 Classroom”, (2nd Edition.). Paperback Publications.
4. Hertz, Mary. Beth. “Digital and Media Literacy in the Age of the Internet: Practical Classroom Applications”, Rowman & Littlefield Publishers.
5. Hobbs Renee R. “Digital and Media Literacy”, Sage Publications.
6. Potter, W. James. “Introduction to Media Literacy”, Sage Publications.

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

BTech (AI) IV Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58022	OEC-II	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

1. To explain the fundamentals of the key elements of a business organization.
2. To learn practical approach to various functional areas of decision making.
3. To Compare different Pricing Strategies.
4. To enhance a knowledge of Capital Budgeting Techniques.
5. To solve the problems using Rations analysis.

Course Outcomes

At the end of this course, students will be able to:

1. Describe the concept of demand and its determinants in Managerial decisions.
2. Analyze the cost concepts and breakeven analysis in production.
3. Evaluate the market structures and different Pricing Strategies.
4. Apply the capital budgeting techniques in financial decisions.
5. Application of Ratios in solving business problems and taking correct decisions.

UNIT-I

Introduction to Managerial Economics: Definition, Nature and scope of Managerial Economics, Demand Analysis- Demand Determinants, Law of Demand and its exceptions.

Elasticity of Demand: Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Methods of Demand Forecasting (Survey Methods, Statistical Methods, Expert Opinion Method, Test Marketing, Controlled Experiments, Judgmental Approach to Demand Forecasting)

UNIT-II

Theory of Production and Cost Analysis: Production Function – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs.

Cost Analysis: Cost concepts, Opportunity Cost, Out of Pocket Costs vs. Imputed Costs. Breakeven Analysis (BEA) – Determination of Breakeven Point (simple problems), Managerial Significance and limitations of BEA.

UNIT-III

Market Structures& Pricing Policies:

Market structures: Types of Competition, Features of Perfect Competition, Monopoly and Monopolistic Competition, Price - Output determination in Perfect Competition and monopoly.

Objectives and Policies of Pricing: Objectives of pricing, Methods of Pricing - Cost Plus Pricing, Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, Limit Pricing, Market Skimming Pricing, Penetration Pricing, Two - Part Pricing, Block Pricing, Peak Load Pricing, Cross Subsidization.

UNIT-IV

Introduction to Financial Accounting: Accounting, Double-Entry Book Keeping, Journal, Ledger, and Trial Balance, Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

UNIT-V

Financial Analysis through ratios: Computation, Analysis and Interpretation of Liquidity Ratios (Current Ratio and Quick Ratio), Activity Ratios (Inventory Turnover Ratio and Debtor Turnover Ratio), Capital Structure Ratios (Debt – Equity, Interest Coverage Ratio), and Profitability Ratios (Gross Profit Ratio, Net Profit Ratio, Operating Profit Ratio, P/E Ratio and EPS).

Text Books

1. Varshney & Maheshwari, "Managerial Economics", Sultan Chand& Sons, 2014.
2. S.A. Siddiqui and A.S. Siddiqui, "Managerial Economics and Financial Analysis", New Age International Publishers, Hyderabad, 2013

References

1. R. K. Sharma & Shashi K Gupta, "Financial and Management Accounting", 4th Ed., Sultan Chand.
2. V. Rajasekaran & R. Lalitha, "Financial Accounting", Pearson Education, New Delhi, 2010.
3. Domnick Salvatore, "Managerial Economics in a Global Economy", 4th Edition, Cengage, 2009.
4. Subhash Sharma & M. P. Vittal, "Financial Accounting for Management, Text & Cases", Machmillan, 2012.
5. S. N. Maheshwari & S. K. Maheshwari, "Financial Accounting", Vikas 2012.
6. Truet and Truet, "Managerial Economics; Analysis, Problems and Cases", Wiley, 2012.
7. Dwivedi, "Managerial Economics", Vikas 2012.

8. M. Kasi Reddy and S.Saraswathi, "Managerial Economics and Financial Accounting", PHI, 2012.
9. Erich A. Helfert, "Techniques of Financial Analysis", Jalco, 2007.

NEGOTIATION SKILLS

<table>
<tr><td colspan="5">BTech (AI) IV Year II Semester</td><td colspan="4">Dept. of Artificial Intelligence</td></tr>
<tr><th>Code</th><th>Category</th><th colspan="3">Hours / Week</th><th>Credits</th><th colspan="3">Marks</th></tr>
<tr><td rowspan="2">A58005</td><td rowspan="2">OEC-III</td><td>L</td><td>T</td><td>P</td><td>C</td><td>CIE</td><td>SEE</td><td>Total</td></tr>
<tr><td>2</td><td>1</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
</table>

Course Objectives

1. To familiarize the students with various negotiation approaches and styles.
2. Understand & develop effective strategies for each stage of a negotiation
3. Identify Cross – cultural challenges that arise in negotiations
4. Enhance communication skills, emphasizing effective listening, persuasion & relationship building
5. Strengthen creative ability to expand the option for resolving a dispute.

Course Outcomes

At the end of the course students will be able to

1. Describe negotiation theories, concepts and tactics to manage negotiations
2. Explain the importance of various factors impacting negotiations.
3. Apply effective negotiation strategies and tactics for different scenarios
4. Identify negotiation practices towards building relationships
5. Evaluate various conflict resolution strategies.

UNIT-I

Introduction to Negotiation: Introduction, Concept of Negotiation, Characteristics of a Negotiating Situation, Basic Negotiation Skills, Interpersonal Skills in Negotiation, Theories of Negotiation.

UNIT-II

Types of Negotiation: Types of Negotiation, Principles of Negotiation, Steps of Negotiation, Win-Win Negotiation, Negotiation Tactics, Factors Affecting Success in Negotiation.

UNIT-III

Strategies of Negotiation: Fundamentals of Negotiation, Effective Strategies to develop Negotiation Skills, Anchoring / BATNA, Process of Negotiation and Negotiation Phases.

UNIT-IV

Improving Negotiation skills: Enhancing Communication skills for effective Listening, Persuasion & Relationship Building, establishing Trust-Building Relationships.

UNIT-V

Managing Negotiation: Managing Different Types of Negotiations, Cross –Cultural Challenges in Negotiations, Industrial Negotiation: Collective Bargaining, Arbitration, Origins of Conflict, Dispute Resolution.

Text Books

1. Fredluthans, Organisational Behavior, 9th ed, Prentice Hall.
2. Roger Fischer, Essentials of Negotiations, Harward Business School Press.

References

1. Beverly DeMarr and Suzanne De Janasz, Negotiation and Dispute Resolution, Prentice Hall, 2013.
2. Roy J Lewicki, Bruce Barry, and David M Saunders, Essentials of Negotiation, 5th Edition, McGraw Hill, 2011
3. Malhotra, Deepak, Negotiating the Impossible: How to Break Deadlocks and Resolve ugly Conflicts (without money or muscle). Oakland, CA: Berrett-Koehler Publishers, 2016.
4. Fatima, Shaheed; Kraus, Sarit; Wooldridge, Michael, Principles of Automated Negotiation. Cambridge, UK; New York: Cambridge University Press, 2015.
5. Subramanian, Guhan, Dealmaking: New Dealmaking Strategies for a Competitive Marketplace. New York: W. W. Norton & Company, 2011.

PROJECT MANAGEMENT

BTech (AI) IV Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58008	OEC-III	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

1. To understand the concept of Project Management.
2. To know about the different approaches to project screening and planning.
3. To explain about the factors of risk involved in project execution.
4. To understand about team leading and functional cooperation.
5. To know about the project performance and future trends in the project management.

Course Outcomes

At the end of this course, students will be able to:

1. Explain about the life cycle and other concepts of Project Management.
2. Apply different approaches to project screening and planning
3. Analyze different risk factors in project execution
4. Estimate how to lead a team, to get functional cooperation
5. Build performance evaluation reports and future trends in project management.

UNIT-I

Introduction: Meaning, Need, Principles Project Lifecycle and its Phases, Project Management Research in brief, Project Management today, Organization strategy and structure and culture, Format of organization structure, Stake holder Management, Organization Culture, creating a culture for Project Management.

UNIT-II

Project Identification and Planning: Defining the project, Project Identification Process, Approaches to Project Screening and Selection, Project Planning, Work Breakdown Structure, Financial Module, Getting Approval and Compiling a Project Charter, setting up a Monitoring and Controlling Process.

UNIT-III

Project Execution: Initiating the Project, Controlling and Reporting Project Objectives, conducting project evaluation, Risk, Risk Management Factors, Project Management, Four Stage Process, Risk Management an Integrated Approach, Cost Management, Creating a Project Budget.

UNIT-IV

Leading Project Teams: Building a Project Team, Characteristics of an effective Project Team, achieving Cross- Functional Co-operation, Virtual Project Teams, Conflicts Management, Negotiations.

UNIT-V

Performance Measurement and Evaluation: Monitoring Project Performances, Project Control Cycles, Earned Value Management, Human factors in Project Evaluation and Control, Project Termination, Types of Project Terminations, Project Follow-up. Current and Future Trends in Project Management.

Text Book

1. Gray, Larson, Project Management, Tata McGraw Hill, 2015
2. Jeffery K. Pinto, Project Management, Pearson Education, 2015

References

1. Enzo Frigenti, Project Management, Kogan, 2015
2. R. Panneerselvam & P. Senthil Kumar, Project Management, PHI, 2015
3. Thomas M. Cappels, Financially Focused Project Management, SPD, 2008.

VALUE ENGINEERING

BTech (AI) IV Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58010	OEC-III	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

1. To understand the concept of value engineering in productivity
2. To understand the different phases of value engineering projects
3. To learn the various decision alternatives
4. To learn value engineering in non-hardware projects
5. To identify the value engineering team and coordinate in different services

Course Outcomes

At the end of this course students will be able to:

1. Apply the importance of value engineering concepts in productivity
2. Analyze the different phases of value engineering projects
3. Evaluate the different decision alternatives and choose the best alternative for optimization
4. Determine the value engineering concept in non-hardware projects and programmes
5. Analyze the value engineering teams with the help of case study.

UNIT-I

Introduction: Value engineering concepts, advantages, applications, problem recognition, and role in productivity, criteria for comparison, element of choice. Level of value engineering in the organization, unique and quantitative evaluation of ideas.

UNIT-II

Value Engineering and Job Plan: Introduction, orientation, information phase, speculation phase analysis phase. Selection and Evaluation of value engineering projects, Project selection, methods selection, value standards, application of value engineering methodology

UNIT-III

Value Engineering Techniques: Selecting Products and Operation for Value Engineering action, Value Engineering Programmes, Decision Making for Optimum Alternative, Use of Decision Matrix, Make or Buy, Measuring Profits, Reporting Results, Follow up, Use of advanced techniques like Function Analysis System.

UNIT-IV

Versatility Of Value Engineering: Value engineering operation in maintenance and repair activities, Value Engineering in non-Hardware Projects. Initiating a Value Engineering Programme

UNIT-V

Value Engineering Level of Effort: Value Engineering Team, Co-coordinator, Designer, different Services, Construction Management Contracts, Value Engineering Case Studies.

Text Books

1. Anil Kumar Mukhopadhyaya, "Value Engineering: Concepts Techniques and applications", SAGE Publications 2010.
2. Del L. Younker, "Value Engineering analysis and methodology", Marcel Dekker Inc, New York, 2004

References

1. Alphonse Dell'Isola, "Value Engineering: Practical Applications for Design, Construction, Maintenance & Operations", R S Means Co., 1997
2. Richard Park, "Value Engineering: A Plan for Invention", St. Lucie Press, 1999.
3. Miles, L.D., "Techniques of Value Analysis and Engineering", Second Edition, McGraw Hill 1989.
4. Khanna, O.P., "Industrial Engineering and Management", Dhanpat Rai & Sons, 1993.
5. Anil Kumar Mukhopadhyaya, "Value Engineering Mastermind: From concept to Value Engineering Certification", SAGE Publications, 2003.

BIG DATA

BTech (AIML) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57068	PEC-III	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. To understand the concepts of big data and hadoop
2. To understand mapreduce concepts
3. To perform data analysis with pig tool and to perform high volume ingestion into Hadoop of event-based data
4. To create and load data into HIVE tables
5. To create Resilient distributed datasets

Course Outcomes

At the end of this course, students will be able to:

1. Work with hadoop distributed file system
2. Develop map reduce based applications
3. Perform data analysis using pig tool
4. To use hive tool for data analysis
5. Big Data processing using SPARK

UNIT-I

Big Data: characteristics of big data, Applications of Big Data, comparison with other systems, data analysis with Hadoop, scaling out, data flow, combiner functions, Hadoop streaming. HDFS, Design of HDFS, HDFS concepts-blocks, name node and data node, clock caching, HDFS federation, HDFS high availability, failover and fencing, the command line interface, Basic file system operations, Hadoop filesystems, Data flow, Anatomy of a file write, Parallel Copying with distcp, Keeping an HDFS Cluster Balanced

UNIT-II

YARN: Anatomy of a YARN Application Run, resource requests, application lifespan, YARN Compared to MapReduce 1, Scheduling in YARN, scheduler options, Anatomy of a MapReduce Job Run.

UNIT-III

Pig: Comparison with Databases, Pig Latin-Structure, Statements, Expressions, Types, Schemas, Functions, Macros, User-Defined Functions- A Filter UDF, An Eval UDF, A Load UDF; Data Processing Operators- Loading and Storing Data, Filtering Data, Grouping and Joining Data, Sorting Data, Combining and Splitting Data, Pig in Practice Parallelism, Anonymous Relations, Parameter Substitution

Flume: working with flume, Transactions and Reliability, The HDFS Sink, Fan Out, Distribution

UNIT-IV

Hive: HiveQL- Data Types, Operators and Functions, Tables-Managed Tables and External Tables, Partitions and Buckets, Storage Formats, Importing Data, Altering Tables, Dropping Tables, Querying Data- Sorting and Aggregating, MapReduce Scripts, Joins, Sub queries, Views User-Defined Functions, Partitioning -static and dynamic

Sqoop: Sqoop Connectors, import, generated code, Working with Imported Data, Exports

UNIT-V

Spark: Resilient Distributed Datasets- Creation, Transformations and Actions, Persistence, Serialization, Shared Variables, Anatomy of a Spark Job Run--Job Submission, DAG Construction, Task Scheduling, Task Execution; Executors and Cluster Managers

HBase: HBasics, Concepts, HBase Versus RDBMS, Building an Online Query Application

Text Book

1. Tom White, “Hadoop: The Definitive Guide: Storage and Analysis at Internet Scale”, 4/e, O'Reilly

References

1. Seema Acharya, Subhashini Chellappan, “Big Data and Analytics”, Wiley India Pvt. Ltd

DEEP LEARNING

BTech (AIML) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57056	PCC	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

1. To advance in training techniques for neural networks
2. To understand various CNN Architectures
3. To understand various RNN Methodologies
4. To custom train Autoencoder Models and implement them.
5. To apply Transfer Learning to solve problems

Course Outcomes

At the end of this course, students will be able to:

1. Have a good understanding of the fundamental issues and basics of deep learning
2. Understand the concept of CNN to apply it in the Image classification problems
3. Learning and understanding the working of various RNN methods
4. Learning and understanding the working of various Autoencoders methods
5. Use Transfer Learning to solve problems with high dimensional data including image and speech

UNIT-I

Deep Learning: Fundamentals, Introduction, Building Block of Neural Networks, Layers, MLPs, Forward pass, backward pass, class, trainer and optimizer, The Vanishing and Exploding Gradient Problems, Difficulties in Convergence, Local and Spurious Optima, Preprocessing, Momentum, learning rate Decay, Weight Initialization, Regularization, Dropout, SoftMax, Cross Entropy loss function, Activation Functions.

UNIT-II

CNN: Introduction, striding and padding, pooling layers, structure, operations and prediction of CNN with layers, CNN -Case study with MNIST, CNN VS Fully Connected

UNIT-III

RNN: Handling Branches, Layers, Nodes, Essential Elements-Vanilla RNNs, GRUs, LSTM

UNIT-IV

Autoencoders: Denoising Autoencoders, Sparse Autoencoders, Deep Autoencoders, Variational Autoencoders, GANS

UNIT-V

Transfer Learning: Types, Methodologies, Diving into Transfer Learning, Challenges

Textbooks

1. Seth Weidman, “Deep Learning from Scratch”, O'Reilly Media, Inc., 2019
2. Ian Goodfellow, Yoshua Bengio and Aaron Courville, “Deep Learning”, MIT Press, 2015
3. Dipanjan Sarkar, Raghav Bali, “Transfer Learning in Action”, Manning Publications, 2021

References

1. Giancarlo Zaccone, Md. Rezaul Karim, Ahmed Menshawy "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017.
2. Antonio Gulli, Sujit Pal, "Deep Learning with Keras", Packt Publishers, 2017.
3. Francois Chollet, "Deep Learning with Python", Manning Publications, 2017.

NATURAL LANGUAGE PROCESSING

BTech (AIML) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57061	PEC-III	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. To learn the fundamentals of Natural Language Processing
2. To understand the semantic aspects and similarity measures
3. To understand the aspects of context-free grammar and perform parsing
4. To understand and identify different word senses and find their relationship
5. To apply the NLP techniques in understanding discourses

Course Outcomes

At the end of this course, students will be able to:

1. Solve problems involving regular expressions and N grams
2. Evaluate Vector models
3. Perform parsing operations
4. Build and analyze applications with semantic roles involving selectional restrictions
5. Utilize NLP learning algorithms in understanding a discourse

UNIT-I

Regular Expressions: Regular Expressions, Corpora, Text Normalization, Minimum Edit Distance

Ngram Models: Ngrams, Evaluating Language models, Generalization, Smoothing

UNIT-II

Lexical Semantics, Vector semantics, Words and Vectors, Cosine for measuring similarity, TF-IDF, PMI

Visualizing Embeddings, Semantic Properties of Embeddings, Bias and Embeddings

UNIT-III

Constituency Grammar: Constituency, Context free grammar, Grammar Rules for English, Treebanks, Grammar Equivalence and Normal Form, Lexicalized Grammar

Parsing: Ambiguity, CKY Parsing

UNIT-IV

Word senses, Relation between senses, WordNet, Word Sense Disambiguation
Semantic Roles, Diathesis alternations, Problems with thematic roles, Proposition Bank, FrameNet, Semantic Role Labelling, Selectional Restrictions

UNIT-V

Coreference Resolution: Coreference Phenomena, coreference Tasks and datasets, Architecture of coreference algorithm, Gender bias in coreference

Discourse Coherence: Coherence Relation, Discourse Structure Parsing, Centering and Entity based Coherence, Representation model for local coherence, Global coherence

Text Books

1. Daniel Jurafsky, James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech", Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, "Natural Language Processing with Python", First Edition, OReilly Media, 2009

References

1. James Allen, "Natural Language Understanding", 2nd Edition, Benjamin, Cummings publishing company, 1995.
2. Rajesh Arumugam, Rajalingappaa Shanmugamani, "Hands-On Natural Language Processing with Python", Packt Publishing Ltd., 2018
3. Deepti Chopra, Nisheeth Joshi, Iti Mathur "Mastering Natural Language Processing with Python", First Edition, Packt Publishing, 2016

FUZZY LOGIC

BTech (AIML) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57069	PEC-III	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. To develop the fundamental concepts such as fuzzy sets, operations and fuzzy relations.
2. To lean about fuzzification of scalar variables and defuzzification of membership functions.
3. To learn three different inference methods for designing fuzzy rule-based systems.
4. To develop fuzzy decision making by introducing some concepts and also Bayesian decision methods
5. To learn different fuzzy classification methods.

Course Outcomes

At the end of this course, students will be able to:

1. Understand the basic ideas of fuzzy sets, operations and properties of fuzzy sets and also about fuzzy relations.
2. Understand the basic features of membership functions and perform fuzzification and defuzzification
3. Design a fuzzy rule-based system.
4. Combining fuzzy set theory with probability for handling random and non-random uncertainty and the decision-making process.
5. Solve real world problems using fuzzy C-Means clustering.

UNIT-I

Classical sets: Operations and properties of classical sets, Mapping of classical sets to the functions. Fuzzy sets - Membership functions, Fuzzy set operations, Properties of fuzzy sets.

Classical and Fuzzy relations: Cartesian product, crisp relations-cardinality, operations and properties of crisp relations. Fuzzy relations-cardinality, operations, properties of fuzzy relations, fuzzy Cartesian product and composition, Fuzzy tolerance and equivalence relations, value assignments and other formats of the composition operation.

UNIT-II

Fuzzification and Defuzzification: Features of the membership functions, various forms, fuzzification, defuzzification to crisp sets, l- cuts for fuzzy relations, Defuzzification to scalars. Fuzzy logic and approximate reasoning, other forms of the implication operation

UNIT-III

Fuzzy Systems: Natural language, Linguistic hedges, Fuzzy (Rule based) System, Aggregation of fuzzy rules, Graphical techniques of inference, Membership value assignments: Intuition, Inference, rank ordering, Fuzzy Associative memories

UNIT-IV

Fuzzy decision making: Fuzzy synthetic evaluation, Fuzzy ordering, Preference and consensus, Multi objective decision making, Fuzzy Bayesian, Decision method, Decision making under Fuzzy states and fuzzy actions, Intuitionistic Fuzzy sets, Interval Valued and Applications

UNIT-V

Fuzzy Classification: Classification by equivalence relations-crisp relations, Fuzzy relations, Cluster analysis, Cluster validity, C-Means clustering, Hard C-Means clustering, Fuzzy C-Means algorithm, Classification metric, Hardening the Fuzzy C-Partition

Text Book

1. Timothy J.Ross, “Fuzzy Logic with Engineering Applications”, 3rd edition, Wiley,2010.
2. Krassimir T. Atanassov, “Intuitionistic Fuzzy Sets - Theory and Applications”, Physica Verlag - Springer, 1999
3. George J.KlirBo Yuan, “Fuzzy sets and Fuzzy logic theory and Applications”, PHI, New Delhi,1995.

References

1. D.K. Prathihar, “Soft Computing Fundamentals and Applications”, 2007
2. S.N. Sivanandam, S.N. Deepa, “Principles of Soft Computing”, 3rd Edition, Wiley Publications, 2013.
3. S. Rajasekaran, G. A. Vijayalakshmi – “Neural Networks and Fuzzy logic and Genetic Algorithms, Synthesis and Applications”, PHI, New Delhi,2003.

SPEECH PROCESSING

BTech (AIML) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57070	PEC-III	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

The students will be able to

1. To learn about the source of sound and its Production process
2. To understand the Signal Processing and Analysis
3. To have an insight on the steps involved in Speech Recognition System Design
4. To learn about models and its implementation
5. To learn about Connected Word Models

Course Outcomes

After the completion of the course, the students will be able to

1. Understand the basic concepts of speech and fundamental signal processing
2. approaches.
3. Analyze various methods of Speech Recognition
4. Understand the coding techniques and Performance Analysis in speech Recognition
5. Apply statistical modeling techniques.
6. Understand the various models of continuous speech recognition system.

UNIT-I

Fundamentals of Speech:

Introduction, Speech Production Process, Representing speech in the Time and Frequency domains, Speech sounds and features, Approaches to Automatic Speech Recognition by Machine.

UNIT-II

Signal Processing and Analysis Methods for Speech Recognition:

Introduction, The Bank of Filters Front End Processor, Linear Predictive Coding Model

for Speech Recognition, Vector Quantization, Auditory-Based Spectral Analysis

Models, Encoder Decoder Model- Encoder Decoder Model with RNN.

UNIT-III

Speech Recognition System Design and Implementation:

Introduction, Applications of Source Coding Techniques, Template Training Methods, Performance Analysis and Recognition Enhancements, Template Adaptation to New Talkers, Discriminative Methods in Speech Recognition.

UNIT-IV

Implementation Hidden Markov Models:

Introduction, Discrete-Time Markov Processes, Extension to HMMs, The Three Basic Problems for HMMs, Types of HMMs, Comparisons of HMMs, Model Clustering and Splitting

UNIT-V

Speech Recognition Based on Connected Word Models:

Introduction, General Notation for the Connected Word Recognition problem, The Two-level Dynamic Programming Algorithm, Level Building Algorithm-Computation of the level Building Algorithm, One-Pass Algorithm, Segmental K-means Training Procedure.

Text Book

1. Lawrence Rabiner, Biing-Hwang Juang, "Fundamentals of Speech Recognition", Pearson Education
2. Daniel Jurafsky, James H Martin, "Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Pearson Education

References

1. Thomas F Quatieri, "Discrete-Time Speech Signal Processing – Principles and Practice", Pearson Education.
2. Claudio Becchetti, Lucio PrinaRicotti, "Speech Recognition", John Wiley and Sons

CLOUD COMPUTING

BTech (AIML) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57071	PEC-IV/V	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. This course provides an insight into cloud computing

Course Outcomes

After the completion of the course, the students will be able to,

1. Understand different Computing Paradigms.
2. Learn the fundamentals of Cloud Computing.
3. Understand various service delivery models of a cloud computing architecture. ·
4. Demonstrate the ways in which the cloud can be programmed and deployed
5. Identify applications that can deploy on a Cloud environment.

UNIT-I

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

UNIT-II

Cloud Computing Fundamentals: Motivation for Cloud Computing, Defining Cloud Computing, 5-4-3 Principles of Cloud computing, Cloud Ecosystem, Requirements for Cloud Services.

UNIT-III

Cloud Computing Architecture and Management: Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications on the Cloud, Managing the Cloud, Migrating Application to Cloud.

UNIT-IV

Cloud Deployment Models: Private cloud, Public Cloud, Community Cloud, Hybrid Cloud.

Cloud Service Models: Infrastructure as a Service, Platform as a Service, Software as a Service.

UNIT-V

Cloud Service Providers: EMC, Google, Amazon Web Services, Microsoft, Windows Azure, IBM, Cloud Models, IBM, Sales force.

Open-Source Support for Cloud: Open-Source Tools for IaaS, Open-Source Tools for PaaS, Open-Source Tools for SaaS.

Text Book

1. K. Chandrasekhran, "Essentials of cloud Computing", CRC press, 2014

References

1. Sandeep Bhowmik, "Cloud Computing", Cambridge University Press; First edition,2017
2. Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, "Cloud Computing: Principles and Paradigms", Wiley, 2011.
3. Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, "Distributed and Cloud Computing", Elsevier, 2012.
4. Tim Mather, Subra Kumaraswamy, Shahed Latif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance", O'Reilly, SPD, rp 2011.

EMBEDDED ROBOTICS

BTech (AIML) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57072	PEC-IV/V	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. To understand the different robotic modules.
2. To learn various sensors in robotic engineering.
3. To understand the different actuators and control units of robot.
4. To study and understand the different type of robots.
5. To analyze the localization and navigation of robotic systems.

Course Outcomes

At the end of this course, students will be able to:

1. analyze different robotics, robotic applications and their usage.
2. learn various sensors used in robotic technology.
3. identify and understand the characteristics of different actuators in robotics.
4. identify and understand the characteristics of different robotics.
5. analyze localization and navigation of robotic systems.

UNIT-I

Robots and Controllers: Introduction to robotics, types, applications, Mobile Robots, embedded Controllers, Interfaces, Operating System, central Processing Unit, Logic Gates, Function Units, Registers and Memory.

UNIT-II

Sensors: Definition, Sensor Categories, Binary Sensor, Analog versus Digital Sensors, Shaft Encoder, A/D Converter, Position Sensitive Device, Compass, Digital Camera.

UNIT-III

Actuators and Control: DC Motors, H-Bridge, Pulse Width Modulation, Stepper Motors, Servos, On-Off Control, PID Control, Velocity Control and Position Control.

UNIT-IV

Classification of robots: Single Wheel Drive, Differential Drive, track robot, Omni-Directional Drive, Inverted Pendulum Robot, Double Inverted Pendulum, Walking Robots.

UNIT-V

Localization and Navigation: Localization, Probabilistic Localization, Coordinate Systems, Environment Representation, Visibility Graph, Voronoi Diagram, Potential Field Method.

Text Book

1. Thomas Braunl, "Embedded Robotics: Mobile Robot Design and Applications with Embedded Systems", 3rd edition, Springer publications, 2008

References

1. Saeed Niku, "An Introduction to Robotics Analysis, Control, Applications", 2 edition, John Wiley and Sons, Inc., 2011.
2. "Industrial Robotics -Technology, Programming and Applications (SIE)" | 2nd Edition, McGraw Hill Education,2007.
3. James G. Keramas, "Robot Technology Fundamentals", Cengage Publications, 2009.

DESIGN PATTERNS

<table>
<tr><td colspan="3">BTech (AIML) IV Year I Semester</td><td colspan="5">Dept. of Artificial Intelligence</td></tr>
<tr><td>Code</td><td>Category</td><td colspan="3">Hours / Week</td><td>Credits</td><td colspan="3">Marks</td></tr>
<tr><td rowspan="2">A57073</td><td rowspan="2">PEC-IV/V</td><td>L</td><td>T</td><td>P</td><td>C</td><td>CIE</td><td>SEE</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
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Course Objectives

1. To Apply the suitable design patterns to refine the basic design for given context.

Course Outcomes

At the end of this course, students will be able to:

1. Identify the appropriate design patterns to solve object-oriented design problems.
2. Develop design solutions using creational patterns.
3. Apply structural patterns to solve design problems.
4. Construct design solutions by using behavioral patterns.

UNIT-I

Introduction: What Is a Design Pattern? Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

UNIT-II

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns

Structural Pattern Part-I: Adapter, Bridge and Composite

UNIT-III

Structural Pattern Part-II: Decorator, Facade, Flyweight, Proxy

Behavioral Patterns Part-I: Chain of Responsibility, Command, Interpreter, and Iterator.

UNIT-IV

Behavioral Patterns Part-II: Mediator, Memento, Observer.

Behavioral Patterns Part-III: State, Strategy, Template Method, Visitor, and Discussion of Behavioral Patterns.

UNIT-V

A Case Study: Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary.

Text Book

1. Gamma, Helm, Johnson, and Vlissides. "Design Patterns: Elements of Reusable Object-Oriented Software", Addison-Wesley,1994

References

1. Eric Freeman, Bert Bates. "Head First Design Patterns (A Brain Friendly Guide)", O'Reilly; 1st edition,2004
2. Mark Grand, "Patterns in JAVA", Vol-I, Wiley DreamTech,2002.
3. Mark Grand, "Patterns in JAVA", Vol-II, Wiley DreamTech,1999.
4. Mark Grand, "JAVA Enterprise Design Patterns", Vol-III, Wiley DreamTech,2001.

BLOCKCHAIN TECHNOLOGY

BTech (AIML) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57074	PEC-IV/V	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. To provide conceptual understanding of the function of Blockchain as a method of securing distributed ledgers.
2. To understand the structure of a Blockchain and why/when it is better than a simple distributed database.

Course Outcomes

At the end of this course, students will be able to:

1. Explain the fundamentals of Blockchain.
2. Understand Public Blockchain System.
3. Interpret Private Blockchain System.
4. Learn Smart Contracts.
5. Understand Application and Limitation of Blockchain.

UNIT-I

Fundamentals of Blockchain: Origin of Blockchain, Blockchain Solution, Components of Blockchain, Block in a Blockchain, The Technology and the Future.

Blockchain Types and Consensus Mechanism: Decentralization and Distribution, Types of Blockchain, Consensus Protocol.

UNIT-II

Cryptocurrency: Bitcoin and the Cryptocurrency, Cryptocurrency Basics, Types of Cryptocurrencies, Cryptocurrency Usage.

Public Blockchain System: Public Blockchain, Popular Public Blockchains, The Bitcoin Blockchain, Ethereum Blockchain

UNIT-III

Private Blockchain System: Key Characteristics of Private Blockchain, Why We Need Private Blockchain, Private Blockchain Examples, Private Blockchain and Open Source, E-commerce Site Example, Various Commands (Instructions) in E-commerce Blockchain, Smart Contract in Private Environment, State Machine, Different Algorithms of Permissioned Blockchain, Byzantine Fault, Multichain.

UNIT-IV

Smart Contracts: Smart Contract, Characteristics of a Smart Contract, Types of Smart Contracts, Types of Oracles, Smart Contracts in Ethereum, Smart Contracts in Industry.

Consortium Blockchain: Key Characteristics of Consortium Blockchain, Why We Need Consortium Blockchain, Hyperledger Platform, Overview of Ripple, Overview of Corda.

UNIT-V

Application of Blockchain: Blockchain in Banking and Finance, Blockchain in Education, Blockchain in Energy, Blockchain in Healthcare, Blockchain in Real-estate, Blockchain in Supply Chain, The Blockchain and IoT.

Limitations and Challenges of Blockchain: Blockchain Implementation – Limitations, Blockchain Implementation – Challenges

Text Book

1. Chandramouli Subramanian, Asha A George, Abhilash K A and Meena Karthikeyan, “Blockchain Technology”, Universities Press,2020.

References

1. Andreas Antonopoulos, “Mastering Bitcoin: Unlocking Digital Cryptocurrencies”, O’Reilly,2014.
2. Melanie Swan, “Blockchain Blueprint for a New Economy”, O’Reilly, 2015.
3. Andreas, “Mastering Bitcoin: Programming the Open Blockchain, Antonopoulos”, M. O’Reilly, 2017.

CYBER SECURITY

BTech (AIML) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57075	PEC-IV/V	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. Analyze Cryptography, DNS and Windows security principles.
2. Analyze different attacking techniques of intruder.
3. Apply different exploitation techniques to gain access.
4. Interpret web exploitation tools and attacks.
5. Summarize defense mechanisms and forensics

Course Outcomes

At the end of this course, students will be able to:

1. Learn the fundamentals of cyber security.
2. Identify different types of attacks and motives of attack
3. Learn different exploitation methods to gain access
4. Understand web exploit tools, statistics and social Engineering attacks
5. Understand different defense and Analysis techniques

UNIT-I

Cyber security Fundamentals: Information Assurance Fundamentals, Basic Cryptography, Symmetric Encryption, Public Key Encryption, The Domain Name System (DNS), Firewalls. AI for cybersecurity and cybersecurity for AI .AI systems' support to cybersecurity .AI malicious uses

UNIT-II

Attacker Techniques and Motivations: How Hackers Cover Their Track, Tunneling Techniques, Fraud Techniques: Phishing, Smishing, Vishing, and Mobile Malicious Code, Rogue Antivirus, Click Fraud. Threat Infrastructure: Botnets, Fast-Flux, Advanced Fast-Flux.

UNIT-III

Exploitation: Techniques to Gain a Foothold: Stack-Based Buffer Overflows, Stacks upon Stacks, Crossing the Line, Protecting against Stack-Based Buffer Overflows.

SQL Injection: Protecting against SQL Injection, Conclusion.

Malicious PDF Files: PDF File Format, Creating Malicious PDF Files, Reducing the Risks of Malicious PDF File

UNIT-IV

Web Exploit Tools: Features for Hiding, Commercial Web Exploit Tools and Services Updates, Statistics, and Administration, Proliferation of Web Exploit Tools Despite Protections, DoS Conditions, Brute Force and Dictionary Attacks, Cross-Site Scripting (XSS)

UNIT-V

Defense and Analysis Techniques: Memory Forensics, Honeypots, Malicious Code Naming, Automated Malicious Code Analysis Systems: Passive Analysis, Active Analysis, Physical or Virtual Machines. Intrusion Detection Systems

Text Books

1. James Graham, Richard Howard, Ryan Olson "Cyber Security Essentials", Taylor and Francis Group, LLC,2011
2. Lorenzo Pupillo Stefano Fantin Afonso Ferreira Carolina Polito, "Artificial Intelligence and Cybersecurity", CEPS,2021

References

1. Thomas A. Johnson, "Cyber Security", Taylor & Francis Group, LLC,2015
2. Marjie T. Britz, "Computer Forensics and Cyber Crime - An Introduction", third edition, Pearson Education,2013

CYBER FORENSICS

BTech (AIML) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57063	PEC-IV/V	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. Create a document review, retention, and destruction policy.
2. Write an acceptable use policy and employer privacy statement.
3. List and describe the generally accepted computer forensic procedures.
4. Explain and list the various legislation and regulations that impact technology.
5. Analyze forensic analysis reports

Course Outcomes

At the end of this course, students will be able to:

1. Perform a forensic investigation by following guidelines to secure the crime or corporate scene.
2. Learn what legal issues are involved and what rights the person of interest has.
3. Perform digitally and court approved images of evidence to be used in a court of law.
4. Learn how to document and store evidence.
5. Learn how to analyze evidence using commercial forensic software and also how to create a report of the said evidence.

UNIT-I

Computer Forensics and Investigations: What is computer Forensics? Use of computer forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceeding, Computer Forensics services, Benefits of Professional Forensics Methodology, Steps taken by Computer Forensics Specialists.

Types of Computer Forensics Technology: Types of Military Computer Forensic Technology, Types of law Enforcement-Computer forensic Technology.

UNIT-II

Computer Forensics Evidence and capture: Data Recovery Defined Data Backup and Recovery, The Role of Back-up in Data Recovery, The Data Recovery Solution

Evidence Collection and Data Seizure: Why Collection Evidence? Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, General Procedure, Collection and Archiving, Methods of Collection, Artifacts, Collection Steps.

UNIT-III

Controlling Communication: The Chain of Custody duplication and Preservation of Digit Evidence, Preserving the Digital Crime Scene, Computer Evidence Processing Steps, Legal Aspects of Collection and Preserving Computer Forensics Evidence.

Computer Image Verification and Authentication: Special Needs of Evidential Authentication

Computer Forensics analysis and validation: Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions

UNIT-IV

Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics using network tools.

Processing Crime and Incident Scenes: Identifying Digital Evidence, Collecting the Evidence in Private-Sector Incident Scenes, Processing law Enforcement Crime Scenes,

Preparing for a Search, securing a Computer Incident or Crime Scene, Storing Digital evidence, obtaining a Digital Hash.

UNIT-V

E-mail Investigations: Exploring the Role of E-mail in Investigations, Exploring the Role of Client and Server in E-mail, Investigating Email Crimes and Violations, Understanding Email Servers, Using Specialized Email Forensics Tools,

Mobile Device Forensics: Understanding Mobile Device Forensics, Understanding Acquisition Procedure for Cell Phones and Mobile Devices

Text Books

1. John R. Vacca, "Computer Forensics, Computer Crime Investigation, firewall Media", New Delhi,2005
2. Nelson, Phillips Enfinger, Steuart, "Computer Forensics and Investigations", Cengage Learning.2009

References

1. Keith J. Jones, Richard Bejthich, Curtis W Rose, “Real Digital Forensics”, Addison Wesley Pearson Education.2006
2. Tony Sammes and Bairn Jenkinson, “Forensic Compiling A Practitioner’s Guide”,
3. Springer International edition.2013
4. Christopher L. T. Brown, “Computer Evidence Collection & Presentation, Firewall Media”. 2005

BIG DATA LAB

BTech (AIML) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57216	PCC Lab	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

List of Programs

1. Installation and HDFS commands
   -to create a directory in HDFS, to list the contents of directory, to send/receive a file to/from local file system to HDFS, to display the contents of a file in HDFS, to Copy and move a file, To remove a file or directory in HDFS.

2. Write a word count map reduce program using the mapper, reducer and configuration functions.

3. Write a map reduce program to perform matrix multiplication

4. Hive
   -create and load data into managed and external tables using insert, as select and from insert command,

   -create and load data into static and dynamic partitions

   -word count program using HIVE

5. Pig
   Create tables and load data

   For each, load, store, filter, distinct, Union, split, dump

   Word count program using pig

6. Spark
   Working with Spark commands like map, reduce, filter, groupBy, sort etc
   Function to find sum of each column of given set

   Running Clustering algorithms in Spark

   Running Classification algorithms in Spark

7. Steam data processing using Kafka
8. Working with Hbase CRUD operations

9. Performing data analysis using Cassandra
10. Handling real time data using Mongodb
11. Developing map reduce application

DEEP LEARNING LAB

BTech (AIML) IV Year I Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57210	PCC-Lab	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

List of Programs

1. Implementation of Linear Regression
2. Deep learning Packages Basics: TensorFlow, Keras and PyTorch
3. Implementation of Neural network
4. Face recognition using CNN
5. Sentiment Analysis using LSTM
6. Language Modeling using RNN
7. Sentiment Analysis using GRU
8. Image Classification with Transfer Learning

TECHNICAL AND BUSINESS COMMUNICATION SKILLS

BTech (AIML) IV Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58001	OEC-II	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Introduction

The course is intended to expose the students to learn and practice the five communication skills: thinking, listening, speaking, reading, and writing in English, the global language of communication. It reflects some of the approaches in English language teaching and learning currently in practice around the world.

Course Objectives

To help the students to develop effective communication skills in all communicative contexts for professional advancement

Course Outcomes

At the end of this course, students will be able to:

1. communicate technical and business correspondence
2. reflect on the themes discussed
3. recognize ethical implications of technical communication in professional contexts
4. identify the contemporary issues in engineering from environmental, societal, economic, and global perspectives
5. demonstrate ethical decisions in complex situations

UNIT-I

E-World & E-Communication

E-language, E-governance, E-commerce/E-business, E-banking, E-waste

UNIT-II

Business Establishment & Infrastructure Development

Power Supply, Industrial Park, Business Correspondence, Follow-up letters, Acceptance & Rejections, Persuasive letters, Resignation letters

UNIT-III

Technology and Society

Robot Soldiers, For a Snapshot of a Web, Placing an order, Proposal Writing, Patents & Rights (National & International), Intellectual Property, Nanotechnology

UNIT-IV

Ethics in Business Communication

Ethical issues involved in Business Communication, Ethical dilemmas facing managers, Ethical Code & Communication, Standards in Daily Life, Total Quality Management, World University Ranking

UNIT-V

Management Information System

Corporate Governance, Business Process Outsourcing, Project Management Communication, Marketing Communication

Text Book

1. S P Dhanavel, "English and Communication Skills for Students of Science and Engineering", Orient Black Swan. 2009.

References

1. Meenakshi Raman & Prakash Singh, "Business Communication", (Second Edition), Oxford University Press. 2012.
2. Sanjay Kumar & Pushp Lata, "Language and Communication skills for Engineers", Oxford University Press. 2018.
3. Anjali Kalkar, et.al., "Business Communication", Orient Black Swan. 2010.
4. Paul V. Anderson, "Technical Communication", Cengage. 2014.
5. Charles W. Knisely & Karin I. Knisely, "Engineering Communication", Cengage. 2015.

DIGITAL MEDIA LITERACY

BTech (AIML) IV Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58019	OEC-II	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

1. prepare the students to use media source and its content
2. train the students become media literate
3. provide practical tips for incorporating media literacy into the traditional curriculum

Course Outcomes

At the end of the course the student will be able to:

1. use media as a learning tool
2. share knowledge in digital media
3. apply the use of persuasive language
4. exhibit copy writing skills
5. contribute their ideas through blogs

UNIT-I

Introduction, Diversity and Media:

Bias in the Media, Peer Driven Social Learning Communities, Social Learning Spaces,

Mirrored Learning Words, Online Events, The Nitty, Gritties

UNIT-II

Digital Literacy in Action:

Internet Safety and Filtering, Establish Proficiency of Tagging

UNIT-III

Blogging:

Basics of Blog Writing, Foundations of Blogging, Blogs as Professional Development Tool, Blogs as a Learning Tool, Creating Knowledge Habitats

UNIT-IV

The Classroom:

A Market place for Learning, Build an Electronic Calendar-Paper less News Paper, Marketing through social media, Writing Techniques

UNIT-V

Gaming as a Literacy:

How Video games promote Learning? Participatory Culture and Engagement, Collaboration and Cooperation, Motivation

Text Book

1. Jacobs, Hayes Heidi. “Media Literacy”, Solution Tree Press: USA.

References

1. Hobbs Renee R.Create “To Learn: Introduction To Digital Literacy”, Wiley-Blackwell Publications.
2. Frank, W. Baker. “Media Literacy in the K-12 Classroom”, (2nd Edition.). Paperback Publications.
3. Hertz, Mary. Beth. “Digital and Media Literacy in the Age of the Internet: Practical Classroom Applications”, Rowman & Littlefield Publishers.
4. Hobbs Renee R. “Digital and Media Literacy”, Sage Publications.
5. Potter, W. James. “Introduction to Media Literacy”, Sage Publications.

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

BTech (AIML) IV Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58022	OEC-II	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

1. To explain the fundamentals of the key elements of a business organization.
2. To learn practical approach to various functional areas of decision making.
3. To Compare different Pricing Strategies.
4. To enhance a knowledge of Capital Budgeting Techniques.
5. To solve the problems using Rations analysis.

Course Outcomes

At the end of this course, students will be able to:

1. Describe the concept of demand and its determinants in Managerial decisions.
2. Analyze the cost concepts and breakeven analysis in production.
3. Evaluate the market structures and different Pricing Strategies.
4. Apply the capital budgeting techniques in financial decisions.
5. Application of Ratios in solving business problems and taking correct decisions.

UNIT-I

Introduction to Managerial Economics: Definition, Nature and scope of Managerial Economics, Demand Analysis- Demand Determinants, Law of Demand and its exceptions.

Elasticity of Demand: Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Methods of Demand Forecasting (Survey Methods, Statistical Methods, Expert Opinion Method, Test Marketing, Controlled Experiments, Judgmental Approach to Demand Forecasting)

UNIT-II

Theory of Production and Cost Analysis: Production Function – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs.

Cost Analysis: Cost concepts, Opportunity Cost, Out of Pocket Costs vs. Imputed Costs. Breakeven Analysis (BEA) – Determination of Breakeven Point (simple problems), Managerial Significance and limitations of BEA.

UNIT-III

Market Structures& Pricing Policies:

Market structures: Types of Competition, Features of Perfect Competition, Monopoly and Monopolistic Competition, Price - Output determination in Perfect Competition and monopoly.

Objectives and Policies of Pricing: Objectives of pricing, Methods of Pricing - Cost Plus Pricing, Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, Limit Pricing, Market Skimming Pricing, Penetration Pricing, Two - Part Pricing, Block Pricing, Peak Load Pricing, Cross Subsidization.

UNIT-IV

Introduction to Financial Accounting: Accounting, Double-Entry Book Keeping, Journal, Ledger, and Trial Balance, Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

UNIT-V

Financial Analysis through ratios: Computation, Analysis and Interpretation of Liquidity Ratios (Current Ratio and Quick Ratio), Activity Ratios (Inventory Turnover Ratio and Debtor Turnover Ratio), Capital Structure Ratios (Debt – Equity, Interest Coverage Ratio), and Profitability Ratios (Gross Profit Ratio, Net Profit Ratio, Operating Profit Ratio, P/E Ratio and EPS).

Text Books

1. Varshney & Maheshwari, "Managerial Economics", Sultan Chand& Sons, 2014.
2. S.A. Siddiqui and A.S. Siddiqui, "Managerial Economics and Financial Analysis", New Age International Publishers, Hyderabad, 2013

References

1. R. K. Sharma & Shashi K Gupta, "Financial and Management Accounting", 4th Ed., Sultan Chand.
2. V. Rajasekaran & R. Lalitha, "Financial Accounting", Pearson Education, New Delhi, 2010.
3. Domnick Salvatore, "Managerial Economics in a Global Economy", 4th Edition, Cengage, 2009.
4. Subhash Sharma & M. P. Vittal, "Financial Accounting for Management, Text & Cases", Machmillan, 2012.
5. S. N. Maheshwari & S. K. Maheshwari, "Financial Accounting", Vikas 2012.
6. Truet and Truet, "Managerial Economics; Analysis, Problems and Cases", Wiley, 2012.

7. Dwivedi, “Managerial Economics”, Vikas 2012.
8. M. Kasi Reddy and S.Saraswathi, “Managerial Economics and Financial Accounting”, PHI, 2012.
9. Erich A. Helfert, “Techniques of Financial Analysis”, Jalco, 2007.

NEGOTIATION SKILLS

BTech (AIML) IV Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58005	OEC-III	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

1. To familiarize the students with various negotiation approaches and styles.
2. Understand & develop effective strategies for each stage of a negotiation
3. Identify Cross – cultural challenges that arise in negotiations
4. Enhance communication skills, emphasizing effective listening, persuasion & relationship building
5. Strengthen creative ability to expand the option for resolving a dispute.

Course Outcomes

At the end of the course students will be able to

1. Describe negotiation theories, concepts and tactics to manage negotiations
2. Explain the importance of various factors impacting negotiations.
3. Apply effective negotiation strategies and tactics for different scenarios
4. Identify negotiation practices towards building relationships
5. Evaluate various conflict resolution strategies.

UNIT-I

Introduction to Negotiation: Introduction, Concept of Negotiation, Characteristics of a Negotiating Situation, Basic Negotiation Skills, Interpersonal Skills in Negotiation, Theories of Negotiation.

UNIT-II

Types of Negotiation: Types of Negotiation, Principles of Negotiation, Steps of Negotiation, Win-Win Negotiation, Negotiation Tactics, Factors Affecting Success in Negotiation.

UNIT-III

Strategies of Negotiation: Fundamentals of Negotiation, Effective Strategies to develop Negotiation Skills, Anchoring / BATNA, Process of Negotiation and Negotiation Phases.

UNIT-IV

Improving Negotiation skills: Enhancing Communication skills for effective Listening, Persuasion & Relationship Building, establishing Trust-Building Relationships.

UNIT-V

Managing Negotiation: Managing Different Types of Negotiations, Cross –Cultural Challenges in Negotiations, Industrial Negotiation: Collective Bargaining, Arbitration, Origins of Conflict, Dispute Resolution.

Text Book

1. Fredluthans, Organisational Behavior, 9th ed, Prentice Hall.
2. Roger Fischer, Essentials of Negotiations, Harward Business School Press.

References

1. Beverly DeMarr and Suzanne De Janasz, Negotiation and Dispute Resolution, Prentice Hall, 2013.
2. Roy J Lewicki, Bruce Barry, and David M Saunders, Essentials of Negotiation, 5th Edition, McGraw Hill, 2011
3. Malhotra, Deepak, Negotiating the Impossible: How to Break Deadlocks and Resolve ugly Conflicts (without money or muscle). Oakland, CA: Berrett-Koehler Publishers, 2016.
4. Fatima, Shaheed; Kraus, Sarit; Wooldridge, Michael, Principles of Automated Negotiation. Cambridge, UK; New York: Cambridge University Press, 2015.
5. Subramanian, Guhan, Dealmaking: New Dealmaking Strategies for a Competitive Marketplace. New York: W. W. Norton & Company, 2011.

PROJECT MANAGEMENT

BTech (AIML) IV Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58008	OEC-III	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

1. To understand the concept of Project Management.
2. To know about the different approaches to project screening and planning.
3. To explain about the factors of risk involved in project execution.
4. To understand about team leading and functional cooperation.
5. To know about the project performance and future trends in the project management.

Course Outcomes

At the end of this course, students will be able to:

1. Explain about the life cycle and other concepts of Project Management.
2. Apply different approaches to project screening and planning
3. Analyze different risk factors in project execution
4. Estimate how to lead a team, to get functional cooperation
5. Build performance evaluation reports and future trends in project management.

UNIT-I

Introduction: Meaning, Need, Principles Project Lifecycle and its Phases, Project Management Research in brief, Project Management today, Organization strategy and structure and culture, Format of organization structure, Stake holder Management, Organization Culture, creating a culture for Project Management.

UNIT-II

Project Identification and Planning: Defining the project, Project Identification Process, Approaches to Project Screening and Selection, Project Planning, Work Breakdown Structure, Financial Module, Getting Approval and Compiling a Project Charter, setting up a Monitoring and Controlling Process.

UNIT-III

Project Execution: Initiating the Project, Controlling and Reporting Project Objectives, conducting project evaluation, Risk, Risk Management Factors, Project Management, Four Stage Process, Risk Management an Integrated Approach, Cost Management, Creating a Project Budget.

UNIT-IV

Leading Project Teams: Building a Project Team, Characteristics of an effective Project Team, achieving Cross- Functional Co-operation, Virtual Project Teams, Conflicts Management, Negotiations.

UNIT-V

Performance Measurement and Evaluation: Monitoring Project Performances, Project Control Cycles, Earned Value Management, Human factors in Project Evaluation and Control, Project Termination, Types of Project Terminations, Project Follow-up. Current and Future Trends in Project Management.

Text Book

1. Gray, Larson, Project Management, Tata McGraw Hill, 2015
2. Jeffery K. Pinto, Project Management, Pearson Education, 2015

References

1. Enzo Frigenti, Project Management, Kogan, 2015
2. R. Panneerselvam & P. Senthil Kumar, Project Management, PHI, 2015
3. Thomas M. Cappels, Financially Focused Project Management, SPD, 2008.

VALUE ENGINEERING

BTech (AIML) IV Year II Semester					Dept. of Artificial Intelligence			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58010	OEC-III	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

1. To understand the concept of value engineering in productivity
2. To understand the different phases of value engineering projects
3. To learn the various decision alternatives
4. To learn value engineering in non-hardware projects
5. To identify the value engineering team and coordinate in different services

Course Outcomes

At the end of this course students will be able to:

1. Apply the importance of value engineering concepts in productivity
2. Analyze the different phases of value engineering projects
3. Evaluate the different decision alternatives and choose the best alternative for optimization
4. Determine the value engineering concept in non-hardware projects and programmes
5. Analyze the value engineering teams with the help of case study.

UNIT-I

Introduction: Value engineering concepts, advantages, applications, problem recognition, and role in productivity, criteria for comparison, element of choice. Level of value engineering in the organization, unique and quantitative evaluation of ideas.

UNIT-II

Value Engineering and Job Plan: Introduction, orientation, information phase, speculation phase analysis phase. Selection and Evaluation of value engineering projects, Project selection, methods selection, value standards, application of value engineering methodology

UNIT-III

Value Engineering Techniques: Selecting Products and Operation for Value Engineering action, Value Engineering Programmes, Decision Making for Optimum Alternative, Use of Decision Matrix,

Make or Buy, Measuring Profits, Reporting Results, Follow up, Use of advanced techniques like Function Analysis System.

UNIT-IV

Versatility Of Value Engineering: Value engineering operation in maintenance and repair activities, Value Engineering in non-Hardware Projects. Initiating a Value Engineering Programme

UNIT-V

Value Engineering Level of Effort: Value Engineering Team, Co-coordinator, Designer, different Services, Construction Management Contracts, Value Engineering Case Studies.

Text Books

1. Anil Kumar Mukhopadhyaya, "Value Engineering: Concepts Techniques and applications", SAGE Publications 2010.
2. Del L. Younker, "Value Engineering analysis and methodology", Marcel Dekker Inc, New York, 2004

References

1. Alphonse Dell'Isola, "Value Engineering: Practical Applications for Design, Construction, Maintenance & Operations", R S Means Co., 1997
2. Richard Park, "Value Engineering: A Plan for Invention", St. Lucie Press, 1999.
3. Miles, L.D., "Techniques of Value Analysis and Engineering", Second Edition, McGraw Hill 1989.
4. Khanna, O.P., "Industrial Engineering and Management", Dhanpat Rai & Sons, 1993.
5. Anil Kumar Mukhopadhyaya, "Value Engineering Mastermind: From concept to Value Engineering Certification", SAGE Publications, 2003.

Program Structure and Syllabus of B. Tech IV Year (I & II Semesters)

Chemical Engineering

R20 Regulation

ANURAG UNIVERSITY

Venkatapur (V), Ghatkesar (M), Medchal-Malkajgiri (Dt.), Hyderabad, Telangana, INDIA

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B. TECH IV YEAR I SEMESTER [6T+2L]

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1	A57085	PCC	Process Dynamics and Control	3	0	0	3
2	A57086	PCC	Process Modeling and simulation	3	0	0	3
3	A57087	PCC	Chemical Process Equipment Design	2	0	0	2
4	A57088	PCC	Artificial Intelligence for Chemical Engineering	3	0	0	3
5	A57089	PCC	Transport Phenomena	3	0	0	3
6	A57090	PEC-IV	1.Design and Analysis of Experiments	3	0	0	3
	A57091		2.Computational Fluid Dynamics				
	A57092		3.Optimization of Chemical Processes				
7	A57223	PCC-Lab	Process Dynamics and Control Lab	0	0	3	1.5
8	A57224	PCC-Lab	Process Modeling & Simulation Lab	0	0	3	1.5
9	A57230	PROJ	Industry Oriented Mini Project	0	0	4	2.0
			TOTAL	**17**	**0**	**10**	**22**

B. TECH IV YEAR II SEMESTER [2T +3PROJ]

S.No	Course Code	Category	Course title	Hours per week			Credits
				L	P	T	
1	A58025	OEC-II	1. Renewable Energy Technology	2	1	0	3
	A58014		2. Disaster Preparedness and Planning				
	A58024		3. Operations Research				
2	A58026	OEC-III	1. Essential English and Employability Skills	2	1	0	3
	A58001		2. Technical and Business communication				
	A58019		3. Digital Media Literacy				
3	A58201	PROJ	Seminar	0	0	4	2
4	A58202	PROJ	Comprehensive Viva-Voce	0	0	0	2
5	A58203	PROJ	Project Work	0	0	20	10
	Total			**4**	**2**	**24**	**20**

ANURAG UNIVERSITY

PROCESS DYNAMICS AND CONTROL

B. Tech IV Year I Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
A57085	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Mathematics-I, II, III and Process Instrumentation, Chemical Engineering Fluid Mechanics, Mass transfer Operations.

Course Objectives

By studying this subject student will learn

1. To represent dynamic systems by equations and by transfer functions in block diagrams and to obtain transient response to disturbances like step, impulse, ramp and sinusoidal forcing function.
2. To understand the higher order system transfer functions
3. To estimate the stability limits for a system, with or without control.
4. To calculate and use the frequency response of a system
5. To analyze, design and tune feedback / feed forward, cascade and model based controllers in the context of various control strategies used to control chemical processes.

Course Outcomes

The student will be able to:

1. Understand the dynamic behavior of different processes.
2. Understand the operation of modern controllers and analyze different components of a control system.
3. Analyze the stability of a control system and design basic control strategies.
4. Understand and discuss the importance of process control in process operation and the role of process control engineers.
5. Able to design the advanced control system strategies for chemical processes.

UNIT I

Introduction to process Dynamics and control. Mathematical tools for modeling. Solutions of Ordinary Differential equations using Laplace transform. Inversion by partial fractions. Further properties of Transforms and Partial Fractions. Response of I order systems: Transfer Function, Transient response to step, impulse, ramp and sinusoidal forcing function. Physical examples of first order systems: liquid level, mixing process, heating process. Concept of time constant. Linearization. Response of first order systems in series: interacting and non-interacting systems.

UNIT II

Higher order systems: Second order system- Transient response of under damped, critically damped, over damped systems to step, impulse and sinusoidal forcing functions. Transportation lag. The Control System: Components of a control system, Negative and Positive feed back control systems, Servo and Regulatory control problems, Development of Block diagram, Controllers and final control elements. Reduction of physical control systems to block diagrams: Block diagram of a chemical reactor control system. Closed loop Transfer function. Overall Transfer functions for single loop control systems. Overall Transfer functions for multi loop control systems. Transient response of simple control systems.

UNIT III

Stability: Concept of stability. Stability criterion. Routh Test for stability. Root Locus: concept of root locus, plotting of the root locus diagram for feedback control systems. Transient response from root locus. Application of root locus to control systems.

UNIT IV

Introduction to frequency response: Bode diagrams for first order, first order system in series, second order systems and for controllers and transportation lag. Bode stability criterion. Gain margin and phase margin. Control system design by frequency response. Nyquist Plots. Nyquist stability criteria.

UNIT V

Advanced control strategies: Cascade Control. Feed Forward Control. Ratio Control. Smith Predictor. Controller tuning and Process Identification: ISE, ITAE, IAE, Ziegler – Nicholas and Cohen-Coon tuning methods.

Text Books

1. Process System Analysis and Control, 3rd Ed., D.R. Coughanowr and Steven E. Le Blanc, Mc Graw Hill, 2009.
2. Donald P. Eckman, "Industrial Instrumentation", Wiley Eastern Limited, 2004

Reference Books

1. Chemical Process Control, G.Stephanopoulos, PHI learning Pvt Ltd., New Delhi, 2010.

2. Outlines of Chemical Instrumentation and Process Control, 3rd Ed., A. Suryanarayana, Khanna Publishers, New Delhi, 2010.

3. Process Control, B.Wayne Bequette, PHI learning Pvt Ltd., New Delhi, 2003.

4. Control system Engineering, 5th Ed, I.J.Nagrath and M. Gopal, New age International Pvt Ltd, 2007

PROCESS MODELING AND SIMULATION

B. Tech IV Year I Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
A57086	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Fluid and Particle Mechanics, Mass Transfer Operations, Process Heat Transfer, Chemical Reaction Engineering

Course Objectives

By studying this subject student will learn about

1. To give the basics of theoretical modelling by the application of Fundamental laws.
2. To get introduced to modelling and simulation of steady state and dynamic behaviour.
3. To train students in computer programming abilities for solving iterative problems.
4. To apply mass and energy balances for Chemical Engineering systems.
5. To solve basic Chemical engineering problems in mass, heat and momentum transfer.

Course Outcomes

The student will be able to:

1. Derive mass balance, energy balance and momentum balance equations for various chemical process systems.
2. Develop models and simulate various processes of chemical industries.
3. Solve Chemical Engineering problems involving linear, non-linear and ordinary differential equations.
4. Develop finite difference equations for chemical engineering systems.
5. Apply the various tools for partial differential equations that come across in chemical engineering.

UNIT I

Mathematical models for chemical engineering systems, fundamentals, introduction to fundamental laws. Classification of mathematical models- steady state Vs dynamic models, lumped Vs distributed parameter models, deterministic Vs stochastic models.

Examples of mathematical models of chemical engineering systems, constant volume CSTRS, two heated tanks, and gas phase pressurized CSTR, non-isothermal CSTR.

UNIT II

Examples of single component vaporizer, batch reactor, reactor with mass transfer, ideal binary distillation column, batch distillation with holdup, Computer simulation, examples, gravity flow tank, three CSTRs in series, binary distillation column, batch reactor. Simulation of Non-isothermal CSTR, VLE dew point, bubble point calculations, counter current heat exchanger

UNIT III

Mathematical formulation of the Physical Problems: Application of the law of conservation of mass-Salt accumulation in a stirred tank- starting an equilibrium still-solvent extraction in two stages-Diffusion with chemical reaction. Application of the law of conservation of energy-Radial heat transfer through a cylindrical conductor-Heating a closed Kettle.

UNIT IV

The difference operator-Properties of the difference operator-Difference tables and other difference operators. Linear Finite Difference Equations: Simultaneous linear differential equations-Calculation of Number of theoretical stages in Liquid Liquid Extraction column.

UNIT V

Numerical solution of partial differential equations- elliptic, parabolic and hyperbolic equations. Finite difference methods, Leibman's method, Crank Nicholson method. Applications to steady state and Unsteady state heat conduction and temperature distribution problems. Introduction to finite element method

Text Books

1. Process Modeling Simulation and Control for Chemical Engineers by W. L. Luyben, McGraw Hill, 2nd Ed., 1990.
2. "Mathematical Methods in Chemical Engineering" by Jenson, V.J. and G.V.Jeffereys, Academic Press. London and New York, 2nd Ed., 1977
3. Gupta, S. K., "Numerical Methods for Engineers, New Academic Science, 2012.

Reference Books

1. Modeling and analysis of Chemical Engineering processes by K.Balu and K. Padmanabhan, IK International private limited, 2007
2. Babu, B.V., Process Plant Simulation, Oxford University Press (2004).
3. Denn, M. M., Process Modeling, Longman Sc & Tech. (1987).
4. Himmelblau, D.M and Bischoff, K.B., Process Analysis and Simulation: Deterministic Systems, John Wiley (1968).
5. Holland, C. D., Fundamentals and Modeling of Separation Processes: Absorption.

CHEMICAL PROCESS EQUIPMENT DESIGN

B. Tech IV Year I Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
A57087	PCC	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60	100

Prerequisites

Heat Transfer, Fluid Mechanics, Mass Transfer, Chemical Process Calculations

Course Objectives

By studying this subject student will learn about

1. To acquire basic understanding of various design parameters and to design various Chemical Engineering equipment's.
2. Study relevant codes for design of chemical plant equipment as per the standard procedures specified by design code books.
3. Learn the fabrication techniques and testing methods.
4. Study design safe process and design appropriate equipment like reactors, mass transfer heat transfer equipment, pipelines storage tanks etc.
5. Learn design and engineering skills directly applied in design, installation and commissioning of equipment's.

Course Outcomes

The student will be able to:

1. Select important parameters of equipment design, Mechanical properties of materials to be used as MOC.
2. Design internal pressure vessels and external pressure vessels, special vessels (e.g. tall vessels) and various parts of vessels (e.g. heads) including various unit operation equipments.
3. Design heat transfer equipments and cooling and heating systems.
4. Ability to scale-up mass transfer processes.
5. Ability to scale-up homogeneous and heterogeneous reactors.

UNIT I

Introduction to Equipment Design

Introduction; development of flow and block diagrams from process description, Piping and instrumentation diagram, material and energy balance, sizing of equipment, design preliminaries, design codes, Material of construction selection procedure, fabrication methods and testing methods, selection of equipment for gas, liquid and solid processes.

UNIT II

Mechanical design of process equipment

Fundamentals principles and equations, General Design considerations of pressure vessels, Design of thin-walled vessels under internal and external pressure, compensation for opening and branches, Design vessels subjected to combined loading, theories of failure, design of flange joints and supports, design of high-pressure vessels, design of storage vessels for volatile and non-volatile liquids.

UNIT III

Design of shell and tube heat exchangers

Basic procedure and theory, Overall heat transfer coefficient, fouling factors, Shell and tube exchanger construction details, mean temperature difference, General design considerations of shell and tube exchanger, tube side heat transfer coefficient and pressure drop, shell side heat transfer and pressure drop.

UNIT IV

Design of separation columns (Distillation, Absorption & extraction)

Continuous distillation basic principles and process description, Design variables in distillation column, Design methods for binary systems, plate efficiency, plate contractors, plate hydraulic design, packed columns.

UNIT V

Design of reactor, evaporator

Introduction, material of construction, Agitation, classification of reactor vessels, reactor selection, Design considerations, Types of evaporators, Design considerations of evaporator, Optimum pipe diameter.

Text Books

1. Chemical Engineering Design: Vol.6, Coulson J.M. and Richardson J.F., Pergamon Press 1983.

2. Process Equipment Design, M.V. Joshi and V. V. Mahajani, 3rd Ed, Mac Millan India Ltd, 1996.

Reference Books

1. Process Design of Equipments, Dr. Shrikanth D. Dawande, Central Techno Publications, 2nd Ed, 2000.
2. Process Equipment Design-Vessel Design: Brownell L.E., Wiley Eastern Ltd.,1986.
3. Introduction to Chemical Equipment Design-Mechanical Aspects: Bhattacharya B.C., CBS Publishers, 1991.
4. Process Heat Transfer: Kern Q., McGraw Hill book Co. Inc., 1982.

ARTIFICIAL INTELLIGENCE FOR CHEMICAL ENGINEERING

B. Tech IV Year I Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
A57088	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Basic chemical engineering knowledge

Course Objectives

By studying this subject student will learn about

1. Understand the basic concept of artificial intelligence.
2. Acquire knowledge on different search strategies
3. Learn the separation tasks
4. Use the AI in chemical engineering applications
5. Apply AI in the field of process industries.

Course Outcomes

The student will be able to:

1. Understand the concept of Artificial intelligence
2. Have firm knowledge on different search strategies
3. Apply separation synthesis to Bypass and Pseudo product Transformation and Heuristic
4. Apply the AI in chemical engineering applications
5. Analyze process parameters.

UNIT I

Introduction to Artificial Intelligence (AI)

Description of AI, Brief History of AI, Uses of AI and Challenges in AI

Expert Systems and Knowledge Representation: Description of Expert System, Uses of Expert Systems in Science and Engineering, Representing Knowledge in Expert Systems, Logic-Based

Systems, Semantic Networks, Frame-based systems, Object-oriented programming, Blackboard systems.

UNIT II

Prolog in artificial intelligence

Search Strategies in Artificial Intelligence, Knowledge Representation in Prolog, Additional Problem-Solving Strategies.

Introduction to exsep: The Application: Separation-Flowsheet Development and multi-component Separation Sequencing and Introduction to Expert-System Development

UNIT III

Chemical engineering perspective of exsep

Introduction, Representation of the Separation-Synthesis Problem, Feasibility Analysis of Separation Tasks, Separation Specification Table (SST), Bypass and Pseudoproduct Transformation and Heuristics for Separation Synthesis

UNIT IV

Applications in chemical engineering

Development of Expert Systems, Applications to Process-Fault Diagnosis, Applications to Process Control and Applications to Process Design

UNIT V

Applications to Process Planning and Operations, Applications to Process Modeling and Simulation and Applications to Product Design, Development and Selection.

Text Books

1. Artificial intelligence in chemical engineering, Quantrille. T. E and Liu Y.A. Academic press, 1991

TRANSPORT PHENOMENA

B. Tech IV Year I Semester					Dept. of Chemical Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57089	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Fluid and Particle Mechanics, Mass Transfer I &II, Process Heat Transfer

Course Objectives

1. To provide fundamentals of momentum, heat and mass transfer and to study analogy between momentum, heat and mass transfer.
2. The course will deal with flow problems involving Newtonian and non-Newtonian fluids, solid-state heat conduction, forced and free convection, binary diffusion with or without chemical reaction
3. To evaluate the concept of diffusivity and mechanism of mass transport.
4. To illustrate the equations of change for isothermal systems.
5. To study and understand the concept of velocity distribution in laminar flow.

Course Outcomes

Students will be able to

1. Understand the analogy between momentum, heat and mass transfer.
2. Formulate a mathematical representation of a flow, heat and mass transfer phenomena.
3. Solve flow, heat and mass transfer problems either individually or coupled for simple geometries analytically.
4. Identify the similarities among the correlations for the flow, heat and mass transfer at interfaces.
5. Study and understand unsteady momentum transport and equations of change for isothermal systems.

UNIT I

Viscosity and the mechanisms of momentum transfer: Importance of transport phenomena, analogous nature of transfer process, Introduction of viscosity and mechanism of momentum transport: Newton's law of viscosity, Newtonian & Non-Newtonian fluids, pressure and temperature dependence of viscosity, theory of viscosity of gases and liquids.

Velocity distribution in laminar flow: Shell momentum balances and boundary conditions of -
a) Flow of falling film b) Flow through the circular tube c) Flow through an annulus d) Adjacent flow of two immiscible fluids.

UNIT II

Thermal Conductivity and mechanism of energy transport : Introduction to thermal conductivity and mechanism of energy transport: Fourier's law of heat conduction, temperature and pressure dependence of thermal conductivity.

Temperature distribution in solids and in laminar flow & numerical problems -

a) Shell energy balance, boundary conditions b) Heat conduction with electrical heat source c) Heat conduction with a nuclear heat source d) Heat conduction with a viscous heat source e) Heat conduction with a chemical heat source f) Heat conduction through composite walls g) Forced and free convection h) Heat conduction in a cooling fin.

UNIT III

Diffusivity and mechanisms of mass transport: Introduction to diffusivity and mechanism of mass transport: Definitions of concentrations, velocities and mass fluxes, Fick's law of diffusion, temperature and pressure dependence of mass diffusivity.

Concentration distribution in solids and in laminar flow & numerical problems -

a) Shell mass balances, boundary conditions b) Diffusion through stagnant gas film c) Diffusion with heterogeneous chemical reaction d) Diffusion with homogeneous chemical reaction e) Diffusion into falling liquid film etc.

UNIT IV

Unsteady Momentum Transport:

Equations of change for isothermal system - a) The equation of continuity b) The equation of motion c) Equation of change in curvilinear coordinate systems d) Use of equation of change to set up steady flow problem e) Equation of mechanical energy f) Dimensional analysis of equation of change.

UNIT V

Simultaneous & Analogy momentum, heat and mass transfer:

Momentum transfer in turbulent flow -

Comparison of laminar and turbulent flows, mechanism of turbulence, intensity of turbulence, scale of turbulence, Reynold's stresses, the time smoothed velocity profile near the wall, Prandtl's mixing length model.
Analogies: Reynold's analogy, Prandtl's analogy, Chilton and Colburn analogy & Martinnelli's analogy.

Text Books

1. Transport Phenomena, Bird R. B., Stewart and Lightfoot, 2nd Edition, John Wiley & Sons.
2. Momentum, heat and mass transfer, Bennett C. O, Mayors J.E, Mc-Graw Hill, New York.

Reference Books

1. Transport phenomena, B.M. Suryavanshi, L.R. Dongre, Nirali Publications.
2. Transport Phenomena, P.L.V.N. Saichandra, Shrikant Barkade, Denett & Co.

DESIGN AND ANALYSIS OF EXPERIMENTS

B. Tech IV Year I Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
A57090	PEC-IV	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Probability & Statistics

Course Objectives

The objective is to provide the student

1. With the basic need of experimental design and analysis of data
2. To familiarize various models (randomization, replication and blocking) and the analysis of resulting data by various means.
3. To make well equipped to apply these methodologies in chemical & Industrial sciences.
4. How to conduct analysis regarding various experimental methodologies
5. How subsequent course in regression analysis should deepen the experience.

Course Outcomes

1. Understand the different philosophical approaches to experimental design and ANOVA techniques
2. Build appropriate statistical models for designed experiments, perform data analysis
3. Construct and analyse appropriate experimental designs for given problems by applying to 2^k factorial designs and Regression model to chemical engineering experimental problems.
4. Construct and analyse appropriate experimental designs for given problems by applying to 3^k factorial designs and Regression model to chemical engineering experimental problems.
5. Able to apply and analyse regression analysis to factorial experiments and predict lack of fit for different systems

UNIT I

Introduction to Testing of Hypothesis [Definitions and Concepts/Theory only of Null Hypothesis & Alternative Hypothesis, tail test]. Introduction to Design of Experiment: Principles of an Experimental Design [Randomness, Replication and Local Control].

Design Terminology [Block, Degree of freedom, Confounding, Design, Effect, factor space, factor, Main effect, Interaction, Level]. Review of ANOVA [Basic assumptions, Concepts of ANOVA tables for one-way and two-way with problems]

UNIT II

Factorial Experiment: [Definition and Concepts/Theory of Factor Effect, Fixed, Random Mixed Factor Effect]. Only Concepts/Theory of [Completely Randomized Design, RBD and LSD Recollection, Graeco-Latin Squares *no problems*].

UNIT III

Factorial design; Concept/Theory of analysis of 2^k factorial designs. Analysis of 2^2, 2^3 and 2^4 factorial designs. [Concept of ANOVA table Problems]. Confounding in Factorial Designs, confounding in 2^3 and 2^4 factorial design.

UNIT IV

Concept/Theory of Analysis of 3^k factorial design. , Analysis of 3^2 and 3^3 factorial design [Concept of ANOVA table Problems] , Confounding in 3^3 factorial design. Introduction to Balanced Incomplete Block Design. Analysis of Balanced Incomplete Block design BIBD [Concept of ANOVA table Problems].

UNIT V

Regression analysis- [Simple Linear Regression, Interval Estimation in Simple Linear Regression, Analysis of Variance of Simple Linear Regression, Lack of Fit of the Simple Linear Regression. Multiple Regression, Polynomial Regression, Nonlinear Regression *with Problems*].

Correlation [Definitions and Correlation in Linear and Multiple Regression].

Text Books

1. Design and analysis of experiments, 2nd ed., D.C. Montgomery, John Wiley and sons, New York, 2003.

2.Statistical Design and Analysis of Experiments with Applications to Engineering and Science, Second Edition, Robert L. Mason, Richard F. Gunst and James L. Hess, A John Wiley & Sons Publication.

Reference Books

1. Design of Experiments in Chemical Engineering, Zivorad R. Lazic, Wiley

2. Experimental Design and Data Analysis for Biologists, Gerry P. Quinn and Michael J. Keough, Cambridge University Press.
3. Dean Voss :- Design and Analysis of Experiments
4. Design of Experiments for Engineers and Scientists, Jiju Antony, Elsevier.

COMPUTATIONAL FLUID DYNAMICS

B. Tech IV Year I Semester					Dept. of Chemical Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57091	PEC-IV	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Fluid Mechanics, Heat transfer and Engineering mathematics

Course Objectives

1. To understand the concepts of Numerical Techniques & Computational Methods.
2. To make the students to demonstrate competence in setting up computational fluid dynamics models for some industrially important applications.
3. To apply finite difference approximation to various systems.
4. To acquire basic knowledge on Finite volume method
5. To understand the various grid generation techniques.

Course Outcomes

Students will be able to

1. Apply various numerical techniques to fluid flow systems
2. Apply conservation laws to different systems.
3. Solve partial differential equations in terms of finite difference equations.
4. Understand the finite volume method
5. Generate grids for different domains.

UNIT I

ELEMENTARY DETAILS IN NUMERICAL TECHNIQUES: Number system and errors, representation of integers, fractions, floating point arithmetic, loss of significance and error propagation, condition for instability, computational methods for error estimation, convergence of sequences.

APPLIED NUMERICAL METHODS: Solution of a system of simultaneous Linear Algebraic Equations, iterative schemes of Matrix inversion, direct methods for Matrix inversion, and direct methods for banded matrices.

UNIT II

INTRODUCTION AND CONSERVATION LAWS:

History and Philosophy of computational fluid dynamics, CFD as a design and research tool, Applications of CFD in engineering. Models of the flow, substantial derivative, divergence of the velocity, continuity equation, momentum equation, energy equation, physical boundary **conditions.**

UNIT III

Finite Differences, discretization, consistency, stability and Fundamentals of fluid flow modeling, introduction, elementary finite difference quotients, implementation aspects of finite – difference equations, consistency, explicit and implicit methods.

Finite Difference Applications in Heat conduction and convection – Heat conduction, steady heat conduction in a rectangular geometry, transient heat conduction, finite difference application in convective heat transfer, closure.

UNIT IV

FINITE VOLUME METHOD: Diffusion problems- explicit and implicit time integration; Convection - diffusion problems- properties of discretization schemes, central, upwind, hybrid, QUICK schemes; Solutions of discretized equations.

UNIT V

GRID GENERATION: Grids With Appropriate Transformation: General transformation of the equations, Metrics and Jacobians of Transformation, Grid generation techniques, algebraic techniques, Elliptic grid generators, coordinate system control, hyperbolic grid generation techniques and parabolic generators.

Text Books

1. Computational fluid flow and heat transfer / Muralidharan – Narosa Publications
2. Anderson, J.D., “Computational Fluid Dynamics: The Basics with Applications”. Mc Graw-Hill, 1995.
3. Versteeg, H.K. and Malasekera, W., “Introduction to Computational Fluid Dynamics: The Finite Volume Method”, Pearson Education Ltd., 2007.
4. Hoffman, K.A., and Chiang, S.T., *Computational Fluid Dynamics*, Vol. I, Engineering Education System, Kansas, USA, 2000

Reference Books

1. Chung T.J Computational Fluid Dynamics Cambridge University Press, 2003.
2. Ghoshdastidar P.S., “Computational Simulation of flow and heat transfer” Tata Mc Graw-Hill Publishing Company Ltd, 1998
3. Subas, V. Patankar “Numerical heat transfer fluid flow”, Hemisphere Publishing Corporation, 1980

OPTIMIZATION OF CHEMICAL PROCESSES

B. Tech IV Year I Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
A57092	PEC-IV	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Mathematics-I, II, II, and Material & Energy Balance Computations

Course Objectives

The objective is to provide the student

1. To provide students understanding of different Optimization techniques.
   Like linear programming and genetic algorithms.
2. Understand different search techniques and apply in process design.
3. To give emperor to application of optimization techniques in petro chemical process.
4. To apply the optimization technique in distillation column design.
5. To apply the Principles of optimization in Bio- Chemical engineering.

Course Outcomes

1. Student will able to formulate unconstrained or constrained objective functions of chemical engineering problems.

2. Gains exposure to application of optimization techniques in case of various petrochemical processes

3. Understands how the problem formulation influences its solvability and interpretation of optimization results.

4. Student will able to formulate Linear programming and applications

5. Student will able to Understand Genetic Algorithms

UNIT I

Nature and organization of optimization problems: what optimization is all about, why optimize, scope and hierarchy of optimization, examples and applications of optimization, the essential features of optimization problems, general procedure for solving optimization problems, obstacles of optimization, classification of models, how to build a model, fitting functions to empirical data, the method of least squares, factorial experimental design, fitting a model to data subject to constraints.

UNIT II

Basic concepts of optimization: Continuity of functions, unimodal versus multimodal functions, convex and concave functions, convex region, necessary and sufficient conditions for an extremum of an unconstrained function, interpretation of the objective function in terms of its quadratic approximation.

Optimization of unconstrained functions: one-dimensional search: Numerical methods for optimizing a function of one variable, scanning and bracketing procedures, Newton's, Quasi-Newton's and Secant methods of uni-dimensional search, region elimination methods, polynomial approximation methods, how the one-dimensional search is applied in multi-dimensional problem, evaluation of uni-dimensional search methods.

UNIT III

Unconstrained multivariable optimization: direct methods, random search, grid search, univariate search, simplex method, conjugate search directions, Powell's method, indirect methods-first order, gradient method, conjugate method ,indirect method-second order-Newton's method forcing the Hessian matrix to be positive definite, Movement in the search directions, termination, summary of Newton's method, relation between conjugate gradient and Quasi-Newton method.

UNIT IV

Linear programming and applications: Basic concepts in linear programming, Degenerate LP's-graphical solution, natural occurrence of linear constraints, the simplex method of solving linear programming problems, standard LP form, obtaining a first feasible solution, the revised simplex method, sensitivity analysis, duality in linear programming, the Karmarkar algorithm, LP applications.

Genetic Algorithms: (Qualitative treatment) Working principles, differences between GAs and traditional methods, similarities between GAs and traditional methods, GAs for constrained optimization, other GA operators, real coded GAs, Advanced GAs.

UNIT V

Optimization of unit operations-1: recovery of waste heat, shell and tube heat exchanger, evaporator design, liquid-liquid extraction process, optimal design of staged distillation column.

Optimization of unit operations-2: Optimal pipe diameter, optimal residence time for maximum yield in an isothermal batch reactor, chemo stat, optimization of thermal cracker using linear programming.

Text Books

1. Optimization of chemical processes by T.F.Edgar and Himmelblau D.M. Mc- Graw. Hill. New York, 2001.
2. Optimization for Engineering Design, Kalyan Moy Deb, PHI Pvt Ltd, New Delhi, 2000.

Reference Books

1. Elementary Principles of Chemical Processes, 4th Edition, Richard M. Felder, Ronald W. Rousseau, Lisa G. Bullard

PROCESS DYNAMICS AND CONTROL LAB

B. Tech IV Year I Semester					Dept. of Chemical Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57223	PCC-Lab	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Prerequisites

Fluid and Particle Mechanics, Mass Transfer Operations, Process Heat Transfer, Chemical Reaction Engineering

Course Objectives

By studying this subject student will learn about

1. To obtain transient response to disturbances like step, impulse, ramp and sinusoidal forcing function.
2. To analyze stability and performance of feedback loops using Laplace and frequency domain techniques.
3. To evaluate the first and second order system responses
4. To apply knowledge on interacting and non-interacting systems
5. Familiar with different types of advanced control strategies

Course Outcomes

The student will be able to:

1. Understand and be able to describe quantitatively the dynamic behavior of process systems
2. Have knowledge on the development and use of right type of control dynamics for process control under different operative conditions.
3. Analyze the usage of control valve characteristics for different industries
4. Able to design control parameters for chemical systems.
5. Able to calculate dynamic parameters of chemical process systems.

EXPERIMENTS:

1. Calibration and determination of time lag of various first order instruments.
Major equipment: First order equipment like Mercury-in- Glass thermometer.

2. Calibration and determination of time lag of various second order instruments.
Major equipment: Second order equipment like Mercury-in- Glass thermometer with Thermal well.

3. Experiments with single and two capacity systems without interaction.
Major equipment: Single tank system, two tank systems

4. Experiments with single and two capacity systems with interaction.
Major equipment: Single tank system, two tank systems

5. Estimation of damping coefficient for U-tube manometer.
Major equipment: U-tube manometer.

6. Level Control Trainer.
Major equipment: Level control trainer setup with computer.

7. Temperature Control Trainer.
Major equipment: Temperature control trainer setup with computer.

8. Pressure Control Trainer.
Major equipment: Pressure control trainer setup with computer

9. Experiments on proportional, reset, rate mode of control etc.
Major equipment: PID control Apparatus.

10. Control valve Characteristics.
Major equipment: Control valve setup.

Text Books

1. Process System Analysis and Control, 3rd Ed., D.R. Coughanowr and Steven E. Le Blanc, Mc Graw Hill, 2009..

PROCESS MODELING & SIMULATION LAB

B. Tech IV Year I Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
A57224	PCC-Lab	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Prerequisites

Fluid and Particle Mechanics, Mass Transfer Operations, Process Heat Transfer, Chemical Reaction Engineering

Course Objectives

By studying this subject student will learn about

1. Develop a sound working knowledge on ASPEN
2. Develop a sound working knowledge on MATLAB
3. Understand the Heat exchanger through simulation
4. Binary Distillation column Simulation
5. Reaction Engineering simulations

Course Outcomes

The student will be able to:

1. Analyze and calculate physical and chemical phenomena involved in various process
2. Application of numerical methods for solving engineering problems and computer programming.
3. Develop algorithms and program to design various equipment.
4. Develop mathematical models for various chemical process
5. Simulate a process using different approaches and process simulators

EXPERIMENTS:

(At least **Ten** experiments out of the following 11 experiments should be performed)

The following experiments have to be conducted using MATLAB, FLUENT

MATLAB Scripts and function files

1. Non-linear algebraic equations – Newton Raphson method (Specific volume of binary mixture.
2. Numerical integration – Simpson's 1/3 rule (Batch Reactor)
3. Three CSTRs in series – open loop
4. Three CSTRs in series – Closed loop
5. Non isothermal CSTR
6. Binary Distillation column
7. Calculation of Bubble pint and Dew point for Ideal multi-component system.
8. Heat Exchanger
9. Interacting System- two tank liquid level & Non interacting system-two tank liquid level
10. Gravity Flow tank
11. Plug flow reactor (Design)
12. One-Dimensional Heat equation using PDE.
13. Simulation studies for a chemical process using Simulink

Text Books

1. Myers, A. L and Seider W.D, Introduction to Chemical Engineering and computer Calculations, Prentice Hall – 1976
2. Computational Simulation tools in Engineering, V. Ramesh Kumar, T. Bala Narsaiah, K. Ravichand, B.S. Publications, 2018

Reference Books

1. A Guide to MATLAB for Chemical Engineering Problem Solving, Kip D. Hauch
2. Introduction to Chemical Engineering Computing, Bruce A. Finlayson, Wiley-India Edn, 2010

RENEWABLE ENERGY TECHNOLOGY

B. Tech IV Year II Semester					Dept. of Chemical Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58025	OEC-II	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Prerequisites

Energy Engineering, Water conservation and management, Nuclear Engineering.

Course Objectives

By studying this subject student will learn about

1. To explain the concepts of Non-renewable and renewable energy systems
2. To outline utilization of renewable energy sources for both domestic and industrial applications
3. To analyze the environmental and cost economics of renewable energy sources in comparison with fossil fuels.
4. To illustrate the characteristics and applications of Wind energy.
5. To study the various other renewable sources of energy.

Course Outcomes

The student will be able to:

1. Students would have the ability to understand the various renewable energy sources available and also the current scenario of energy in India.
2. Understand one of the most important types of renewable energy-solar energy.
3. Understand the various types of other renewable energy resources for producing energy.
4. Students can analyze and quantify energy usage using energy from biomass.
5. Understand the wind energy conservation and systems and types of wind turbines.

UNIT I

Introduction to renewable energy, world energy status, current energy scenario in India, environmental aspects of energy utilization, energy and sustainable development, Overview of conventional & renewable energy sources, need & development of renewable energy sources.

UNIT II

Solar Energy:

Solar energy (basic concepts, flat plate and concentrating collectors, solar desalination, solar pumping, solar photo voltaic conversion, solar cells), applications of solar energy systems.

UNIT III

Wind Energy:

Wind energy (availability, wind power plants, wind energy conversion systems, site characteristics, types of wind turbines), classification of wind, characteristics, applications of wind turbines, offshore wind energy – Hybrid systems, wind resource assessment, Betz limit, site selection, wind energy conversion devices

UNIT IV

Energy from biomass:

Energy from biomass (biomass resources, biomass conversion technologies - direction combustion, pyrolysis, gasification, anaerobic digestion, bioethanol and biodiesel production) analysis, Properties of biogas (Calorific value and composition), biogas plant technology and status, Bio energy system, design and constructional features.

UNIT V

Other Renewable Sources (Tidal energy; geothermal energy; hydroelectric), Tidal and wave energy its scope and development, Scheme of development of tidal energy. Small hydro Power Plant: Importance of small hydro power plants and their Elements, types of turbines for small hydro, estimation of primary and secondary power. Geothermal Energy: Geothermal power plants, various types, hot springs and steam ejection.

Text Books

1.Fundamentals of Renewable energy systems, D. Mukherjee, S. Chakrabarti, New Age International Publishers.

2. Textbook of Renewable Energy, S.C. Bhatia, R.K. Gupta, Woodhead Publishing India Pvt. Ltd.

Reference Books

1. Renewable Energy Technology, I S Jha, Subir Sen, M K Tiwari, D P Kothari, New Age International Publishers.

2. Renewable Energy Sources and Management, Ganesh S. Mali, Prakash Patil, Nirali Prakashan.

DISASTER PREPAREDNESS AND PLANNING

B. Tech IV Year II Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
A58014	OEC-II	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

By studying this subject student will learn about

1. To know the concept, definition and terminology of the Disaster Management.
2. To know the classification & occurrence of disasters in India and elsewhere.
3. To know and analyse the socio-economic, environmental & political and gender etc., aspects of disasters impacts.
4. To know the Pre, Post and emergency management mitigation strategies &activities of Disaster Management Cycle.
5. To know the environment of vulnerable Disaster areas & to implement developmental activities to minimise the impacts.

Course Outcomes

The student will be able to:

1. To acquire knowledge of concepts and terminology to understand disaster Management.
2. To acquaint with different disasters in India and other parts of the world.
3. To classify, assess the magnitude & intensity of various impacts of disasters.
4. To learn the management methods (Risk & crisis Mgmt) at various stages of Disaster.
5. Learn effective sustainable environmental modification techniques to decrease the vulnerability in disaster prone areas.

UNIT I

INTRODUCTION
Concepts and definitions: disaster, hazard, vulnerability, risk, capacity, impact, prevention, mitigation.

UNIT II

DISASTERS

Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills etc); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility

UNIT III

DISASTER IMPACTS

Disaster impacts (environmental, physical, social, ecological, economical, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate-change and urban disasters.

UNIT IV

DISASTER RISK REDUCTION (DRR)

Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

UNIT V

DISASTERS, ENVIRONMENT AND DEVELOPMENT

Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Text Books

1. Disaster Management - *H.K. Gupta* - University Press, India, 2003.
2. Handbook of Disaster Management: techniques & Guidelines - *Singh B.K., Rajat* Publications, 2008.
3. Disaster Mitigation: Experiences and Reflections - *Pardeep Sahni*
4. Disaster Risk Reduction in South Asia - *Pradeep Sahni* - Prentice Hall, 2004.

Reference Books

1. Disaster Management - *Ghosh G.K.*, APH Publishing Corporation, 2006.
2. Disaster Management - *R.R Singh* - Rawat Publication, New Delhi, 2000.
3. Space Technology for Disaster Mitigation in India (INCED) - *R.R. Singh*,University of Tokyo, 1994
4. Disaster Management in Hills- *Dr. Satender* - Concept publishing co.,New Delhi, 2003
5. Action plan For Earthquake, Disaster, Mitigation in Disaster Management - *A.S.Arya , V.K. Sharma* , IIPA publications, New Delhi, 1994
6. An overview on Natural & Man made Disaster & their Reduction - *R.K.Bhandani*, CSIR, New Delhi
7. Manuals on Natural Disaster management in India - *M.C. Gupta*, National Centre for Disaster Management, IIPA, New Delhi, 2001

OPERATIONS RESEARCH

B. Tech IV Year II Semester					Dept. of Chemical Engineering		
Code	**Category**	**Hours/Week**			**Credits**	**Marks**		
A58024	OEC-II	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		2	1	0	3	40	60	100

Course Objectives

The objectives of this course are to:

1. understand linear programming models in practical applications
2. familiarize the transportation problems by using different methods
3. learn the Johnson method for processing of jobs and machines and replacement policy concepts in industry
4. know the concepts of game theory and inventory control techniques to classify inventory items
5. acquaint with the concepts of queuing methods and simulation tools for optimization

Course Outcomes

After completion of this course, the students will be able to:

1. solve linear programming and simplex method problems in real time applications
2. adapt the assignment method for optimum resource allocation and transportation method with optimum transportation cost for industry applications
3. analyze sequencing and replacement models and apply them for optimization
4. apply game theory for optimal decision making and inventory models to optimize the cost
5. formulate different real life probabilistic situations using Monte Carlo simulation technique and apply queuing theory concepts in industry

Unit I

Linear Programming Problem – Introduction to Operations Research – Linear Programming – Mathematical Formulation – Graphical method – Simplex method – Big M-method – Duality

Unit II

Transportation Problem – Introduction – Formulation – Solution of the balanced and unbalanced transportation problem (Min and Max) – Northwest Corner rule, row minima method, column minima method, least cost method, Vogel's approximation method – Optimality test – MODI method
Assignment problem – Applications – Minimization and Maximization of balanced and unbalanced assignment problems for optimal solution – Travelling salesman problems

Unit III

Sequencing – Basic concepts – Problems with n jobs and 2 machines – n jobs and 3 machines problem – 2 jobs and m machines problem

Replacement -Replacement of items that deteriorate with time – No changes in the value of money – changes in the value of money – Items that fail completely – Individual replacement and group replacement policies

Unit IV

Inventory - Basic terminology used in Inventory – Models with deterministic demand – model (a) demand rate uniform and production rate infinite, model (b) demand rate non-uniform and production rate infinite, model (c) demand rate uniform and production rate finite

Game theory -Basic terminology used in game theory – Minimax and Maximin principle – problems with saddle point and without saddle point – Dominance principle - Graphical solution – Algebraic method

Unit V

Queuing -Introduction to queuing theory – terminologies – classification of queuing models – single server problems – multi server problems

Simulation - Basic concepts – phases of simulation – applications – advantages and disadvantages – Random number generation – Monte Carlo Simulation applied to inventory and queuing problems

Text Books

1. Operations Research: Theory and Applications / J.K Sharma, 5th Edition / Macmillan Publishers India ltd 2009
2. Operations Research / S. Kalavathy, 4th Edition / Vikas Pubilcations House Pvt Ltd.
3. Introduction to Operations Research / Frederic S. Hillier, Gerald J. Lieberman, Bodhibrata Nag, PreetamBasu, 10th Edition / Mc Graw Hill publications

Reference Books

1. Operations Research / Prem Kumar Gupta, D.S Hira / S. Chand and Company Ltd.
2. Operations Research by P. Rama Murthy / 2nd Edition / New Age International Publishers
3. Operations Research / Sudhir Kumar Pundir / CBS Publications
4. Operations Research An Introduction / H.A. Taha / PHI, 2008
5. Principles of Operations Research / H.M. Wagner / PHI, Delhi, 1982
6. Introduction to Optimization: Operations Research / J.C. Pant / Jain Brothers, Delhi, 2008

ESSENTIAL ENGLISH AND EMPLOYABILITY SKILLS

B. Tech IV Year II Semester					Dept. of Chemical Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58026	OEC-III	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Introduction

The purpose of graduate education is not only to gain knowledge but also to acquire employability skills fit for the qualification. The challenge of fresh graduates does not end with merely acquiring a job but to maintain credibility and sustainability throughout their career. Hence, varied skills and competencies are the pre-requisites for professional students who emerge from colleges and are ready to take up global careers.

Course Objectives

By studying this subject student will learn about

a. To enable students to develop their personality, infuse confidence and increase employability skills in any chosen career.
b. To provide the students hands-on experience to cope with the demands of the world of recruiters.
c. To help the students acquire the job skills essential for employment.

Course Outcomes

The student will be able to:

a. Enhancement of employability skills and professional etiquette.
b. Acquisition of productive knowledge, competent learning and innovative thinking skills.
c. Implementation of verbal and non-verbal communication competencies in work place.

UNIT I

"Six Sigma: Dabbawala" from **"English for Employability"** by K Purushotham published by Orient Black Swan, Hyderabad, India.

"Personality Development: A Must for Leadership and Career Growth" from **"Personality Development and Soft Skills"** by Barun.K.Mitra, published by Oxford Publications -

Introduction, Learning about Personality Development from 3 Cases, Personality Analysis, Freudian analysis of Personality Development, Swami Vivekananda's Concept of Personality Development, Personality Begets Leadership Qualities.

UNIT II

"Yet I am not defeated!" from **"English for Employability"** by K Purushotham published by Orient Black Swan, Hyderabad, India.

"Interpersonal skills" from **"Personality Development and Soft Skills"** by Barun.K.Mitra, published by Oxford Publications -

The Personality Attribute of Taking Bold Decisions, Personality Types and Leadership Qualities, Personality Tests

UNIT III

"Patricia Narayanan: An Entrepreneur by accident", from **"English for Employability"** by K Purushotham published by Orient Black Swan, Hyderabad, India.

"Soft Skills: Demanded by Every Employer" from **"Personality Development and Soft Skills"** by Barun.K.Mitra, published by Oxford Publications

Introduction to Soft Skills, Lessons from the 3 Case Studies, Change in Today's Work place; Soft Skills as a Competitive Weapon, Antiquity of Soft Skills, Classification of Soft Skills

UNIT IV

"Satya Nadella: CEO of Microsoft" from "English for Employability" by K Purushotham published by Orient Black Swan, Hyderabad, India.

"Interview Skills" from **"Personality Development and Soft Skills"** by Barun.K.Mitra, published by Oxford Publications.

UNIT V

"Body Language Reveals Your Inner self and Personality" from **"Personality Development and Soft Skills"** by Barun.K.Mitra, published by Oxford Publications -

Introduction, Emotions Displayed by Body Language , Handshake-The Most Common Body Language, Eyes-A Powerful Reflection of One's Inner Self, Entry to My Space – Personal Zones May Vary, Body Language Exhibited during Different Professional Interactions.

Text Books

Textbook 1: “English for Employability” by K Purushotham published by Orient Black Swan, Hyderabad

Textbook 2: “Personality Development and Soft Skills” by Barun K.Mitra, published by Oxford University Press

Reference Books

1. Cottrell,Stella.Skills for Success.London:Palgrave Macmillan,2003.
2. Enhancing English and Employability Skills, State Board of Technical Education and Training, Hyderabad: Orient Blackswan Private Limited, 2012.
3. Knight,T.Peter and Mantz Yorke.Assessment, Learning and Employability.U.K:Mac Graw-Hill House,2003.
4. Rao,M.S. Soft Skills Enhancing Employability.New Delhi: I.K.Publishing House,2010.
5. Rao, Nageshwar.Communication Skills. New Delhi: Himalaya Publishing House Pvt.Ltd, 2008.
6. Sharma,T.K.Enhancing Employability in Education.India:Patridge Publishing House.2015.
7. Sharma,T.K.Enhancing Employability in Education.India:Patridge Publishing House.2015.
8. Sinha, K. K.Business Communication.NewDelhi: Galgotia Publishing Company ,2008.
9. Yadav, Shalini. Communication Techniques, New Delhi: University Science Press,2010.

TECHNICAL AND BUSINESS COMMUNICATION SKILLS

B. Tech IV Year II Semester					Dept. of Chemical Engineering			
Code	Category	Hours / Week			Credits	Marks		
A58001	OEC-III	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Introduction

The course is intended to expose the students to learn and practice the five communication skills thinking, listening, speaking reading, and writing in English, the global language of communication. It reflects some of the approaches in English language teaching and learning currently in practice around the world.

Course Objectives

By studying this subject student will learn about to help the students to develop effective communication skills in all communicative contexts for professional advancement.

Course Outcomes

The student will be able to:

1. communicate technical and business correspondence
2. reflect on the themes discussed
3. recognize ethical implications of technical communication in professional contexts
4. identify the contemporary issues in engineering from environmental, societal, economic, and global perspectives
5. demonstrate ethical decisions in complex situations.

UNIT I

E-World & E-Communication:

E-language - E-governance - E-commerce/E-business - E-banking - E-waste

UNIT II

Business Establishment & Infrastructure Development: Power Supply - Industrial Park - Business Correspondence: Follow-up letters - Acceptance & Rejections - Persuasive letters - Resignation letters.

UNIT III

Technology and Society:

Robot Soldiers - For a Snapshot of a Web - Placing an order - Proposal Writing - Patents & Rights (National & International) - Intellectual Property - Nanotechnology

UNIT IV

Ethics in Business Communication:

Ethical issues involved in Business Communication - Ethical dilemmas facing managers - Ethical Code & Communication - Standards in Daily Life - Total Quality Management - World University Ranking.

UNIT V

Management Information System:

Corporate Governance - Business Process Outsourcing - Project Management Communication - Marketing Communication

Text Books

Dhanavel, P. S. English and Communication Skills for Students of Science and Engineering. Orient Black Swan. 2009.

Reference Books

1. Anderson, V. Paul. *Technical Communication.* Cengage. 2014.
2. Kalkar, Anjali. et.al. *Business Communication*. Orient Black Swan. 2010.
3. Knisely, W. Charles. and Knisely, I. Karin. *Engineering Communication.* Cengage. 2015.
4. Kumar, Sanjay. and Pushp Lata. *Language and Communication skills for Engineers.* Oxford University Press. 2018.
5. Raman, Meenakshi and Singh, Prakash. *Business Communication.* (Second Edition.). Oxford University Press. 2012.

DIGITAL MEDIA LITERACY

B. Tech IV Year II Semester					Dept. of Chemical Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58019	OEC-III	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Introduction

The course is introduced to build a relationship between media Literacy to traditional forms. It will enable the students understand the media around them and learn to use media literacy effectively. The students can also excel their writing skills through media.

Course Objectives

By studying this subject student will learn about

1. prepare the students to use media source and its content
2. train the students become media literate
3. provide practical tips for incorporating media literacy into the traditional curriculum

Course Outcomes

The student will be able to:

1. use media as a learning tool
2. share knowledge in digital media
3. apply the use of persuasive language
4. exhibit copy writing skills
5. contribute their ideas through blogs

UNIT I

Introduction – Diversity and Media:
Bias in the Media - Peer Driven Social Learning Communities - Social Learning Spaces - Mirrored Learning Words - Online Events - The Nitty - Gritties

UNIT II

Digital Literacy in Action:

Internet Safety and Filtering - Establish Proficiency of Tagging

UNIT III

Blogging:
Basics of Blog Writing - Foundations of Blogging - Blogs as Professional Development Tool - Blogs as a Learning Tool - Creating Knowledge Habitats

UNIT IV

The Classroom:
A Market place for Learning - Build an Electronic Calendar-Paper less News Paper - Marketing through Social Media - Writing Techniques.

UNIT V

Gaming as a Literacy:
How Video games promote Learning? - Participatory Culture and Engagement - Collaboration and Cooperation - Motivation

Text Books

Media Literacy by Heidi Hayes Jacobs, Solution Tree Press, USA (E-book is available to download)

Reference Books

1. Hobbs Renee R.*Create To Learn: Introduction To Digital Literacy*. *Wiley-Blackwell Publications.*
2. Frank, W. Baker. *Media Literacy in the K-12 Classroom.* (2nd Edition.). Paperback Publications.
3. Hertz, Mary. Beth. *Digital and Media Literacy in the Age of the Internet: Practical Classroom Applications.* Rowman & Littlefield Publishers.
4. Hobbs Renee R. *Digital and Media Literacy.* Sage Publications.
5. Potter, W. James. *Introduction to Media Literacy.* Sage Publications.

ANURAG UNIVERSITY

Venkatapur (V), Ghatkesar (M), Medchal (Dist.), Hyderabad, Telangana, India. 500 088. www.anurag.edu.in

Department of Computer Science and Engineering

Minutes of the Fifth Board of Studies (BoS) meeting

The fifth Board of Studies (BoS) Meeting of the Department of Computer Science and Engineering (CSE), Anurag University was held on 21st November 2022 from 3.00 p.m. The internal BoS members, the senior and doctorate faculty, and the course coordinators of the CSE Department were present in offline mode at the A-block conference hall and the external members were present for the BoS meeting in online mode.

The link for the meeting

https://us02web.zoom.us/j/82106885358?pwd=cmFhLzA5aGIZdU10b1ZtNIF4aEVUdz09

Agenda of the Meeting;

1. To approve the course structure and syllabus of the 4th year B.Tech Computer Science and Engineering program.
2. To approve the course structure and syllabus of the 4th year B.Tech Computer Science and Engineering – Data Science
3. To approve the replacement of the Skill Integrated Language Lab course with the Verbal Ability and Critical Reasoning Lab course for the 3rd year Second Semester of the CSE and CSE-DS Program.
4. To approve the moving of the principles of cryptography course (PE II) from 3rd year Second semester to 4th-year 1st semester as professional core and rename the course as Cryptography and Information security
5. Permission for e-approval to add new elective course and contents
6. Any other item with the permission of the chair

The Chairperson, of BoS has communicated the following well in advance to all the members of BoS:

a) Agenda of 5th BoS
b) Proposed B.Tech IV Year Course structure and syllabus of B.Tech- CSE
c) Proposed B.Tech IV Year Course structure of CSE-Data Science (DS)

The Meeting was convened to discuss the above agenda

The Chairperson welcomed the members and conducted the proceedings. The following Resolutions are made in the meeting.

Item No. 1: Course Structure and syllabus of IV B. Tech in CSE- of AU-R20 regulations.

Resolution: The BoS members had an elaborate discussion on the Course structure and syllabus of the IV Year of B. Tech CSE program and resolved to approve the same with the following modifications:

a) In the Fundamentals of Cloud computing course, the members asked to include virtualization in Unit I.
b) suggested to change the first two units of the Web mining course.
c) Asked to add basics of cryptography in information security to rename the title as Cryptography and information security.

The above-mentioned changes of item 1 are adopted.

Item No. 2: Course Structure and syllabus of IV Year B. Tech in CSE-Data Science (CSE-DS) of AU-R20

Resolution: After the discussions on the Course structure and syllabus of the IV Year of B. Tech CSE-DS program, the BoS members and resolved to approve the same with the following modifications:

a) Insisted to make Deep Learning a core subject in place of Big Data analytics since they are undergoing the machine learning course in the previous semester. It is resolved to swap these two courses (Deep Learning with Big Data analytics).
b) Suggested to incorporate the changes that are advised in item 1: a, b, and c of above in the CSE-DS program.

The above-mentioned changes of item 2 are incorporated.

Item No.3: To approve the replacement of the Skill Integrated Language Lab course with the Verbal Ability and Critical Reasoning Lab course for the 3rd year Second Semester of the CSE and CSE-DS Program.

ResolutionThe Board has approved the same

Item 4:To approve the moving of the principles of cryptography course (PE II) from 3rd year Second semester to 4th year 1st semester as professional core and rename the course as Cryptography and Information security, since part of the contents remains the same.

Resolution:The board has approved the same (it is also placed in items 1 and 2).

Item No.5: In case of amendments/changes in the course structure or syllabi, the Board has suggested the following:

Resolution: a) In any case, if there are major changes or amendments either in the course structure or syllabus, the BOS meeting shall be called for its approval.

b) In any case, if there are minor changes or amendments either in the course structure or syllabus, it will be communicated to all BOS members through e-mail for e-approval.

The meeting was concluded with the Vote of Thanks.

The following members attended the meeting

S.No	Name	Designation	Designation in BoS
1	Dr. R.B.V. Subramanyam	Professor, Dept. of CSE, and Chief Investigator, Electronics & ICT Academy (Set up by MeitY, Govt. of India), NIT, Warangal	External Member
2	Dr. Rajiv Wankar	Professor, Dept. of CSE, University of Hyderabad	External Member
3	Mr. Richard King	Regional Head, Academic Interface program, TCS, Hyderabad	External Member
4	Dr. G. Vishnu Murthy	Professor & Head Dept. of C S E , Dean-Engineering, AU	Internal Member
5	Ms. Sravanthi Satyavarapu	Asst. Manager, Tech. Mahindra, Alumini, Hyderabad	External Member
6	Dr.M. Sridevi	Assoc. Professor Dept. of CSE, AU, Hyderabad	Internal Member
7	Dr. V. Vijaya Kumar	Professor- Dean- Research & Development, AU, Hyderabad	Chairperson - CSE

Member Invitee

S.No	Name	Designation	Designation in BoS
1	Prof.Syeda Sameen Fatima,	Registrar, Professor, Dept. of AI, AU.	Member Invitee
2.	Dr.Balram	Professor, Dept.of CSE	Member Invitee
3	Dr.A.Mallikarjun Reddy	Assoc., Prof., Dept of CSE	Member Invitee
4	Dr.P.Srilatha	Asst., Prof., Dept of CSE	Member Invitee
5	Dr.Siva prasad	Asst., Prof., Dept of CSE	Member Invitee
6	Dr.A.Jyothi	Asst., Prof., Dept of CSE	Member Invitee
7	Dr.J.Shiva prasanth	Asst., Prof., Dept of CSE	Member Invitee
8	Dr.Balakrishna	Asst., Prof., Dept of CSE	Member Invitee
9.	Ms.B.Ujwala	Asst., Prof., Dept of CSE	Member Invitee

Sd/

Chairperson Board of studies Department of Computer Science and

Engineering Anurag University, Hyderabad

Course Structure and Syllabus

B.Tech(CSE)

(IV Year)

Department of Computer Science and Engineering

ANURAG UNIVERSITY

Hyderabad, Medchal (Dist),

Telangana– 500 088

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ANURAG UNIVERSITY

B.Tech. CSE

B. TECH IV YEAR I SEM (7thSemester) 5 T +2 L + Mini project

Serial No	Course Code	Category	Course Title	Hours per week L	T	P	Credits
1	A57054	HSS&MC	Managerial Economics and Financial Analysis	2	1	0	3
2	A57055	PCC	Cryptography and Information Security	3	1	0	4
3	A57056	PEC-III	1. Deep Learning	3	1	0	4
	A57057		2. Mobile Application Development				
	A57058		3. Software Testing				
	A57059		4. Data Science and Visualization				
4	A57060	PEC - IV	1. Fundamentals of Cloud Computing	3	0	0	3
	A57061		2. Natural Language Processing				
	A57062		3. Web Mining				
5	A57063	PEC-V	1. Cyber Forensics	3	0	0	3
	A57064		2. Human Computer Interaction				
	A57065		3. Fundamentals of Blockchain Technology				
6	A57209	PCC	Cryptography and Information Security-Lab	0	0	3	1.5
7	A57210	PEC-III-Lab	1. Deep Learning Lab	0	0	3	1.5
	A57211		2. Mobile Application Development Lab				
	A57212		3. Software Testing Lab				
	A57213		4. Data Science and Visualization Lab				
8	A57230	PROJ	Industry Oriented Mini Project	0	0	4	2
Total							22

B.TECH IV YEAR II SEM **2T +3 L/P**

Subject Code	Course Code	Category	Course Title	Hours per week			Credits
				L	T	P	
1	A58001	OEC-II	1. Technical and Business Communication Skills	2	1	0	3
	A58019		2. Digital Media Literacy				
	A58010		3. Value Engineering				
2	A58005	OEC-III	1. Negotiation Skills	2	1	0	3
	A58008		2. Project Management				
	A58021		3. Stress Management				
3	A58201	PROJ	Seminar	0	0	4	2
4	A58202		Comprehensive Viva-Voce	0	0	0	2
5	A58203	PROJ	Project	0	0	20	10
			Total				**20**

ANURAG UNIVERSITY

IV Year B.Tech CSE I SEM	L	T/P	C
	2	1/0	3

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS (HSS&MC)

Course Objectives:

The objective of this course is to familiarize the student with the concepts of managerial economics and financial accounting, demand and cost concepts, market structures, pricing and financial ratios

Course Outcomes:

At the end of the course students will be able to:

1. Describe the concept of demand and its determinants in managerial decisions
2. Know the cost concepts and breakeven analysis in production
3. Identify various market structures and different pricing strategies
4. Have knowledge of capital budgeting techniques in financial decisions
5. Have knowledge of Ratios in solving of business problems

Unit-I

Introduction to Managerial Economics: Definition, nature and scope of managerial economics, demand analysis- demand determinants, Law of Demand and its exceptions.

Elasticity of Demand: Definition, types, measurement and significance of elasticity of demand. demand forecasting, methods of demand forecasting.

Unit-II

Theory of Production and Cost Analysis: Production Function – Isoquants and Iso costs, MRTS, Least Cost Combination of Inputs.

Cost Analysis: Cost concepts, Opportunity cost, Breakeven Analysis (BEA) – determination of breakeven point, managerial significance and limitations of BEA.

Unit –III

Market structures: Types of competition, features of perfect competition, monopoly and monopolistic competition, price - output determination in perfect competition

Objectives and Policies of Pricing: objectives of pricing**,** methods of pricing - cost plus pricing, marginal cost pricing, going rate pricing, limit pricing, market skimming pricing, penetration pricing, two - part pricing, block pricing, peak load pricing, cross subsidization.

Unit –IV

Capital and Capital Budgeting: Capital and its significance. Types of capital. estimation of fixed and working capital requirements. Methods and sources of raising finance. Nature and scope of capital budgeting, features of capital budgeting proposals. Methods of capital Budgeting: Payback Method. Accounting Rate of Return (ARR) and Net Present Value Method

Unit –V

Introduction to Financial Accounting: Definition of Accounting**,** Double-Entry Book Keeping, Journal, Ledger, and Trial Balance, Final Accounts.

Ratio Analysis: Computation, Analysis and Interpretation of Liquidity Ratios Activity Capital Structure Ratios and Profitability Ratios.

TEXT BOOKS:

1. Arya Sri: Managerial Economics and Financial Analysis, TMH,2009
2. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2014

REFERENCES:

1. R. K. Sharma & Shashi K Gupta, Financial Management, Kalyani Publishers, 2020
2. V. Rajasekaran & R. Lalitha, Financial Accounting, Pearson Education, 2010.
3. Domnick Salvatore, Managerial Economics in a Global Economy, 9e, Oxford Univ Press, 2018.
4. S N Maheshwari, CA Sharad K Maheshwari & Dr Suneel K Maheshwari, Financial Accounting, 6/e, Vikas Publications, 2018

ANURAG UNIVERSITY

IV Year B.Tech CSE I SEM

L	T/P	C
3	1/0	4

CRYPTOGRAPHY AND INFORMATION SECURITY

(PCC)

Prerequisites:

Fundamentals of Networking, Mathematical Fundamentals

Course Objectives

1. Understand fundamentals of cryptography and classic encryption techniques.
2. Compare and analyze encryption Algorithms
3. Summarize Authentication Functions using MAC and Hash
4. Analyze security importance of various web Applications
5. Categorize various types of Intruders and Viruses

Course Outcomes

By the completion of the course, the students will be able to:

1. Assess fundamentals of cryptography and classic encryption techniques.
2. Compare various encryption Algorithms.
3. Summarize authentication functions using MAC and Hash
4. Outline security importance of various web applications.
5. Categorize various types of intruders and viruses.

Unit I:

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques symmetric and asymmetric key cryptography, steganography.

Unit II :

Symmetric key Ciphers: DES structure, DES Analysis, Security of DES, variants of DES, Block cipher modes of operation , AES structure, Analysis of AES , Key distribution

Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Analysis of RSA, Diffie-Hellman Key exchange.

Unit III:

Message Authentication and Hash Functions: Authentication requirements and functions, MAC and Hash Functions, MAC Algorithms: Secure Hash Algorithm, Whirlpool, HMAC, Digital signatures, X.509, Kerberos.

Unit IV

Security at layers (Network, Transport, Application): IPSec, Secure Socket Layer(SSL), Transport Layer Security(TLS), Secure Electronic Transaction(SET), Pretty Good Privacy(PGP), S/MIME.

Unit V

Intruders, Virus and Firewalls: Intruders, Intrusion detection, password management, Virus and related threats, Countermeasures, Firewall design principles, Types of firewalls.

Text Books:

1. B.Forouzan, Cryptography and Network Security,Tata McGraw-Hill.
2. William Stallings, Cryptography and Network Security, Pearson Education,4th Edition

Reference Books:

1. C K Shyamala, N Harini, Dr T R Padmanabhan, Cryptography and Network Security : Wiley India, 1st Edition.
2. Bernard Menezes, Network Security and Cryptography: CENGAGE Learning
3. AtulKahate, Cryptography and Network Security: McGraw Hill, 2nd Edition

Reference Links:

1. http://www.cs.iit.edu/~cs549/cs549s07/lectures.htm
2. http://williamstallings.com/Extras/Security-Notes/
3. http://williamstallings.com/NetworkSecurity/styled/

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IV Year B.Tech CSE I SEM	L	T/P	C
	3	1/0	4

DEEP LEARNING

(PEC-III)

Prerequisites:

Basic Mathematics, P&S, Python, Machine Learning

Course Objectives:

1. To advance in training techniques for neural networks
2. To understand various CNN Architectures
3. To understand various RNN Methodologies
4. To custom train Autoencoder Models and implement them.
5. To apply Transfer Learning to solve problems

Course outcomes:

At the end of this course, students will be able to:

1. Have a good understanding of the fundamental issues and basics of deep learning
2. Understand the concept of CNN to apply it in the Image classification problems
3. Learning and understanding the working of various RNN methods
4. Learning and understanding the working of various Autoencoders methods
5. Use Transfer Learning to solve problems with high dimensional data including image and speech

UNIT I :

Deep Learning: Fundamentals, Introduction, Building Block of Neural Networks, Layers, MLPs, Forward pass, backward pass, class, trainer and optimizer, The Vanishing and Exploding Gradient Problems, Difficulties in Convergence, Local and Spurious Optima, Preprocessing, Momentum, learning rate Decay, Weight Initialization, Regularization, Dropout, SoftMax, Cross Entropy loss function, Activation Functions.

UNIT II:

CNN: Introduction, striding and padding, pooling layers, structure, operations and prediction of CNN with layers, CNN -Case study with MNIST, CNN VS Fully Connected

UNIT III:

RNN: Handling Branches, Layers, Nodes, Essential Elements-Vanilla RNNs, GRUs, LSTM

UNIT IV:

Autoencoders: Denoising Autoencoders, Sparse Autoencoders, Deep Autoencoders, Variational Autoencoders, GANS

UNIT V:

Transfer Learning- Types, Methodologies, Diving into Transfer Learning, Challenges

Text Books:

1. Seth Weidman, "Deep Learning from Scratch", O'Reilly Media, Inc., 2019
2. Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning" , MIT Press, 2015
3. Dipanjan Sarkar, Raghav Bali, "Transfer Learning in Action", Manning Publications, 2021

Reference Books:

1. Giancarlo Zaccone, Md. Rezaul Karim, Ahmed Menshawy "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017.
2. Antonio Gulli, Sujit Pal, "Deep Learning with Keras", Packt Publishers, 2017.
3. Francois Chollet, "Deep Learning with Python", Manning Publications, 2017.

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IV Year B.Tech CSE I SEM	L	T/P	C
	3	1/0	4

MOBILE APPLICATION DEVELOPMENT

(PEC-III)

Course Objectives:

1. Outline the usage of Android development framework.
2. Analyze the main components of an Android application and its entire life Cycle.
3. Develop database programming using SQLite.
4. Identify the use of location-based service in android applications.
5. Design SMS and MMS applications using Intents.

Course Outcomes:

At the end of this Mobile Application Development course, students will be able to:

1. Analyze the architecture of android and current trends in mobile operating systems.
2. Apply suitable software tools and APIs for the design of User Interfaces to a particular mobile application.
3. Design applications for mobile devices using SQLite Database.
4. Apply the location-based services in android applications.
5. Summarize the Monitoring changes to the phone, network, data connectivity and SIM states.

UNIT I:

Introduction to Android, Features of Android, The development framework: Understanding the Android Software Stack, Android Application Architecture; the Dalvik Virtual Machine, Creating First Android Application, Types of Android Applications, Android Development Tools: The Android Virtual Device Manager, Android Emulator, The Dalvik Debug Monitor Service.

UNIT II:

Creating applications and Activities: Introduction to the application Manifest File, Using the Manifest Editor, Externalizing Resources: Creating Resources - Simple Values, Drawables, Layouts, Menus, Animations.The Android Activity Life cycle. **Building User Interfaces:** Fundamental Android UI design, Introducing Layouts: Defining Layouts, Using Layouts to Create Device Independent User Interfaces, Optimizing Layouts.

UNIT III:

Databases and Content Providers: Introduction to Android Databases, Introducing SQLite, Content Values and Cursors, working with SQLite Databases- Creating Content Providers, Using Content Providers - Introducing the Content Resolver, Querying Content Providers, Adding, Deleting, and Updating Content

UNIT IV:

Maps and Location based services: Using the location-based services, selecting a Location Provider, selecting a Location provider, finding current location; **Creating Map-Based Activities**: Introducing Map View and Map Activity, Creating a Map-Based Activity

UNIT V:

Telephony and SMS: Using telephony - Initiating Phone Calls, Accessing Telephony Properties and Phone State, Introducing SMS and MMS - Using SMS and MMS in Your Application, Sending SMS and MMS from Your Application Using Intents, Sending SMS Messages Using the SMS Manager.

Text Book:

1. Reto Meier, Professional Android 4 Application Development, 1stEdition, Wrox Press, Wiley Publishing, 2014.

Reference Books:

1. Pradeep Kothari, Android Application Development (with Kitkat Support), Black Book, 2014, Dreamtech Press publisher, Kogent Learning Inc., 2014
2. Erik Hellman, Android Programming: Pushing the Limits, 1st Edition, Wiley Publications, 2014.
3. Mike Wolfson, Android Developer Tools Essentials, O'Reilly Edition, 1st Edition, 2013.

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IV Year B.Tech CSE I SEM	L	T/P	C
	3	1/0	4

SOFTWARE TESTING

(PEC-III)

Course Objectives:

1. To gain knowledge on testing in software development life-cycle, software testing process levels and testing terminologies
2. To learn techniques and algorithms for test case design
3. To understand various issues involved with applying test criteria during software development
4. To comprehend how to develop the many testing criteriato be applied with a variety of technologies.

Course Outcomes:

At the end of this course students will be able to:

1. Understand Software Testing terminology,various activitiesof Test Engineerand Test coverage criteria
2. Design Test cases from graphs
3. Design Test cases from logical expressions
4. Design Test cases from partitions of the input space and syntax
5. Test Object-Oriented and Web Application Softwares

Unit – I

Activities of a Test Engineer: Testing Levels Based on Software Activity, Beizer's Testing Levels Based on Test Process , Maturity Automation of Test Activities, Software Testing Limitations and Terminology, Coverage Criteria for Testing: Infeasibility and Subsumption, Characteristics of a Good Coverage Criterion, Older Software Testing Terminology

Unit – II

Graph Coverage: Graph Coverage: Graph Coverage Criteria, Graph Coverage for Source Code, Graph Coverage for Design Elements, Graph Coverage for Specifications, Graph Coverage for Use Cases, Representing Graphs Algebraically

Unit – III

Logic Coverage: Logic Predicates and Clauses, Logic Expression Coverage Criteria: Active Clause Coverage, Inactive Clause Coverage, Infeasibility and Subsumption, Making a Clause Determine a Predicate, Finding Satisfying Values. Structural Logic Coverage of Programs, Specification-Based Logic Coverage, Logic Coverage of Finite State Machines, Disjunctive Normal Form Criteria

Unit – IV

Input Space Partitioning: Input Domain Modeling, Combination Strategies Criteria, Constraints among Partitions

Syntax-Based Testing: Syntax-Based Coverage Criteria, Program-Based Grammars, Integration and Object-Oriented Testing, Specification-Based Grammars, Input Space Grammars

Unit – V

Practical Considerations: Regression Testing, Integration and Testing, Test Process, Test Plans, Identifying Correct Outputs

Engineering Criteria for Technologies: Testing Object-Oriented Software, Testing Web Applications and Web Services, Testing Graphical User Interfaces, Real-Time Software and Embedded Software

Text Books

1. Paul Ammann and Jeff Offutt, Introduction to Software Testing, Cambridge University Press, 2008.
2. Software Testing techniques - Boris Beizer, Second Edition, Dreamtech Press
3. Software Testing Tools – Dr. K.V.K.K.Prasad, Dreamtech Press

Reference Books

1. Glenford J. Myers, The Art of Software Testing, Second edition, 2008.
2. Paul C. Jorgensen, Software Testing: A Craftsman's Approach, Fourth edition, CRC Press, 2014.
3. Lisa Crispin and Janet Gregory, Agile Testing: A Practical Guide for Testers and Agile Teams, Addison-Wesley, 2009.

IV Year B.Tech CSE I SEM	L	T/P	C
	3	1/0	4

DATA SCIENCE AND VISUALIZATION

(PEC-III)

Prerequisites:

Programming knowledge

Course Objectives:

1. To provide an overview and best practices of data visualization
2. To introduce the data types, relationships, and Data Science Process.
3. To provide the basic principles for data visualization.
4. To introduce the storytelling for effective data presentation.
5. To introduce a trends in market research and data visualization dashboards,

Course Outcomes:

At the conclusion of the course, students should be able to:

1. Identify the skill sets needed for best practices of data visualization and Data Science
2. Understands different phases in data science process and significance data types, relationships
3. Identify principles of data visualization.
4. Apply the storytelling for effective data presentation
5. Evaluate trends in business using data visualization dashboards.

Unit I:

Introduction: What is data visualization? History, The data visualization process, Why is data visualization so important in reports and statements? Explaining, Exploring, Analyzing.

Data Science Definition – Big Data and Data Science Hype – Why data science – The Current Landscape – Skill sets required for Data Scientist

Unit II:

Data types: Quantitative, Qualitative, relationships: Ranking, Deviation, Nominal comparisons, Correlation, Partial and total relationships, Series over time.

Data Science Process: Research Goals- Retrieving data- Cleansing, integrating, and transforming data- Exploratory data analysis- Build the models

Unit III:

Basic principles for data visualization, Visualization formats: Bar chart, Histograms, Pie charts, Scatter plots, Heat maps, Line charts, Bubble charts, Radar charts, Waterfall charts, Tree maps, Area charts

Layout and design: communicative elements, Prioritize patterns in your visualizations: Gestalt

Unit IV:

Storytelling for social and market communication, Data storytelling, A basic recipe for storytelling in your presentations and final reports, Trends in market research and data visualization dashboards, Scrolly telling.

Unit V:

Application of Data Visualization, Applications of Data Science, Next-generation data scientists. Visualizing data tools: HTML5 CANVAS: Linear interpolations, A Simple Column Chart, Animations, Google Charts API Basics, D3.js, and Dashboard using Tableau, Future of data visualization,.

Text Books:

1. Chun-houh Chen, Wolfgang Härdle, Antony Unwin, "Handbook of Data Visualization", Springer, 2008.
2. Pérez, J. and Vialcanet, G., Visualize It: A Comprehensive Guide to Data Visualization, 2013.
3. Introducing Data Science, Davy Cielen, Arno D. B. Meysman, Mohamed Ali, Manning Publications Co., 1st edition, 2016.

Reference Books:

1. E. Tufte, “The Visual Display of Quantitative Information”, Second Edition, Graphics Press, 2007.
2. Cathy O’Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O’Reilly. 2014.
3. Ward, Grinstein Keim, “Interactive Data Visualization: Foundations, Techniques, and Applications”, Natick: A K Peters, Ltd.
4. Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment", O'Reilly, 2008.
5. A Julie Steele and Noah Iliinsky, “Designing Data Visualizations: Representing Informational Relationships”, O’Relly.
6. Andy Kirk, Data Visualization: A Successful Design Process, PAKT.
7. Scott Murray, “Interactive Data Visualization for Web”, O’Relly.
8. Nathan Yau, "Data Points: Visualization that means something", Wiley, 2013.

Web references:

1. Visualization through Tableau http://www.tableausoftware.com/public
2. Gap Minder and Google Motion Charts (www.gapminder.org).

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IV Year B.Tech CSE I SEM	L	T/P	C
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FUNDAMENTALS OF CLOUD COMPUTING

(PEC-IV)

Prerequisites:

Computer Organization and Computer Networks.

Course Objectives:

1. This course provides an insight into cloud computing

Course Outcomes:

After the end of the course, the students will be able to:

1. Understand different Computing Paradigms and Virtualization
2. Learn the fundamentals of Cloud Computing.
3. Understand various service delivery models of a cloud computing architecture.
4. Demonstrate the ways in which the cloud can be programmed and deployed
5. Identify applications that can deploy on a Cloud environment.

Unit I:

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing

Virtualization: Introduction to Virtualization, Approaches in Virtualization, Hypervisor and Its Role, Types of Virtualization

Unit II:

Cloud Computing Fundamentals: Motivation for Cloud Computing, Defining Cloud Computing, 5-4-3 Principles of Cloud computing, Cloud Ecosystem, Requirements for Cloud Services.

Unit III:

Cloud Computing Architecture and Management: Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications on the Cloud, Managing the Cloud, Migrating Application to Cloud.

Unit IV:

Cloud Deployment Models: Private cloud, Public Cloud, Community Cloud, Hybrid Cloud.

Cloud Service Models: Infrastructure as a Service, Platform as a Service, Software as a Service.

Unit V:

Cloud Service Providers: EMC, Google, Amazon Web Services, Microsoft, Windows Azure, IBM, Cloud Models, IBM, Sales force.

Open-Source Support for Cloud: Open-Source Tools for IaaS, Open-Source Tools for PaaS, Open-Source Tools for SaaS.

Text Books:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

Reference Books:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.

2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.

3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp 2011.

ANURAG UNIVERSITY

IV Year B.Tech CSE I SEM	L	T/P	C
	3	0	3

NATURAL LANGUAGE PROCESSING

(PEC-IV)

Pre-requisites:

Artificial Intelligence, Machine Learning, Python Programming

Course Objectives:

1. To learn the fundamentals of Natural Language Processing
2. To understand the semantic aspects and similarity measures
3. To understand the aspects of context-free grammar and perform parsing
4. To understand and identify different word senses and find their relationship
5. To apply the NLP techniques in understanding discourses

Course Outcomes:

At the end of this course, students will be able to:

6. Solve problems involving regular expressions and N grams
7. Evaluate Vector models
8. Perform parsing operations
9. Build and analyze applications with semantic roles involving selectional restrictions
10. Utilize NLP learning algorithms in understanding a discourse

UNIT I:

REGULAR EXPRESSIONS AND N-GRAM MODELS

Regular Expressions - Regular Expressions, Corpora, Text Normalization, Minimum Edit Distance

Ngram Models - Ngrams, Evaluating Language models, Generalization, Smoothing

UNIT II :

Lexical Semantics, Vector semantics, Words and Vectors, Cosine for measuring similarity, TF-IDF, PMI

Visualising Embeddings, Semantic Properties of Embeddings, Bias and Embeddings

UNIT III :

Constituency Grammar - Constituency, Context free grammar, Grammar Rules for English, Treebanks, Grammar Equivalence and Normal Form, Lexicalized Grammar

Parsing - Ambiguity, CKY Parsing

UNIT IV:

WORD SENSES AND SEMANTIC ROLE

Word senses, Relation between senses, WordNet, Word Sense Disambiguation
Semantic Roles, Diathesis alternations, Problems with thematic roles, Proposition Bank, FrameNet, Semantic Role Labelling, Selectional Restrictions

UNIT V :

COREFERENCE RESOLUTION AND DISCOURSE COHERENCE

Coreference Resolution - Coreference Phenomena, coreference Tasks and datasets, Architecture of coreference algorithm, Gender bias in coreference

Discourse Coherence - Coherence Relation, Discourse Structure Parsing, Centering and Entity based Coherence, Representation model for local coherence, Global coherence

Text Books:

1. Daniel Jurafsky, James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech", Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, "Natural Language Processing with Python", First Edition, OReilly Media, 2009

Reference Books:

1 James Allen, "Natural Language Understanding", 2nd Edition, Benjamin, Cummings publishing company, 1995.
2 Rajesh Arumugam, Rajalingappaa Shanmugamani, "Hands-On Natural Language Processing with Python" , Packt Publishing Ltd., 2018
3 Deepti Chopra, Nisheeth Joshi, Iti Mathur "Mastering Natural Language Processing with Python" First Edition, Packt Publishing, 2016

ANURAG UNIVERSITY

IV Year B.Tech CSE I SEM	L	T/P	C
	3	0	3

WEB MINING

(PEC-IV)

Pre-requisites:

Probability & Statistics, Basics of Internet Knowledge

Course Objectives:

1. To describe web mining and understand the need for web mining.
2. Differentiate between Web mining and data mining
3. Understand the different methods to introduce structure to web-based data.
4. To understand how information is retrieved from Social media & WWW

Course Outcome:

By the end of the course, Student will be able to:

1. Identify the difference between Web mining & Data Mining.
2. Learn the methods of data extraction and Processing.
3. Learn the social network data mining.
4. Understand the concepts of Information Retrieval System from Web.
5. Do text processing, Language Processing.

UnitI:

Introduction: A brief history of web and hypertext data, Topic directories, clustering and classification.

Web data extraction and processing: Web crawling and indexing, Hyperlink analysis, resources discovery and vertical portals. Structured and unstructured data mining.

Unit-II:

Infrastructure: Crawling the web: HTML, HTTP Basics, engineering large- scale crawlers.

DNS Catching, Perfecting and resolutions.

Multiple current fetches: Multithreading, Link extraction and Normalization.Txt repository.Similarity and clustering

Unit-III:

Mining social network data: Social Network Analysis, Information propagation in social network, Community discovery in social networks, expert finding in social networks, Link prediction in social networks. **Mining user generated contents:** The Social Web, Mining micro blogging data, Mining social tagging data.

Unit-IV:

Information Retrieval: Basic Concepts of Information Retrieval, Information Retrieval Methods – Boolean Model, Vector Space Model and Statistical Language Model, Relevance Feedback, Evaluation Measures, Text and Web Page Preprocessing – Stopword Removal, Stemming, Web Page Preprocessing, Duplicate Detection, Inverted Index and Its Compression – Inverted Index, Search using Inverted Index, Index Construction, Index Compression, Latent Semantic Indexing – Singular Value Decomposition.

Unit-V:

Opinion Mining: motivation and problem definition, Research issues on Opinion Mining, Natural Language Processing, Text processing and Opinion Mining resources.

Opinion Mining – Sentiment Classification – Classification based on Sentiment Phrases, Classification Using Text Classification Methods, Feature based Opinion Mining and Summarization – Problem Definition, Object feature extraction.

Text Books:

1. SoumenChakrabarti,"Mining the Web: Discovering Knowledge from Hypertext Data" Second edition, Morgan Kauffmann.
2. Bing Liu" Web Data Mining: Exploring hyperlinks, contents and usage data " , Springer Second Edition.

Reference Books:

1. "Mining the Social Web" by Mathew A. Russell, Mikhail Klassen" 3rd Edition, O Reilly publication.
2. "Mining the World Wide Web: An Information Search Approach." by Chang, G., Healey, M. J., McHugh, J. A. M., Wang, J. T. L. Kluwer Academic Publishers.
3. "Web mining: Applications & Techniques" by Antony Scime.

ANURAG UNIVERSITY

IV Year B.Tech CSE I SEM	L	T/P	C
	3	0	3

CYBER FORENSICS

(PEC-V)

Course Objectives:

1. Create a document review, retention, and destruction policy.
2. Write an acceptable use policy and employer privacy statement.
3. List and describe the generally accepted computer forensic procedures.
4. Explain and list the various legislation and regulations that impact technology.
5. Analyze forensic analysis reports

Course Outcomes:

At the end of this course, students will be able to:

1. Perform a forensic investigation by following guidelines to secure the crime or corporate scene.
2. Learn what legal issues are involved and what rights the person of interest has.
3. Perform digitally and court approved images of evidence to be used in a court of law.
4. Learn how to document and store evidence.
5. Learn how to analyze evidence using commercial forensic software and also how to create a report of the said evidence.

UNIT-I

Computer Forensics and Investigations: What is computer Forensics? Use of computer forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceeding, Computer Forensics services, Benefits of Professional

Forensics Methodology, Steps taken by Computer Forensics Specialists.

Types of Computer Forensics Technology: Types of Military Computer Forensic Technology, Types of law Enforcement-Computer forensic Technology.

UNIT-II

Computer Forensics Evidence and capture: Data Recovery Defined Data Backup and Recovery, The Role of Back-up in Data Recovery, The Data Recovery Solution

Evidence Collection and Data Seizure: Why Collection Evidence? Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, General Procedure, Collection and Archiving, Methods of Collection, Artifacts, Collection Steps.

UNIT-III

Controlling Communication: The Chain of Custody duplication and Preservation of Digit

Evidence: Preserving the Digital Crime Scene, Computer Evidence Processing Steps, Legal Aspects of Collection and Preserving Computer Forensics Evidence.

Computer Image Verification and Authentication: Special Needs of Evidential Authentication

Computer Forensics analysis and validation: Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions

UNIT-IV

Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics using network tools.

Processing Crime and Incident Scenes: Identifying Digital Evidence, Collecting the Evidence in Private-Sector Incident Scenes, Processing law Enforcement Crime Scenes, Preparing for a Search, securing a Computer Incident or Crime Scene, Storing Digital evidence, obtaining a Digital Hash.

UNIT-V

E-mail Investigations: Exploring the Role of E-mail in Investigations, Exploring the Role of Client and Server in E-mail, Investigating Email Crimes and Violations, Understanding Email Servers, Using Specialized Email Forensics Tools,

Mobile Device Forensics: Understanding Mobile Device Forensics, Understanding Acquisition Procedure for Cell Phones and Mobile Devices

TEXT BOOKS:

1. John R.Vacca, Computer Forensics, Computer Crime Investigation, firewall Media, New Delhi,2005
2. Nelson, Phillips Enfinger, Steuart, Computer Forensics and Investigations, Cengage Learning.2009

REFERENCES:

1. Keith J. Jones, Richard Bejthich, Curtis W Rose, Real Digital Forensics, AdditionWesley Pearson Education.2006
2. Tony Sammesand Bairn Jenkinson, Forensic Compiling A Practitioner's Guide, Springer International edition.2013
3. Christopher L.T.Brown, Computer Evidence Collection & Presentation, Firewall Media.2005

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IV Year B.Tech CSE I SEM	L	T/P	C
	3	0	3

HUMAN COMPUTER INTERACTION

(PEC-V)

Prerequisites:

Web Technologies

Unit – I

Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

Unit – II

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, and understanding business functions.

Unit – III

Screen Designing : Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

Unit – IV

Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

Unit – V

Software tools – Specification methods, interface – Building Tools. Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.

Text Books

1. The essential guide to user interface design: Wilbert O Galitz,Wilely Dreama Tech 2007
2. Designing the user interface design: Ben Shneiderman 3rd Edition, Pearson Education Asia 2001

Suggested / Reference Books

1. Human – Computer Interaction. ALAN DIX, JANET FINCAY, GRE GORYD, ABOWD, RUSSELL BEALG, PEARSON.
2. Interaction Design PRECE, ROGERS, SHARPS. Wiley Dreamtech,

Other Resources

1. http://courses.iicm.tugraz.at/hci/hci.pdf
2. http://www.prenhall.com/behindthebook/0132240858/pdf
3. http://ebooksfile.com/pdf/Zz2/human-computer-interaction-sample-exam-questions.pdf
4. http://nptel.ac.in/courses.php?disciplineId=106

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IV Year B.Tech CSE I SEM	L	T/P	C
	3	0	3

FUNDAMENTALS OF BLOCKCHAIN TECHNOLOGY

(PEC-V)

Pre-Requisites:

Object Oriented Programming Through Java, Basic Knowledge Of Computer Security, Data Structures

Course Objectives:

1. Identify different components and types of Blockchain.
2. Learn Smart Contracts for public Blockchain
3. Apply Ethereum tool for Deploying the Smart Contract
4. Interpret Private Blockchain System
5. Analyse the impact of Blockchain in business

Course Outcomes:

At the end of this course, students will be able to:

1. Summarize types and applications of Blockchain
2. Understand Smart Contracts for Public Blockchain System
3. Illustrate the design and deployment of smart contract through Ethereum
4. Apply Private Blockchain System in different Networks
5. Categorize different Business Applications of Blockchain

UNIT I:

Fundamentals of Blockchain: Origin of Blockchain, Blockchain Solution, Components of Blockchain, Block in a Blockchain, The Technology and the Future.

Blockchain Types and Consensus Mechanism: Decentralization and Distribution, Types of Blockchain, Consensus Protocol

UNIT II:

Blockchain, EthereumBlockchain

Smart Contracts: Smart Contract, Characteristics of a Smart Contract

Ethereum Solidity: Introduction, Datatype, operator, enum, arrays, loops

UNIT III:

Ethereum Solidity: Mapping, Structure, State Modifiers, Exception Handling in Solidity, Inheritance, Compile and Deploy the Smart Contract. Introduction to Truffle IDE and metamask.

UNIT IV:

Private Blockchain System: Key Characteristics of Private Blockchain, Why We Need

Private Blockchain, Private Blockchain Examples, Private Blockchain and Open Source, E-commerce Site Example, Various Commands (Instructions) in E-commerce Blockchain, Smart Contract in Private Environment, State Machine, Different Algorithms of Permissioned Blockchain, Byzantine Fault, Multichain.

UNIT V:

Application of Blockchain: Blockchain in Banking and Finance, Blockchain in

Education, Blockchain in Energy, Blockchain in Healthcare, Blockchain in Real-estate, Blockchain in Supply Chain, The Blockchain and IoT.

Limitations and Challenges of Blockchain: Blockchain Implementation – Limitations, Blockchain Implementation – Challenges

Text Books:

1. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017
2. BlockchainTechnology:ChandramouliSubramanian,Asha A George,Abhilash K A and MeenaKarthikeyan,Published by University Press

Reference Books

1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos Blockchain by Melanie Swa, O'Reilly
2. Philipp Hacker, IoannisLianos (2019). Regulating Blockchain: Techno-Social and Legal Challenges, OUP Oxford. (ISBN-13: 978-0198842187).

Reference Link

1. Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits - https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html

IV Year B.Tech CSE I SEM	L	T/P	C
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CRYPTOGRAPHYAND INFORMATION SECURITYLAB

PC LAB

Course Outcomes

1. Implement port Scanning
2. Investigate Security of Network
3. Analyze Packet Protocols ,IP Spoofing
4. Implement Various Encryption Algorithms
5. Implement Brute Force Algorithm

Week 1

1. Installation of NetCat.

Week2

2. Implement port scanning with NetCat

Week 3

3. Perform the following using NetCat
   - Banner Grabbing .
   - Chat Interface
   - File Transfer

Week 4

4.Installation of Network Miner

Week 5

5.Perform an experiment to sniff packets and IPs using Network

Week 6

6. perform Sniffing of Web Browser User-Agents.

Week 7

6. Implement Simple Data Encryption Standard (SDES) Algorithm through C program

Week 8,9

7. Implement Diffie–Hellman key exchange algorithm through C program.

Week 10

8. Installation of cryptool 2

Week 11

9. Implement DES algorithm using cryptool 2

Week 12

10. Implement RSA algorithm using cryptool 2

Week 13

11. Implement HASH algorithm using cryptool 2

Week 14

12. Implement SHA1 algorithm using crpty tool 2

Week 15

13. Implement brute force algorithm in C .

IV Year B.Tech CSE I SEM	L	T/P	C
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Deep Learning Lab

(PEC-III LAB)

Prerequisites:

DM, P&S, Python, AI, ML

List of Programs:

1. Implementation of Linear Regression
2. Deep learning Packages Basics: TensorFlow, Keras and PyTorch
3. Implementation of Neural network
4. Face recognition using CNN
5. Sentiment Analysis using LSTM
6. Language Modeling using RNN
7. Sentiment Analysis using GRU
8. Image Classification with Transfer Learning

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IV Year B.Tech CSE I SEM	L	T/P	C
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MOBILE APPLICATION DEVELOPMENT LAB

(PEC-III LAB)

Course Outcomes:

At the end of this Mobile Application Development Lab course, students will be able to:

1. Develop user interfaces for the Android platform.
2. Implement various mobile applications using Emulators.
3. Create a database for mobile applications using SQLite Database.
4. Perform location-based services in android applications.
5. Create telephony and SMS for android applications.

List of Experiments:

1. Develop an Application that Uses GUI Components, Font and Colors
2. Develop an Application that Uses Layout Managers and Event Listeners.
3. Develop a Native Calculator Application.
4. Write an Application that Draws Basic Graphical Primitives on The Screen.
5. Develop an Application that Makes Use of Database.
6. Develop a Native Application that Uses GPS Location Information.
7. Implement an Application that Writes Data to The SD Card.
8. Implement an Application that Creates an Alert Upon Receiving A Message.
9. Write a Mobile Application that Creates Alarm Clock

IV Year B.Tech CSE I SEM	L	T/P	C
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SOFTWARE TESTING LAB

(PEC-III LAB)

Prerequisites:

Data Structure, Object Oriented Programming, Web technologies

Course Objectives:

1. Manual testing using functional test
2. White box test case design based on path ,data, and logic
3. Explore Regression and Integration testing
4. Testing of Object-Oriented and Web Applications Softwares

Course Outcomes:

At the end of this course students will be able to:

1. Performed Manual testing based on test cases
2. Design and execute Test cases of Path and Data coverage Criteria
3. Design and execute Test cases of Data and Logic coverage Criteria
4. Performed Regression and integration Testing
5. Testing Object-Oriented and Web Applications Software

List of Programs:

Week 1

Write functional test cases of ATM and perform manual testing to find faults and failures

Week2

Design and execute Edge and Node coverage Test cases of Student grade Assignment computer program

Week 3

Design and implement a program that will compute all paths (edge and Node) in a graph, it will be to accept a graph as input by reading a list of nodes, initial nodes, final nodes, and edges.

Week 4

Write Program to Reducing Graphs to Path Expressions of give Control Flow graph

Write Program to Find Maximum and Minimum number of test cases of give Control Flow graph

Week 5

Design and execute all du path test cases of Pattern matching of two strings

Week 6

Design and execute complete set of coupling du-pairs of compute the quadratic root for two numbers

Week 7

Design and execute Predicate coverage (PC) and Clause coverage (CC) Test cases of Quadratic program

Week 8

Design and execute Combinatorial coverage (CoC) Correlated active clause coverage Test cases of Quadratic program

Week 9

Design and execute Data partition based test case of Quadratic program

Week 10

Demonstrate Java mutation tool

Week 11

Demonstrate the Regression and Integration testing

Week 12

Demonstrate and execute all Object-Oriented Testing Criteria

Week 13-14

Demonstrate and execute all web application Testing Criteria

IV Year B.Tech CSE I SEM	L	T/P	C
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DATA SCIENCE AND VISUALIZATION LAB
(PEC-III LAB)

Prerequisites:

Some exposure to programming.

Course Objectives:

1. To acquire in-depth understanding of the data visualization techniques.
2. To empower students with tools and techniques for handling and analyzing data.
3. To empower students with tableau tool for managing and interpreting data.
4. To strengthen the analytical and problem solving skill through developing real time applications.

CourseOutcomes

At the end of the course, students should be able to:

1. Understand data visualization concepts related to different applications.
2. Apply different techniques for accessing data sources.
3. Create different charts, stories using Tableau.
4. Create powerful business dashboards using Tableau.

Programming Languages/Tools:

- Tableau Desktop. Tableau's data visualization software is provided through the

  Tableau for teaching program at http://www.tableau.com/data-visualizationsoftware

List of Experiments:

Week 1:

Introduction to Tableau interface / Installation of Tableau.

Week 2-Week 3:

Apply accessing, importing data/connecting to external Sources using Tableau. Graphs and Layouts, Colors, Size, Text and Typography, Shape, Lines.

Week 4-Week6:

Charting in Tableau: Colors, Shapes, and Sizes, Dual Line Charts, Tableau Tooltip. Bar Charts, Line Graphs, Pie Charts, Maps, Scatter Plots, Gantt Charts, Bubble Charts, Histograms, Bullet Charts, Heat Maps and Highlight Tables, Tree maps and Box-and-Whisker Plots.

Week 7:

Multivariate visualization on given dataset using Tableau.

Week 8:

Maps and Geographic Data Analysis using Tableau.

Week 9-Week 12:

Creating dashboards and stories: Hierarchies, Actions, Filters, and Parameters using Tableau. Connecting/publishing data using Tableau Public Server.

Week 13-Week 16:

Study projects on selected applications using data visualization. Submission of abstract, introduction, related work, and progress, Final report, final presentations and videos

References:

1. Nandeshwar, A. (2015), Tableau Data Visualization Cookbook, Mumbai: PACKT / Shroff Publishers.
2. https://public.tableau.com/en-us/s/resources

ANURAG UNIVERSITY

IV Year B.Tech CSE II SEM	L	T/P	C
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TECHNICAL AND BUSINESS COMMUNICATION SKILLS

(OEC-II)

Introduction

The course is intended to expose the students to learn and practice the five communication skills thinking, listening, speaking reading, and writingin English, the global language of communication. It reflects some of the approaches in English language teaching and learning currently in practice around the world.

Objective

To help the students to develop effective communication skills in all communicative contexts for professional advancement

Course Outcomes

On successful completion of the course, students will be able to

1. communicate technical and business correspondence
2. reflect on the themes discussed
3. recognize ethical implications of technical communication in professional contexts
4. identify the contemporary issues in engineering from environmental, societal, economic, and global perspectives
5. demonstrate ethical decisions in complex situations

UNIT-I

E-World & E-Communication:

E-language - E-governance - E-commerce/E-business - E-banking - E-waste

UNIT-II

Business Establishment & Infrastructure Development:
Power Supply - Industrial Park - Business Correspondence: Follow-up letters - Acceptance & Rejections - Persuasive letters - Resignation letters

UNIT-III

Technology and Society:
Robot Soldiers - For a Snapshot of a Web - Placing an order - Proposal Writing - Patents & Rights (National & International) - Intellectual Property - Nanotechnology

UNIT-IV

Ethics in Business Communication:
Ethical issues involved in Business Communication - Ethical dilemmas facing managers - Ethical Code & Communication - Standards in Daily Life - Total Quality Management - World University Ranking

UNIT-V

Management Information System:
Corporate Governance - Business Process Outsourcing - Project Management Communication - Marketing Communication

Textbook:

1. Dhanavel, P. S. English and Communication Skills for Students of Science and Engineering. Orient Black Swan. 2009.

References:

1. Anderson, V. Paul. *Technical Communication.* Cengage. 2014.
2. Kalkar, Anjali. et.al. *Business Communication*. Orient Black Swan. 2010.
3. Knisely, W. Charles. and Knisely, I. Karin. *Engineering Communication.* Cengage. 2015.
4. Kumar, Sanjay. and PushpLata. *Language and Communication skills for Engineers.* Oxford University Press. 2018.
5. Raman, Meenakshi and Singh, Prakash. *Business Communication.* (Second Edition.). Oxford University Press. 2012.

IV Year B.Tech CSE II SEM	L	T/P	C
	2	1/0	3

DIGITAL MEDIA LITERACY
(OEC-II)

Introduction

The course is introduced to build a relationship between media Literacy to traditional forms. It will enable the students understand the media around them and learn to use media literacy effectively. The students can also excel their writing skills through media.

Learning Objectives

The students will be able to

1. prepare the students to use media source and its content
2. train the students become media literate
3. provide practical tips for incorporating media literacy into the traditional curriculum

Course Outcomes

After the completion of the course, the students will

1. Use media as a learning tool
2. Share knowledge in digital media
3. Apply the use of persuasive language
4. Exhibit copy writing skills
5. Contribute their ideas through blogs

Prescribed Textbook:

Jacobs , Hayes Heidi. ***Media Literacy.*** Solution Tree Press: USA.

(E-book is available to download)

UNIT-I

Introduction – Diversity and Media:

Bias in the Media - Peer Driven Social Learning Communities - Social Learning Spaces -Mirrored Learning Words - Online Events - The Nitty - Gritties

UNIT-II

Digital Literacy in Action:

Internet Safety and Filtering - Establish Proficiency of Tagging

UNIT-III

Blogging:

Basics of Blog Writing - Foundations of Blogging - Blogs as Professional Development Tool - Blogs as a Learning Tool - Creating Knowledge Habitats

UNIT-IV

The Classroom:

A Market place for Learning - Build an Electronic Calendar-Paper less News Paper - Marketing through Social Media - Writing Techniques

UNIT-V

Gaming as a Literacy:

How Video games promote Learning? - Participatory Culture and Engagement - Collaboration and Cooperation - Motivation

References:

1. Hobbs ReneeR.Create To Learn: Introduction To Digital Literacy:Wiley-Blackwell Publications.
2. Frank, W. Baker. Media Literacy in the K-12 Classroom. (2nd Edition.). Paperback Publications.
3. Hertz, Mary. Beth. Digital and Media Literacy in the Age of the Internet: Practical Classroom Applications. Rowman& Littlefield Publishers.
4. Hobbs Renee R. Digital and Media Literacy. Sage Publications.
5. Potter, W. James. Introduction to Media Literacy. Sage Publications.

ANURAG UNIVERSITY

IV Year B.Tech CSE II SEM	L	T/P	C
	2	1/0	3

VALUE ENGINEERING
(OEC-II)

Course Objectives

The course is designed to help the student understand the concepts of Value engineering, understand different phases of value engineering and decision alternatives, and teams.

Course Outcomes

At the end of the course the student will be able to

1. Understand the importance of value engineering concepts in productivity
2. Identify the different phases of value engineering projects
3. Know the different decision alternatives and choose the best alternative for optimization
4. Identify the value engineering concept in non-hardware projects and programmes
5. Analyze the value engineering teams with the help of case study.

Unit-I

Introduction: Value engineering concepts, advantages, applications, problem recognition, and role in productivity, criteria for comparison, element of choice. Level of value engineering in the organization, unique and quantitative evaluation of ideas.

Unit-II

Value Engineering and Job Plan: Introduction, orientation, information phase, speculation phase analysis phase. Selection and Evaluation of value engineering projects, Project selection, methods selection, value standards, application of value engineering methodology

Unit-III

Value Engineering Techniques: Selecting Products and Operation for Value Engineering action, Value Engineering Programmes, Decision Making for Optimum Alternative, Use of Decision Matrix,

Make or Buy, Measuring Profits, Reporting Results, Follow up, Use of advanced technique like Function Analysis System.

Unit–IV

Versatility Of Value Engineering: Value engineering operation in maintenance and repair activities, Value Engineering in non-Hardware Projects. Initiating a Value Engineering Programme

Unit–V

Value Engineering Level of Effort: Value Engineering Team, Co-coordinator, Designer, different Services, Construction Management Contracts, Value Engineering Case Studies.

TEXT BOOKS:

1. Anil Kumar Mukhopadhyaya, "Value Engineering: Concepts Techniques and applications", SAGE Publications 2010.
2. Del L. Younker, "Value Engineering analysis and methodology", Marcel Dekker Inc, New York, 2004

REFERENCES:

1. Alphonse Dell'Isola, "Value Engineering: Practical Applications for Design, Construction, Maintenance & Operations", R S Means Co., 1997
2. Richard Park, "Value Engineering: A Plan for Invention", St. Lucie Press, 1999.
3. Anil Kumar Mukhopadhyaya, "Value Engineering Mastermind: From concept to Value Engineering Certification", SAGE Publications, 2003

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IV Year B.Tech CSE II SEM	L	T/P	C
	2	1/0	3

NEGOTIATION SKILLS

(OEC-III)

Course Objectives:

1. To familiarize the students with various negotiation approaches and styles.
2. Understand & develop effective strategies for each stage of a negotiation
3. Identify Cross – cultural challenges that arise in negotiations
4. Enhance communication skills, emphasizing effective listening, persuasion & relationship building
5. Strengthen creative ability to expand the option for resolving a dispute.

Course outcomes:

At the end of the course students will be able to

1. Describe negotiation theories, concepts and tactics to manage negotiations
2. Explain the importance of various factors impacting negotiations.
3. Apply effective negotiation strategies and tactics for different scenarios
4. Identify negotiation practices towards building relationships
5. Evaluate various conflict resolution strategies.

Unit- I

Introduction to Negotiation: Introduction, Concept of Negotiation, Characteristics of a Negotiating Situation, Basic Negotiation Skills, Interpersonal Skills in Negotiation, Theories of Negotiation.

Unit- II

Types of Negotiation: Types of Negotiation, Principles of Negotiation, Steps of Negotiation, Win-Win Negotiation, Negotiation Tactics, Factors Affecting Success in Negotiation.

Unit- III

Strategies of Negotiation: Fundamentals of Negotiation, Effective Strategies to develop Negotiation Skills, Anchoring / BATNA, Process of Negotiation and Negotiation Phases.

Unit –IV

Improving Negotiation skills: Enhancing Communication skills for effective Listening, Persuasion & Relationship Building, establishing Trust-Building Relationships.

Unit- V

Managing Negotiation: Managing Different Types of Negotiations**,** Cross –Cultural Challenges in Negotiations, Industrial Negotiation: Collective Bargaining, Arbitration, Origins of Conflict, Dispute Resolution.

TEXT BOOKS:

1. Fredluthans, Organisational Behavior, 9^{th}ed, Prentice Hall.
2. Roger Fischer, Essentials of Negotiations, Harward Business School Press.

REFERENCES:

1.Beverly DeMarr and Suzanne De Janasz, Negotiation and Dispute Resolution, Prentice Hall, 2013.

2. Roy J Lewicki, Bruce Barry, and David M Saunders, Essentials of Negotiation, 5th Edition, McGraw Hill, 2011

3. Malhotra, Deepak, Negotiating the Impossible: How to Break Deadlocks and Resolve ugly Conflicts (without money or muscle). Oakland, CA: Berrett-Koehler Publishers, 2016.

4. Fatima, Shaheed; Kraus, Sarit; Wooldridge, Michael, Principles of Automated Negotiation. Cambridge, UK; New York: Cambridge University Press, 2015.

5. Subramanian, Guhan, Dealmaking: New Dealmaking Strategies for a Competitive Marketplace. New York: W. W. Norton & Company, 2011.

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IV Year B.Tech CSE II SEM	L	T/P	C
	2	1/0	3

PROJECT MANAGEMENT
(OEC-III)

Course Objectives:

1. To understand the concept of Project Management.
2. To know about the different approaches to project screening and planning.
3. To explain about the factors of risk involved in project execution.
4. To understand about team leading and functional cooperation.
5. To know about the project performance and future trends in the project management.

Course Outcomes:

At the end of the course students will be able to

1. Explain about the life cycle and other concepts of Project Management.
2. Apply different approaches to project screening and planning
3. Analyze different risk factors in project execution
4. Estimate how to lead a team, to get functional cooperation
5. Build performance evaluation reports and future trends in project management.

Unit-I

Introduction: Meaning, Need, Principles Project Lifecycle and its Phases, Project Management Research in brief, Project Management today, Organization strategy and structure and culture, Format of organization structure, Stake holder Management, Organization Culture, creating a culture for Project Management.

Unit-II

Project Identification and Planning: Defining the project, Project Identification Process, Approaches to Project Screening and Selection, Project Planning, Work Breakdown Structure,

Financial Module, Getting Approval and Compiling a Project Charter, setting up a Monitoring and Controlling Process.

Unit-III

Project Execution: Initiating the Project, Controlling and Reporting Project Objectives, Conducting project evaluation, Risk, Risk Management Factors, Project Management, Four Stage Process, Risk Management an Integrated Approach, Cost Management, Creating a Project Budget.

Unit-IV

Leading Project Teams: Building a Project Team, Characteristics of an effective Project Team, achieving Cross- Functional Co-operation, Virtual Project Teams, Conflicts Management, Negotiations.

Unit-V

Performance Measurement and Evaluation: Monitoring Project Performances, Project Control Cycles, Earned Value Management, Human factors in Project Evaluation and Control, Project Termination, Types of Project Terminations, Project Follow-up. Current and Future Trends in Project Management.

TEXT BOOKS:

1. Gray, Larson, Project Management, Tata McGraw Hill, 2015
2. Jeffery K. Pinto, Project Management, Pearson Education, 2015

REFERENCES

1. Enzo Frigenti, Project Management, Kogan, 2015
2. R. Panneerselvam& P. Senthil Kumar, Project Management, PHI, 2015
3. Thomas M. Cappels, Financially Focused Project Management, SPD, 2008.

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IV Year B.Tech CSE II SEM	L	T/P	C
	2	1/0	3

STRESS MANAGEMENT

(OE-III)

Course Objectives:

The course is designed to help the student understand the concepts of project management, explain how to identify the projects and planning, analyze how to execute the projects, assess how to lead the team and evaluation of projects and to explain the performance measurement and evaluation of the projects.

Course Outcomes:

1. Understand the sources of reducing stress among employees.
2. Iimprove the physiological and physical illness of employees and self.
3. Develop a right attitude among employees and self.
4. Adopt stress management strategies for personal well-being and well-being of team members.
5. Understand the leadership styles in stress and time management techniques

Unit-I

Introduction to Stress Management

Nature of stress, approaches to stress, Good stress Vs. Bad stress, the individual and work. Occupational stress, role stress, source of managerial stress.

Unit-II

Stress & thought process learning Stress & thought process learning. Manifestations of stress - stages of stress, signs of stress at work, personality types and stress.

Unit-III

Various linkages and Assessment of Stress Stress & personality, stress & motivation, verbal & non-verbal indications of stress, assessment of stress, general sources of stress, stress and health, physiological and psychological illness.

Unit-IV

Stress Management Stress management, stress diary, becoming change skilled, adopting a healthy lifestyle, right attitude, thought awareness, imaginary (auto-genic therapy), learning to relax, correct breathing, and goal planning.

Unit-V

Stress and Leadership Styles Stress & management of change, stress & conflict, leadership styles in stressful & non-stressful situations, organization and stress management, recognizing the signs, approaches to the problem, providing assistance. Time management, general advice - ten commandments for effective stress management.

TEXT BOOKS:

1.R. P. Banerjee, Stress Management through Mind Engineering, Sage Spectrum, 2021

2. Alok Chkarawal, Prathibha Goyal, Stress Management, Studera Press, 2018

REFERENCES

1. Wolfgand Linden, Stress Management, Sage Publication, 2005
2. Jonathan C Smith, Stress Management: A Comprehensive Handbook of Techniques and Strategies , 2002
3. K. Hari Gopal, Organizational Stress, University Press.
4. Ann Edworthy, Managing Stress, Open University Press, Buckingham, Phildephia.
5. Dr. Rakesh Chopra Santosh Sharma, The stress Cyclone Suffer or Emerge out: The choice of yours, Institute of corporate Management, Excel Books.

Course Structure and Syllabus

B.Tech (CSE-Data Science)

(IV Year)

Department of Computer Science and Engineering

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B.Tech. CSE - Data Science (DS)

B.TECH IV YEAR I SEM **(7th Semester)** **5 T +2 L + Mini project**

Serial No	Course Code	Category	Course Title	Hours per week			Credits
				L	T	P	
1	A57054	HSS&MC	Managerial Economics and Financial Analysis	2	1	0	3
2	A57056	PCC	Deep Learning	3	1	0	4
3	A57055	PEC-III	1.Cryptography and Information Security	3	1	0	4
	A57066		1. Big Data Analytics				
	A57058		2. Software Testing				
4	A57061	PEC - IV	1.Natural Language Processing	3	0	0	3
	A57062		2.Web Mining				
	A57064		3.Human Computer Interaction				
	A57067		4. Data Science and Analytics				
5	A57060	PEC-V	1.Fundamentals of Cloud Computing	3	0	0	3
	A57065		2.Fundamentals of Blockchain Technology				
	A57063		3.Cyber Forensics				
6	A57210	PCC	Deep Learning Lab	0	0	3	1.5
7	A57209	PEC-III-Lab	1. Cryptography and Information Security Lab	0	0	3	1.5
	A57214		2. Big Data Analytics Lab				
	A57212		3. Software Testing Lab				
8	A57230	PROJ	Industry Oriented Mini Project	0	0	4	2
Total							22

B.TECH IV YEAR II SEM **2T +3 L/P**

Serial No	Course Code	Category	Course Title	Hours per week			Credits
				L	T	P	
1	A58001	OEC-II	1.Technical and Business Communication Skills	2	1	0	3
	A58019		2.Digital Media Literacy				
	A58010		3.Value Engineering				
2	A58005	OEC-III	1.Negotiation Skills	2	1	0	3
	A58008		2.Project Management				
	A58021		3.Stress Management				
3	A58201	PROJ	Seminar	0	0	4	2
4	A58202	PROJ	Comprehensive Viva-Voce	0	0	0	2
5	A58203	PROJ	Project	0	0	20	10
Total							**20**

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IV Year B.Tech CSE-DS I SEM	L	T/P	C
	2	1/0	3

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS
(HSS&MC)

Course Objectives:

The objective of this course is to familiarize the student with the concepts of managerial economics and financial accounting, demand and cost concepts, market structures, pricing and financial ratios

Course Outcomes:

At the end of the course students will be able to:

1. Describe the concept of demand and its determinants in managerial decisions
2. Know the cost concepts and breakeven analysis in production
3. Identify various market structures and different pricing strategies
4. Have knowledge of capital budgeting techniques in financial decisions
5. Have knowledge of Ratios in solving of business problems

Unit-I

Introduction to Managerial Economics: Definition, nature and scope of managerial economics, demand analysis- demand determinants, Law of Demand and its exceptions.

Elasticity of Demand: Definition, types, measurement and significance of elasticity of demand. demand forecasting, methods of demand forecasting.

Unit-II

Theory of Production and Cost Analysis: Production Function – Isoquants and Iso costs, MRTS, Least Cost Combination of Inputs.

Cost Analysis: Cost concepts, Opportunity cost, Breakeven Analysis (BEA) – determination of breakeven point, managerial significance and limitations of BEA.

Unit –III

Market structures: Types of competition, features of perfect competition, monopoly and monopolistic competition, price - output determination in perfect competition

Objectives and Policies of Pricing: objectives of pricing, methods of pricing - cost plus pricing, marginal cost pricing, going rate pricing, limit pricing, market skimming pricing, penetration pricing, two - part pricing, block pricing, peak load pricing, cross subsidization.

Unit –IV

Capital and Capital Budgeting: Capital and its significance. Types of capital. estimation of fixed and working capital requirements. Methods and sources of raising finance. Nature and scope of capital budgeting, features of capital budgeting proposals. Methods of capital Budgeting: Payback Method. Accounting Rate of Return (ARR) and Net Present Value Method

Unit –V

Introduction to Financial Accounting: Definition of Accounting, Double-Entry Book Keeping, Journal, Ledger, and Trial Balance, Final Accounts.

Ratio Analysis: Computation, Analysis and Interpretation of Liquidity Ratios Activity Capital Structure Ratios and Profitability Ratios.

TEXT BOOKS:

1. Arya Sri: Managerial Economics and Financial Analysis, TMH,2009
2. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2014

REFERENCES:

1. R. K. Sharma & Shashi K Gupta, Financial Management, Kalyani Publishers, 2020
2. V. Rajasekaran & R. Lalitha, Financial Accounting, Pearson Education, 2010.
3. Domnick Salvatore, Managerial Economics in a Global Economy, 9e, Oxford Univ Press, 2018.
4. S N Maheshwari, CA Sharad K Maheshwari & Dr Suneel K Maheshwari, Financial Accounting, 6/e, Vikas Publications, 2018

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IV Year B.Tech CSE-DS I SEM	L	T/P	C
	3	1/0	4

DEEP LEARNING

(PCC)

Prerequisites:

Basic Mathematics, P&S, Python, Machine Learning

Course Objectives:

1. To advance in training techniques for neural networks
2. To understand various CNN Architectures
3. To understand various RNN Methodologies
4. To custom train Autoencoder Models and implement them.
5. To apply Transfer Learning to solve problems

Course outcomes:

At the end of this course, students will be able to:

1. Have a good understanding of the fundamental issues and basics of deep learning
2. Understand the concept of CNN to apply it in the Image classification problems
3. Learning and understanding the working of various RNN methods
4. Learning and understanding the working of various Autoencoders methods
5. Use Transfer Learning to solve problems with high dimensional data including image and speech

UNIT I :

Deep Learning: Fundamentals, Introduction, Building Block of Neural Networks, Layers, MLPs, Forward pass, backward pass, class, trainer and optimizer, The Vanishing and Exploding Gradient Problems, Difficulties in Convergence, Local and Spurious Optima, Preprocessing, Momentum, learning rate Decay, Weight Initialization, Regularization, Dropout, SoftMax, Cross Entropy loss function, Activation Functions

UNIT II:

CNN: Introduction, striding and padding, pooling layers, structure, operations and prediction of CNN with layers, CNN -Case study with MNIST, CNN VS Fully Connected

UNIT III:

RNN: Handling Branches, Layers, Nodes, Essential Elements-Vanilla RNNs, GRUs, LSTM

UNIT IV:

Autoencoders: Denoising Autoencoders, Sparse Autoencoders, Deep Autoencoders,

Variational Autoencoders, GANS

UNIT V:

Transfer Learning- Types, Methodologies, Diving into Transfer Learning, Challenges

Text Books:

1. Seth Weidman, "Deep Learning from Scratch", O'Reilly Media, Inc., 2019
2. Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning" , MIT Press, 2015
3. Dipanjan Sarkar, Raghav Bali, "Transfer Learning in Action", Manning Publications, 2021

Reference Books:

1. Giancarlo Zaccone, Md. Rezaul Karim, Ahmed Menshawy "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017.
2. Antonio Gulli, Sujit Pal, "Deep Learning with Keras", Packt Publishers, 2017.
3. Francois Chollet, "Deep Learning with Python", Manning Publications, 2017.

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IV Year B.Tech CSE-DS I SEM	L	T/P	C
	3	1/0	4

CRYPTOGRAPHY AND INFORMATION SECURITY

(PEC-III)

Prerequisites:

Fundamentals of Networking, Mathematical Fundamentals

Course Objectives

1. Understand fundamentals of cryptography and classic encryption techniques.
2. Compare and analyze encryption Algorithms
3. Summarize Authentication Functions using MAC and Hash
4. Analyze security importance of various web Applications
5. Categorize various types of Intruders and Viruses

Course Outcomes

1. Assess fundamentals of cryptography and classic encryption techniques.
2. Compare various encryption Algorithms.
3. Summarize authentication functions using MAC and Hash
4. Outline security importance of various web applications.
5. Categorize various types of intruders and viruses.

Unit I:

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques symmetric and asymmetric key cryptography, steganography.

Unit II :

Symmetric key Ciphers: DES structure, DES Analysis, Security of DES, variants of DES, Block cipher modes of operation , AES structure, Analysis of AES , Key distribution

Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Analysis of RSA, Diffie-Hellman Key exchange.

Unit III:

Message Authentication and Hash Functions: Authentication requirements and functions, MAC and Hash Functions, MAC Algorithms: Secure Hash Algorithm, Whirlpool, HMAC, Digital signatures, X.509, Kerberos.

Unit IV

Security at layers (Network, Transport, Application): IPSec, Secure Socket Layer(SSL), Transport Layer Security(TLS), Secure Electronic Transaction(SET), Pretty Good Privacy(PGP), S/MIME.

Unit V

Intruders, Virus and Firewalls: Intruders, Intrusion detection, password management, Virus and related threats, Countermeasures, Firewall design principles, Types of firewalls.

Text Books:

1. B.Forouzan, Cryptography and Network Security,Tata McGraw-Hill.
2. William Stallings, Cryptography and Network Security, Pearson Education,4th Edition

Reference Books:

1. C K Shyamala, N Harini, Dr T R Padmanabhan, Cryptography and Network Security : Wiley India, 1st Edition.
2. Bernard Menezes, Network Security and Cryptography: CENGAGE Learning
3. AtulKahate, Cryptography and Network Security: McGraw Hill, 2nd Edition

Reference Links:

1. http://www.cs.iit.edu/~cs549/cs549s07/lectures.htm
   http://williamstallings.com/Extras/Security-Notes/
2. http://williamstallings.com/NetworkSecurity/styled/

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IV Year B.Tech CSE-DS I SEM	L	T/P	C
	3	1/0	4

BIG DATA ANALYTICS

(PEC-III)

Course Objectives:

1. Discuss the overview of big data analytics concepts and growth rate
2. Introduce the tools required to manage and analyze big data like Hadoop, NoSQL Data Management.
3. Summarize the fundamental concepts of Hadoop Distributed file systems
4. Describe the techniques involved with Map Reduce Applications.
5. Analyze various recommender systems for applications

Course Outcomes:

At the end of the course students will be able to:

1. Appraise the concept and application of Big Data
2. Apply scalable algorithms on NO SQL for big data analytics.
3. Elaborate the notion of Hadoop Distributed File System and applications
4. Apply MapReduce for the given problem
5. Implement recommender systems for different application

Unit-I

Introduction To Big Data: Characteristics of Big Data, Traits of Big data, Challenges of Conventional Systems, Sources of Big Data, Applications of big data, Features and benefits of big data, Analysis vs Reporting, CAP theorem, Modern Data Analytic Tools.

Introduction to Hadoop Programming languages: Pig, Hive.

NOSQL Databases: Cassandra, Mongo, HBase.

Unit-II

NOSQL Data Management: Introduction to NoSQL, aggregate data models, aggregates, key-value and document data Models, relationships, graph databases, schema less databases, materialized views, distribution models, sharding, master-slave replication, peer-peer replication, sharing and replication

Unit –III

Introduction To Hadoop: History of Hadoop, Data Storage and Analysis, Hadoop – Setup, Hadoop operation modes, Configurations of Hadoop. Hadoop Ecosystem, Hadoop Distributed File System, HDFS Architecture, concepts of Blocks in HDFS Architecture, Name Nodes and Data Nodes, using command Line Interface with HDFS, HDFS Commands, Features of HDFS.

Unit –IV

MapReduce Applications: MapReduce workflows, unit tests with MR Unit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic MapReduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats

Unit –V

Social Media Analytics and Text Mining: Introducing social media; Key elements of social media; Sentiment Analysis, Performing Social Media Analytics.

TEXT BOOKS:

1. BIG DATA- Black Book, Dream Tech Press, 2019.

REFERENCES:

1. Seema Acharya, S. Chellappan," Big Data and Analytics", Wiley,2014

2. Tom White "Hadoop: The Definitive Guide" 4th Edition, O'reilly Media, 2015.

3. Michael Minelli, Michele Chambers, Ambiga Dhiraj, Jim Stogdill, "Big Data Big Analytics:

   Emerging Business Intelligence and Analytic Trends for Today's Businesses", 1st Edition, Wiley Publications,2013

4. Chris Eaton, Dirk De Roos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGraw Hill Publishing, 2012

5. Pete Warden, "Big Data Glossary", O'Reilly, 2011.

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IV Year B.Tech CSE-DS I SEM	L	T/P	C
	3	1/0	4

SOFTWARE TESTING

(PEC-III)

Course Objectives:

1. To gain knowledge on testing in software development life-cycle, software testing process levels and testing terminologies
2. To learn techniques and algorithms for test case design
3. To understand various issues involved with applying test criteria during software development
4. To comprehend how to develop the many testing criteria to be applied with a variety of technologies.

Course Outcomes:

At the end of this course students will be able to:

1. Understand Software Testing terminology, various activities of Test Engineer and Test coverage criteria
2. Design Test cases from graphs
3. Design Test cases from logical expressions
4. Design Test cases from partitions of the input space and syntax
5. Test Object-Oriented and Web Application Softwares

Unit – I

Activities of a Test Engineer: Testing Levels Based on Software Activity, Beizer's Testing Levels Based on Test Process , Maturity Automation of Test Activities, Software Testing Limitations and Terminology, Coverage Criteria for Testing: Infeasibility and Subsumption, Characteristics of a Good Coverage Criterion, Older Software Testing Terminology

Unit – II

Graph Coverage: Graph Coverage: Graph Coverage Criteria, Graph Coverage for Source Code, Graph Coverage for Design Elements, Graph Coverage for Specifications, Graph Coverage for Use Cases, Representing Graphs Algebraically

Unit – III

Logic Coverage: Logic Predicates and Clauses, Logic Expression Coverage Criteria: Active Clause Coverage, Inactive Clause Coverage, Infeasibility and Subsumption, Making a Clause Determine a Predicate, Finding Satisfying Values. Structural Logic Coverage of Programs, Specification-Based Logic Coverage, Logic Coverage of Finite State Machines, Disjunctive Normal Form Criteria

Unit – IV

Input Space Partitioning: Input Domain Modeling, Combination Strategies Criteria, Constraints among Partitions

Syntax-Based Testing: Syntax-Based Coverage Criteria, Program-Based Grammars, Integration and Object-Oriented Testing, Specification-Based Grammars, Input Space Grammars

Unit – V

Practical Considerations: Regression Testing, Integration and Testing, Test Process, Test Plans, Identifying Correct Outputs

Engineering Criteria for Technologies: Testing Object-Oriented Software, Testing Web Applications and Web Services, Testing Graphical User Interfaces, Real-Time Software and Embedded Software

Text Books

1. Paul Ammann and Jeff Offutt, Introduction to Software Testing, Cambridge University Press, 2008.
2. Software Testing techniques - Boris Beizer, Second Edition, Dreamtech Press
3. Software Testing Tools – Dr.K.V.K.K. Prasad, Dreamtech Press

Reference Books

1. Glenford J. Myers, The Art of Software Testing, Second edition, 2008.
2. Paul C. Jorgensen, Software Testing: A Craftsman's Approach, Fourth edition, CRC Press, 2014.
3. Lisa Crispin and Janet Gregory, Agile Testing: A Practical Guide for Testers and Agile Teams, Addison-Wesley, 2009.

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IV Year B.Tech CSE-DS I SEM	**L**	**T/P**	**C**
	3	**0**	**3**

NATURAL LANGUAGE PROCESSING

(PEC-IV)

Pre-requisites:

Artificial Intelligence, Machine Learning, Python Programming

Course Objectives:

1. To learn the fundamentals of Natural Language Processing
2. To understand the semantic aspects and similarity measures
3. To understand the aspects of context-free grammar and perform parsing
4. To understand and identify different word senses and find their relationship
5. To apply the NLP techniques in understanding discourses

Course Outcomes:

At the end of this course, students will be able to:

1. Solve problems involving regular expressions and N grams
2. Evaluate Vector models
3. Perform parsing operations
4. Build and analyze applications with semantic roles involving selectional restrictions
5. Utilize NLP learning algorithms in understanding a discourse

UNIT I:

REGULAR EXPRESSIONS AND N-GRAM MODELS

Regular Expressions - Regular Expressions, Corpora, Text Normalization, Minimum Edit Distance
Ngram Models - Ngrams, Evaluating Language models, Generalization, Smoothing

UNIT II :

Lexical Semantics, Vector semantics, Words and Vectors, Cosine for measuring similarity, TF-IDF, PMI

Visualising Embeddings, Semantic Properties of Embeddings, Bias and Embeddings

UNIT III :

Constituency Grammar - Constituency, Context free grammar, Grammar Rules for English, Treebanks, Grammar Equivalence and Normal Form, Lexicalised Grammar
Parsing - Ambiguity, CKY Parsing

UNIT IV:

WORD SENSES AND SEMANTIC ROLE

Word senses, Relation between senses, WordNet, Word Sense Disambiguation
Semantic Roles, Diathesis alternations, Problems with thematic roles, Proposition Bank, FrameNet, Semantic Role Labelling, Selectional Restrictions

UNIT V :

COREFERENCE RESOLUTION AND DISCOURSE COHERENCE

Coreference Resolution - Coreference Phenomena, coreference Tasks and datasets, Architecture of coreference algorithm, Gender bias in coreference
Discourse Coherence - Coherence Relation, Discourse Structure Parsing, Centering and Entity based Coherence, Representation model for local coherence, Global coherence

Text Books:

1. Daniel Jurafsky, James H. Martin, “Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech”, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, “Natural Language Processing with Python”, First Edition, OReilly Media, 2009

Reference Books:

1. James Allen, “Natural Language Understanding”, 2nd Edition, Benjamin, Cummings publishing company, 1995.
2. Rajesh Arumugam, Rajalingappaa Shanmugamani, “Hands-On Natural Language Processing with Python” , Packt Publishing Ltd., 2018
3. Deepti Chopra, Nisheeth Joshi, Iti Mathur “Mastering Natural Language Processing with Python” First Edition, Packt Publishing, 2016

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IV Year B.Tech CSE-DS I SEM	L	T/P	C
	3	0	3

WEB MINING

(PEC-IV)

Pre-requisites:

Probability & Statistics, Basics of Internet Knowledge

Course Objectives:

1. To describe web mining and understand the need for web mining.
2. Differentiate between Web mining and data mining
3. Understand the different methods to introduce structure to web-based data.
4. To understand how information is retrieved from Social media & WWW

Course Outcome:

By the end of the course, Student will be able to:

1. Identify the difference between Web mining & Data Mining.
2. Learn the methods of data extraction and Processing.
3. Learn the social network data mining.
4. Understand the concepts of Information Retrieval System from Web.
5. Do text processing, Language Processing.

UnitI:

Introduction: A brief history of web and hypertext data, Topic directories, clustering and classification.

Web data extraction and processing: Web crawling and indexing, Hyperlink analysis, resources discovery and vertical portals. Structured and unstructured data mining.

Unit-II:

Infrastructure: Crawling the web: HTML,HTTP Basics, engineering large- scale crawlers.

DNS Catching, Perfecting and resolutions.

Multiple current fetches: Multithreading, Link extraction and Normalization.Txt repository.Similarity and clustering

Unit-III:

Mining social network data: Social Network Analysis, Information propagation in social network, Community discovery in social networks, expert finding in social networks, Link prediction in social networks. **Mining user generated contents:** The Social Web, Mining micro blogging data, Mining social tagging data.

Unit-IV:

Information Retrieval: Basic Concepts of Information Retrieval, Information Retrieval Methods – Boolean Model, Vector Space Model and Statistical Language Model, Relevance Feedback, Evaluation Measures, Text and Web Page Preprocessing – Stopword Removal, Stemming, Web Page Preprocessing, Duplicate Detection, Inverted Index and Its Compression – Inverted Index, Search using Inverted Index, Index Construction, Index Compression, Latent Semantic Indexing – Singular Value Decomposition.

Unit-V:

Opinion Mining: motivation and problem definition, Research issues on Opinion Mining, Natural Language Processing, Text processing and Opinion Mining resources.

Opinion Mining – Sentiment Classification – Classification based on Sentiment Phrases, Classification Using Text Classification Methods, Feature based Opinion Mining and Summarization – Problem Definition, Object feature extraction.

Text Books:

1. Soumen Chakrabarti,"Mining the Web: Discovering Knowledge from Hypertext Data" Second edition, Morgan Kauffmann.
2. Bing Liu" Web Data Mining: Exploring hyperlinks, contents and usage data " , Springer Second Edition.

Reference Books:

1. "Mining the Social Web" by Mathew A. Russell, Mikhail Klassen" 3rd Edition, O Reilly publication.
2. "Mining the World Wide Web: An Information Search Approach." by Chang, G., Healey, M. J., McHugh, J. A. M., Wang, J. T. L. Kluwer Academic Publishers.
3. "Web mining: Applications & Techniques" by Antony Scime.

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IV Year B.Tech CSE-DS I SEM	L	T/P	C
	3	0	3

HUMAN COMPUTER INTERACTION

(PEC-IV)

Prerequisites:

Web Technologies

Unit – I

Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design.A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

Unit – II

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, and understanding business functions.

Unit – III

Screen Designing : Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

Unit – IV

Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

Unit – V

Software tools – Specification methods, interface – Building Tools. Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.

Text Books

1. The essential guide to user interface design: Wilbert O Galitz,WilelyDreama Tech 2007
2. Designing the user interface design: Ben Shneiderman 3rd Edition, Pearson Education Asia 2001

Suggested / Reference Books

1. Human – Computer Interaction. ALAN DIX, JANET FINCAY, GRE GORYD, ABOWD, RUSSELL BEALG, PEARSON.
2. Interaction Design PRECE, ROGERS, SHARPS. Wiley Dreamtech,

Other Resources

1. http://courses.iicm.tugraz.at/hci/hci.pdf
2. http://www.prenhall.com/behindthebook/0132240858/pdf
3. http://ebooksfile.com/pdf/Zz2/human-computer-interaction-sample-exam-questions.pdf
4. http://nptel.ac.in/courses.php?disciplineId=106

ANURAG UNIVERSITY

IV Year B.Tech CSE-DS I SEM	L	T/P	C
	3	0	3

DATA SCIENCE AND ANALYTICS

(PEC-IV)

Prerequisites:

Basic Mathematics, Machine Learning and Data Visualization

Course Objectives:

1. To gain a foundational understanding of data science.
2. To understand the data science process and significance of exploratory data analysis (EDA).
3. To develop scoring and ranking Systems.
4. To understand the Handling Large Data on a single computer.
5. To understand the Text mining and text analytics.

Course Outcomes:

At the end of the course, students should be able to:

1. Describe what Data Science is and the skill sets needed to be a data scientist.
2. Analyze the data science process and significance of exploratory data analysis (EDA)
3. Apply the scoring and ranking systems for datasets.
4. Apply basic algorithms for Handling Large Data.
5. Interprets Text mining and text analytics.

Unit I:

Introduction

Computer Science, Data Science, and Real Science, Asking Interesting Questions from Data:The Baseball Encyclopedia the Internet Movie Database (IMDb) Google Ngrams, New York Taxi Records

Properties of Data: Structured vs. Unstructured Data, Quantitative vs. Categorical Data, Big Data vs. Little Data **Classification and Regression**, **Data Science Television**: The Quant Shop, Kaggle Challenges About the War Stories, **War Story**: Answering the Right Question

Unit II:

Data Munging

Languages for Data Science: The Importance of Notebook Environments, Standard Data Formats **Collecting Data**: Hunting, Scraping, Logging

Cleaning Data: Errors vs. Artifacts. Data Compatibility, Dealing with Missing Values, Outlier

War Story: Beating the Market Crowd sourcing: The Penny Demo, when is the Crowd Wise, Mechanisms for Aggregation, Crowd sourcing Services, Gamification

Exploratory data analysis: Build the models

Unit III:

Scores and Rankings

The Body Mass Index (BMI), **Developing Scoring Systems**: Gold Standards and Proxies, Scores vs. Rankings, Recognizing Good Scoring Functions, Z-scores and Normalization

Advanced Ranking Techniques: Elo Rankings, Merging Rankings, Digraph-based Rankings, PageRank

War Story: Clyde's Revenge, Arrow's Impossibility Theorem, War Story: Who's Bigger

Unit IV:

Handling Large Data on a single computer

Problems when handling large data, **General techniques for handling large data:** Choosing the right algorithm, Choosing the right data structure, Selecting the right tools

General programming tips for dealing with large data sets: Don't reinvent the wheel, Get the most of your hardware, reduce your computing needs, **Case study:** Predicting Malicious Urls, Building a recommender system inside a database

Unit V:

Text mining and Analytics

Text mining in the real world, Text mining techniques: Bag of words, Stemming and Lemmatization, Decision tree Classifier.

Case Study- Classifying Reddit Posts: Research Goal, data retrieval, data preparation, data exploration, data analysis, presentation and automation

Text Books:

1. Skiena, Steven S, The Data Science Design Manual, CRC press
2. Introducing Data Science, Davy Cielen, Arno D. B. Meysman, Mohamed Ali, Manning Publications Co., 1st edition, 2016.

Reference Books:

1. Pang-Ning Tan, Michael Steinbach, Anuj Karpatne, Vipin Kumar, Introduction to Data Mining (Second Edition)
2. V.K. Jain, Data Science and Analytics (with Python, R and SPSS Programming), Khanna Book Publishing Company.
3. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning,Second Edition. ISBN 0387952845. 2009.
4. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, Third Edition. ISBN 0123814790. 2011.
5. Data Science from Scratch: First Principles with Python, Joel Grus, O'Reilly, 1st edition, 2015.

IV Year B.Tech CSE-DS I SEM	L	T/P	C
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FUNDAMENTALS OF CLOUD COMPUTING
(PEC-V)

Prerequisites:

Computer Organization and Computer Networks.

Course Objectives:

1. This course provides an insight into cloud computing

Course Outcomes:

After the end of the course, the students will be able to:

1. Understand different Computing Paradigms and Virtualization
2. Learn the fundamentals of Cloud Computing.
3. Understand various service delivery models of a cloud computing architecture.
4. Demonstrate the ways in which the cloud can be programmed and deployed
5. Identify applications that can deploy on a Cloud environment.

UNIT-I

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing

Virtualization: Introduction to Virtualization, Approaches in Virtualization, Hypervisor and Its Role, Types of Virtualization

UNIT-II

Cloud Computing Fundamentals: Motivation for Cloud Computing, Defining Cloud Computing, 5-4-3 Principles of Cloud computing, Cloud Ecosystem, Requirements for Cloud Services.

UNIT-III

Cloud Computing Architecture and Management: Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications on the Cloud, Managing the Cloud, Migrating Application to Cloud.

UNIT-IV

Cloud Deployment Models: Private cloud, Public Cloud, Community Cloud, Hybrid Cloud.

Cloud Service Models: Infrastructure as a Service, Platform as a Service, Software as a Service.

UNIT-V

Cloud Service Providers: EMC, Google, Amazon Web Services, Microsoft, Windows Azure, IBM, Cloud Models, IBM, Sales force.

Open-Source Support for Cloud: Open-Source Tools for IaaS, Open-Source Tools for PaaS, Open-Source Tools for SaaS.

TEXT BOOKS:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

REFERENCES:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp 2011.

ANURAG UNIVERSITY

IV Year B.Tech CSE-DS I SEM	L	T/P	C
	3	0	3

FUNDAMENTALS OF BLOCKCHAIN TECHNOLOGY

(PEC-V)

Pre-Requisites:

Object Oriented Programming Through Java, Basic Knowledge Of Computer Security, Data Structures

Course Objectives:

1. Identify different components and types of Blockchain.
2. Learn Smart Contracts for public Blockchain
3. Apply Ethereum tool for Deploying the Smart Contract
4. Interpret Private Blockchain System
5. Analyse the impact of Blockchain in business

Course Outcomes:

At the end of this course, students will be able to:

1. Summarize types and applications of Blockchain
2. Understand Smart Contracts for Public Blockchain System
3. Illustrate the design and deployment of smart contract through Ethereum
4. Apply Private Blockchain System in different Networks
5. Categorize different Business Applications of Blockchain

UNIT I:

Fundamentals of Blockchain: Origin of Blockchain, Blockchain Solution, Components of Blockchain, Block in a Blockchain, The Technology and the Future.

Blockchain Types and Consensus Mechanism: Decentralization and Distribution, Types of Blockchain, Consensus Protocol

UNIT II:

Blockchain, Ethereum Blockchain

Smart Contracts: Smart Contract, Characteristics of a Smart Contract

Ethereum Solidity: Introduction, Datatype, operator, enum, arrays, loops

UNIT III:

Ethereum Solidity: Mapping, Structure, State Modifiers, Exception Handling in Solidity, Inheritance, Compile and Deploy the Smart Contract. Introduction to Truffle IDE and metamask.

UNIT IV:

Private Blockchain System: Key Characteristics of Private Blockchain, Why We Need

Private Blockchain, Private Blockchain Examples, Private Blockchain and Open Source, E-commerce Site Example, Various Commands (Instructions) in E-commerce Blockchain, Smart Contract in Private Environment, State Machine, Different Algorithms of Permissioned Blockchain, Byzantine Fault, Multichain.

UNIT V:

Application of Blockchain: Blockchain in Banking and Finance, Blockchain in

Education, Blockchain in Energy, Blockchain in Healthcare, Blockchain in Real-estate, Blockchain in Supply Chain, The Blockchain and IoT.

Limitations and Challenges of Blockchain: Blockchain Implementation – Limitations, Blockchain Implementation – Challenges

Text Books:

1. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017
2. Blockchain Technology:ChandramouliSubramanian,Asha A George,Abhilash K A and MeenaKarthikeyan,Published by University Press

Reference Books

1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos Blockchain by Melanie Swa, O'Reilly
2. Philipp Hacker, IoannisLianos (2019). Regulating Blockchain: Techno-Social and Legal Challenges, OUP Oxford. (ISBN-13: 978-0198842187).

Reference Link

1. Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits - https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html

ANURAG UNIVERSITY

IV Year B.Tech CSE-DS I SEM	L	T/P	C
	3	0	3

CYBER FORENSICS
(PEC-V)

Course Objectives:

1. Create a document review, retention, and destruction policy.
2. Write an acceptable use policy and employer privacy statement.
3. List and describe the generally accepted computer forensic procedures.
4. Explain and list the various legislation and regulations that impact technology.
5. Analyze forensic analysis reports

Course Outcomes:

At the end of this course, students will be able to:

6. Perform a forensic investigation by following guidelines to secure the crime or corporate scene.
7. Learn what legal issues are involved and what rights the person of interest has.
8. Perform digitally and court approved images of evidence to be used in a court of law.
9. Learn how to document and store evidence.
10. Learn how to analyze evidence using commercial forensic software and also how to create a report of the said evidence.

UNIT-I

Computer Forensics and Investigations: What is computer Forensics? Use of computer forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceeding, Computer Forensics services, Benefits of Professional

Forensics Methodology, Steps taken by Computer Forensics Specialists.

Types of Computer Forensics Technology: Types of Military Computer Forensic Technology, Types of law Enforcement-Computer forensic Technology.

UNIT-II

Computer Forensics Evidence and capture: Data Recovery Defined Data Backup and Recovery, The Role of Back-up in Data Recovery, The Data Recovery Solution

Evidence Collection and Data Seizure: Why Collection Evidence? Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, General Procedure, Collection and Archiving, Methods of Collection, Artifacts, Collection Steps.

UNIT-III

Controlling Communication: The Chain of Custody duplication and Preservation of Digit

Evidence: Preserving the Digital Crime Scene, Computer Evidence Processing Steps, Legal Aspects of Collection and Preserving Computer Forensics Evidence.

Computer Image Verification and Authentication: Special Needs of Evidential Authentication

Computer Forensics analysis and validation: Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote

acquisitions

UNIT-IV

Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics using network tools.

Processing Crime and Incident Scenes: Identifying Digital Evidence, Collecting the Evidence in Private-Sector Incident Scenes, Processing law Enforcement Crime Scenes,

Preparing for a Search, securing a Computer Incident or Crime Scene, Storing Digital evidence, obtaining a Digital Hash.

UNIT-V

E-mail Investigations: Exploring the Role of E-mail in Investigations, Exploring the Role of Client and Server in E-mail, Investigating Email Crimes and Violations, Understanding Email Servers, Using Specialized Email Forensics Tools,

Mobile Device Forensics: Understanding Mobile Device Forensics, Understanding Acquisition Procedure for Cell Phones and Mobile Devices

TEXT BOOKS:

1. John R.Vacca, Computer Forensics, Computer Crime Investigation, firewall Media, New Delhi,2005
2. Nelson, Phillips Enfinger, Steuart, Computer Forensics and Investigations, Cengage Learning.2009

REFERENCES:

1. Keith J. Jones, Richard Bejthich, Curtis W Rose, Real Digital Forensics, AdditionWesley Pearson Education.2006
2. Tony Sammesand Bairn Jenkinson, Forensic Compiling A Practitioner's Guide, Springer International edition.2013 Christopher L.T.Brown, Computer Evidence Collection & Presentation, Firewall Media.2005

ANURAG UNIVERSITY

IV Year B.Tech CSE-DS I SEM	L	T/P	C
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Deep Learning Lab

(PCC- LAB)

Prerequisites:

DM, P&S, Python, AI, ML

List of Programs:

1. Implementation of Linear Regression
2. Deep learning Packages Basics: TensorFlow, Keras and PyTorch
3. Implementation of Neural network
4. Face recognition using CNN
5. Sentiment Analysis using LSTM
6. Language Modeling using RNN
7. Sentiment Analysis using GRU
8. Image Classification with Transfer Learning

ANURAG UNIVERSITY

IV Year B.Tech CSE-DS I SEM	L	T/P	C
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CRYPTOGRAPHY AND INFORMATION SECURITY LAB
(PEC-III LAB)

Course Outcomes

By the completion of the course, Students will be able to:

1. Implement port Scanning
2. Investigate Security of Network
3. Analyze Packet Protocols ,IP Spoofing
4. Implement Various Encryption Algorithms
5. Implement Brute Force Algorithm

Week 1

1. Installation of NetCat.

Week2

2. Implement port scanning with NetCat

Week 3

3. Perform the following using NetCat
   - Banner Grabbing .
   - Chat Interface
   - File Transfer

Week 4

4. Installation of Network Miner

Week 5

5. Perform an experiment to sniff packets and IPs using Network

Week 6

6. Perform Sniffing of Web Browser User-Agents.

Week 7

7. Implement Simple Data Encryption Standard (SDES) Algorithm through C program

Week 8, 9

8. Implement Diffie–Hellman key exchange algorithm through C program.

Week 10

9. Installation of cryptool 2

Week 11

10. Implement DES algorithm using cryptool 2

Week 12

11. Implement RSA algorithm using cryptool 2

Week 13

12. Implement HASH algorithm using cryptool 2

Week 14

13. Implement SHA1 algorithm using crpty tool 2

Week 15

14. Implement brute force algorithm in C.

ANURAG UNIVERSITY

IV Year B.Tech CSE-DS I SEM	L	T/P	C
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BIG DATA ANALYTICS LAB

(PEC-III LAB)

Course Outcomes:

At the end of this Big Data Analytics Lab course, students will be able to:

1. Develop various programs in Hadoop.
2. Perform file operation in HDFS
3. Perform query operation using pig
4. Practice various commands in HIVE
5. Create applications for Big Data analytics

List of Experiments:

Week 1

Downloading and installing Hadoop; Understanding different Hadoop modes. Start-up scripts, Configuration files.

Week2

Implement the following file management tasks in Hadoop:

1. Adding files and directories
2. Retrieving files
3. Deleting files

Week 3

Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.

1. Find the number of occurrences of each word appearing in the input file(s)

2. Performing a Map Reduce Job for word search count (look for specific keywords in a file)

Week 4

Stop word elimination problem: Input:

1. A large textual file containing one sentence per line

2. A small file containing a set of stop words (One stop word per line) Output: A textual file containing the same sentences of the large input file without the words appearing in the small file.

Week 5

Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather large volumes of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record oriented. Data available at: https://github.com/tomwhite/hadoopbook/tree/master/input/ncdc/all.

1. Find average, max and min temperature for each year in the NCDC data set?

2. Filter the readings of a set based on the value of the measurement, Output the line of input files associated with a temperature value greater than 30.0 and store it in a separate file.

Week 6

Implement of Matrix Multiplication with Hadoop Map Reduce

Week 7

Command line interface with HDFS

Week 8

Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.

Week 9

PIG Programs:

1. Run the Pig Latin Scripts to find Word Count

2. Run the Pig Latin Scripts to find a max temp for each and every year.

Week 10

Installation of Hive along with practice examples.

Week 11

Use Hive to create, alter, and drop databases, tables, views, functions, and indexes.

Week 12

Write a Pig script for:

1. DML operations on Cassandra Database.

2. Retrieving data from MongoDB.

Week 13

HBase Shell Commands practice

Week 14

Data analytics on Amazon food dataset, find all the pairs of items frequently reviewed together.

1. Transposes the original Amazon food dataset, obtaining a PairRDD of the type:
   <user_id> → <list of the product_ids reviewed by user_id>
2. Counts the frequencies of all the pairs of products reviewed together;
3. Writes on the output folder all the pairs of products that appear more than once and their frequencies. The pairs of products must be sorted by frequency.

Note: The above experiments are for indicative purposes only. However, the concerned faculty member can add a few more experiments in addition to the existing. In such cases the concerned faculty member should get the syllabus approved by the BoS.

IV Year B.Tech CSE-DS I SEM	L	T/P	C
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SOFTWARE TESTING LAB

(PEC-III LAB)

Prerequisites:

Data Structure, Object Oriented Programming, Web technologies

Course Objectives:

1. Manual testing using functional test
2. White box test case design based on path ,data, and logic
3. Explore Regression and Integration testing
4. Testing of Object-Oriented and Web Applications Softwares

Course Outcomes:

At the end of this course students will be able to:

1. Performed Manual testing based on test cases
2. Design and execute Test cases of Path and Data coverage Criteria
3. Design and execute Test cases of Data and Logic coverage Criteria
4. Performed Regression and integration Testing
5. Testing Object-Oriented and Web Applications Software

List of Programs:

Week 1

Write functional test cases of ATM and perform manual testing to find faults and failures

Week2

Design and execute Edge and Node coverage Test cases of Student grade Assignment computer program

Week 3

Design and implement a program that will compute all paths (edge and Node) in a graph, it will be to accept a graph as input by reading a list of nodes, initial nodes, final nodes, and edges.

Week 4

Write Program to Reducing Graphs to Path Expressions of give Control Flow graph

Write Program to Find Maximum and Minimum number of test cases of give Control Flow graph

Week 5

Design and execute all du path test cases of Pattern matching of two strings

Week 6

Design and execute complete set of coupling du-pairs of compute the quadratic root for two numbers

Week 7

Design and execute Predicate coverage (PC) and Clause coverage (CC) Test cases of Quadratic program

Week 8

Design and execute Combinatorial coverage (CoC) Correlated active clause coverage Test cases of Quadratic program

Week 9

Design and execute Data partition based test case of Quadratic program

Week 10

Demonstrate Java mutation tool

Week 11

Demonstrate the Regression and Integration testing

Week 12

Demonstrate and execute all Object-Oriented Testing Criteria

Week 13-14

Demonstrate and execute all web application Testing Criteria

ANURAG UNIVERSITY

IV Year B.Tech CSE-DS II SEM	L	T/P	C
	2	1/0	3

TECHNICAL AND BUSINESS COMMUNICATION SKILLS

(OEC-II)

Introduction

The course is intended to expose the students to learn and practice the five communication skills thinking, listening, speaking reading, and writingin English, the global language of communication. It reflects some of the approaches in English language teaching and learning currently in practice around the world.

Objective

To help the students to develop effective communication skills in all communicative contexts for professional advancement

Course Outcomes

On successful completion of the course, students will be able to

1. communicate technical and business correspondence
2. reflect on the themes discussed
3. recognize ethical implications of technical communication in professional contexts
4. identify the contemporary issues in engineering from environmental, societal, economic, and global perspectives
5. demonstrate ethical decisions in complex situations

UNIT-I

E-World & E-Communication:
E-language - E-governance - E-commerce/E-business - E-banking - E-waste

UNIT-II

Business Establishment & Infrastructure Development:
Power Supply - Industrial Park - Business Correspondence: Follow-up letters - Acceptance & Rejections - Persuasive letters - Resignation letters

UNIT-III

Technology and Society:
Robot Soldiers - For a Snapshot of a Web - Placing an order - Proposal Writing - Patents & Rights (National & International) - Intellectual Property - Nanotechnology

UNIT-IV

Ethics in Business Communication:
Ethical issues involved in Business Communication - Ethical dilemmas facing managers - Ethical Code & Communication - Standards in Daily Life - Total Quality Management - World University Ranking

UNIT-V

Management Information System:
Corporate Governance - Business Process Outsourcing - Project Management Communication - Marketing Communication

Textbook:

1. Dhanavel, P. S. English and Communication Skills for Students of Science and Engineering. Orient Black Swan. 2009.

References:

1. Anderson, V. Paul. *Technical Communication.* Cengage. 2014.
2. Kalkar, Anjali. et.al. *Business Communication*. Orient Black Swan. 2010.
3. Knisely, W. Charles. and Knisely, I. Karin. *Engineering Communication.* Cengage. 2015.
4. Kumar, Sanjay. and PushpLata. *Language and Communication skills for Engineers.* Oxford University Press. 2018.
5. Raman, Meenakshi and Singh, Prakash. *Business Communication.* (Second Edition.). Oxford University Press. 2012.

ANURAG UNIVERSITY

IV Year B.Tech CSE-DS II SEM	L	T/P	C
	2	1/0	3

DIGITAL MEDIA LITERACY

(OEC-II)

Introduction

The course is introduced to build a relationship between media Literacy to traditional forms. It will enable the students understand the media around them and learn to use media literacy effectively. The students can also excel their writing skills through media.

Learning Objectives

The students will be able to

1. prepare the students to use media source and its content
2. train the students become media literate
3. provide practical tips for incorporating media literacy into the traditional curriculum

Course Outcomes

After the completion of the course, the students will

1. Use media as a learning tool
2. Share knowledge in digital media
3. Apply the use of persuasive language
4. Exhibit copy writing skills
5. Contribute their ideas through blogs

Prescribed Textbook:

Jacobs , Hayes Heidi. ***Media Literacy.*** Solution Tree Press: USA.

(E-book is available to download)

UNIT-I

Introduction – Diversity and Media:

Bias in the Media - Peer Driven Social Learning Communities - Social Learning Spaces -Mirrored Learning Words - Online Events - The Nitty - Gritties

UNIT-II

Digital Literacy in Action:

Internet Safety and Filtering - Establish Proficiency of Tagging

UNIT-III

Blogging:

Basics of Blog Writing - Foundations of Blogging - Blogs as Professional Development Tool - Blogs as a Learning Tool - Creating Knowledge Habitats

UNIT-IV

The Classroom:

A Market place for Learning - Build an Electronic Calendar-Paper less News Paper - Marketing through Social Media - Writing Techniques

UNIT-V

Gaming as a Literacy:

How Video games promote Learning? - Participatory Culture and Engagement - Collaboration and Cooperation - Motivation

References:

1. Hobbs Renee R.Create To Learn: Introduction To Digital Literacy:Wiley-Blackwell Publications.
2. Frank, W. Baker. Media Literacy in the K-12 Classroom. (2nd Edition.). Paperback Publications.
3. Hertz, Mary. Beth. Digital and Media Literacy in the Age of the Internet: Practical Classroom Applications. Rowman & Littlefield Publishers.
4. Hobbs Renee R. Digital and Media Literacy. Sage Publications.
5. Potter, W. James. Introduction to Media Literacy. Sage Publications.

ANURAG UNIVERSITY

IV Year B.Tech CSE-DS II SEM	L	T/P	C
	2	1/0	3

VALUE ENGINEERING

(OE-II)

Course Objectives

The course is designed to help the student understand the concepts of Value engineering, understand different phases of value engineering and decision alternatives, and teams.

Course Outcomes

At the end of the course the student will be able to

1. Understand the importance of value engineering concepts in productivity
2. Identify the different phases of value engineering projects
3. Know the different decision alternatives and choose the best alternative for optimization
4. Identify the value engineering concept in non-hardware projects and programmes
5. Analyze the value engineering teams with the help of case study.

Unit-I

Introduction: Value engineering concepts, advantages, applications, problem recognition, and role in productivity, criteria for comparison, element of choice. Level of value engineering in the organization, unique and quantitative evaluation of ideas.

Unit-II

Value Engineering and Job Plan: Introduction, orientation, information phase, speculation phase analysis phase. Selection and Evaluation of value engineering projects, Project selection, methods selection, value standards, application of value engineering methodology

Unit-III

Value Engineering Techniques: Selecting Products and Operation for Value Engineering action, Value Engineering Programmes, Decision Making for Optimum Alternative, Use of Decision Matrix, Make or Buy, Measuring Profits, Reporting Results, Follow up, Use of advanced technique like Function Analysis System.

Unit–IV

Versatility Of Value Engineering: Value engineering operation in maintenance and repair activities, Value Engineering in non-Hardware Projects. Initiating a Value Engineering Programme

Unit–V

Value Engineering Level of Effort: Value Engineering Team, Co-coordinator, Designer, different Services, Construction Management Contracts, Value Engineering Case Studies.

TEXT BOOKS:

1. Anil Kumar Mukhopadhyaya, "Value Engineering: Concepts Techniques and applications", SAGE Publications 2010.
2. Del L. Younker, "Value Engineering analysis and methodology", Marcel Dekker Inc, New York, 2004

REFERENCES:

1. Alphonse Dell'Isola, "Value Engineering: Practical Applications for Design, Construction, Maintenance & Operations", R S Means Co., 1997
2. Richard Park, "Value Engineering: A Plan for Invention", St. Lucie Press, 1999.
3. Anil Kumar Mukhopadhyaya, "Value Engineering Mastermind: From concept to Value Engineering Certification", SAGE Publications, 2003

ANURAG UNIVERSITY

IV Year B.Tech CSE-DS II SEM	L	T/P	C
	2	1/0	3

NEGOTIATION SKILLS
(OEC-III)

Course Objectives:

1. To familiarize the students with various negotiation approaches and styles.
2. Understand & develop effective strategies for each stage of a negotiation
3. Identify Cross – cultural challenges that arise in negotiations
4. Enhance communication skills, emphasizing effective listening, persuasion & relationship building
5. Strengthen creative ability to expand the option for resolving a dispute.

Course outcomes:

At the end of the course students will be able to

1. Describe negotiation theories, concepts and tactics to manage negotiations
2. Explain the importance of various factors impacting negotiations.
3. Apply effective negotiation strategies and tactics for different scenarios
4. Identify negotiation practices towards building relationships
5. Evaluate various conflict resolution strategies.

Unit- I

Introduction to Negotiation: Introduction, Concept of Negotiation, Characteristics of a Negotiating Situation, Basic Negotiation Skills, Interpersonal Skills in Negotiation, Theories of Negotiation.

Unit- II

Types of Negotiation: Types of Negotiation, Principles of Negotiation, Steps of Negotiation, Win-Win Negotiation, Negotiation Tactics, Factors Affecting Success in Negotiation.

Unit- III

Strategies of Negotiation: Fundamentals of Negotiation, Effective Strategies to develop Negotiation Skills, Anchoring / BATNA, Process of Negotiation and Negotiation Phases.

Unit –IV

Improving Negotiation skills: Enhancing Communication skills for effective Listening, Persuasion & Relationship Building, establishing Trust-Building Relationships.

Unit- V

Managing Negotiation: Managing Different Types of Negotiations, Cross –Cultural Challenges in Negotiations, Industrial Negotiation: Collective Bargaining, Arbitration, Origins of Conflict, Dispute Resolution.

TEXT BOOKS:

1. Fredluthans, Organisational Behavior, 9th ed, Prentice Hall.
2. Roger Fischer, Essentials of Negotiations, Harward Business School Press.

REFERENCES:

1. Beverly DeMarr and Suzanne De Janasz, Negotiation and Dispute Resolution, Prentice Hall, 2013.

2. Roy J Lewicki, Bruce Barry, and David M Saunders, Essentials of Negotiation, 5th Edition, McGraw Hill, 2011

3. Malhotra, Deepak, Negotiating the Impossible: How to Break Deadlocks and Resolve ugly Conflicts (without money or muscle). Oakland, CA: Berrett-Koehler Publishers, 2016.

4. Fatima, Shaheed; Kraus, Sarit; Wooldridge, Michael, Principles of Automated Negotiation. Cambridge, UK; New York: Cambridge University Press, 2015.

5. Subramanian, Guhan, Dealmaking: New Dealmaking Strategies for a Competitive Marketplace. New York: W. W. Norton & Company, 2011.

ANURAG UNIVERSITY

IV Year B.Tech CSE-DS II SEM	L	T/P	C
	2	1/0	3

PROJECT MANAGEMENT
(OEC-III)

Course Objectives:

1. To understand the concept of Project Management.
2. To know about the different approaches to project screening and planning.
3. To explain about the factors of risk involved in project execution.
4. To understand about team leading and functional cooperation.
5. To know about the project performance and future trends in the project management.

Course Outcomes:

At the end of the course students will be able to

1. Explain about the life cycle and other concepts of Project Management.
2. Apply different approaches to project screening and planning
3. Analyze different risk factors in project execution
4. Estimate how to lead a team, to get functional cooperation
5. Build performance evaluation reports and future trends in project management.

Unit-I

Introduction: Meaning, Need, Principles Project Lifecycle and its Phases, Project Management Research in brief, Project Management today, Organization strategy and structure and culture, Format of organization structure, Stake holder Management, Organization Culture, creating a culture for Project Management.

Unit-II

Project Identification and Planning: Defining the project, Project Identification Process, Approaches to Project Screening and Selection, Project Planning, Work Breakdown Structure, Financial Module, Getting Approval and Compiling a Project Charter, setting up a Monitoring and Controlling Process.

Unit-III

Project Execution: Initiating the Project, Controlling and Reporting Project Objectives, Conducting project evaluation, Risk, Risk Management Factors, Project Management, Four Stage Process, Risk Management an Integrated Approach, Cost Management, Creating a Project Budget.

Unit-IV

Leading Project Teams: Building a Project Team, Characteristics of an effective Project Team, achieving Cross- Functional Co-operation, Virtual Project Teams, Conflicts Management, Negotiations.

Unit-V

Performance Measurement and Evaluation: Monitoring Project Performances, Project Control Cycles, Earned Value Management, Human factors in Project Evaluation and Control, Project Termination, Types of Project Terminations, Project Follow-up. Current and Future Trends in Project Management.

TEXT BOOKS:

1. Gray, Larson, Project Management, Tata McGraw Hill, 2015
2. Jeffery K. Pinto, Project Management, Pearson Education, 2015

REFERENCES

1. Enzo Frigenti, Project Management, Kogan, 2015
2. R. Panneerselvam& P. Senthil Kumar, Project Management, PHI, 2015
3. Thomas M. Cappels, Financially Focused Project Management, SPD, 2008.

IV Year B.Tech CSE-DS II SEM	L	T/P	C
	2	1/0	3

STRESS MANAGEMENT
(OE-III)

Course Objectives:

The course is designed to help the student understand the concepts of project management, explain how to identify the projects and planning, analyze how to execute the projects, assess how to lead the team and evaluation of projects and to explain the performance measurement and evaluation of the projects.

Course Outcomes:

By the completion of the course, Students will be able to:

1. Understand the sources of reducing stress among employees.
2. Improve the physiological and physical illness of employees and self.
3. Develop a right attitude among employees and self.
4. Adopt stress management strategies for personal well-being and well-being of team members.
5. Understand the leadership styles in stress and time management techniques

Unit-I

Introduction to Stress Management

Nature of stress, approaches to stress, Good stress Vs. Bad stress, the individual and work. Occupational stress, role stress, source of managerial stress.

Unit-II

Stress & thought process learning Stress & thought process learning. Manifestations of stress - stages of stress, signs of stress at work, personality types and stress.

Unit-III

Various linkages and Assessment of Stress Stress & personality, stress & motivation, verbal & non-verbal indications of stress, assessment of stress, general sources of stress, stress and health, physiological and psychological illness.

Unit-IV

Stress Management Stress management, stress diary, becoming change skilled, adopting a healthy lifestyle, right attitude, thought awareness, imaginary (auto-genic therapy), learning to relax, correct breathing, and goal planning.

Unit-V

Stress and Leadership Styles Stress & management of change, stress & conflict, leadership styles in stressful & non-stressful situations, organization and stress management, recognizing the signs, approaches to the problem, providing assistance. Time management, general advice - ten commandments for effective stress management.

TEXT BOOKS:

1.R. P. Banerjee, Stress Management through Mind Engineering, Sage Spectrum, 2021

2. Alok Chkarawal, Prathibha Goyal, Stress Management, Studera Press, 2018

REFERENCES

1. Wolfgand Linden, Stress Management, Sage Publication, 2005
2. Jonathan C Smith, Stress Management: A Comprehensive Handbook of Techniques and Strategies , 2002
3. K. Hari Gopal, Organizational Stress, University Press.
4. Ann Edworthy, Managing Stress, Open University Press, Buckingham, Phildephia.
5. Dr. Rakesh Chopra Santosh Sharma, The stress Cyclone Suffer or Emerge out: The choice of yours, Institute of corporate Management, Excel Books.

Program Structure and Syllabus of

B. Tech IV Year

Information Technology

R20 Regulations

B. TECH IV YEAR I SEMESTER [4 T + 4 P]

S.No	Course Code	Category	Course	Hours per week L	T	P	Credits
1	A57054	HSS&MC	Managerial Economics and Financial Analysis	2	1	0	3.0
2	A57077	PCC	Cryptography and Network Security	3	1	0	4.0
3	A57078 A57066 A57079	PEC-IV	1. Introduction to Block chain Technology 2. Big Data Analytics 3. User Experience Design	3	1	0	4.0
4	A57080 A57081 A57082	OEC - I	1. Essential English & Employability Skills 2. Technical and Business Communication Skills 3. English for Professionals	3	0	0	3.0
5	A57217	PCC LAB	Cryptography and Network Security Lab	0	0	4	2.0
6	A57218	PCC LAB	Internet of Things Lab	0	0	4	2.0
7	A57219 A57214 A57220	PEC-IV LAB	1. Block chain Technology 2. Big Data Analytics 3. User Experience Design	0	0	4	2.0
8	A57230	PROJ	Industry Oriented Mini Project	0	0	4	2.0
			TOTAL	**11**	**3**	**16**	**22**

B. TECH IV YEAR II SEMESTER [2 T + 3 P]

S.No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1	A58023	OEC-II	1. Management Science	2	1	0	3.0
	A58024		2. Operations Research				
	A58002		3. Intellectual Property Rights				
2	A58005	OEC-III	1. Negotiation Skills	2	1	0	3.0
	A58008		2. Project Management				
	A58010		3. Value Engineering				
3	A58201	PROJ	Seminar	0	0	4	2.0
4	A58202	PROJ	Comprehensive Viva-Voce	0	0	0	2.0
5	A58203	PROJ	Project Work	0	0	20	10.0
			TOTAL	**4**	**2**	**24**	**20**

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

B. Tech IV Year I Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57054	HSS & MC	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

Course Objectives of Managerial Economics and Financial Analysis are to:

The objective of this course is to familiarize the student with the concepts of managerial economics and financial accounting, demand and cost concepts, market structures, pricing and financial ratios

Course Outcomes

At the end of this Managerial Economics and Financial Analysis course, students will be able to:

1. Describe the concept of demand and its determinants in managerial decisions.
2. Know the cost concepts and breakeven analysis in production.
3. Identify various market structures and different pricing strategies.
4. Have knowledge of capital budgeting techniques in financial decisions.
5. Have knowledge of Ratios in solving of business problems.

UNIT I

Introduction to Managerial Economics: Definition, nature and scope of managerial economics, demand analysis - demand determinants, Law of Demand and its exceptions.

Elasticity of Demand: Definition, types, measurement and significance of elasticity of demand, demand forecasting, methods of demand forecasting.

UNIT II

Theory of Production and Cost Analysis: Production Function – Isoquants and Iso costs, MRTS, Least Cost Combination of Inputs.

Cost Analysis: Cost concepts, Opportunity cost, Breakeven Analysis (BEA) – determination of breakeven point, managerial significance and limitations of BEA.

UNIT III

Market structures: Types of competition, features of perfect competition, monopoly and monopolistic competition, price - output determination in perfect competition.

Objectives and Policies of Pricing: objectives of pricing**,** methods of pricing - cost plus pricing, marginal cost pricing, going rate pricing, limit pricing, market skimming pricing, penetration pricing, two - part pricing, block pricing, peak load pricing, cross subsidization.

UNIT IV

Capital and Capital Budgeting: Capital and its significance. Types of capital estimation of fixed and working capital requirements, Methods and sources of raising finance. Nature and scope of capital budgeting, features of capital budgeting proposals. Methods of capital Budgeting: Payback Method. Accounting Rate of Return (ARR) and Net Present Value Method.

UNIT V

Introduction to Financial Accounting: Definition of Accounting**,** Double-Entry Book Keeping, Journal, Ledger, and Trial Balance, Final Accounts.

Ratio Analysis: Computation, Analysis and Interpretation of Liquidity Ratios Activity Capital Structure Ratios and Profitability Ratios.

Text Books

1. Arya Sri: Managerial Economics and Financial Analysis, TMH, 2009.
2. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2014.

Reference Books

1. R. K. Sharma & Shashi K Gupta, Financial Management, Kalyani Publishers, 2020
2. V. Rajasekaran & R. Lalitha, Financial Accounting, Pearson Education, 2010.
3. Domnick Salvatore, Managerial Economics in a Global Economy, 9e, Oxford Univ Press, 2018.
4. S N Maheshwari, CA Sharad K Maheshwari & Dr Suneel K Maheshwari, Financial Accounting, 6/e, Vikas Publications, 2018.

CRYPTOGRAPHY AND NETWORK SECURITY

B. Tech IV Year I Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57077	Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

Course Objectives of Cryptography and Network Security are to:

1. Describe the basic concepts of classical encryption techniques, finite fields and number theory
2. Discuss the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms
3. Design issues and working principles of various authentication protocols, PKI standards
4. Explore various secure communication standards including Kerberos, IPsec, and SSL/TLS and email
5. Describe the concepts of cryptographic utilities and authentication mechanisms to design secure applications

Course Outcomes

At the end of this Cryptography and Network Security course, students will be able to:

1. Identify information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts of finite fields and number theory
2. Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication
3. Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms
4. Apply different digital signature algorithms to achieve authentication and create secure applications
5. Analyze different attacks on networks and evaluate the performance of firewalls and security protocols like SSL, IPSec, and PGP

UNIT I

Classical Encryption Techniques: Security Attacks, Services & Mechanisms, Symmetric Cipher Model. Cyber Threats, Phishing Attack, Web Based Attacks, SQL Injection Attacks, Buffer Overflow& Format String Vulnerabilities, TCP session hijacking, UDP Session Hijacking. **Block Ciphers:** Traditional Block Cipher Structure, Block Cipher Design Principles.

UNIT II

Symmetric Key Cryptography: Data Encryption Standard (DES), Advanced Encryption Standard (AES), Blowfish, IDEA, Block Cipher Modes of Operations. **Number Theory:** Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems, The Chinese Remainder Theorem, Discrete Logarithms.

UNIT III

Public Key Cryptography: Principles, Public Key Cryptography Algorithms, RSA Algorithm, Diffie Hellman Key Exchange, Elliptic Curve Cryptography. **Cryptographic Hash Functions:** Application of Cryptographic Hash Functions, Requirements & Security, Secure Hash Algorithm, Message Authentication Functions, Requirements & Security, HMAC & CMAC. **Digital Signatures:** NIST Digital Signature Algorithm, Key Management and Distribution.

UNIT IV

User Authentication: Remote User Authentication Principles, Kerberos. Electronic Mail Security: Pretty Good Privacy (PGP) And S/MIME. IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

UNIT V

Transport Level Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Shell (SSH). **Firewalls:** Characteristics, Types of Firewalls, Placement of Firewalls, Firewall Configuration, Trusted Systems.

Text Books

1. Cryptography and Network Security-William Stallings, Pearson Education, 7th Edition.
2. Cryptography, Network Security and Cyber Laws –Bernard Menezes, Cengage Learning, 2010 edition.

Reference Books

1. Cryptography and Network Security-Behrouz A Forouzan, Debdeep Mukhopadhyay, Mc-GrawHill, 3rd Edition, 2015.
2. Network Security Illustrated, Jason Albanese and Wes Sonnenreich, MGH Publishers, 2003.

INTRODUCTION TO BLOCK CHAIN TECHNOLOGY (PEC-IV)

B. Tech IV Year I Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57078	Professional Elective-IV	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

Course Objectives of Block Chain Technology are to:

1. Identify different components and types of Blockchain
2. Apply Ethereum tool for application development
3. Interpret various components of DApps and multichain
4. Summarize the architecture of Hyperledger Fabric
5. Analyze the impact of Blockchain in business

Course Outcomes

At the end of this Block Chain Technology course, students will be able to:

1. Summarize types and applications of Blockchain
2. Design and deploy smart contract through Ethereum
3. Apply DApps through Truffle IDE
4. Apply Hyper Ledger Fabric model in different Networks
5. Categorize different Business Applications of Blockchain

UNIT I

What is Blockchain: Definition, history, Digital Money to Distributed Ledgers

Why Blockchain: Properties of Blockchain, Requirements for consensus protocols, Proof of Work (PoW), Proof of Stake (PoS), Zero Knowledge Proofs, Byzantine Models, hashing, Merkle Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Types of Blockchain.

UNIT II

Ethereum Solidity: Introduction, Datatype, operator, enum, arrays, loops, Mapping, Structure, State Modifiers, Exception Handling in Solidity, Inheritance, Events, Self-Destruction, ERC Tokens, Constructors, Libraries, Compile and Deploy the Smart Contract.

UNIT III

Truffle IDE: Creating user interface, textboxes, radio buttons, drop down list, developing a DApp, Publish the DApp Connecting to DApp, truffle migrate, truffle test.

Multichain: Chain code (go) and Multi Chain, Privacy and Permissions in Multi Chain, Mining in Multi Chain, Multiple configurable Blockchains using Multi Chain, Setting up a Private Blockchain, Blockchain Bytes

UNIT IV

Hyperledger (go Lang): Introduction, architecture, Consensus, API, frameworks, setting up Development Environment using Composer, Developing and Testing business networks, Hyperledger Fabric Model Various ways to create Hyperledger Fabric Blockchain Network

UNIT V

Blockchain transforming business, Blockchain in governance.

Case Studies: Supply chain management, real estate, healthcare, Government sectors, bitcoin.

Text Book

1. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guide to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017

Reference Books

1. Chandramouli Subramanian,Asha A George,Abhilash K A and Meena Karthikeyan, Blockchain Technology, Published by University Press
2. Philipp Hacker, Ioannis Lianos, Regulating Blockchain: Techno-Social and Legal Challenges, OUP Oxford. (ISBN-13: 978-0198842187), 2019
3. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos Blockchain by Melanie Swa, O'Reilly
4. Hyperledger Fabric - https://www.hyperledger.org/projects/fabric
5. Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits - https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html

BIG DATA ANALYTICS (PEC-IV)

B. Tech IV Year I Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57066	Professional Elective-IV	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

Course Objectives of Big Data Analytics are to:

1. Discuss the overview of big data analytics concepts and growth rate
2. Introduce the tools required to manage and analyze big data like Hadoop, NoSQL Data Management.
3. Summarize the fundamental concepts of Hadoop Distributed file systems
4. Describe the techniques involved with Map Reduce Applications.
5. Analyze various recommender systems for applications

Course Outcomes

At the end of this Big Data Analytics course, students will be able to:

1. Appraise the concept and application of Big Data
2. Apply scalable algorithms on NO SQL for big data analytics.
3. Elaborate the notion of Hadoop Distributed File System and applications
4. Apply MapReduce for the given problem
5. Implement recommender systems for different application

UNIT I

Introduction To Big Data: Characteristics of Big Data, Traits of Big data, Challenges of Conventional Systems, Sources of Big Data, Applications of big data, Features and benefits of big data, Analysis vs Reporting, CAP theorem, Modern Data Analytic Tools. **Introduction to Hadoop Programming languages**: Pig, Hive. **NOSQL Databases**: Cassandra, Mongo, HBase.

UNIT II

NOSQL Data Management: Introduction to NoSQL, aggregate data models, aggregates, key-value and document data Models, relationships, graph databases, schema less databases, materialized views, distribution models, sharding, master-slave replication, peer-peer replication, sharing and replication

UNIT III

Introduction To Hadoop: History of Hadoop, Data Storage and Analysis, Hadoop –Setup, Hadoop operation modes, Configurations of Hadoop.

Hadoop Ecosystem, Hadoop Distributed File System, HDFS Architecture, concepts of Blocks in HDFS Architecture, Name Nodes and Data Nodes, using command Line Interface with HDFS, HDFS Commands, Features of HDFS.

UNIT IV

MapReduce Applications: MapReduce workflows, unit tests with MR Unit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic MapReduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats

UNIT V

Social Media Analytics and Text Mining: Introducing social media; Key elements of social media; Sentiment Analysis, Performing Social Media Analytics.

Text Book

1. BIG DATA- Black Book, Dream Tech Press, 2019.

Reference Books

1. Seema Acharya, S. Chellappan," Big Data and Analytics", Wiley,2014
2. Tom White "Hadoop: The Definitive Guide" 4th Edition, O'reilly Media, 2015.
3. Michael Minelli, Michele Chambers, Ambiga Dhiraj, Jim Stogdill, "Big Data Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", 1st Edition, Wiley Publications,2013
4. Chris Eaton, Dirk De Roos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGraw Hill Publishing, 2012
5. Pete Warden, "Big Data Glossary", O'Reilly, 2011.

USER EXPERIENCE DESIGN (PEC-IV)

B. Tech IV Year I Semester					Dept. of Information Technology			
Code	Category	Hours / Week			Credits	Marks		
A57079	Professional Elective-IV	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

Course Objectives of User Experience Design are to:

1. Outline UX Design for different Applications.
2. Discuss the design technologies for individuals and persons with disabilities.
3. Outline the foundation of digital imaging for building prototypes.
4. Explore research Design and Evolution Methodologies for the user experience.
5. Elaborate the User Motivations and Experiences.

Course Outcomes

At the end of this User Experience Design course, students will be able to:

1. Describe the user-focused design
2. Create a UX design workflow in various forms effectively
3. Apply UX design concepts in Wireframing.
4. Analyze UX products.
5. Create user interface design prototype

UNIT I

Introduction to UX and Design, User Experience, UX for People, Brief History of UX, UX for Interfaces, UX for products, UX for Content, UX for Services, UX for Spaces. UX Principles, Design Thinking, Golden Rules UX design, Perspective, Design for Real life, Focus on Solutions, Key Concepts, Design Process, Goal Definition and Problem

UNIT II

User Research, Defining User research goal, Research Learning Spiral, Objectives, Types of research methods. Building Foundations, Evaluating Design, Synthesize User Groups, User Interviews, Personas and its creation.

UNIT III

Design and develop, Wireframing, Good Wireframing, Art of Efficiency, Information System Architecture. Principles, Information Architecture System, User Journey, User Flows, Prototyping and Types and Fidelity of Prototypes.

UNIT IV

Test and Measure, Usability Teasing, A/B Testing, Biometrics, Data and Analytics, Reports,

Launch and iterate, Visual Design Principles, Gestalt Basics, Visual Design Tool Kit.

UNIT V

Human Behavior and Motivations, Create Trust, Empathy Map, Accessibility, Customized Experiences, Essential Value of UX Design, User Benefits, Product Benefits, Biasness Benefits, UX design jobs, Disciplines of UX Design, Common Tools.

Text Book

1. Theo Farrington, UX Design 2020-The Ultimate Beginner's Guide to User Experience,2020

Reference Books

1. Mads Soegaard, The Basics of User Experience Design, Interaction Design Foundation
2. Learn UX: Applying Lean Principles to Improve User Experience Book by Jeff Gotheff and Josh Seiden, 2013
3. A Project Guide to UX Design, Second Edition Russ Unger and Carolyn Chandler, 2012

Reference Links:

1. https://www.uxbooth.com/articles/complete-beginners-guide-to-design-research/
2. https://www.uxbooth.com/articles/creating-personas/
3. https://www.interaction-design.org/literature/topics/wireframing
4. https://www.uxpin.com/studio/blog/what-is-a-prototype-a-guide-to-functional-ux/

ESSENTIAL ENGLISH & EMPLOYABILITY SKILLS (OEC-I)

B. Tech IV Year I Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57080	Open Elective-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Introduction

The purpose of graduate education is not only to gain knowledge but also to acquire employability skills fit for the qualification. The challenge of fresh graduates does not end with merely acquiring a job but to maintain credibility and sustainability throughout their career. Hence, varied skills and competencies are the pre-requisites for professional students who emerge from colleges and are ready to take up global careers.

Course Objectives

1. To enable students to develop their personality, infuse confidence and increase employability skills in any chosen career
2. To provide the students hands-on experience to cope with the demands of the world of recruiters
3. To help the students acquire the job skills essential for employment.

Course Outcomes

At the end of this course, students will be able to:

1. Enhance employability skills and professional etiquette to work in the corporate world
2. Develop leadership, interpersonal and decision-making skills
3. Acquire productive knowledge, competent learning, and innovative thinking skills from specifically selected lessons
4. Analyze the importance of tackling various job interviews
5. Provide insights to implement verbal and non-verbal communication competencies in workplace

UNIT I

Six Sigma: Dabbawala from English for Employability

Personality Development: A Must for Leadership and Career Growth from Personality Development and Soft Skills

Introduction - Learning about Personality Development from 3 Cases - Personality Analysis - Freudian analysis of Personality Development - Swami Vivekananda's Concept of Personality Development - Personality Begets Leadership Qualities

UNIT II

Yet I am not defeated! from English for Employability

Interpersonal skills from Personality Development and Soft Skills

The Personality Attribute of Taking Bold Decisions - Personality Types and Leadership Qualities - Personality Tests

UNIT III

Patricia Narayanan: An Entrepreneur by accident, from English for Employability

Soft Skills: Demanded by Every Employer from Personality Development and Soft Skills

Introduction to Soft Skills - Lessons from the 3 Case Studies - Change in Today's Workplace - Soft Skills as a Competitive Weapon - Antiquity of Soft Skills - Classification of Soft Skills

UNIT IV

Satya Nadella: CEO of Microsoft from English for Employability

Interview Skills from Personality Development and Soft Skills

UNIT V

Body Language Reveals Your Inner self and Personality from Personality Development and Soft Skills. Introduction - Emotions Displayed by Body Language – Handshake -The Most Common Body Language - Eyes - A Powerful Reflection of One's Inner self - Entry to My Space - Personal Zones may vary - Body Language exhibited during different Professional Interactions.

Text Books

1. Purushotham, K. English for Employability. Orient Black Swan, Hyderabad.
2. Mitra, K. Barun. Personality Development and Soft Skills. Oxford University Press.

Reference Books

1. Enhancing English and Employability Skills. State Board of Technical Education and Training. Hyderabad: Orient Black swan Private Limited, 2012.
2. Rao, M. S. Soft Skills Enhancing Employability. New Delhi: I. K. Publishing House, 2010.
3. Rao, Nageshwar. Communication Skills. New Delhi: Himalaya Publishing House Pvt. Ltd, 2008.
4. Sharma, T. K. Enhancing Employability in Education. India: Patridge Publishing House. 2015.
5. Yadav, Shalini. Communication Technique. New Delhi: University Science Press, 2010.

TECHNICAL AND BUSINESS COMMUNICATION SKILLS (OEC-I)

B. Tech IV Year I Semester					Dept. of Information Technology			
Code	Category	Hours / Week			Credits	Marks		
A57081	Open Elective-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Introduction

The course is intended to expose the students to learn and practice the five communication skills: thinking, listening, speaking, reading, and writing in English, the global language of communication. It reflects some of the approaches in English language teaching and learning currently in practice around the world.

Course Objective

To help the students to develop effective communication skills in all communicative contexts for professional advancement.

Course Outcomes

At the end of this Technical and Business Communication Skills course, students will be able to:

1. Communicate technical and business correspondence
2. Reflect on the themes discussed
3. Recognize ethical implications of technical communication in professional contexts
4. Identify the contemporary issues in engineering from environmental, societal, economic, and global perspectives
5. Demonstrate ethical decisions in complex situations

UNIT I

E-World & E-Communication

E-language - E-governance - E-commerce/E-business - E-banking - E-waste.

UNIT II

Business Establishment & Infrastructure Development

Power Supply - Industrial Park - Business Correspondence: Follow-up letters - Acceptance & Rejections -Persuasive letters - Resignation letters.

UNIT III

Technology and Society

Robot Soldiers - For a Snapshot of a Web - Placing an order - Proposal Writing - Patents & Rights (National & International) - Intellectual Property – Nanotechnology.

UNIT IV

Ethics in Business Communication

Ethical issues involved in Business Communication - Ethical dilemmas facing managers - Ethical Code & Communication - Standards in Daily Life - Total Quality Management - World University Ranking.

UNIT V

Management Information System

Corporate Governance - Business Process Outsourcing - Project Management Communication - Marketing Communication

Text Book

1. English and Communication Skills for Students of Science and Engineering by S P Dhanavel. Orient Black Swan. 2009.

Reference Books

1. Business Communication (Second Edition) by Meenakshi Raman & Prakash Singh by Oxford University Press. 2012.
2. Language and Communication skills for Engineers by Sanjay Kumar & Pushp Lata by Oxford University Press. 2018.
3. Business Communication by Anjali Kalkar, et.al. Orient Black Swan. 2010.
4. Technical Communication by Paul V. Anderson. Cengage. 2014.
5. Engineering Communication by Charles W. Knisely & Karin I. Knisely. Cengage. 2015.

ENGLISH FOR PROFESSIONALS (OEC-I)

B. Tech IV Year I Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57082	Open Elective-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Introduction

The course aims at preparing the students with the tools needed for successful communication at the professional front. It is designed to improve students' academic and professional skills which the employers are currently looking for.

Course Objective

To prepare the students to use the language effectively in all professional pursuits

Course Outcomes

At the end of this Computer Networks course, students will be able to:

1. Analyze the language use in communicative process
2. Describe the process and product
3. Interpret the ideas in group activities
4. Apply different approaches to comprehend the written text
5. Write any technical and official correspondence within the framework

UNIT I

Essentials of Communication:

Essentials of Grammar-Rudiments of Communications Skills (Listening, Speaking, Reading, and Writing)- Applied Grammar and Usage- Non-Verbal Communication.

UNIT II

Listening Skills:

Art of Listening- Developing Effective Listening Skills-Process of Listening, Intensive & Extensive Listening

Podcasts, Vodcasts (ICT enabled) - Five steps to Active Listening-Effective and Ineffective Listening Skills-Listening & Note-taking

UNIT III

Speaking Skills:

Dynamics of Effective Speaking -Group Discussion-Simulated Presentations, Process & Product Descriptions- Proxemics, Paralinguistic Features

UNIT IV

Reading Skills:

The Art of Effective Reading- Basic steps to Effective Reading-Extensive and Intensive Reading - Approaches to Efficient Reading-Reading Comprehension.

UNIT V

Writing Skills:

Art of Condensation-Descriptive Writing Techniques-Writing & Answering Memos, Circulars -Inter & Intra Official Communication -Writing Minutes of Meeting-Netiquette - E-mail & Blog Writing - Note-making.

Text Book

1. Kumar, Sanjay and Pushpa Lata, Communication Skills, Second edition, Oxford University Press, 2015.

Reference Books

1. Adair, John. The Effective Communicator. Jaico Publishing House.1995.
2. Adler, B.Ronald. Communicating at Work.(Seventh edition.) McGraw Hill.2004.
3. Aruna, Koneru. Professional Communication.McGraw Hill.2017.
4. Ibbotson,Mark.Cambridge English for Engineering Professionals. Cambridge University.2008.
5. Oxford English for Careers.Oxford University Press.

CRYPTOGRAPHY AND NETWORK SECURITY LAB (PCC LAB)

B. Tech IV Year I Semester					Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57217	Program Core	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

Course Outcomes

At the end of this Network Security lab course, students will be able to:

1. Build a honey pot & installation of rootkits.
2. Imitate reconnaissance tools and packet sniffer tools.
3. Implement VPN (Virtual Private Network).
4. Implement Shared key using Diffie Hellman algorithm.
5. Evaluate RSA Encryption and Decryption model

List of Experiments

Week 1

1. Setup a honeypot and monitor the honeypot on network (KF Sensor).
2. Installation of rootkits and study about the variety of options.

Week 2

1. Study the use of network reconnaissance tools like WHOIS, dig, traceroute, nslookup to gather information about networks and domain registrars.
2. Study of packet sniffer tools like Wireshark, ethereal, tcpdump etc. Use the tools to do the following

a) Observer performance in promiscuous as well as non-promiscuous mode.
b) Show that packets can be traced based on different filters.

Week 3

Write a program to study the steps of implementation of Virtual Private Network

(VPNs) using Packet tracer or GNS3.

Week 4

Perform an experiment for Port Scanning with nmap, super scan or any other equivalent Using nmap

a) Find Open ports on a system.

b) Find machines which are active.

c) Find the version of remote OS on other systems.

d) Find the version of s/w installed on other system (using nmap or any other software).

Week 5-6

1. Implementation of Transposition Cipher.
2. Implementation of Double Transposition Cipher

Week 7-8

Implementation of Stream Cipher RC4

Week 9-10

1. Implementation of Diffie Hellman Algorithm
2. Implementation of RSA Algorithm

Week 11-12

Implementation of DES Algorithm

Week 13-14

Implementation of AES Algorithm

Week 15

Review

The following Software / Tools used in this lab are open source:

1. KF Sensor, WHOIS, dig, traceroute, nslookup.
2. Wireshark, ethereal, tcpdump.
3. Packet tracer / GNS3
4. nmap, Rootkits, Net Stumbler.

Note: The above experiments are for indicative purposes only. However, the concerned faculty member can add a few more experiments in addition to the existing. In such cases the concerned faculty member should get the syllabus approved by the BoS.

INTERNET OF THINGS LAB (PCC LAB)

<table>
<tr><th colspan="5">B. Tech IV Year I Semester</th><th colspan="4">Dept. of Information Technology</th></tr>
<tr><td>Code</td><td>Category</td><td colspan="3">Hours / Week</td><td>Credits</td><td colspan="3">Marks</td></tr>
<tr><td rowspan="2">A57218</td><td rowspan="2">Program Core</td><td>L</td><td>T</td><td>P</td><td>C</td><td>CIE</td><td>SEE</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>4</td><td>2</td><td>50</td><td>50</td><td>100</td></tr>
</table>

Course Outcomes

At the end of this Internet of Things Lab course, students will be able to:

1. Identify the sensors and actuators required for their application and control through programs
2. Differentiate the two basic boards and select the one which is suitable for their requirement.
3. Establish network connectivity over different components by applying network protocol.
4. Demonstrate serial communication with the help of UART, ADC, DAC
5. Design Traffic system, Health Care System as an IoT application.

List of Experiments

Week 1

Basics of Internet of Things: Sensors, Actuators, IoT architecture and Gateway

Week 2

GPIO programming using Raspberry pi Arduino with few examples.

Week 3

GPIO programming using Raspberry pi with few Examples

Week 4

Blinking LED through Raspberry pi or Arduino.

Week 5

IoT sensors interface with Raspberry pi or Arduino (Temperature/Light sensors).

Week 6

IoT Networking: Connectivity technologies, Protocols and Interoperability in IoT.

Week 7

Speed Control of motors using PWM with python programming.

Week 8

Use sensors to measure temperature, humidity, light and distance.

Week 9

Integration of Actuators with Raspberry pi or Arduino (Servo motor/Relay).

Week 10

Capture Image with Raspberry pi or Arduino.

Week 11

Design Traffic control system: using Raspberry pi or Arduino.

Week 12

Design Temperature dependent auto cooling system: Using Raspberry pi or Arduino.

Week 13

IoT applications in home automation: Implementing IoT home applications using Raspberry pi or Arduino.

Week 14

Experiment on HTTP-to-CoAP semantic mapping Proxy in IoT Toolkit.

Week 15

DAC conversion using Raspberry pi or Arduino.

Week 16

ADC conversion using Raspberry pi or Arduino.

Review.

Text Book

1. Arshdeep Bahga and Vijay Madisetti, Internet of Things A Hands –on approach, Universities Press, 2015.

Reference Books

1. HonboZhou,The Internet of Things in the Cloud: A Middleware Perspective, CRC Press, 2012.
2. Dieter Uckelmann, Mark Harrison, Florian Michahelles, Architecting the Internet of Things, Springer – 2011.
3. David Easley and Jon Kleinberg, Networks, Crowds, and Markets: Reasoning About a Highly Connected World, Cambridge University Press, 2010.
4. Olivier Hersent, Omar Elloumi and David Boswarthick, The Internet of Things: Applications to the Smart Grid and Building Automation, Wiley, 2012.

Note: The above experiments are for indicative purposes only. However, the concerned faculty member can add a few more experiments in addition to the existing. In such cases the concerned faculty member should get the syllabus approved by the BoS.

BLOCK CHAIN TECHNOLOGY LAB (PE-IV LAB)

B. Tech IV Year I Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57219	Professional Elective-IV	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

Course Outcomes

At the end of this Block Chain Technology Lab course, students will be able to:

1. Implement Smart Contracts and its deployment in remix
2. Illustrate Meta mask account creation
3. Build and publish DApps
4. Implement and test Hyperledger Fabric model
5. Experiment with Blockchain Network

List of Experiments

Week 1

Introduction to remix IDE

Week 2

Write a smart contract for voting and deploy using remix.

Week 3

Write a smart contract for bidding and deploy using remix.

Week 4

Write a smart contract for fund raising to a charity and deploy using remix.

Week 5

Write a smart contract for maintaining a savings account in a bank and deploy using remix.

Week 6

Create a metamask account.

Week 7

Write a smart contract and add ERC tokens to it using Metamask.

Week 8

Deploying a DApp that runs on a test network

Week 9,10

Create and Deploy a Business Network on Hyperledger

Week 11

Set up Hyperledger Fabric Blockchain using Hyperledger Composer locally

Week 12

Create a private Blockchain and Connect to your Blockchain

Week 13

Develop a business network Deploy and Test business networks

Week 14

Creation and transaction of new assets between nodes.

Note: The above experiments are for indicative purposes only. However, the concerned faculty member can add a few more experiments in addition to the existing. In such cases the concerned faculty member should get the syllabus approved by the BoS.

BIG DATA ANALYTICS LAB (PEC-IV LAB)

B. Tech IV Year I Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57214	Professional Elective-IV	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

Course Outcomes

At the end of this Big Data Analytics Lab course, students will be able to:

1. Develop various programs in Hadoop.
2. Perform file operation in HDFS
3. Perform query operation using pig
4. Practice various commands in HIVE
5. Create applications for Big Data analytics

List of Experiments

Week 1

Downloading and installing Hadoop; Understanding different Hadoop modes. Start-up scripts, Configuration files.

Week 2

Implement the following file management tasks in Hadoop:

1. Adding files and directories
2. Retrieving files
3. Deleting files

Week 3

Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.

1. Find the number of occurrences of each word appearing in the input file(s)

2. Performing a Map Reduce Job for word search count (look for specific keywords in a file)

Week 4

Stop word elimination problem:

Input:

1. A large textual file containing one sentence per line
2. A small file containing a set of stop words (One stop word per line)

Output: A textual file containing the same sentences of the large input file without the words appearing in the small file.

Week 5

Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather large volumes of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented. Data available at: https://github.com/tomwhite/hadoop- book/tree/master/input/ncdc/all.

1. Find average, max and min temperature for each year in the NCDC data set?
2. Filter the readings of a set based on the value of the measurement, Output the line of input files associated with a temperature value greater than 30.0 and store it in a separate file.

Week 6

Implement of Matrix Multiplication with Hadoop Map Reduce

Week 7

Command line interface with HDFS

Week 8

Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.

Week 9

PIG Programs:

1. Run the Pig Latin Scripts to find Word Count

2. Run the Pig Latin Scripts to find a max temp for each and every year.

Week 10

Installation of Hive along with practice examples.

Week 11

Use Hive to create, alter, and drop databases, tables, views, functions, and indexes.

Week 12

Write a Pig script for:

1. DML operations on Cassandra Database.
2. Retrieving data from MongoDB.

Week 13

HBase Shell Commands practice

Week 14

Data analytics on Amazon food dataset, find all the pairs of items frequently reviewed together.

1. Transposes the original Amazon food dataset, obtaining a PairRDD of the type:
   <user_id> → <list of the product_ids reviewed by user_id>
2. Counts the frequencies of all the pairs of products reviewed together;
3. Writes on the output folder all the pairs of products that appear more than once and their frequencies. The pairs of products must be sorted by frequency.

Note: The above experiments are for indicative purposes only. However, the concerned faculty member can add a few more experiments in addition to the existing. In such cases the concerned faculty member should get the syllabus approved by the BoS.

USER EXPERIENCE DESIGN LAB (PEC-IV LAB)

B. Tech IV Year I Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57220	Professional Elective-IV	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

Course Outcomes

At the end of this User Experience Design Lab course, students will be able to:

1. Learn Visual design that covers concepts like color theory and Layout
2. Design and implement Pattern for User Interface to create perfect prototypes
3. Design and sketch wireframes for website interaction pattern and usability principles
4. Design and sketch wireframes for mobile interaction pattern and usability principles
5. Create implementations of Placeholder content

List of Experiments

Week 1

Design and implement to add Color Font styling and interactive design to a website User Interface

Week 2

Construct and shapes, Icons, interactions and gestures in web app design

Week 3

Flight booking app interface design - Native iOS app prototype with a date-picker and interactive dialogs

Week 4 & Week 5

Improving Loading screens: In the example above we are fetching data from three separate API's before displaying the welcome screen.

Week 6 & Week 7

Design and implement low and medium and medium-fidelity wireframes, mockups and prototypes for websites using Invision Freehand tool or React Javascript.

1. Select Shapes, Images, and Text elements from the Toolbar and place them on the Canvas to design your prototype.
2. View and add new screens in the Screens palette. Screens are similar to Artboards or Frames in other applications. Each screen contains its own Canvas and an entire prototype can contain many different screens, which you can link together using events.
3. Canvas – Place elements onto the Canvas to build your designs and wireframes.
4. Alignment – –Align and distribute elements on the Canvas.
5. Properties – view and edit an element's styling, position, and visibility during simulation in the Properties palette. Different elements have their own distinct properties you can customize.
6. Events – Create interactions and turn wireframes into high-fi prototypes in the Events palette
7. Layers – view and reorder elements' hierarchical positioning on the Canvas. Drag an element to reorder it above or below other elements. Hover over an element or group to see options to hide or show it while editing.

Week 8 & Week 9

Design and implement low and medium-fidelity wireframes, mockups and prototypes for Mobile Using Invision Freehand tool or React Javascript.

Week 10

Implement Placeholder Content:

Add contents to Placeholder with proper animation

Tools for UI/UX: Any on the tool required

1. Invision Freehand
2. Balsamiq
3. Sketch

Note: The above experiments are for indicative purposes only. However, the concerned faculty member can add a few more experiments in addition to the existing. In such cases the concerned faculty member should get the syllabus approved by the BoS.

MANAGEMENT SCIENCE (OEC-II)

B. Tech IV Year II Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58023	Open Elective-II	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

Course Objectives of Management Science are to:

1. Explain the concepts of Management theories and practices.
2. Introduce to production and quality concepts in operations management.
3. Know the processes of HR and Marketing functions
4. Understand the concepts of project planning for execution of projects
5. Explain the contemporary issues and challenges faced by an organization

Course Outcomes

At the end of this Management Science course, students will be able to:

1. Explain the concepts of business management and approaches.
2. Identify the role of production and quality concepts in efficiency of operations management.
3. Analyze the key functions of human resource management and marketing management.
4. Assess time and cost factors influencing project completion
5. Describe contemporary management concepts and practices

UNIT I

Introduction to Management: Nature and importance of management, Functions of Management, Taylor's Scientific Management Theory, Fayol's principles of management, Maslow's theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two factor Theory of Motivation. Systems Approach to Management, Leadership Styles, Social Responsibilities of Manager, Organization levels and types of organization structures.

UNIT II

A. **Operations Management**: Principles and Types of Plant Layout-Methods of production (Job, batch and Mass production), Work Study - Basic procedure involved in Method Study and Work measurement- Statistical Quality Control - X chart, R chart, C chart, P chart, (simple problems), Acceptance Sampling.

B. **Materials Management**: Objectives, Need for inventory control, EOQ, ABC Analysis, Purchase procedure, Stores management and Stores records, Supply chain management.

UNIT III

A. Human Resources Management (HRM): Evolution of HRM, Concepts of HRM, Basic functions of HR Manager - Manpower Planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating.

B. Marketing: Functions of Marketing, Marketing Mix, Product Life cycle, Channels of distribution.

UNIT IV

Project Management (PERT/CPM): Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of completing the project within given time, Project Cost Analysis, Project Crashing.

UNIT V

Strategic & Contemporary Management Practices: Mission, Goals, Objectives, Policy, Strategy, Programmes, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives. Just-In-Time (JIT) system, Total Quality Management (TQM), Six Sigma and Capability Maturity Model (CMM) levels, Value Chain Analysis concepts.

Text Books

1. G.Shainesh, Philip Kotler, Kevin lane Keller, Alexander Chernev, Jagdish N. Sheth, Marketing Management, 16/e, Pearson, 2022.
2. 2. Aryasri, Management Science, TMH, New Delhi, 2009

Reference Books

1. Charles W. L. Hill/Melissa A. Schilling/Gareth R. Jones, Strategic Management, 12/e, Cengage
2. William J. Stevenson, Operations Management, 13/3, McGraw Hill, 2022
3. Gary Dessler & Biju Varrkey, Human Resource Management, 16/e, Pearson, 2020

OPERATIONS RESEARCH (OEC-II)

B. Tech IV Year II Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58024	Open Elective-II	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

Course Objectives of Operations Research are to:

1. Know a short history of Operations Research (OR) and be able to explain the term OR and Appreciate the nature of Linear programming problems
2. Introduce a suitable method when the problem is to maximize the objective function instead of minimizing it
3. Know processing of n-jobs through two machines, 3-machines & etc.
4. Examine the functions that inventory performs and its importance in managerial
5. Understand replacement of depreciable assets

Course Outcomes

At the end of this Operations Research course, students will be able to:

1. Construct mathematical models for linear programming problems
2. Identify minimum transportation and efficient assignment of work
3. Allocation of job sequencing models and find Value of the game with LPP models
4. Use inventory models with deterministic demand models
5. Apply replacement models in various fields

UNIT I

Introduction to Operation Research: Definition, Scope, Objectives, Phases, Models and limitations of Operation Research. Linear Programming Problem- Formulation, Graphical Solution of LPP, Simplex Method, Artificial Variable Technique (Big M and Two-Phase method) and Dual Simplex Method.

UNIT II

Transportation Problem, Formulation, Solution, Unbalanced Transportation problem. Finding basic feasible solutions- Northwest corner rule, least cost method and Vogel's approximation method. Optimality test MODI method. Assignment model: Formulation, Hungarian method for optimal solution, solving unbalanced problem and Traveling salesman problem.

UNIT III

Sequencing models: Solution of sequencing problem-Processing n x 2, n x 3, 2 x m and n x m. Game Theory: Competitive games, rectangular game with saddle point- minimax (maxmin) method of optimal strategies. Dominance principle, rectangular games without saddle point – mixed strategy for 2 X 2 games. Value of the game with Linear Programming Methods.

UNIT IV

Inventory models: Inventory costs, Models with deterministic demand-model (a) demand rate uniform and production rate infinite, model (b) demand rate non-uniform and production rate infinite, model (c) demand rate uniform and production rate finite.

UNIT V

Replacement models: Replacement of Items that deteriorate whose maintenance costs increase with time without change in the money value. Replacement of items that fail suddenly: individual replacement policy, group replacement policy.

Text Books

1. S. D. Sharma, Operations Research.
2. Kanti Swarup, Operations Research, Sultan Chand & Sons.

Reference Books

1. Hamdy, A. Taha: Operation Research: An Introduction, PHI, 2007.
2. Hillier, F.S. Lieberman, G.J.: Introduction to operation research 8ed, Tata McGraw-Hill.
3. Gillett: Introduction to Operation Research, TMH.

INTELLECTUAL PROPERTY RIGHTS (OEC-II)

B. Tech IV Year II Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58002	Open Elective-II	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

The course aims to help the student understand the concept of Intellectual Property Rights and helps the student to appreciate the purpose and function of a trademark and the process involved in getting copyright, patent and related issues. The student is introduced to the importance of trade Secret and Geographical Indications.

Course Outcomes

At the end of this Intellectual Property Rights course, students will be able to:

1. Explain the concepts of intellectual property rights and related agencies.
2. Describe the purpose and functions of a trademark in a competitive environment.
3. Analyze the process of copyright and procedure.
4. Understand the process of patent and patent issues.
5. Explore the trade secret and geographical indications of its protection from unfair practices.

UNIT I

Introduction to Intellectual Property: Concept of intellectual property rights, importance of intellectual property rights. Types of intellectual property, international agencies, and treaties.

UNIT II

Trademarks: Concept of trademarks, purpose, and function of trademarks. Acquisition of trademark rights, protectable matter, selecting and evaluating trademark, trademark registration processes.

UNIT III

Law of Copy Rights: Concept of copyright right, fundamentals of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration.

UNIT IV

Law of Patents: Introduction to patent, foundation of patent law, patent searching process, ownership rights and transfer.

UNIT V

Trade Secrets & Geographical Indication: Law pertaining to trade secrets, determination of trade secrets. Trade secret litigation. Unfair competitions. Geographical Indication, concept of geographical indication, importance of geographical indication, new development of intellectual property rights.

Text Books

1. Deborah. E. Bouchoux, Intellectual property right, 5/e, 2018, Cengage learning.
2. Neeraj Pandey, Intellectual property right, PHI, 2019.

Reference Book

1. Ramakrishna Chintakunta and M. Geethavani, Kindle e 2021
2. Prabuddha Ganguli,Intellectual Property Right:Unleashing the Knowledge Economy, 2/e, 2017 Tata Mc Graw Hill Publishing company Ltd.

NEGOTIATION SKILLS (OEC-III)

B. Tech IV Year II Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58005	Open Elective-III	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

This is an introductory course on negotiation skills. The student is introduced to various types and stages of negotiation, basic strategies of negotiation.

Course Outcomes

At the end of this Negotiation Skills course, students will be able to:

1. Describe negotiation theories and required skills
2. Explain the various factors that affect the negotiation process and ethics involved in the negotiation
3. Apply effective negotiation strategies and tactics for different scenarios
4. Identify negotiation practices towards building relationships
5. Evaluate various strategies for conflicts resolution and effectively managing industrial relations.

UNIT I

Introduction to Negotiation: Introduction, Concept of Negotiation, Characteristics of a Negotiating Situation, Basic Negotiation Skills, Interpersonal Skills in Negotiation, Theories of Negotiation.

UNIT II

Types and Ethics in Negotiation: Types of Negotiation, Principles of Negotiation, Steps of Negotiation, Win-Win Negotiation, Negotiation Tactics, Factors Affecting Success in Negotiation.

Ethics: definition, applying ethical reasoning, approaches to ethical reasoning

UNIT III

Strategies and multiple parties and teams Negotiation: Fundamentals of negotiation, effective strategies to develop negotiation skills, anchoring / BATNA, nature of multi-party negotiation. Differences between two party and multi-party negotiation. Managing multiparty negotiation. Inter-team negotiations.

UNIT IV

Improving Negotiation skills: Enhancing Communication skills for effective Listening, Persuasion & Relationship Building, establishing Trust-Building Relationships.

UNIT V

Managing Negotiation: Managing Different Types of Negotiations, Cross –Cultural Challenges in Negotiations, Industrial Negotiation: Collective Bargaining, Arbitration, Origins of Conflict, Dispute Resolution.

Text Books

1. Essentials of Negotiation, 5th Edition, Roy J Lewicki, Bruce Barry, and David M Saunders, McGraw Hill, 2020.

Reference Books

1. Beverly DeMarr and Suzanne De Janasz (2013).Negotiation and Dispute Resolution, Prentice Hall, 2013.
2. Malhotra, Deepak, Negotiating the Impossible: How to Break Deadlocks and Resolve ugly Conflicts (without money or muscle). Oakland, CA: Berrett-Koehler Publishers, 2016.

PROJECT MANAGEMENT (OEC-III)

B. Tech IV Year II Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58008	Open Elective-III	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

The course is designed to help the student understand the concepts of project management, explain how to identify the projects and planning, analyze how to execute the projects, assess how to lead the team and evaluation of projects and to explain the performance measurement and evaluation of the projects.

Course Outcomes

At the end of this Project Management course, students will be able to:

1. Explain the phases of project life cycle.
2. Identify the projects and planning the projects
3. Know the project evaluation process
4. Appreciate the role of teams in project management
5. Discuss the recent trends in project management.

UNIT I

Introduction: Introduction to project management, need for project management, project management principles. Project lifecycle, project management phases in lifecycle, project management research in brief, project management today, organization structure, stake holder management, creating a culture for project management.

UNIT II

Project Identification and Planning: Project identification process, defining the project, approaches to project screening and selection, project planning, work breakdown structure,

financial module, getting approval and compiling a project charter, setting up a monitoring and controlling process.

UNIT III

Project Execution: Initiating the project, controlling and reporting project objectives, conducting project evaluation, risk, role of risk management, project management, risk management an integrated approach, cost management, creating a project budget.

UNIT IV

Leading Project Teams: Building a Project Team, Characteristics of an effective Project Team, achieving Cross- Functional Cooperation, Virtual Project Teams, Conflicts Management, Negotiations.

UNIT V

Performance Measurement and Evaluation: Monitoring Project Performances, Project Control Cycles, Earned Value Management, Human factors in Project Evaluation and Control, Project Termination, Types of Project Terminations, Project Follow-up. Current and Future Trends in Project Management.

Text Books

1. Jeffery K. Pinto, Project Management, Pearson Education, 2015

References Books

1. Clifford Gray and Erik Larson, Project Management, Tata McGraw Hill Edition, 6e, 2014.
2. R. Panneerselvam & P. Senthilkumar, Project Management, PHI, 2015
3. Thomas M.Cappels, Financially Focused Project Management, SPD, 2008.
4. Guide to Project Management Body of Knowledge (PMBOK® Guide) of Project Management Institute, USA.

VALUE ENGINEERING (OEC-III)

B. Tech IV Year II Semester					Dept. of Information Technology			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58010	Open Elective-III	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

The course is designed to help the student understand the concepts of Value engineering, understand different phases of value engineering and decision alternatives, and teams.

Course Outcomes

At the end of this Value Engineering course, students will be able to:

1. Understand the importance of value engineering concepts in productivity
2. Identify the different phases of value engineering projects
3. Know the different decision alternatives and choose the best alternative for optimization
4. Identify the value engineering concept in non-hardware projects and programmes
5. Analyze the value engineering teams with the help of case study.

UNIT I

Introduction: Value engineering concepts, advantages, applications, problem recognition, and role in productivity, criteria for comparison, element of choice. Level of value engineering in the organization, unique and quantitative evaluation of ideas.

UNIT II

Value Engineering and Job Plan: Introduction, orientation, information phase, speculation phase analysis phase. Selection and Evaluation of value engineering projects, Project selection, methods selection, value standards, application of value engineering methodology.

UNIT III

Value Engineering Techniques: Selecting Products and Operation for Value Engineering action, Value Engineering Programmes, Decision Making for Optimum Alternative, Use of Decision Matrix, Make or Buy, Measuring Profits, Reporting Results, follow up, Use of advanced techniques like Function Analysis System.

UNIT IV

Versatility of Value Engineering: Value engineering operation in maintenance and repair activities, Value Engineering in non-Hardware Projects. Initiating a Value Engineering Programme.

UNIT V

Value Engineering Level of Effort: Value Engineering Team, Co-coordinator, Designer, different Services, Construction Management Contracts, Value Engineering Case Studies.

Text Books

1. Anil Kumar Mukhopadhyaya, "Value Engineering: Concepts Techniques and applications", SAGE Publications 2010.
2. Del L. Younker, "Value Engineering analysis and methodology", Marcel Dekker Inc, New York, 2004

Reference Books

1. Alphonse Dell'Isola, "Value Engineering: Practical Applications for Design, Construction, Maintenance & Operations", R S Means Co., 1997
2. Richard Park, "Value Engineering: A Plan for Invention", St. Lucie Press, 1999.
3. Anil Kumar Mukhopadhyaya, "Value Engineering Mastermind: From concept to Value Engineering Certification", SAGE Publications, 2003

Program Structure and Syllabus

B. Tech IV Year

Cyber Security

R20 Regulations

B. TECH IV YEAR I SEMESTER [4 T + 4 P]

S.No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1	A57054	HSS&MC	Managerial Economics and Financial Analysis	2	1	0	3.0
2	A57078	PCC	Introduction to Block chain	3	1	0	4.0
3	A57066	PEC-IV	1. Big Data Analytics	3	1	0	4.0
	A57083		2. Machine Learning and its Applications				
	A57084		3. Ethical Hacking				
4	A57080	OEC - I	1. Essential English & Employability Skills	3	0	0	3.0
	A57081		2. Technical and Business Communication Skills				
	A57082		3. English for Professionals				
5	A57218	PCC LAB	Internet of Things Lab	0	0	4	2.0
6	A57219	PCC LAB	Block chain Technology Lab	0	0	4	2.0
7	A57214	PEC-IV LAB	1. Big Data Analytics	0	0	4	2.0
	A57221		2. Machine Learning				
	A57222		3. Ethical Hacking				
8	A57230	PROJ	Industry Oriented Mini Project	0	0	4	2.0
			TOTAL	**11**	**3**	**16**	**22**

B. TECH IV YEAR II SEMESTER [2 T + 3 P]

S.No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1	A58023	OEC-II	1. Management Science	2	1	0	3.0
	A58024		2. Operations Research				
	A58002		3. Intellectual Property Rights				
2	A58005	OEC-III	1. Negotiation Skills	2	1	0	3.0
	A58008		2. Project Management				
	A58010		3. Value Engineering				
3	A58201	PROJ	Seminar	0	0	4	2.0
4	A58202	PROJ	Comprehensive Viva-Voce	0	0	0	2.0
5	A58203	PROJ	Project	0	0	20	10.0
			TOTAL	**4**	**2**	**24**	**20**

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

B. Tech IV Year I Semester					Cyber Security			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57054	HSS & MC	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

Course Objectives of Managerial Economics and Financial Analysis are to:

The objective of this course is to familiarize the student with the concepts of managerial economics and financial accounting, demand and cost concepts, market structures, pricing and financial ratios

Course Outcomes

At the end of this Managerial Economics and Financial Analysis course, students will be able to:

6. Describe the concept of demand and its determinants in managerial decisions.
7. Know the cost concepts and breakeven analysis in production.
8. Identify various market structures and different pricing strategies.
9. Have knowledge of capital budgeting techniques in financial decisions.
10. Have knowledge of Ratios in solving of business problems.

UNIT I

Introduction to Managerial Economics: Definition, nature and scope of managerial economics, demand analysis - demand determinants, Law of Demand and its exceptions.

Elasticity of Demand: Definition, types, measurement and significance of elasticity of demand, demand forecasting, methods of demand forecasting.

UNIT II

Theory of Production and Cost Analysis: Production Function – Isoquants and Iso costs, MRTS, Least Cost Combination of Inputs.

Cost Analysis: Cost concepts, Opportunity cost, Breakeven Analysis (BEA) – determination of breakeven point, managerial significance and limitations of BEA.

UNIT III

Market structures: Types of competition, features of perfect competition, monopoly and monopolistic competition, price - output determination in perfect competition.

Objectives and Policies of Pricing: objectives of pricing**,** methods of pricing - cost plus pricing, marginal cost pricing, going rate pricing, limit pricing, market skimming pricing, penetration pricing, two - part pricing, block pricing, peak load pricing, cross subsidization.

UNIT IV

Capital and Capital Budgeting: Capital and its significance. Types of capital estimation of fixed and working capital requirements, Methods and sources of raising finance. Nature and scope of capital budgeting, features of capital budgeting proposals. Methods of capital Budgeting: Payback Method. Accounting Rate of Return (ARR) and Net Present Value Method.

UNIT V

Introduction to Financial Accounting: Definition of Accounting**,** Double-Entry Book Keeping, Journal, Ledger, and Trial Balance, Final Accounts.

Ratio Analysis: Computation, Analysis and Interpretation of Liquidity Ratios Activity Capital Structure Ratios and Profitability Ratios.

Text Books

1. Arya Sri: Managerial Economics and Financial Analysis, TMH, 2009.
2. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2014.

Reference Books

1. R. K. Sharma & Shashi K Gupta, Financial Management, Kalyani Publishers, 2020
2. V. Rajasekaran & R. Lalitha, Financial Accounting, Pearson Education, 2010.
3. Domnick Salvatore, Managerial Economics in a Global Economy, 9e, Oxford Univ Press, 2018.
4. S N Maheshwari, CA Sharad K Maheshwari & Dr Suneel K Maheshwari, Financial Accounting, 6/e, Vikas Publications, 2018.

INTRODUCTION TO BLOCK CHAIN TECHNOLOGY

B. Tech IV Year I Semester					Cyber Security			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57078	Program Core	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

Course Objectives of Block Chain Technology are to:

1. Identify different components and types of Blockchain
2. Apply Ethereum tool for application development
3. Interpret various components of DApps and multichain
4. Summarize the architecture of Hyperledger Fabric
5. Analyze the impact of Blockchain in business

Course Outcomes

At the end of this Block Chain Technology course, students will be able to:

1. Summarize types and applications of Blockchain
2. Design and deploy smart contract through Ethereum
3. Apply DApps through Truffle IDE
4. Apply Hyper Ledger Fabric model in different Networks
5. Categorize different Business Applications of Blockchain

UNIT I

What is Blockchain: Definition, history, Digital Money to Distributed Ledgers

Why Blockchain: Properties of Blockchain, Requirements for consensus protocols, Proof of Work (PoW), Proof of Stake (PoS), Zero Knowledge Proofs, Byzantine Models, hashing, Merkle Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Types of Blockchain

UNIT II

Ethereum Solidity: Introduction, Datatype, operator, enum, arrays, loops, Mapping, Structure, State Modifiers, Exception Handling in Solidity, Inheritance, Events, Self-Destruction, ERC Tokens, Constructors, Libraries, Compile and Deploy the Smart Contract

UNIT III

Truffle IDE: Creating user interface, textboxes, radio buttons, drop down list, developing a DApp, Publish the DApp Connecting to DApp, truffle migrate, truffle test.

Multichain: Chain code (go) and Multi Chain, Privacy and Permissions in Multi Chain, Mining in Multi Chain, Multiple configurable Blockchains using Multi Chain, Setting up a Private Blockchain, Blockchain Bytes

UNIT IV

Hyperledger (go Lang): Introduction, architecture, Consensus, API, frameworks, setting up Development Environment using Composer, Developing and Testing business networks, Hyperledger Fabric Model Various ways to create Hyperledger Fabric Blockchain Network

UNIT V

Blockchain transforming business, Blockchain in governance.

Case Studies: Supply chain management, real estate, healthcare, Government sectors, bitcoin.

Text Book

1. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guide to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017

Reference Books

1. Chandramouli Subramanian,Asha A George,Abhilash K A and Meena Karthikeyan, Blockchain Technology, Published by University Press
2. Philipp Hacker, Ioannis Lianos, Regulating Blockchain: Techno-Social and Legal Challenges, OUP Oxford. (ISBN-13: 978-0198842187), 2019
3. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos Blockchain by Melanie Swa, O'Reilly
4. Hyperledger Fabric - https://www.hyperledger.org/projects/fabric
5. Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits - https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html

BIG DATA ANALYTICS (PEC-IV)

B. Tech IV Year I Semester					Cyber Security			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57066	Professional Elective-IV	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

Course Objectives of Big Data Analytics are to:

1. Discuss the overview of big data analytics concepts and growth rate
2. Introduce the tools required to manage and analyze big data like Hadoop, NoSQL Data Management.
3. Summarize the fundamental concepts of Hadoop Distributed file systems
4. Describe the techniques involved with Map Reduce Applications.
5. Analyze various recommender systems for applications

Course Outcomes

At the end of this Big Data Analytics course, students will be able to:

1. Appraise the concept and application of Big Data
2. Apply scalable algorithms on NO SQL for big data analytics.
3. Elaborate the notion of Hadoop Distributed File System and applications
4. Apply MapReduce for the given problem
5. Implement recommender systems for different application

UNIT I

Introduction To Big Data: Characteristics of Big Data, Traits of Big data, Challenges of Conventional Systems, Sources of Big Data, Applications of big data, Features and benefits of big data, Analysis vs Reporting, CAP theorem, Modern Data Analytic Tools. **Introduction to Hadoop Programming languages**: Pig, Hive. **NOSQL Databases**: Cassandra, Mongo, HBase.

UNIT II

NOSQL Data Management: Introduction to NoSQL, aggregate data models, aggregates, key-value and document data Models, relationships, graph databases, schema less databases, materialized views, distribution models, sharding, master-slave replication, peer-peer replication, sharing and replication

UNIT III

Introduction To Hadoop: History of Hadoop, Data Storage and Analysis, Hadoop –Setup, Hadoop operation modes, Configurations of Hadoop.

Hadoop Ecosystem, Hadoop Distributed File System, HDFS Architecture, concepts of Blocks in HDFS Architecture, Name Nodes and Data Nodes, using command Line Interface with HDFS, HDFS Commands, Features of HDFS.

UNIT IV

MapReduce Applications: MapReduce workflows, unit tests with MR Unit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic MapReduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats

UNIT V

Social Media Analytics and Text Mining: Introducing social media; Key elements of social media; Sentiment Analysis, Performing Social Media Analytics.

Text Book

1. BIG DATA- Black Book, Dream Tech Press, 2019.

Reference Books

1. Seema Acharya, S. Chellappan," Big Data and Analytics", Wiley,2014
2. Tom White "Hadoop: The Definitive Guide" 4th Edition, O'reilly Media, 2015.
3. Michael Minelli, Michele Chambers, Ambiga Dhiraj, Jim Stogdill, "Big Data Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", 1st Edition, Wiley Publications,2013
4. Chris Eaton, Dirk De Roos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGraw Hill Publishing, 2012
5. Pete Warden, "Big Data Glossary", O'Reilly, 2011.

MACHINE LEARNING AND ITS APPLICATIONS (PEC-IV)

B. Tech IV Year I Semester					Cyber Security			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57083	Professional Elective-IV	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

Course Objectives are to:

1. Summarize the need for machine learning for various problem solving
2. Outline the various supervised learning algorithms in machine learning
3. Discuss various unsupervised learning algorithms in machine learning
4. Elaborate Artificial Neural network and deep learning
5. Describe active learning, instance-based learning and ensemble learning

Course Outcomes

At the end of this course, students will be able to:

1. Describe Fundamental concepts of machine learning and its applications.
2. Apply supervised learning algorithms for the given problem
3. Compare the performance of unsupervised learning algorithms
4. Discuss Artificial Neural Network and deep learning
5. Appraise active learning, instance-based learning and ensemble learning

UNIT I

Introduction to Machine Learning: What is Machine Learning, Why Machine Learning, Types of Machine Learning Systems, Challenges of Machine Learning, Applications of Machine Learning, Essential libraries and Tools, Generalization overfitting and underfitting, Bias–variance trade-off, metrics (TB-1)

UNIT II

Supervised Learning: Classification and Regression, Linear Regression: Single and Multiple, Logistic Regression: Ridge Regression, Lasso Regression, k-Nearest Neighbour, Naive Bayes Classifier, Decision Tree, Support Vector Machine (TB-1)

UNIT III

Unsupervised Learning: Introduction, Supervised Vs Unsupervised Learning, Applications of Unsupervised Learning, clustering, k-Means Clustering, Agglomerative Clustering, Comparing and evaluating the clustering algorithms (TB-2).

UNIT IV

Artificial Neural Networks - Introduction, Understanding the Biological Neuron, Exploring the Artificial Neuron, Types of Activation Functions, Early Implementations of ANN, Architectures of Neural Network: Single-layer feed forward network, Multi-layer feed forward ANNs, Recurrent network, Learning Process in ANN, Backpropagation, Deep Learning (TB-1).

UNIT V

Other types of learning: Introduction, Representation of Learning, Active Leaning, Heuristic for Active Learning, Active Learning Query Strategies, Instance Based Learning, Radial Basis function, Ensemble learning algorithms, bagging, boosting, gradient boosting Machines (TB-1).

Text Books

1. Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, Machine Learning, 2019, Pearson.
2. Andreas C. Müller, Sarah Guido, Introduction to Machine Learning with Python, October 2016, O'Reilly Media, Inc.

Reference Books

1. Aurélien Géron, Hands-on Machine Learning with Scikit-Learn, Keras, and TensorFlow Concepts, Tools, and Techniques to Build Intelligent Systems, 2019.
2. Tom M. Mitchell, Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.
3. Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
4. Stephen Marsland, Machine Learning: An Algorithmic Perspective, CRC Press, 2009.
5. http://www.cs.cmu.edu/~tom/mlbook.html

ETHICAL HACKING (PEC-IV)

B. Tech IV Year I Semester					Cyber Security			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57084	Professional Elective-IV	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives

Course Objectives of Ethical Hacking are to:

1. Outline the various types of Ethical Hacking
2. Discuss about basic footprinting concepts
3. Summarize various malware threats
4. Describe web server Hacking
5. Identify various digital forensics problems

Course Outcomes

At the end of this Ethical Hacking course, students will be able to:

1. Summarize Types of Ethical Hacking.
2. Explain about web and network hacking
3. Demonstrate report writing and Mitigation
4. Formulate the use of safe techniques on the World Wide Web
5. Analyze various digital forensic problems

UNIT I

Introduction to Ethical Hacking:Security Fundamental, Security testing, Hacker and Cracker, Descriptions, Test Plans-keeping It legal, Ethical and Legality, The Attacker's Process, The Ethical Hacker's Process, Security and the Stack

UNIT II

Foot printing and Scanning: Information Gathering, Determining the Network Range, Identifying Active Machines, Finding Open Ports and Access Points, OS Fingerprinting Services, Mapping the Network Attack Surface, Enumeration, System Hacking

UNIT III

Malware Threats: Viruses and Worms, Trojans, Covert Communication, Keystroke Logging and Spyware, Malware Counter measures, Sniffers, Session Hijacking, Denial of Service and Distributed, Denial of Service

UNIT IV

Web Server Hacking: A Web Server Hacking, Web Application Hacking, Database Hacking, Wireless Technologies, Mobile Device Operation and Security, Wireless LANs

UNIT V

IDS, Firewalls and Honeypots: Intrusion Detection Systems, Firewalls, Honeypots, Physical Security, Social Engineering, Case Studies

Text Book

1. Ec-Council, "Ethical Hacking and Countermeasures: Attack Phases", Delmar Cengage Learning, 2009.
2. Michael T. Simpson, Kent Backman, James E. Corley, "Hands-On Ethical Hacking and Network Defense", Cengage Learning, 2012

Reference Books

1. Patrick Engebretson, "The Basics of Hacking and Penetration Testing – Ethical Hacking and Penetration Testing Made Easy", Syngress Media, Second Revised Edition, 2013.
2. Jon Erickson, "Hacking: The Art of Exploitation", No Starch Press, Second Edition, 2008.

ESSENTIAL ENGLISH & EMPLOYABILITY SKILLS (OEC-I)

B. Tech IV Year I Semester					Cyber Security			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57080	Open Elective-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Introduction

The purpose of graduate education is not only to gain knowledge but also to acquire employability skills fit for the qualification. The challenge of fresh graduates does not end with merely acquiring a job but to maintain credibility and sustainability throughout their career. Hence, varied skills and competencies are the pre-requisites for professional students who emerge from colleges and are ready to take up global careers.

Course Objectives

4. To enable students to develop their personality, infuse confidence and increase employability skills in any chosen career
5. To provide the students hands-on experience to cope with the demands of the world of recruiters
6. To help the students acquire the job skills essential for employment.

Course Outcomes

At the end of this course, students will be able to:

6. Enhance employability skills and professional etiquette to work in the corporate world
7. Develop leadership, interpersonal and decision-making skills
8. Acquire productive knowledge, competent learning, and innovative thinking skills from specifically selected lessons
9. Analyze the importance of tackling various job interviews
10. Provide insights to implement verbal and non-verbal communication competencies in workplace

UNIT I

Six Sigma: Dabbawala from English for Employability

Personality Development: A Must for Leadership and Career Growth from Personality Development and Soft Skills

Introduction - Learning about Personality Development from 3 Cases - Personality Analysis - Freudian analysis of Personality Development - Swami Vivekananda's Concept of Personality Development - Personality Begets Leadership Qualities

UNIT II

Yet I am not defeated! from English for Employability

Interpersonal skills from Personality Development and Soft Skills

The Personality Attribute of Taking Bold Decisions - Personality Types and Leadership Qualities - Personality Tests

UNIT III

Patricia Narayanan: An Entrepreneur by accident, from English for Employability

Soft Skills: Demanded by Every Employer from Personality Development and Soft Skills

Introduction to Soft Skills - Lessons from the 3 Case Studies - Change in Today's Workplace - Soft Skills as a Competitive Weapon - Antiquity of Soft Skills - Classification of Soft Skills

UNIT IV

Satya Nadella: CEO of Microsoft from English for Employability

Interview Skills from Personality Development and Soft Skills

UNIT V

Body Language Reveals Your Inner self and Personality from Personality Development and Soft Skills. Introduction - Emotions Displayed by Body Language – Handshake -The Most Common Body Language - Eyes - A Powerful Reflection of One's Inner self - Entry to My Space - Personal Zones may vary - Body Language exhibited during different Professional Interactions.

Text Books

1. Purushotham, K. English for Employability. Orient Black Swan, Hyderabad.
2. Mitra, K. Barun. Personality Development and Soft Skills. Oxford University Press.

Reference Books

1. Enhancing English and Employability Skills. State Board of Technical Education and Training. Hyderabad: Orient Black swan Private Limited, 2012.

2. Rao, M. S. Soft Skills Enhancing Employability. New Delhi: I. K. Publishing House, 2010.
3. Rao, Nageshwar. Communication Skills. New Delhi: Himalaya Publishing House Pvt. Ltd, 2008.
4. Sharma, T. K. Enhancing Employability in Education. India: Patridge Publishing House. 2015.
5. Yadav, Shalini. Communication Technique. New Delhi: University Science Press, 2010.

TECHNICAL AND BUSINESS COMMUNICATION SKILLS (OEC-I)

B. Tech IV Year I Semester					Cyber Security			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57081	Open Elective-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Introduction

The course is intended to expose the students to learn and practice the five communication skills: thinking, listening, speaking, reading, and writing in English, the global language of communication. It reflects some of the approaches in English language teaching and learning currently in practice around the world.

Course Objective

To help the students to develop effective communication skills in all communicative contexts for professional advancement.

Course Outcomes

At the end of this Technical and Business Communication Skills course, students will be able to:

1. Communicate technical and business correspondence
2. Reflect on the themes discussed
3. Recognize ethical implications of technical communication in professional contexts
4. Identify the contemporary issues in engineering from environmental, societal, economic, and global perspectives
5. Demonstrate ethical decisions in complex situations

UNIT I

E-World & E-Communication

E-language - E-governance - E-commerce/E-business - E-banking - E-waste

UNIT II

Business Establishment & Infrastructure Development

Power Supply - Industrial Park - Business Correspondence: Follow-up letters - Acceptance & Rejections -Persuasive letters - Resignation letters

UNIT III

Technology and Society

Robot Soldiers - For a Snapshot of a Web - Placing an order - Proposal Writing - Patents & Rights (National & International) - Intellectual Property – Nanotechnology

UNIT IV

Ethics in Business Communication

Ethical issues involved in Business Communication - Ethical dilemmas facing managers - Ethical Code & Communication - Standards in Daily Life - Total Quality Management - World University Ranking

UNIT V

Management Information System

Corporate Governance - Business Process Outsourcing - Project Management Communication - Marketing Communication

Text Book

1. English and Communication Skills for Students of Science and Engineering by S P Dhanavel. Orient Black Swan. 2009.

Reference Books

1. Business Communication (Second Edition) by Meenakshi Raman & Prakash Singh by Oxford University Press. 2012.
2. Language and Communication skills for Engineers by Sanjay Kumar & Pushp Lata by Oxford University Press. 2018.
3. Business Communication by Anjali Kalkar, et.al. Orient Black Swan. 2010.
4. Technical Communication by Paul V. Anderson. Cengage. 2014.
5. Engineering Communication by Charles W. Knisely & Karin I. Knisely. Cengage. 2015.

ENGLISH FOR PROFESSIONALS (OEC-I)

B. Tech IV Year I Semester					Cyber Security			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57082	Open Elective-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Introduction

The course aims at preparing the students with the tools needed for successful communication at the professional front. It is designed to improve students' academic and professional skills which the employers are currently looking for.

Course Objective

To prepare the students to use the language effectively in all professional pursuits

Course Outcomes

At the end of this Computer Networks course, students will be able to:

1. Analyze the language use in communicative process
2. Describe the process and product
3. Interpret the ideas in group activities
4. Apply different approaches to comprehend the written text
5. Write any technical and official correspondence within the framework

UNIT I

Essentials of Communication:

Essentials of Grammar-Rudiments of Communications Skills (Listening, Speaking, Reading, and Writing)- Applied Grammar and Usage- Non-Verbal Communication.

UNIT II

Listening Skills:

Art of Listening- Developing Effective Listening Skills-Process of Listening, Intensive & Extensive Listening

Podcasts, Vodcasts (ICT enabled) - Five steps to Active Listening-Effective and Ineffective Listening Skills-Listening & Note-taking

UNIT III

Speaking Skills:

Dynamics of Effective Speaking -Group Discussion-Simulated Presentations, Process & Product Descriptions- Proxemics, Paralinguistic Features

UNIT IV

Reading Skills:

The Art of Effective Reading- Basic steps to Effective Reading-Extensive and Intensive Reading -Approaches to Efficient Reading-Reading Comprehension

UNIT V

Writing Skills:

Art of Condensation-Descriptive Writing Techniques-Writing & Answering Memos, Circulars -Inter & Intra Official Communication -Writing Minutes of Meeting-Netiquette - E-mail & Blog Writing -Note-making

Text Book

1. Kumar, Sanjay and Pushp Lata, Communication Skills, Second edition, Oxford University Press, 2015.

Reference Books

1. Adair, John.The Effective Communicator. Jaico Publishing House.1995.
2. Adler, B.Ronald.Communicating at Work.(Seventh edition.) McGraw Hill.2004.
3. Aruna, Koneru. Professional Communication.McGraw Hill.2017.
4. Ibbotson,Mark.Cambridge English for Engineering Professionals. Cambridge University.2008.
5. Oxford English for Careers.Oxford University Press.

INTERNET OF THINGS LAB (PCC LAB)

B. Tech IV Year I Semester					Cyber Security			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57218	Program Core	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

Course Outcomes

At the end of this Internet of Things Lab course, students will be able to:

1. Identify the sensors and actuators required for their application and control through programs
2. Differentiate the two basic boards and select the one which is suitable for their requirement.
3. Establish network connectivity over different components by applying network protocol.
4. Demonstrate serial communication with the help of UART, ADC, DAC
5. Design Traffic system, Health Care System as an IoT application.

List of Experiments

Week 1

Basics of Internet of Things: Sensors, Actuators, IoT architecture and Gateway

Week 2

GPIO programming using Raspberry pi Arduino with few examples.

Week 3

GPIO programming using Raspberry pi with few Examples

Week 4

Blinking LED through Raspberry pi or Arduino.

Week 5

IoT sensors interface with Raspberry pi or Arduino (Temperature/Light sensors).

Week 6

IoT Networking: Connectivity technologies, Protocols and Interoperability in IoT.

Week 7

Speed Control of motors using PWM with python programming.

Week 8

Use sensors to measure temperature, humidity, light and distance.

Week 9

Integration of Actuators with Raspberry pi or Arduino (Servo motor/Relay).

Week 10

Capture Image with Raspberry pi or Arduino.

Week 11

Design Traffic control system: using Raspberry pi or Arduino.

Week 12

Design Temperature dependent auto cooling system: Using Raspberry pi or Arduino.

Week 13

IoT applications in home automation: Implementing IoT home applications using Raspberry pi or Arduino.

Week 14

Experiment on HTTP-to-CoAP semantic mapping Proxy in IoT Toolkit.

Week 15

DAC conversion using Raspberry pi or Arduino.

Week 16

ADC conversion using Raspberry pi or Arduino.

Review.

Text Book

1. Arshdeep Bahga and Vijay Madisetti, Internet of Things A Hands –on approach, Universities Press, 2015.

Reference Books

1. HonboZhou,The Internet of Things in the Cloud: A Middleware Perspective, CRC Press, 2012.
2. Dieter Uckelmann, Mark Harrison, Florian Michahelles, Architecting the Internet of Things, Springer – 2011.
3. David Easley and Jon Kleinberg, Networks, Crowds, and Markets: Reasoning About a Highly Connected World, Cambridge University Press, 2010.
4. Olivier Hersent, Omar Elloumi and David Boswarthick, The Internet of Things: Applications to the Smart Grid and Building Automation, Wiley, 2012.

Note: The above experiments are for indicative purposes only. However, the concerned faculty member can add a few more experiments in addition to the existing. In such cases the concerned faculty member should get the syllabus approved by the BoS.

BLOCK CHAIN TECHNOLOGY LAB (PCC LAB)

B. Tech IV Year I Semester					Cyber Security			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57219	Program Core	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

Course Outcomes

At the end of this Block Chain Technology Lab course, students will be able to:

1. Implement Smart Contracts and its deployment in remix
2. Illustrate Meta mask account creation
3. Build and publish DApps
4. Implement and test Hyperledger Fabric model
5. Experiment with Blockchain Network

List of Experiments

Week 1

Introduction to remix IDE

Week 2

Write a smart contract for voting and deploy using remix.

Week 3

Write a smart contract for bidding and deploy using remix.

Week 4

Write a smart contract for fund raising to a charity and deploy using remix.

Week 5

Write a smart contract for maintaining a savings account in a bank and deploy using remix.

Week 6

Create a metamask account.

Week 7

Write a smart contract and add ERC tokens to it using Metamask.

Week 8

Deploying a DApp that runs on a test network

Week 9,10

Create and Deploy a Business Network on Hyperledger

Week 11

Set up Hyperledger Fabric Blockchain using Hyperledger Composer locally

Week 12

Create a private Blockchain and Connect to your Blockchain

Week 13

Develop a business network Deploy and Test business networks

Week 14

Creation and transaction of new assets between nodes.

Note: The above experiments are for indicative purposes only. However, the concerned faculty member can add a few more experiments in addition to the existing. In such cases the concerned faculty member should get the syllabus approved by the BoS.

BIG DATA ANALYTICS LAB (PE-IV LAB)

B. Tech IV Year I Semester					Cyber Security			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57214	PE-IV LAB	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

Course Outcomes

At the end of this Big Data Analytics Lab course, students will be able to:

1. Develop various programs in Hadoop.
2. Perform file operation in HDFS
3. Perform query operation using pig
4. Practice various commands in HIVE
5. Create applications for Big Data analytics

List of Experiments

Week 1

Downloading and installing Hadoop; Understanding different Hadoop modes. Start-up scripts, Configuration files.

Week 2

Implement the following file management tasks in Hadoop:

1. Adding files and directories
2. Retrieving files
3. Deleting files

Week 3

Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.

1. Find the number of occurrences of each word appearing in the input file(s)

2. Performing a Map Reduce Job for word search count (look for specific keywords in a file)

Week 4

Stop word elimination problem:

Input:

3. A large textual file containing one sentence per line
4. A small file containing a set of stop words (One stop word per line)

Output: A textual file containing the same sentences of the large input file without the words appearing in the small file.

Week 5

Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather large volumes of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented. Data available at: https://github.com/tomwhite/hadoop- book/tree/master/input/ncdc/all.

Find average, max and min temperature for each year in the NCDC data set?
Filter the readings of a set based on the value of the measurement, Output the line of input files associated with a temperature value greater than 30.0 and store it in a separate file.

Week 6

Implement of Matrix Multiplication with Hadoop Map Reduce

Week 7

Command line interface with HDFS

Week 8

Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.

Week 9

PIG Programs:

3. Run the Pig Latin Scripts to find Word Count
4. Run the Pig Latin Scripts to find a max temp for each and every year.

Week 10

Installation of Hive along with practice examples.

Week 11

Use Hive to create, alter, and drop databases, tables, views, functions, and indexes.

Week 12

Write a Pig script for:

1. DML operations on Cassandra Database.
2. Retrieving data from MongoDB.

Week 13

HBase Shell Commands practice

Week 14

Data analytics on Amazon food dataset, find all the pairs of items frequently reviewed together.

1. Transposes the original Amazon food dataset, obtaining a PairRDD of the type:
   <user_id> → <list of the product_ids reviewed by user_id>
2. Counts the frequencies of all the pairs of products reviewed together;
3. Writes on the output folder all the pairs of products that appear more than once and their frequencies. The pairs of products must be sorted by frequency.

Note: The above experiments are for indicative purposes only. However, the concerned faculty member can add a few more experiments in addition to the existing. In such cases the concerned faculty member should get the syllabus approved by the BoS.

MACHINE LEARNING LAB (PEC-IV LAB)

B. Tech IV Year I Semester					Cyber Security			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57221	Program Core	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

Course Outcomes

At the end of this Machine Learning Lab course, students will be able to:

1. Explore various packages of machine learning available in Python
2. Implement various supervised learning algorithms
3. Implement clustering techniques for given problems and compare the performance
4. Perform ensemble learning for the given dataset
5. Demonstrates CNN model for image classification

Week 1

Usage of python with tool in machine learning and Data analysis using NumPy and Pandas.

Week 2

Implementation of Data visualization using Matplotlib, Seaborn

Week 3

Implementation of Data visualization using Plotly and cufflinks

Week 4

Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select the appropriate data set for your experiment and draw graphs.

Week 5

Implement logistic regression algorithm for stock prices prediction

Week 6

Implementation of decision tree based ID3 algorithm and use an appropriate data set for building the decision tree.

Week 7

Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.

Week 8

Implementation of naive Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

Week 9

Implement a classifier for the sales data using a Support vector machine

Week 10

Implement K- means clustering algorithm for identifying cancerous data and compare the performance.

Week 11

Implementation of Agglomerative Clustering algorithm to cluster a set of data stored

in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering.

Week 12

Implementation of Boosting-Ada Boost and Gradient Boost to convert weak learner to

strong learners.

Week 13

Develop a CNN model for image classification

Week 14

Review

Note: The above experiments are for indicative purposes only. However, the concerned faculty member can add a few more experiments in addition to the existing. In such cases the concerned faculty member should get the syllabus approved by the BoS.

ETHICAL HACKING LAB (PEC-IV LAB)

B. Tech IV Year I Semester					Cyber Security			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57222	Program Core	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

Course Outcomes

At the end of this Ethical Hacking Lab course, students will be able to:

1. Conduct detailed reconnaissance using document metadata, search engines, and other publicly available information sources to build a technical and organizational understanding of the target environment.
2. Utilize scanning tools to conduct comprehensive network sweeps, port scans, OS fingerprinting, and version scanning to develop a map of target environments.
3. Recognize security vulnerabilities, such as weak configurations, unpatched systems.
4. Apply penetration testing tools to exploit and investigate vulnerable systems.
5. Implementing on web application-based attacks

List of Experiments

Week 1

Perform Network Scanning using NMAP in windows and ZENMAP in kali Linux.

Week 2

Install Wireshark and apply filters to gather different information

Week 3

Use Nessus and NIKTO tool to find all the vulnerabilities with its level and generate a report for an organization

Week 4

Find the link accessed by the victim using Wireshark

Week 5

Perform Session hijacking/ find credentials of unsecure real time website using Wireshark

Week 6

Execute basic commands of Linux
Use CHMOD command to change the privileges and permissions
Perform Kali Linux Login Bypass in virtual machine

Week 7

Perform reconnaissance to find all the relevant information on selected website using 10 network information gathering tools.

Week 8

Perform windows Login Bypass using net user and John the ripper

Week 9

Create Trojan and Exploit victim's machine by taking its complete access

Week 10

Generate Word list from using wordlist generator Crunch

Week 11

Exploit windows to gain access of victim's machine using Metasploit framework

Week 12

Exploit Windows XP using Metasploit

Week 13

Exploit Windows 10 using Metasploit

Week 14

Review

Note: The above experiments are for indicative purposes only. However, the concerned faculty member can add a few more experiments in addition to the existing. In such cases the concerned faculty member should get the syllabus approved by the BoS.

MANAGEMENT SCIENCE (OEC-II)

B. Tech IV Year II Semester					Cyber Security			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58023	Open Elective-II	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

Course Objectives of Management Science are to:

1. Explain the concepts of Management theories and practices.
2. Introduce to production and quality concepts in operations management.
3. Know the processes of HR and Marketing functions
4. Understand the concepts of project planning for execution of projects
5. Explain the contemporary issues and challenges faced by an organization

Course Outcomes

At the end of this Management Science course, students will be able to:

1. Explain the concepts of business management and approaches.
2. Identify the role of production and quality concepts in efficiency of operations management.
3. Analyze the key functions of human resource management and marketing management.
4. Assess time and cost factors influencing project completion
5. Describe contemporary management concepts and practices

UNIT I

Introduction to Management: Nature and importance of management, Functions of Management, Taylor's Scientific Management Theory, Fayol's principles of management, Maslow's theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two factor Theory of Motivation. Systems Approach to Management, Leadership Styles, Social Responsibilities of Manager, Organization levels and types of organization structures.

UNIT II

Operations Management: Principles and Types of Plant Layout-Methods of production (Job, batch and Mass production), Work Study - Basic procedure involved in Method Study and Work measurement- Statistical Quality Control - X chart, R chart, C chart, P chart, (simple problems), Acceptance Sampling.

Materials Management: Objectives, Need for inventory control, EOQ, ABC Analysis, Purchase procedure, Stores management and Stores records, Supply chain management.

UNIT III

Human Resources Management (HRM): Evolution of HRM, Concepts of HRM, Basic functions of HR Manager - Manpower Planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating.

Marketing: Functions of Marketing, Marketing Mix, Product Life cycle, Channels of distribution.

UNIT IV

Project Management (PERT/CPM): Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of completing the project within given time, Project Cost Analysis, Project Crashing.

UNIT V

Strategic & Contemporary Management Practices: Mission, Goals, Objectives, Policy, Strategy, Programmes, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives. Just-In-Time (JIT) system, Total Quality Management (TQM), Six Sigma and Capability Maturity Model (CMM) levels, Value Chain Analysis concepts.

Text Books

1. G.Shainesh, Philip Kotler, Kevin lane Keller, Alexander Chernev, Jagdish N. Sheth, Marketing Management, 16/e, Pearson, 2022.
2. 2. Aryasri, Management Science, TMH, New Delhi, 2009

Reference Books

1. Charles W. L. Hill/Melissa A. Schilling/Gareth R. Jones, Strategic Management, 12/e, Cengage
2. William J. Stevenson, Operations Management, 13/3, McGraw Hill, 2022
3. Gary Dessler & Biju Varrkey, Human Resource Management, 16/e, Pearson, 2020

OPERATIONS RESEARCH (OEC-II)

B. Tech IV Year II Semester					Cyber Security			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58024	Open Elective-II	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

Course Objectives of Operations Research are to:

1. Know a short history of Operations Research (OR) and be able to explain the term OR and Appreciate the nature of Linear programming problems
2. Introduce a suitable method when the problem is to maximize the objective function instead of minimizing it
3. Know processing of n-jobs through two machines, 3-machines & etc.
4. Examine the functions that inventory performs and its importance in managerial
5. Understand replacement of depreciable assets

Course Outcomes

At the end of this Operations Research course, students will be able to:

1. Construct mathematical models for linear programming problems
2. Identify minimum transportation and efficient assignment of work
3. Allocation of job sequencing models and find Value of the game with LPP models
4. Use inventory models with deterministic demand models
5. Apply replacement models in various fields

UNIT I

Introduction to Operation Research: Definition, Scope, Objectives, Phases, Models and limitations of Operation Research. Linear Programming Problem- Formulation, Graphical Solution of LPP, Simplex Method, Artificial Variable Technique (Big M and Two-Phase method) and Dual Simplex Method.

UNIT II

Transportation Problem, Formulation, Solution, Unbalanced Transportation problem. Finding basic feasible solutions- Northwest corner rule, least cost method and Vogel's approximation method. Optimality test MODI method. Assignment model: Formulation, Hungarian method for optimal solution, solving unbalanced problem and Traveling salesman problem.

UNIT III

Sequencing models: Solution of sequencing problem-Processing n x 2, n x 3, 2 x m and n x m. Game Theory: Competitive games, rectangular game with saddle point- minimax (maxmin) method of optimal strategies. Dominance principle, rectangular games without saddle point – mixed strategy for 2 X 2 games. Value of the game with Linear Programming Methods.

UNIT IV

Inventory models: Inventory costs, Models with deterministic demand-model (a) demand rate uniform and production rate infinite, model (b) demand rate non-uniform and production rate infinite, model (c) demand rate uniform and production rate finite.

UNIT V

Replacement models: Replacement of Items that deteriorate whose maintenance costs increase with time without change in the money value. Replacement of items that fail suddenly: individual replacement policy, group replacement policy.

Text Books

1. S. D. Sharma, Operations Research.
2. Kanti Swarup, Operations Research, Sultan Chand & Sons.

Reference Books

1. Hamdy, A. Taha: Operation Research: An Introduction, PHI, 2007.
2. Hillier, F.S. Lieberman, G.J.: Introduction to operation research 8ed, Tata McGraw-Hill.
3. Gillett: Introduction to Operation Research, TMH.

INTELLECTUAL PROPERTY RIGHTS (OEC-II)

B. Tech IV Year II Semester					Cyber Security			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58002	Open Elective-II	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

The course aims to help the student understand the concept of Intellectual Property Rights and helps the student to appreciate the purpose and function of a trademark and the process involved in getting copyright, patent and related issues. The student is introduced to the importance of trade Secret and Geographical Indications.

Course Outcomes

At the end of this Intellectual Property Rights course, students will be able to:

1. Explain the concepts of intellectual property rights and related agencies.
2. Describe the purpose and functions of a trademark in a competitive environment.
3. Analyze the process of copyright and procedure.
4. Understand the process of patent and patent issues.
5. Explore the trade secret and geographical indications of its protection from unfair practices.

UNIT I

Introduction to Intellectual Property: Concept of intellectual property rights, importance of intellectual property rights. Types of intellectual property, international agencies, and treaties.

UNIT II

Trademarks: Concept of trademarks, purpose, and function of trademarks. Acquisition of trademark rights, protectable matter, selecting and evaluating trademark, trademark registration processes.

UNIT III

Law of Copy Rights: Concept of copyright right, fundamentals of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration.

UNIT IV

Law of Patents: Introduction to patent, foundation of patent law, patent searching process, ownership rights and transfer.

UNIT V

Trade Secrets & Geographical Indication: Law pertaining to trade secrets, determination of trade secrets. Trade secret litigation. Unfair competitions. Geographical Indication, concept of geographical indication, importance of geographical indication, new development of intellectual property rights.

Text Books

1. Deborah. E. Bouchoux, Intellectual property right, 5/e, 2018, Cengage learning.
2. Neeraj Pandey, Intellectual property right, PHI, 2019.

Reference Book

1. Ramakrishna Chintakunta and M. Geethavani, Kindle e 2021
2. Prabuddha Ganguli,Intellectual Property Right:Unleashing the Knowledge Economy, 2/e, 2017 Tata Mc Graw Hill Publishing company Ltd.

NEGOTIATION SKILLS (OEC-III)

B. Tech IV Year II Semester					Cyber Security			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58005	Open Elective-III	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

This is an introductory course on negotiation skills. The student is introduced to various types and stages of negotiation, basic strategies of negotiation.

Course Outcomes

At the end of this Negotiation Skills course, students will be able to:

1. Describe negotiation theories and required skills
2. Explain the various factors that affect the negotiation process and ethics involved in the negotiation
3. Apply effective negotiation strategies and tactics for different scenarios
4. Identify negotiation practices towards building relationships
5. Evaluate various strategies for conflicts resolution and effectively managing industrial relations.

UNIT I

Introduction to Negotiation: Introduction, Concept of Negotiation, Characteristics of a Negotiating Situation, Basic Negotiation Skills, Interpersonal Skills in Negotiation, Theories of Negotiation.

UNIT II

Types and Ethics in Negotiation: Types of Negotiation, Principles of Negotiation, Steps of Negotiation, Win-Win Negotiation, Negotiation Tactics, Factors Affecting Success in Negotiation.

Ethics: definition, applying ethical reasoning, approaches to ethical reasoning

UNIT III

Strategies and multiple parties and teams Negotiation: Fundamentals of negotiation, effective strategies to develop negotiation skills, anchoring / BATNA, nature of multi-party negotiation. Differences between two party and multi-party negotiation. Managing multiparty negotiation. Inter-team negotiations.

UNIT IV

Improving Negotiation skills: Enhancing Communication skills for effective Listening, Persuasion & Relationship Building, establishing Trust-Building Relationships.

UNIT V

Managing Negotiation: Managing Different Types of Negotiations**,** Cross –Cultural Challenges in Negotiations, Industrial Negotiation: Collective Bargaining, Arbitration, Origins of Conflict, Dispute Resolution.

Text Books

1. Essentials of Negotiation, 5th Edition, Roy J Lewicki, Bruce Barry, and David M Saunders, McGraw Hill, 2020.

Reference Books

1. Beverly DeMarr and Suzanne De Janasz (2013).Negotiation and Dispute Resolution, Prentice Hall, 2013.
2. Malhotra, Deepak, Negotiating the Impossible: How to Break Deadlocks and Resolve ugly Conflicts (without money or muscle). Oakland, CA: Berrett-Koehler Publishers, 2016.

PROJECT MANAGEMENT (OEC-III)

B. Tech IV Year II Semester					Cyber Security			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58008	Open Elective-III	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

The course is designed to help the student understand the concepts of project management, explain how to identify the projects and planning, analyze how to execute the projects, assess how to lead the team and evaluation of projects and to explain the performance measurement and evaluation of the projects.

Course Outcomes

At the end of this Project Management course, students will be able to:

1. Explain the phases of project life cycle.
2. Identify the projects and planning the projects
3. Know the project evaluation process
4. Appreciate the role of teams in project management
5. Discuss the recent trends in project management.

UNIT I

Introduction: Introduction to project management, need for project management, project management principles. Project lifecycle, project management phases in lifecycle, project management research in brief, project management today, organization structure, stake holder management, creating a culture for project management.

UNIT II

Project Identification and Planning: Project identification process, defining the project, approaches to project screening and selection, project planning, work breakdown structure,

financial module, getting approval and compiling a project charter, setting up a monitoring and controlling process.

UNIT III

Project Execution: Initiating the project, controlling and reporting project objectives, conducting project evaluation, risk, role of risk management, project management, risk management an integrated approach, cost management, creating a project budget.

UNIT IV

Leading Project Teams: Building a Project Team, Characteristics of an effective Project Team, achieving Cross- Functional Cooperation, Virtual Project Teams, Conflicts Management, Negotiations.

UNIT V

Performance Measurement and Evaluation: Monitoring Project Performances, Project Control Cycles, Earned Value Management, Human factors in Project Evaluation and Control, Project Termination, Types of Project Terminations, Project Follow-up. Current and Future Trends in Project Management.

Text Books

1. Jeffery K. Pinto, Project Management, Pearson Education, 2015

References Books

1. Clifford Gray and Erik Larson, Project Management, Tata McGraw Hill Edition, 6e, 2014.
2. R. Panneerselvam & P. Senthilkumar, Project Management, PHI, 2015
3. Thomas M.Cappels, Financially Focused Project Management, SPD, 2008.
4. Guide to Project Management Body of Knowledge (PMBOK® Guide) of Project Management Institute, USA.

VALUE ENGINEERING (OEC-III)

B. Tech IV Year II Semester					Cyber Security			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58010	Open Elective-III	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

The course is designed to help the student understand the concepts of Value engineering, understand different phases of value engineering and decision alternatives, and teams.

Course Outcomes

At the end of this Value Engineering course, students will be able to:

1. Understand the importance of value engineering concepts in productivity
2. Identify the different phases of value engineering projects
3. Know the different decision alternatives and choose the best alternative for optimization
4. Identify the value engineering concept in non-hardware projects and programs
5. Analyze the value engineering teams with the help of case study.

UNIT I

Introduction: Value engineering concepts, advantages, applications, problem recognition, and role in productivity, criteria for comparison, element of choice. Level of value engineering in the organization, unique and quantitative evaluation of ideas.

UNIT II

Value Engineering and Job Plan: Introduction, orientation, information phase, speculation phase analysis phase. Selection and Evaluation of value engineering projects, Project selection, methods selection, value standards, application of value engineering methodology.

UNIT III

Value Engineering Techniques: Selecting Products and Operation for Value Engineering action, Value Engineering Programmes, Decision Making for Optimum Alternative, Use of Decision Matrix,

Make or Buy, Measuring Profits, Reporting Results, follow up, Use of advanced techniques like Function Analysis System.

UNIT IV

Versatility of Value Engineering: Value engineering operation in maintenance and repair activities, Value Engineering in non-Hardware Projects. Initiating a Value Engineering Programme.

UNIT V

Value Engineering Level of Effort: Value Engineering Team, Co-coordinator, Designer, different Services, Construction Management Contracts, Value Engineering Case Studies.

Text Books

1. Anil Kumar Mukhopadhyaya, "Value Engineering: Concepts Techniques and applications", SAGE Publications 2010.
2. Del L. Younker, "Value Engineering analysis and methodology", Marcel Dekker Inc, New York, 2004

Reference Books

1. Alphonse Dell'Isola, "Value Engineering: Practical Applications for Design, Construction, Maintenance & Operations", R S Means Co., 1997
2. Richard Park, "Value Engineering: A Plan for Invention", St. Lucie Press, 1999.
3. Anil Kumar Mukhopadhyaya, "Value Engineering Mastermind: From concept to Value Engineering Certification", SAGE Publications, 2003

ANURAG UNIVERSITY
DEPARTMENT OF CIVIL ENGINEERING

6th Board of Studies Meeting

Held on 19th November 2022

Minutes of Meeting

The 6th Board of Studies (BOS) meeting of Civil Engineering was held on Saturday, 19th November 2022 at 2:00 PM in the Seminar hall of C-block. The following members were present.

S. No.	Name of Members	Position
1	Dr. K. R. C. Reddy, Professor	Chairman
2	Dr. K. Madhusudan Reddy, Assoc. Professor & HOD	Convener
3	Dr. R. Pradeep Kumar, Professor, IIIT Hyd.	Member
4	Dr. K. Srinivasa Raju, Professor BITS Pilani- Hyd.	Member
5	Dr. P. Rajasekhar, Professor, OU	Member
6	Mr. Ravikanth Chittiprolu, Entrepreneur	Member
7	Dr. K. Ramanjaneyuli, Professor	Member
8	Dr. G. Venkat Rao, Professor	Member
9	Dr. B. Narender, Assoc. Professor	Member
10	Dr. P. Pradeep Kumar, Assoc. Professor	Member
11	Dr. Dasguna Nuli, Assoc. Professor	Member
12	Mr. K. Saibaba, Assoc. Professor	Member
13	Mr. D. Rahul, Alumni	Member

The chairman has welcomed the members and presented the outline of the agenda of the meeting as given below.

1. To approve the syllabus of B. Tech. IV year Civil Engineering

2. Industry Oriented Courses
3. Any Other

A draft copy of syllabus of the B. Tech. final year Civil Engineering is being prepared by the expert faculty members of the Department, keeping in view of AICTE model curriculum, R18 curriculum and the curriculum of few other universities. The originally approved 'Course Structure' and the draft copy of IV year syllabus has been presented in the meeting for the discussion, the comments were noted and the 'minutes of the meeting' are presented below.

Item-1: To approve the syllabus of B. Tech. IV year Civil Engineering

The BOS members have reviewed the 'course structure' and draft copy of the 'syllabus' critically and suggested the following points.

1. **Based on the priority, the industry requirement and employability opportunities, t**he BoS members have recommended to interchange the Courses 'Engineering Economics' of IV year I-Semester (HSS&MC) and 'Construction Technology and Project Management (CTPM)' of III year II-Semester (PEC-III)
2. The BoS members also felt that, based on industry requirement and employability opportunities, they strongly suggested to include an additional elective course on 'Pre-Engineered Buildings' in the Professional Elective-VI.
3. The BoS members have suggested to include few topics on 'precast construction' in the course 'Prestressed Concrete Structures' of Professional Elective-V and suggested to rename it as 'Precast and Prestressed Concrete Structures'.

Resolution: All the suggested points have been considered and they are included in the final copy of the 'course structure 'and the 'syllabus' of the IV year Civil Engineering,

- The CTPM is shifted from professional elective-III in III year to core course in IV year I-Semester in place of 'Engineering Economics'
- The 'Engineering Economics' which is a core course now is shifted as one of courses of Professional Elective-III.
- The Pre-Engineered Building is included as an extra course in Professional Elective-VI.
- Few topics on 'precast construction' are included in the course 'Prestressed Concrete Structures' and renamed it as 'Precast and Prestressed Concrete Structures' as one of the courses of Professional Elective-V

Item-2: Industry oriented Courses

The industry oriented courses are being separated from the course structure as given below. The BoS members expressed satisfaction and approved the list by strongly recommending to include the additional course on 'Pre-Engineered Buildings'

S. No.	Category	Course Title	Hours per week			Credits
			L	T	P/D	
1	HSS&MC	Construction Technology and Project Management	3	0	0	3
2	ESC	Geospatial Technology	3	0	0	3
3	ESC	Geospatial Technology Laboratory	0	0	2	1
4	PEC-II	Traffic Engineering and Management	3	0	0	3
5	PEC-III	Disaster Preparedness and Planning	3	0	0	3
6	PEC-V	Rehabilitation and Retrofitting of Structures	3	0	0	3
7	PEC-V	Precast and Prestressed Concrete Structures	3	0	0	3
8	PEC-VI	Pre-Engineered Building	3	0	0	3

Item-3: Any other

The BoS members have strongly recommended to include the 'Engineering Mechanics' course of I year curriculum to take up in the BoS of Civil Engineering in future as they feel to include few topics related to civil engineering.
Resolution: It is left to the decision of the 'Academic Council.

HOD/CED

Dr. K. R. C. Reddy
Chiarman BoS

Enclosure:

1. Modified Course Structure of all four years of B. Tech. Civil Engineering
2. 'Course Structure' and 'Syllabus' of III B. Tech. Civil Engineering I- and II-Semester
3. 'Course Structure' and 'Syllabus' of IV B. Tech. Civil Engineering I- and II-Semester

COURSE STRUCTURE AND SYLLABUS

OF

B. TECH. IV YEAR (I & II SEMESTERS)

CIVIL ENGINEERING

R 20 REGULATIONS

ANURAG UNIVERSITY

Venkatapur (V), Ghatkesar (M), Medchal-Malkajgiri (Dt.), Hyderabad, Telangana, INDIA

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B. Tech. IV Year I-Semester (7th Semester) 6T+2L+1 PROJ

S. No.	Course Code	Category	Course Title	Hours per week			Credits
				L	T	P/D	
1	A57001	PCC	Estimation and Costing	3	0	0	3
2	A57002	ESC	Geospatial Technology	3	0	0	3
3	A57003	HSS&MC	Construction Technology and Project Management	3	0	0	3
4		PEC	**Professional Elective-IV**	3	0	0	3
	A57004		1. Advanced Structural Design				
	A57005		2. Air Pollution and Control				
	A57006		3. Railways and Airport Engineering				
5		PEC	**Professional Elective-V**	3	0	0	3
	A57007		1. Precast and Prestressed Concrete Structures				
	A57008		2. Ground Improvement Techniques				
	A57009		3. Water Distribution Systems				
6		PEC	**Professional Elective-VI**	3	0	0	3
	A57010		1. Pre-Engineered Buildings				
	A57011		2. Earth Retaining Structures				
	A57012		3. Ground Water Development and Management.				
	A57013		4. Industrial Wastewater and Management				
7	A57201	ESC	Geospatial Technology Laboratory	0	0	2	1
8	A57202	ESC	Computer Applications in Civil Engineering Laboratory	0	0	2	1
9	A57230	PROJ	Industry Oriented Mini Project	0	0	4	2
	TOTAL						**22**

B. Tech. IV Year II-Semester (8th Semester) 2T+ 3 PROJ

S. No.	Course Code	Category	Course Title	Hours per week			Credits
				L	T	P/D	
1	A58001	OEC	**Open Elective-II** 1. Technical and Business Communication Skills	2	1	0	3
	A58002		2. Intellectual Property Rights				
	A58016		**3.** Python Programming				
2	A58004	OEC	**Open Elective-III** 1. Instrumentation and Sensors	2	1	0	3
	A58005		2. Negotiation Skills				
	A58099		**3.** Introduction to Machine Learning				
3	A58201	PROJ	Seminar	0	0	4	2
4	A58202	PROJ	Comprehensive Viva	0	0	0	2
5	A58203	PROJ	Project Work	0	0	20	10
	TOTAL						**20**

Estimation and Costing

B. Tech. IV Year I Semester					Dept. of Civil Engineering			
	Category	**Hours / Week**			**Credits**	**Marks**		
A57001	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. To identify the various specifications of works in buildings.
2. To understand the quantities of works in buildings with different methods.
3. To quantify the earthwork excavations of roads, canals and sanitary works.
4. To categorize the analysis of rates for material and labor.
5. To decide the civil engineering tenders, contracts and acts

Course Outcomes

At the end of the course the students will be able to

CO 1: To understand different types of estimate and identifying the specifications.
CO2: Estimate the quantities of various items of building works.
CO 3: To calculate earthwork excavation of roads, canals.
CO 4: Analyze the rates of individual items for the preparation of the estimates.
CO 5: To recommend the suitable tenders and contracts.

UNIT-I

Introduction: Introduction to the process of estimation; Types of estimation, Specification of work, necessity of specification types of specification, general specification, specification of bricks, cement, sand, water, lime, reinforcement, detailed specification for earthwork, cement, concrete, brickwork, flooring, D.P.C, R.C.C, cement plastering, white and color washing, distempering, painting.

UNIT-II

Quantity estimation of buildings: General items of work in Building, different methods of estimation, Detailed and abstract estimate of different quantities in a building.
Bar Bending Scheduling: Estimation of steel quantities for R.C.C Works: Percentage reinforcement; standard hooks and cranks of reinforcement bars, R.C.C. framed building.

UNIT-III

Quantity estimation of : Bituminous and C.C. Road work including earthwork, Irrigation canal work including earthwork, Single pipe culvert and single cell rectangular box culvert, Septic tank.

UNIT-IV

Rate analysis: Purpose, importance and necessity of the rate analysis, factors affecting, Standard Schedule of Rates, task work, daily output from different equipment/ productivity, Labour costs, percentage breakup of the cost.

UNIT-V

Tender: Preparation of tender documents, importance of inviting tenders, contract types, relative merits, prequalification. general and special conditions, termination of contracts, penalty and liquidated charges, Settlement of disputes, R.A. Bill & Final Bill, Payment of advance, insurance, claims, price variation, etc. Preparing Bids- Bid Price buildup: Material, Labor, Equipment costs, Risks, Direct & Indirect Overheads, Profits; Bid conditions, alternative specifications; Alternative Bids. Bid process management, Introduction to acts pertaining to- Minimum wages, Workman's compensation, Contracts, Arbitration, Easement rights.

Textbooks

1. B.N. Dutta, Estimating and Costing in Civil Engineering, UBS Publishers, 2002.
2. M. Chakraborti, Estimation, costing, specifications and valuation in Civil Engineering, M. Chakraboti Publishers, 2006.

References

1. Relevant Indian Standard Specifications-National Building Codes.
2. IS-1200-1992 “Methods of Measurements of builds and Civil Engineering Works”
3. Standard schedule of rates and standard data by public works department.

Geospatial Technology

B. Tech IV Year I Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A57002	ESC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Surveying

Course Objectives

1. To understand the principles of remote sensing
2. To obtain knowledge of remote sensing techniques
3. To provide knowledge of geographic information system
4. To know the spatial analysis method
5. To impart knowledge of RS & GIS applications.

Course Outcomes

At the end of the course, the students will be able to

CO 1: Identify the principles and processes of remote sensing
CO 2: Illustrate interaction and interpretation of remote sensing
CO 3: Demonstrate data presentation in geographic information system
CO 4: Analyze spatial & attribute data for solving spatial problems
CO 5: Discover different RS & GIS application methods.

UNIT-I

Introduction to Photogrammetry: Principle and types of aerial photographs, stereoscopy, Map Vs Mosaic, ground control, Parallax measurements for height, and determinations.
Remote Sensing – I: Basic concepts and foundation of remote sensing – elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology, and units.

UNIT-II

Remote Sensing – II: Energy resources, energy interactions with earth surface features and atmosphere, resolution, sensors and satellite visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of water bodies, introduction to digital data analysis.

UNIT-III

Geographic Information System: Introduction, GIS definition, and terminology, GIS categories, components of GIS, fundamental operations of GIS, A theoretical framework for GIS. Types of data representation**:** Data collection and input overview, data input and output. Keyboard entry and coordinate geometry procedure, manual digitizing and scanning, Raster GIS, Vector GIS – File management, Spatial data – Layer-based GIS, Feature-based GIS mapping.

UNIT-IV

GIS Spatial Analysis: Computational Analysis Methods (CAM), Visual Analysis Methods (VAM), Data storage-vector data storage, attribute data storage, an overview of the data manipulation and analysis. Integrated analysis of the spatial and attribute data.

UNIT-V

RS and GIS applications (Case study): Land use and Land Cover mapping, Watershed Management, surface water mapping, and inventory, rainfall – Runoff relations, flood & drought impact assessment & monitoring, Transportation, Geology, Emergency Management, Agriculture.

Textbooks

1. Remote Sensing and its applications by LRA Narayana University Press 1999.
2. Principals of Geophysical Information Systems – Peter A Burrough and Rachael A. Mc Donnell, Oxford Publishers 2004.

References

1. Remote sensing and image interpretation by Thomas Lillesand, 7th Edition, John Wiley &sons.
2. Concepts & Techniques of GIS by C.P.Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
3. Remote Sensing and Geographical Information systems by M.Anji Reddy JNTU Hyderabad 2001, B.S.Publications.
4. Remote sensing of the environment –An earth resource perspective by John R Jensen,Prentice Hall
5. GIS by Kang – tsung chang, TMH Publications & Co.
6. Basics of Remote sensing & GIS by S.Kumar, Laxmi Publications.
7. Fundamental of GIS by Mechanical designs John Wiley & Sons.

On line links

1. https://onlinecourses.nptel.ac.in
2. www.iirs.gov.in
3. www.nrsc.gov.in

Construction Technology and Project Management

B. Tech. IV Year I Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A57003	HSS&MC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

1. To make them understand how to Project Monitoring and Control
2. To provide an understanding of Planning, Scheduling, Time estimates, etc.
3. To impart the knowledge of Construction equipment
4. To provide knowledge about Construction Management and quality control.
5. To provide knowledge about construction Management, Contract Management

Course Outcomes

At the end of the course the students will be able to

CO 1: Able to plan, control and monitor construction projects concerning time.
CO 2: Understanding how structures are built and projects are developed.
CO 3: Apply the techniques about how to optimize construction projects.
CO 4: understanding of how construction projects are administered concerning contract structures.
CO 5: Gain knowledge of various contract types and dispute resolution methods.

UNIT-I

Construction Planning- Construction projects- types and features, phases of a project, construction project planning- Stages of project planning: pre-tender planning, pre-construction planning, the role of client and contractor, work break-down structure, Techniques of planning- Bar charts, Gantt Charts. Networks: basic terminology, types of precedence relationships, preparation of CPM networks: activity on link and activity on node representation, computation of float values, critical paths.

UNIT-II

Construction Costs and Construction methods: Classification of costs, the time-cost trade-off in construction projects. Types of foundations and construction methods, Common building construction methods, Modular construction methods, Precast concrete construction methods; Basics of Slip forming for tall structures; Basic construction methods for steel structures; Basics of construction methods for Bridges; Introduction to current LEED for New Construction rating system.

UNIT-III

Construction Equipment: Conventional construction methods Vs Mechanized methods and advantages; Equipment for Earthmoving, Dewatering; Concrete mixing, transporting, and placing; Cranes, Hoists, and other equipment for lifting; Equipment for transportation of materials. Planning and organizing construction site and resources- Documentation at the site; Manpower: planning, organizing, staffing, motivation; Materials: concepts of planning, procurement, and inventory control.

UNIT-IV

Project Monitoring and Control: Supervision, record keeping, periodic progress reports, and periodical progress meetings. Updating of plans: purpose, frequency, and methods of updating, Common causes of time and cost overruns, and corrective measures. Basics of Modern Project management systems such as Lean Construction; Use of Building Information Modeling (BIM) in project management; Quality control: the concept of quality, use of manuals and checklists for quality control, Safety, Health, and Environment on project sites: accidents; their causes, effects, and preventive measures.

UNIT-V

Contracts Management: Types of Contracts, Parties to a Contract; Contract Formation, Common contract clauses: Notice to proceed, rights and duties of various parties, notices to be given, Contract duration and price. Performance parameters; Delays, penalties, and liquidated damages; Suspension and Termination. Conventional and Alternative Dispute Resolution methods, Legal Aspects in Contract Management.

Textbooks

1. 'Construction Project Management – Theory and Practice', Niraj Jha, Pearson Education, 2nd Edition, 2015
2. 'Building Construction', Varghese, P.C., Prentice Hall India, 2007.

References

1. Chudley, R., Construction Technology, ELBS Publishers, 2007.
2. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
3. Nunnally, S.W. Construction Methods and Management, Prentice-Hall, 2006
4. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi

NPTEL

1. https://nptel.ac.in/cosurses/105103093/

Advanced Structural Design
Professional Elective-IV

B. Tech IV Year I Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A57004	PEC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Design of RC Structures and Design of Steel Structures

Course Objectives

1. To understand the theory and design of retaining walls
2. Identify and assess combined footing behavior under loads
3. Outline various methods for types RC water tanks
4. To provide the knowledge of plastic analysis.
5. To Provide the knowledge of design of roof trusses and prefabricated structures

Course Outcomes

At the end of the course the students will be able to

1. Classify and design of retaining walls
2. Understand the theory and design of combined footing
3. Understand the theory and design of circular and rectangular water tanks
4. Understand the plastic behavior of steel structures.
5. Design of roof trusses and prefabricated structures

UNIT-I

Retaining Walls: Introduction, types, analysis and design of RCC cantilever and counter fort retaining walls.

UNIT-II

Combined Footings: Introduction, design of rectangular footing, trapezoidal footing, strap footing and introduction to raft.

UNIT-III

Design of RCC Water Tanks: Introduction, Type of Water tanks, Analysis for Self Weight, Water Pressure and Earth Pressure, Design and Detailing of **On ground**- Rectangle and Circular Water

Tanks, **Underground** –Rectangle water tank -**Overhead** – Circular and Intze Tanks by IS code method (Working Stress Method).

UINIT-IV

Plastic Analysis: Introduction - idealized stress – strain diagrams - shape factor for various section – moment curvature relationship – ultimate moment - plastic hinge - collapse load mechanism for beams – lower and upper bound theorems – ultimate strength of fixed and continuous beams.

UNIT-V

Design of Roof Trusses: Types of roof trusses - loads on trusses - estimation of wind loads as per IS 875 - purling design and Rafter design.
Prefabricated Structures: Introduction, Prefabricated components and design philosophy

Textbooks

1. Dr. H. J. Shah; Design of Reinforced Concrete Volume I and II, Charotar Publication
2. P. C. Varghese, 'Advanced Reinforced concrete structures ' 2nd Edition, PHI Learning Pvt. Ltd., 2014
3. Duggal,S.K., Limit State Design of Steel Structures, Tata McGraw Hill, New Delhi, 2010

References

1. Ramchandra, V. Gehlot, Design of Steel Structures (Vol. 2), Scientific Publishers, 2015
2. Bruggeling A.S. G and Huyghe G.F. "Prefabrication with Concrete", A.A. Balkema Publishers,USA,1991.
3. Lewitt,M. " Precast Concrete- Materials, Manufacture, Properties And Usage", Applied Science Publishers , London And New Jersey, 1982.
4. R. Park and T. Paulay, Reinforced Cement Concrete Structures, , MISL-WILEY Series, Wiley India Pvt. Ltd, 2009.
5. Unnikrishnan Pillai, Reinforced Concrete Design, McGraw Hill Pub, 2009.
6. Subramanian. N, Design of Steel Structures, Oxford University Press, New Delhi.
7. "Handbook on Precast Concrete Buildings", Indian Concrete Institute, 2016.
8. "Structural design manual", Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 2009.
9. Punmia B.C. Ashok Kumar Jain and Arun K. Jain, Reinforced Concrete Design, Lakshmi Publishers, 2006, 10th Edition

IS Codes

1. IS 456 : 2000, Indian Standard Plain and Reinforced Concrete - Code of Practice
2. IS 3370 Part I: 2009. Concrete Structures for Storage of Liquids - Code of Practice (General requirements)

3. IS 3370 Part II : 2009 Concrete Structures for Storage of Liquids - Code of Practice (Reinforced concrete structures)
4. IS 800:2007 General Construction In Steel — Code Of Practice, BIS
5. Steel Tables

On line links

1. http://nptel.ac.in/lec26.pdf
2. https://www.youtube.com/watch?v=BNZp9121cms

Air Pollution and Control
Professional Elective-IV

B. Tech IV Year I Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A57005	PEC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Environmental Engineering, Environmental Studies

Course Objectives

1. To impart the knowledge of Air pollution sources and Characteristics.
2. To understand the Air sampling and pollution measurement methods.
3. To obtain the knowledge of various methods for removal of gaseous pollutants.
4. To provide the knowledge of Noise Pollution and its sources.
5. To impart the knowledge of effect of noise pollution and remedial measures.

Course Outcomes

At the end of the course the students will be able to

CO 1: Identify the sources of air pollution.
CO 2: Illustrate the air sampling and measurements methods.
CO 3: Recommend the best Air pollution control equipment based on pollutants
CO 4: Identify the various Noise pollution sources.
CO 5: Assess the effect of noise pollution and recommend control methods.

UNIT-I

Air pollutants, Sources, classification, Combustion Processes and pollutant emission, Effects on Health, vegetation, materials and atmosphere, Reactions of pollutants in the atmosphere and their effects-Smoke, smog and ozone layer disturbance, Greenhouse effect.

UNIT-II

Air sampling and pollution measurement methods, principles and instruments, Ambient air quality and emission standards, Air pollution indices, Air Act, legislation and regulations, control principles.

UNIT-III

Removal of gaseous pollutants by adsorption, absorption, reaction and other methods. Particulate emission control, settling chambers, cyclone separation, Wet collectors, fabric filters, electrostatic precipitators and other removal methods like absorption, adsorption, precipitation, Biological air pollution control technologies, Indor air qualities.

UINIT-IV

Noise pollution: Basics of acoustics and specification of sound; sound power, sound intensity and sound pressure levels; plane, point and line sources, multiple sources; outdoor and indoor noise propagation, psychoacoustics and noise criteria.

UNIT-V

Effects of noise on health, annoyance rating schemes; special noise environments: Infrasound, ultrasound, impulsive sound, and sonic boom; noise standards and limit values; noise instrumentation and monitoring procedure. Noise indices. Noise control methods

Textbooks

1. Wark, K., Warner, C.F., and Davis, W.T., "Air Pollution: Its Origin and Control", Addison-Wesley Publisher. 1998.
2. Boubel, R.W., Fox, D.L., Turner, D.B., Stern, A.C., "Fundamentals of Air Pollution", Elsevier Science, Academic Press. 2005.
3. Noel De Nevers, "Air Pollution Control Engineering", Waveland Press, Incorporated 2017.

References

1. Seinfield J H and Pandis S N, Atmospheric Chemistry and Physics: From Air Pollution to Climate Change, Wiley (1998).
2. Turner D B, Workbook of Atmospheric Dispersion Estimates, CRC Press (1994).
3. Lodge J P, Methods of Air Sampling and Analysis, CRC Press (1988).

On line links

https://archive.nptel.ac.in/courses/105/107/105107213/

Railways and Airport Engineering
Professional Elective-IV

B. Tech IV Year I Semester					Dept. of Civil Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57006	**PEC**	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Transportation Engineering.

Course Objectives

1. To impart knowledge on principles of permanent way geometric design.
2. To familiarize with modernization and maintenance of railways.
3. To introduce metro systems engineering.
4. To impart knowledge on airport planning and design.
5. To introduce airport visual aids and air traffic control.

Course Outcomes

At the end of the course the students will be able to

CO 1: Design geometric elements of permanent way.
CO 2: Outline modernization in railway operations and maintenance.
CO 3: Explain the need of metro systems, planning and construction.
CO 4: Discuss planning and design of various airport components.
CO 5: Summarize airport markings, lighting, and operational aids.

UNIT-I

Permanent way: Coning of wheels, defects in rails, creep, track fittings and fastenings.
Geometric design: Gradient, grade compensation, speed on curves, cant, negative cant, widening of gauges on curves, and problems.

UNIT-II

Points and crossings: Necessity, turnout, crossings, interlocking of points and signals.

Modernization of railways: Modernization of traction, speed trends, modernization of track, automation in operations – Mechanized maintenance, directed track maintenance.

UNIT-III

Metro systems: Overview of metro systems, need for metros, routing studies, basic planning and financials - construction methods for elevated and underground stations, viaduct spans and bridges, underground tunnels - depots, commercial and service buildings.

UINIT-IV

Airport planning: Aircraft characteristics, Airport classification (ICAO), Airport site selection, airport planning, master plan, and surveys for airport site selection.

Airport components: Runway orientation, windrose diagrams and problems - basic runway length, corrections and problems - runway geometrics, airport and runway capacity, taxiway elements, holding and terminal aprons.

UNIT-V

Airport marking and lighting: Runway, taxiway markings, and airport lighting.
Air traffic control: Need, air traffic control network, enroute aids, and landing aids.

Textbooks

1. S. C. Saxena and S. P. Arora, A Text Book of Railway Engineering, 6th Edition, Dhanpat Rai Publishing Co Pvt Ltd, New Delhi, 2010.
2. S. K. Khanna, M. G. Arora, and S. S. Jain, Airport Planning and Design, 6th Edition, Nemchanad and Brothers, Roorkee, 2017.
3. Paul Garbutt, World Metro Systems, 2nd Edition, Capital Transport Pub,1997.

References

1. S. P. Chandola, A Text Book of Transportation Engineering, 1st Edition, S. Chand & Company Pvt. Ltd., New Delhi, 2014.
2. Rangwala, "Railway Engineering", Charotar Publishing House, 2013.
3. Rangwala, "Airport Engineering", Charotar Publishing House, 2013.

MOOCS

1. https://nptel.ac.in/courses/105107123

Precast and Prestressed concrete structures
Professional Elective-V

B. Tech IV Year I Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A57007	PEC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Strength of Materials I & II, Structural Analysis, Concrete Technology, Design of RC structures.

Course Objectives

1. To understand the necessity of precast constructions.
2. To understand the structural concepts and arrangements & requirement of precast systems.
3. Differentiate between the different systems of prestressing concrete
4. Know and classify the various types of losses in pre and post tensioned members.
5. Analyze the prestressed concrete members for various loads.

Course Outcomes

At the end of the course the students will be able to

CO1 Understand the process of precast construction.
CO2 Know the structural concepts and requirement of precast systems.
CO3 Classify the different systems of prestressing concrete..
CO4 Explain the various types of losses occurring in pre and post tensioning process
CO5 Explain the procedure of analysis of prestressed concrete structures.

UNIT-I

Introduction to Precast Concrete Construction: Description of Precast Concrete Construction, difference between Precast and conventional cast in situ Concrete construction, Comparison with cast-in-situ construction, advantages and disadvantages of precast construction. Need, principles and types of precast, automation in manufacturing of precast elements, Standardization, Transportation, Erection of precast elements and materials in Precast Structures –concrete, Steel reinforcement and non-cementitious material, Structural steel works and welding and bolting. Joints and connections.

UNIT-II

Introduction to Structural Concepts of Precast concrete Systems: Loads, Load path, Precast Concrete building system and Precast frame analysis, Overview of limit states and Structural Ties.

Arrangement and requirement of Precast Reinforced Concrete Components: Introduction to Precast Concrete Floors: General Introduction, Precast concrete flooring options, flooring arrangements, general requirements.

Introduction to Precast Concrete Beams – General introduction, Types of precast beams, Construction methods, loading arrangements, beam behavior, composite and non-composite reinforced concrete beams.

Introduction to precast concrete Columns – General introduction, types, requirement, advantages and disadvantages, Geometry, Strength and General requirements.

Introduction to precast concrete Walls – General introduction and requirements. Types, connections, advantages and disadvantages. Introduction to shear walls.

UNIT-III

Introduction to Prestressed Concrete: Definition, Principles of pre-stressed concrete and basic terminology, Applications, advantages and disadvantages of prestressed concrete over reinforced concrete, materials used and properties of materials and necessity of high grade materials and concrete, Types of Pre-stressing steel -Wire, Cable, tendon.

Classification and systems of prestressing - Pre tensioning – process and applications, Post-tensioning – process and applications, Systems for posttensioning - BBRV, Freyssinet, Magnel Blaton, Gifford Udall, Dywidag and dynamic prestress systems. Introduction to IS 1343-2012 Indian Standard Code Book

UINIT-IV

Losses of prestress: losses of prestress in pretension and post tensioned members, loss due to elastic shortening, shrinkage, creep, relaxation of steel, friction, anchorages slip. BIS recommendations for percentage loss in case of Pre and Post tensioning.

UNIT-V

Analysis of Prestress and Bending Stress in PSC Members: Basic assumptions in analysis of pre-stressed concrete members, Concentric and eccentric tendons, Resultant stresses, Pressure line, Kern points , Cable profile , load balancing concept , Analysis of prestress in simple sections and stress diagrams for prestress, dead and live loads.

Textbooks

1. Precast Concrete Structures by KIM S. ELLIOT, Second Edition, CRC Press, Taylor & Francis Group.

2. Structural design manual", Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 2009.
3. The Structural Precast Concrete Handbook 2nd Edition, ISBN : 981-04-3609-2, Building and Construction Authority, May 2001.
4. N. Krishna Raju, "Prestressed Concrete", Tata McGraw Hill Publications, Sixth Edition, 2019.
5. S.Ramamrutham, "Prestressed Concrete", Dhanpat Rai Publications.

References

1. Nilson A.H., Darwin D. and Dolan C. W., " Design of Concrete Structures" 14th edition, Mc. Graw Hill, New York, 2010.
2. Mokk. L, (1964), Prefabricated Concrete for Industrial and Public Structures, Publishing House of the Hungarian Academy of Sciences, Budapest
3. Precast concrete structures, Hubert Bachmann and Alfred Steinle' First edition,2011, Ernst &Sohn, GmbH &Co., ISBN978-3-433-60096-2.
4. PCI Journal– Proposed Design Requirements for Precast Concrete, Prestressed Concrete Institute, PCI Committee on Building Code and PCI Technical Activities Committee.
5. ICI Bulletin, Handbook on Precast concrete Structures, 1st ed. Chennai: Indian Concrete Institute, 2016.
6. T.Y. Lin & Ned H.Burns, "Design of Prestressed Concrete Structures", John Wiley & Sons. Wiley India Private Limited. Third Edition

IS Codes

1. IS 456 : 2000, Indian Standard Plain and Reinforced Concrete - Code of Practice
2. IS 1343:2012, 'Prestressed Concrete – Code of Practice' 2nd Revision, Bureau of Indian Standards.

On line links

1. https://precast.org/education/classes/webinars/precast-101/
2. https://www.youtube.com/c/CivilEngineeringDepartmentLJIET/videos
3. https://www.youtube.com/watch?v=LIrr2tdfLEA
4. https://www.youtube.com/watch?v=uiQzx1YFOBs
5. NPTEL Course - Pre-stressed Concrete Structures, IIT Madras, Prof. Devdas Menon, Dr. Amlan Kumar Sengupta https://nptel.ac.in/courses/105106117

Ground Improvement Techniques
Professional Elective-V

B. Tech IV Year I Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A57008	PEC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Engineering Geology, Geotechnical Engineering, Foundation Engineering

Course Objectives

1. To identify basic deficiencies of various soil deposits
2. To know the problems of expansive soils and foundation techniques
3. To know the different insitu densification techniques in granular soils
4. To learn the dewatering technique depending on site conditions
5. To know the applications of geosynthetics

Course Outcomes

On successful completion of this course, it is expected that the students will be able to

CO 1: Understand the different foundation techniques in expansive soils.

CO 2: Discuss the different ground improvement techniques

CO 3: Understand the soil stabilization methods.

CO 4: Discuss the reinforced earth and its design.

CO 5: Describe the methods involving the improvement of expansive soils.

UNIT-I

Expansive soils: Problems of expansive soils – tests for identification – methods of determination of swell pressure. Improvement of expansive soils – Foundation techniques in expansive soils – under reamed piles.

UNIT-II

In-situ densification methods in granular Soils: Vibration at the ground surface, Impact at the Ground Surface, Vibration at depth, Impact at depth. In – situ densification methods in Cohesive soils: – preloading or dewatering, Vertical drains – Sand Drains, Sand wick geodrains – Stone and lime columns – thermal methods

UNIT-III

Stabilization: Methods of stabilization-mechanical-cement- lime-bituminous-chemical stabilization with calcium chloride, sodium silicate and gypsum Reinforced Earth: Principles – Components of reinforced earth – factors governing design of reinforced earth walls – design principles of reinforced earth walls.

UINIT-IV

Dewatering: Methods of de-watering- sumps and interceptor ditches- single, multi stage well points - vacuum well points- Horizontal wells-foundation drains-blanket drains- criteria for selection of fill material around drains –Electro-osmosis. Grouting: Objectives of grouting- grouts and their properties- grouting methods- ascending, descending and stage grouting- hydraulic fracturing in soils and rocks- post grout test.

UNIT-V

Geosynthetic: Geotextiles- Types, Functions and applications – Geogrids and geo-membranes – functions and applications. Miscellaneous: Pre-stressed Anchors, Rock Anchoring, Contiguous Pile Foundations, and Soil Nailing and Uplift Anchors

Textbooks

2. Hausmann M.R. (1990), Engineering Principles of Ground Modification, McGraw-Hill International Edition.
3. PPurushotham Raj (2016). Ground Improvement Techniques, Laxmi Publications, New Delhi

References

1. Moseley M.P. (1993) Ground Improvement, Blackie Academic and Professional, Boca Taton, Florida, USA.
2. Xanthakos P.P, Abramson, L.W and Brucwe, D.A (1994) Ground Control and Improvement, John Wiley and Sons,New York, USA.
3. Robert M. Koerner (1997), Designing with Geosynthetics, Prentice Hall New Jercy, USA
4. Ground Improvement Techniques by Dr. G.L. SivakumarBabu, Department of Civil Engineering, IISc Bangalore.

On line links

http://nptel.iitm.ac.in/

Water Distribution Systems

Professional Elective-V

B. Tech IV Year I Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A57009	PEC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Hydrology and water resources engineering

Course Objectives

At the end of the course the students will be able to

1. To learn the concept of computation of optimal diameter of rising
2. To estimate the storage capacity of a distribution reservoirs
3. To obtain the knowledge about sources of water
4. To study various criteria of planning of an optimal water distribution network
5. To study quality and supply valves of water required for industrial operations

Course Outcomes

At the end of the course the students will be able to

CO1: Understanding the various head loss formula used for water distribution design.
CO2: Estimation of storage capacity of a distribution reservoir
CO3: Narrates the origin of Natural waters and to synthesize it for regular use
CO4: Understanding techniques of the optimal planning of water distribution networks
CO5: Explains the industry requirements of water for its operations & Pipe appurtenances

UNIT-I

Introduction- General principle used in pipe line design, various components of water transmission and distribution systems, Head loss formula, minor losses, equivalent pipe concept
Rising main- Basic requirements, Types, diameter computation by considering various cost elements. Optimal diameter of rising main

UNIT-II

Distribution reservoirs- impounding and service reservoirs, necessity, various storages, location and height, various component parts, capacity computation.

Design principle of water distribution system- Planning, design and analysis of WDN, component parts
Pipe appurtenances- Various valves and fittings, pumps, pressure release valve and check valves

UNIT-III

Analysis of water distribution network- Parameter inter relationship, formulation of equations, types of problem, Hardy cross method, Newton Raphson method, Linear theory method, Electrical analogy method, Multi reservoir system analysis

UINIT-IV

Node Flow analysis- Node Head Analysis (NHA) and Node Flow Analysis (NFA), Node classification, Node flow compatibility, NFA of serial network

UNIT-V

Design of optimal WDN- Various approaches, cost head loss ratio criterion, Linear Programming technique, introduction to nonlinear programming

Textbooks

1. Analysis of Water distribution Systems, T.M. Walski. C.B.S. Publication
2. Analysis of Flow in pipe network, Jepson R.W. Ann Arbor Science, Michigan USA
3. Analysis of Flow in pipe networ, Gupta Rajesh Bhave P.R.Narosh.Publishing House New Delhi

References

1. Analysis of Water Distribution Network Part I to Part III Dr. P.R.Bhave Journal of IWWA Vol XIII No. 2
2. Node Flow analysis of Serial water distribution System Dr. P.R.Bhave Journal of IWWA Vol XII
3. Raghunath H.M., Ground Water Hydrology", New Age International (P) Limited, New Delhi, 2010.
4. Todd D.K, Ground Water Hydrology, John Wiley and Sons, New York, 2000.

On line links

1. Water Distribution System:3 Methods of Water Distribution & 4 Distribution Networks (dreamcivil.com)
2. Water Distribution Systems - Bing video

Pre-Engineered Buildings
Professional Elective-VI

B. Tech IV Year I Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A57010	PEC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Design of Steel Structures & Structural Analysis

Course Objectives

1. To understand the difference between conventional and pre-engineered buildings
2. To explain the primary systems of pre-engineered buildings
3. To demonstrate the design of PEB frame under the influence of various loads
4. To distinguish the design parameters of PEB frames.
5. To judge the PEB frame connection design methodology.

Course Outcomes

At the end of the course the students will be able to

CO 1: Understand the difference between conventional and pre-engineered buildings.
CO 2: Explain the primary systems of pre-engineered buildings
CO 3: Demonstrate the design of PEB frame under the influence of various loads
CO 4: Distinguish the design parameters of PEB Frames.
CO 5: Judge the PEB frame connection design methodology.

UNIT-I

Pre-Engineered Buildings: Introduction, history, Advantages of PEB, Applications of PEB, Materials used for manufacturing of PEB, difference between conventional steel buildings and pre-engineered buildings.

UNIT-II

Pre-Engineered Building Components: Primary System: Main frames, Gable End Frame - Secondary frame system: Sizes and Properties of Purlins & Girts – Bracing System: Rod, angle, Portal, Pipe bracing – Sheeting and Cladding: Roof Sheeting and Wall sheeting – Accessories: Turbo Ventilators, Ridge vents, Sky Lights, Louvers, Insulation, Stair cases.

UNIT-III

Design Loads On Pre-Engineered Buildings: Design of PEB frame under the influence of Dead, Live, Collateral, Wind, Seismic and Other applicable Loads. Serviceability Limits as per code.

UINIT-IV

PEB Design Methodology: Design Parameters of PEB Frames - Depth of the section, Depth to Flange width ratios, Thickness of Flange to thickness of Web ratio. d/tw, bf/tf ratios of sections as per IS code. Section Sizes as per Manufacturing Limitations. Analysis and Design of Rigid Frames.

UNIT-V

PEB Frame Connection Design Methodology: Rigid Frame Moment Connection, Shear Connection, High strength bolts & grades, Lever arm, bolt Patten its effect on connection design, thickness of connection plate. Selection of governing forces for connection design.

Textbooks

1. Pre-Engineered Steel Building, K.S. Vivek and P.Vyshnavi, LAP Lamdert Academic Publishing.
2. Metal building systems: Design and Specifications, Third edition, Alexander Newman, McGraw- Hill Education

References

1. AISC: American Institute Of Steel Construction, Manual Of Steel Construction, Allowable Stress Design.
2. Technical Manual- Kirby Building system, August 2016 PEB Steel Buildings Co., Ltd

IS Codes

1. Design. IS 875: Part 1 to 5 Code Of Practice For Design Loads (Other Than Earthquake) For Buildings and Structures.
2. IS: 875 (Part 1) – 1987 Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures (Dead Load)
3. IS: 875 (Part 2) – 1987 Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures (Imposed Load)
4. IS: 875 (Part 3) – 1987 Code of Practice for Design Loads (Other than Earthquake) for Buildings And Structures (Wind Load)
5. IS1893 Part I Criteria for Earthquake Resistant Design Of Structures – part I. General Provisions And Buildings
6. IS: 800- 2007: General Construction in Steel – Code of Practice

Earth Retaining Structures

Professional Elective-VI

B. Tech IV Year I Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A57011	PEC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Geotechnical Engineering, Foundation Engineering

Course Objectives

1. To understand lateral earth pressure theories and design of retaining walls.
2. To design anchored bulkheads by different methods.
3. To understand pressure envelops and design of braced cuts and cofferdams.
4. To understand stability of earth dams and its protection and construction.
5. To get the exposure on the soil reinforcement and utility in Retaining Structure

Course Outcomes

At the end of the course the students will be able to.

CO 1: Evaluate the lateral earth pressure based on various theories

CO 2: Design the anchored bulkheads using available methods

CO 3: Study the stability of earth dam in relevant to the critical cases

CO 4: Understand the importance of construction and protection of earthen dams

CO 5: Analyze the stability of earth retaining structures

UNIT-I

Lateral Pressure: Determining active and passive pressures: Culmanns, Rebhan's, logarithmic spiral methods, friction circle method. Consideration of surcharge, seepage, earth quake, wave effect, stratification, type of backfill, wall friction and adhesion.

UNIT-II

Anchored bulkheads: Classification of anchored bulkheads, free and fixed earth support methods. Rowe's theory for free earth supports and equivalent beam methods for fixed earth supports. Design of anchored rods and deadman.

UNIT-III

Earth dams- Stability analysis: Classification, seepage control in embankments and foundations, seepage analysis, stability analysis: upstream and down stream for steady seepage, rapid draw down, end of construction, method of slices and Bishop's method

UINIT-IV

Earth dams -Protection & Construction: Slope protection, filters, embankment construction materials and construction, quality control, grouting techniques. Instrumentation and performance observations in earth dams

UNIT-V

Principles of soil reinforcement: Principles of soil reinforcement; Design and construction of geosynthetic reinforced soil retaining structures – walls and slopes, Codal provisions

Textbooks

1. Basic & Applied soil mechanics – Gopal Ranjan & ASR Rao, New Age International Publishers, 2011.
2. Embankment Dams by Sharma Hd, Publisher: India Book House(IBH) Limited,1991
3. Engineering for Embankment Dams By B. Singh & R. S. Varshney, A A Balkema Publishers, 1995
4. Earth Reinforcement and Soil Structures by Colin John Francis Phillip Jones, Butterworths & Co.

References

1. Foundation design by W. C. Teng, Prentice Hall,1962
2. Analysis and design of foundations by Bowles. J. W McGraw Hill, 4th edition, 1955.
3. Earth and Rock-Fill Dams: General Design and Construction Considerations by United States Army Corps of Engineers, University Press of the Pacific, 2004
4. Soil mechanics in engineering and practice by Karl Terzaghi, Ralph B. Peck, Gholamreza Mesri, 3rd Edition. Wiley India Pvt Ltd, 2010.
5. Reinforced Soil Engineering: Advances in Research and Practice by Hoe I. Ling, Dov Leshchinsky, Fumio Tatsuoka, Marcel Dekker, Inc.

Ground Water Development and Management
Professional Elective-VI

B. Tech IV Year I Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A57012	PEC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Hydrology and water resources Engineering, Irrigation Engineerign

Course Objectives

1. Understand flow towards wells in confined and unconfined aquifers.
2. Understand the principals involved in design and construction of wells.
3. Create awareness on improving the groundwater potential
4. Know the importance of saline water intrusion in coastal aquifers
5. Appreciate various geophysical approaches for groundwater exploration

Course Outcomes

At the end of the course the students will be able to

CO 1: Analyse radial flow towards wells in confined and unconfined aquifers
CO 2: Design wells and understand the construction practices.
CO 3: Take effective measures for controlling saline water intrusion.
CO 4: Determine the process of artificial recharge
CO 5: Interpret geophysical exploration data for scientific source finding of aquifers.

UNIT-I

Introduction: Groundwater in the hydrologic cycle, groundwater occurrence, aquifer parameters and their determination, general groundwater flow equation. Well Hydraulics Steady radial flow and unsteady radial flow to a well in confined and unconfined aquifers, Theis solution, Jocob and Chow's methods, Leaky aquifers.

UNIT-II

Well Design Water well design-well diameter, well depth, well screen-screen length, slot size, screen diameter and screen selection, design of collector wells, infiltration gallery.

UNIT-III

Saline Water Intrusion in aquifer: Occurrence of saline water intrusions, Ghyben- Herzberg relation, Shape of interface, control of seawater intrusion. Groundwater Basin Management: Concepts of conjunction use, Case studies.

UINIT-IV

Artificial Recharge: Concept of artificial recharge of groundwater, recharge methods- basin,stream-channel, ditch and furrow, flooding and recharge well methods, recharge mounds and induced recharge. Saline Water Intrusion Occurrence of saline water intrusion, Ghyben- Herzberg relation, Shape of interface, control of saline water intrusion.

UNIT-V

Geophysics: Surface methods of exploration of groundwater – Electrical resistivity and Seismic refraction methods, Sub-surface methods – Geophysical logging and resistivity logging. Aerial Photogrammetry applications.

Textbooks

1. Groundwater' by Raghunath H M, New Age International Publishers, 2005.
2. Groundwater Hydrology 'by Todd D.K., Wiley India Pvt Ltd., 2014.
3. Groundwater Hydrology 'by Todd D K and L W Mays, CBS Publications, 2005.

References

1. Groundwater Assessment and Management' by Karanth K R, Tata McGraw Hill Publishing Co., 1987.
2. 'Groundwater Hydrology' by Bouwer H, McGraw Hill Book Company, 1978.
3. 'Groundwater Systems Planning and Management' by Willis R and W.W.G. Yeh, Prentice Hall Inc., 1986.
4. 'Groundwater Resources Evaluation' by Walton W C, Mc Graw Hill Book Company, 1978.

On line links

1. Geophysical Methods Used In Groundwater Exploration (ukessays.com)
2. Artificial Groundwater Recharge | U.S. Geological Survey (usgs.gov)
3. (PDF) Saline Water Intrusion: Its Management and Control (researchgate.net)

Industrial Wastewater and Management

Professional Elective-VI

B. Tech IV Year I Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A57013	PEC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites

Environmental Engineering

Course Objectives

1. To study the sources and characteristics of industrial wastewater
2. To impart the knowledge of various pollution prevention options.
3. To understand the various industrial wastewater treatment method.
4. To acquire the knowledge on operational problems of effluent treatment plants.
5. To impart an idea about waste treatment flow sheet for different industries

Course Outcomes

At the end of the course the students will be able to:

CO 1: Identify the industrial scenario in India.
CO 2: Provide pollution prevention and control strategies for industrial effluents.
CO 3: Explain various technologies for removal of pollutants.
CO 4: Design treatment plants to meet desired needs and imposed constraints.
CO 5: Recommend the pollution control methods for specific industries.

UNIT-I

Industrial scenario in India, Uses of water by Industry-sources, generation rates and Environmental Impacts, Regulatory Requirements, Characterization-Toxicity and Bioassay Tests.

UNIT-II

Prevention vs Control of Industrial Pollution, Source Reduction Techniques, Waste Minimization - Equalization - Neutralization - Floatation -Precipitation – Adsorption.

UNIT-III

Aerobic and Anaerobic Biological Treatment - Sequencing Batch Reactors - High-Rate Reactors - Chemical Oxidation – Fenton's Oxidation- Ozonation - Photocatalysis - Wet Air Oxidation - Evaporation - Ion Exchange - Membrane Technologies.

UINIT-IV

Individual and Common Effluent Treatment Plants -Zero Effluent Discharge Systems and Management of RO Rejects, Quality requirements for wastewater reuse – Industrial reuse, – Disposal of Effluent on Land & Water - Residual Management.

UNIT-V

Industrial Manufacturing Process - Description, Wastewater Characteristics, Source Reduction Options and Waste Treatment Flow Sheet for Textiles - Tanneries, Pulp and Paper, Metal Finishing, Pharmaceuticals, Sugar, and Distilleries.

Textbooks

1. S. C. Bhatia, Handbook of Industrial Pollution and Control, Volume I and II, CBS Publishers, New Delhi, 2003.
2. Metcalf & Eddy, "Wastewater engineering Treatment disposal reuse", Tata McGraw Hill,2002
3. Eckenfelder, W.W., "Industrial Water Pollution Control", McGraw-Hill 1999.

References

1. Wang L.K., Yung-Tse Hung, Howard H.Lo and Constantine Yapijakis, "Handbook of Industrial and Hazardous Wastes Treatment" , Marcel Dekker, Inc., USA, 2004.
2. World Bank Group, " Pollution Prevention and Abatement Handbook – Towards Cleaner Production" , World Bank and UNEP, Washington D.C., 1998
3. Paul L. Bishop, " Pollution Prevention:- Fundamentals and Practice" , Mc-Graw Hill International, Boston,2000.

Online links

1. https://nptel.ac.in/courses/105106119
2. https://nptel.ac.in/courses/116104045

Geospatial Technology Laboratory

<table>
<tr><th colspan="5">B. Tech IV Year I Semester</th><th colspan="4">Dept. of Civil Engineering</th></tr>
<tr><td rowspan="1">Code</td><td>Category</td><td colspan="3">Hours / Week</td><td>Credits</td><td colspan="3">Marks</td></tr>
<tr><td rowspan="2">A57201</td><td rowspan="2">ESC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>CIE</td><td>SEE</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>2</td><td>1</td><td>50</td><td>50</td><td>100</td></tr>
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Prerequisites

Triangulation, Photogrammetry & Remote sensing

Course Objectives

1. To impart the knowledge on the topo sheet.
2. To impart knowledge on existing topo data.
3. To impart knowledge on data sets.
4. To impart knowledge on spatial data.
5. To provide the knowledge of methods of the Digitization process.

Course Outcomes

At the end of the course, the students will be able to

CO 1: Identity, locate, and acquire spatial data pertinent to projects.
CO 2: Evaluate the appropriateness of the existing data sources.
CO 3: Understand the data creation process and create simple data sets.
CO 4: Create spatial data from tabular information that includes a spatial reference
CO 5: Perform 3D spatial analyses (attribute and spatial queries).

List of Experiments

1. Introduction to Geographical information systems & Layout of the map.
2. Geo referencing topo sheet and satellite image.
3. Database creation and analysis.
4. Generations of thematic maps.
5. Vector and Raster data analysis.
6. Land Use and Land Cover Mapping.
7. Elevation Analysis (3D).
8. Water Shed Analysis (3D).
9. Soil Strata Analysis (3D).

Computer Applications in Civil Engineering

B. Tech IV Year I Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A57202	ESC	L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	50	100

Prerequisites

C – Language, Design of Concrete Structure, Transportation Engineering, Geo-Technical Engineering, Construction Management.

Course Objectives

1. To gain knowledge on the development of RCC design procedures using a programming language.
2. To gain knowledge on the development of Steel design procedures using a programming language.
3. To understand and develop programs on various geotechnical related problems.
4. To understand and develop programs on various transportation related problems.
5. To gain knowledge how to schedule and develop a network in a construction project.

Course Outcomes

At the end of the course the students will be able

CO 1: To develop the program for RCC design problems.
CO 2: To construct a program for steel design problems.
CO 3: To develop the program on geotechnical related problems.
CO 4: To develop the program on transportation related problems.
CO 5: To create a schedule and network in a construction project.

List of Experiments

Note: The following list of programs need to be developed either using MS – Excel, or MS – Project, or C – Language, or MATLAB, or any other programming language.

Structural Engineering

1. Calculation of short and long term deflection of RC members as per IS 456:2000
2. Design of one-way and two-way slabs.
3. Design of Columns.
4. Design of rectangular and square footings.
5. Design of compression and tension members.

6. Design of rolled steel beams.

Geotechnical Engineering

7. Safe bearing capacity soil
8. Pressure bulb.
9. Quantity of seepage using Laplace equation

Transportation Engineering

10. Geometric Design of Highways (Super Elevation).
11. Pavement Design (Flexible or Rigid).
12. Stopping sight distance.

Construction Management

13. Develop the schedule for a construction project.
14. Develop a network analysis for a construction project.
15. Manage and control a construction project.

References

1. Greg Perry, "C Programming Absolute Beginner's Guide", Que Publishing 3rd edition.
2. Kernighan Brian W, "C Programming Language", Pearson, 2nd edition.
3. Holly Moore, "MATLAB For Engineers", Pearson, 5th edition.
4. William Palm, "MATLAB for Engineering Applications", Tata McGraw Hill, 4th edition.
5. George Lindfield and John Penny, "Numerical Methods Using MATLAB", Academic Press, 4th edition.
6. Bansal. R. K, Goel. A. K, Sharma. M. K, "MATLAB and its Applications in Engineering", Pearson Education, 2012.
7. Amos Gilat, "MATLAB-An Introduction with Applications", Wiley India.

IS Codes

1. IS 456 (2000) Plain and reinforced concrete—code of practice. Bureau of Indian Standards, New Delhi.
2. IS 800 (2007) General Construction in Steel – code of practice. Bureau of Indian Standards, New Delhi.
3. IS 808 (1989) Dimensions for Hot Rolled Steel Beams, Columns, Channel and angle Sections. Bureau of Indian Standards, New Delhi.

Industry Oriented Mini Project

B. Tech IV Year I Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A57230	PROJ	L	T	P	C	CIE	SEE	Total
		0	0	4	2	-	100	100

- The industry-oriented mini-Project is taken up during the vacation after III Year II Semester examinations.
- The mini- project report shall be evaluated in IV Year I Semester.
- The industry oriented mini project shall be submitted in report-form and should be presented before the committee, which shall be evaluated as SEE for 100 marks.
- The committee consists of the Head of the Department, Supervisor and a senior faculty member.

Course Objectives

1. To expose the students to industry practices
2. To correlate the theory to the practices adopted in construction

Course Outcomes

At the end of the course the students will be able to

CO 1: Understand the construction methods
CO 2: Differentiate the theory and the actual practices adopted in construction
CO 3: Examine the latest technologies adopted in the construction
CO 4: Asses the men and materials in Construction

Technical and Business Communication Skills

Open Elective-II

B. Tech IV Year II Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A58001	OEC	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Prerequisites

Technical English

Course Objectives

1. To understand and demonstrate writing and speaking processes through invention, organization, drafting, revision, editing, and presentation.
2. To understand the importance of specifying audience and purpose and to select appropriate communication choices.
3. To understand and appropriately apply modes of expression, i.e., descriptive, expositive, narrative, scientific, and self-expressive, in written, visual, and oral communication.
4. To participate effectively in groups with emphasis on listening, critical and reflective thinking, and responding.
5. To understand and apply basic principles of critical thinking, problem solving, and technical proficiency in the development of exposition and argument.

Course Outcomes

At the end of the course the students will be able to

CO 1: Understand and demonstrate the use of basic and advanced proper writing techniques.
CO 2: Proofread and edit copies of business correspondence.
CO 3: Use career skills that are needed to succeed such as using ethical tools, working collaboratively, observing business etiquette and resolving workplace conflicts.
Co 4: Plan successfully for and participate in meetings and conduct proper techniques.
CO 5: Develop interpersonal skills that contribute to effective and satisfying personal, social and professional relationships.

UNIT-I

Introduction: Communication-Defining communication, Process of communication, Communication Model, Objectives of communication, Principles of communication, Importance of Business communication, Importance Feedback.

UNIT-II

Verbal and Non-verbal Communication: Channels of communication, Types of communication, Dimensions of communication, Barriers to communication Verbal, Non-Verbal, Formal, Informal communication.

UNIT-III

Writing Communication Skills: Fundamental of Business writing, Format of Business, Types of Business letter, Inquiry letter, complaint letter Persuasive letter, Proposal, Report Writing.

UINIT-IV

Recruitment and Employment Correspondence: Employment Messages Writing Resume, Application letter, Writing the opening paragraph, Writing the closing paragraph, summarizing

UNIT-V

Business and Social Etiquette: Spoken skills Conducting Presentation, Oral presentation, Debates, Speeches, Interview, Group Discussion, English Pronunciation, Building Vocabulary. Barriers to Effective Communication and ways to overcome them, Listening: Importance of Listening.

Textbooks

1. K. K. Sinha, 'Business Communication', Taxmann's Publisher, Taxmann Publication Pvt Ltd, India, 2012.
2. Veera Kumar, Vikrant Kumar, 'Business Communication', Thakur Publication Pvt Ltd, 2016.

References

1. N. S. Raghunathan, B. Santhanam, 'Business Communication', Margham Publications, 4th Revised & Enlarged Edition, 2019.

Online links

https://nptel.ac.in/courses/109104031

Intellectual Property Rights
Open Elective-II

B. Tech IV Year II Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A58002	OEC	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Prerequisites
-

Course Objectives

1. To explain the concepts of intellectual property rights and related agencies.
2. To understand the purpose and functions of a trademark.
3. To analyze the process of copyright and procedure.
4. To understand the process of patent and patent issues.
5. To explore the trade secret and geographical indications of its protection.

Course Outcomes
At the end of the course the students will be able to

CO 1: Explain the concepts of intellectual property rights and related agencies
CO 2: Describe the purpose and functions of a trademark..
CO 3: Analyze the process of copyright and procedure.
Co 4: Understand the process of patent and patent issues.
CO 5: Explore the trade secret and geographical indications of its protection.

UNIT-I

Introduction to IPR:
Concept of intellectual property rights, importance of intellectual property rights. Types of intellectual property, international agencies, and treaties.

UNIT-II

Trademarks:
Concept of trademarks, purpose, and function of trademarks. Acquisition of trademark rights, protectable matter, selecting and evaluating trademark, trademark registration processes

UNIT-III

Law of copyrights:
Concept of copyright right, fundamentals of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration.

UINIT-IV

Law of patents:
Introduction to patent, foundation of patent law, patent searching process, ownership rights and transfer.

UNIT-V

Trade Secrets & Geographical Indication:
Law pertaining to trade secrets, determination of trade secrets. Trade secret litigation. Unfair competitions. Geographical Indication, concept of geographical indication, importance of geographical indication, new development of intellectual property rights

Textbooks

1. Deborah. E. Bouchoux,Intellectual property right, 5/e,2018,cengage learning.
2. Neeraj Pandey, Intellectual property right, PHI, 2019

References

1. Ramakrishna Chintakunta and M. Geethavani, Kindle e 2021
2. Prabuddha Ganguli,Intellectual Property Right:Unleashing the Knowledge Economy, 2/e, 2017 Tata Mc Graw Hill Publishing company Ltd

Python Programming
Open Elective-II

B Tech IV Year II Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A58016	OEC	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives
1. Understand the basics and function of Python Programming Language.
2. Understand the string operation and sequences used in Python Programming Languages.
3. Understand the data structures used in Python Programming Languages.
4. Know the classes and objects in Python Programming Language.
5. Use the reusability concepts in Python Programming Language.

Course Outcomes
At the end of this Data Structures course, students will be able to:

1. Apply control structures, functions and packages in Problem Solving. (L3)
2. Analyze various String handling functions and data structures(L4)
3. Model the object-oriented problems with classes and objects (L4)
4. Solve the problems by using Inheritance and polymorphism (L3)
5. Illustrate programs on Exception Handling and various packages(L3)

Unit-I

Introduction to Python:
Features of Python Language, Data Types, Operators, Expressions, Control Statement, Standard I/O Operations.

Functions and Modules:
Declaration and Definition Function Calling, More on Defining Functions, Recursive Functions, Modules, Packages in Python, Doc Strings.

Unit-II

Strings and Regular Expressions:
String Operations, Built-in String Methods and Functions, Comparing Strings, function in Regular Expression.

Sequence: List, Tuples, Dictionaries, Sets.

Unit-III

Introduction to Object Oriented Programming: Features of OOP,Merits and demerits of Object Oriented Programming Languages,Applications of OOP

Implementation of classes and objects in Python:

Classes and Objects, Class Method and Self Argument. The __init__Method, Class Variables and Object Variables, The __del__Method, Public and Private Data Members, Private Methods, Built-in Functions to Check, Get, Set and Delete Class Attributes, Garbage Collection (Destroying Objects).

Unit-IV

Implementation of Inheritance in Python:
Inheriting Classes in Python, Types of Inheritance, Abstract Classes and Interfaces, Meta class,
Implementation of Operator Overloading in Python:
Introduction, Implementing Operator Overloading, Overriding Methods
Exception Handling in Python:
Introduction, Exception hierarchy, Handling Exception, Multiple Except Blocks and Multiple Exceptions, Finally Block.

Unit-V

Python NumPy: NumPy ND array, Data Types, Functions of NumPy Array, NumPy Array Indexing, Mathematical Functions on Arrays in NumPy
Python Pandas: Pandas Features, Dataset in Pandas, Data Frames, Manipulating the Datasets, Describing a Dataset, group by Function, Filtering, Missing Values in Pandas, Concatenating Data Frames. Import data from csv file.
Introduction to Matplotlib:, Plot, Scatterplot, Introduction to Tkinter ,Date and Time Packages

Text Books

1.ReemaThareja,Python Programming using Problem Solving Approach, First Edition,Oxford Higher Eduction,2017

2.James Payne, Beginning Python using Python 2.6 and Python 3,1st Edition

Reference Books

1. Charles Dierach, Introduction to Computer Science using Python, 2013
2. https://www.programiz.com/python-programming
3. https://www.javatpoint.com/python-tutorial
4. https://www.geeksforgeeks.org/python-programming-language/

Instrumentation and Sensors

Open Elective-III

B. Tech IVYear II Semester					Dept. of Civil Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58004	**OEC**	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

1. To provide the concept of measurements, sensing and instrumentation.
2. To understand the installation and operation of the sensor.
3. To understand sensors and transducers.
4. To utilize sensors for measuring data.
5. To analyze sensor data measurement.

Course Outcomes

At the end of the course the students will be able to

CO1: Understand the fundamentals of measurement, sensing and instrumentation.
CO2: Learn the sensor installation and operation of sensors.
CO3: Understand the operation of sensors and transducers.
CO4: Utilize sensors for measuring data.
CO5: Interpret results and errors of sensor data.

UNIT-I

Fundamentals of Measurement, Sensing and Instrumentation: Definition of measurement and instrumentation, physical variables, common types of sensors, Describe the function of these sensors, Use appropriate terminology to discuss sensor applications; and qualitatively interpret signals from a known sensor type, types of instrumentation, Sensor Specifics, Permanent installations, Temporary Installations.

UNIT-II

Sensor Installation and Operation: Predict the response of sensors to various inputs, Construct a conceptual instrumentation and monitoring program, Describe the order and methodology for sensor installation; and Differentiate between types of sensors and their modes of operation and measurement and Approach to Planning Monitoring Programs, Define target, Sensor selection, Sensor siting, Sensor Installation & Configuration, Advanced topic, Sensor design, Measurement uncertainty.

UNIT-III

Sensors and Transducers: Definition, Classification & selection of sensors, Measurement of displacement using Potentiometer, LVDT & Optical Encoder, Measurement of force using strain gauge, Measurement of pressure using LVDT based diaphragm & piezoelectric sensor.

UINIT-IV

Sensors and measurements: Measurement of temperature using Thermistor, Thermocouple & RTD, Concept of thermal imaging, Measurement of position using Hall effect sensors, Proximity sensors: Inductive & Capacitive, Use of proximity sensor as accelerometer and vibration sensor, Flow Sensors: Ultrasonic & Laser, Level Sensors: Ultrasonic & Capacitive.

UNIT-V

Measurements and observations: Understanding various instruments from basics of instrumentation. Measurements and observations with equipment, analysis of observed data, Interpretation of results and errors involved in equipment and preparation of evaluation report.

Textbooks

1. Alan S Morris, Measurement and Instrumentation Principles, 3rd/e, Butterworth Hienemann, 2001.
2. David A. Bell, Electronic Instrumentation and Measurements 2nd/e, Oxford Press.

Referencebooks

1. S. Tumanski, Principle of Electrical Measurement, Taylor & Francis, 2006.
2. Ilya Gertsbakh, Measurement Theory for Engineers, Springer, 2010.
3. DVS Murthy, Transducers and Instrumentation, PHI 2nd Edition 2013.
4. D Patranabis, Sensors and Transducers, PHI 2nd Edition 2013.

On line links

1. https://en.wikipedia.org/wiki/Instrumentation
2. https://www.electronicsforu.com/technology-trends/tech-focus/advanced-sensors
3. https://www.electronicsforu.com/technology-trends/tech-focus/latest-sensors-applications
4. **https://www.astisensor.com**

Negotiation skills
Open Elective-III

B. Tech IVYear II Semester					Dept. of Civil Engineering			
Code	Category	Hours / Week			Credits	Marks		
A58005	OEC	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

1. To describe negotiation theories and required skills
2. To explain the various factors that affect the negotiation process and ethics
3. To understand the effective negotiation strategies and tactics
4. To identify negotiation practices towards building relationships
5. To understand various strategies for conflicts resolution.

Course Outcomes

At the end of the course the students will be able to

CO 1: Describe negotiation theories and required skills.
CO 2: Explain the various factors that affect the negotiation process and ethics
CO 3: Apply effective negotiation strategies and tactics for different scenarios.
Co 4: Identify negotiation practices towards building relationships.
CO 5: Evaluate various strategies for conflicts resolution

UNIT-I

Introduction to Negotiation
Introduction, Concept of Negotiation, Characteristics of a Negotiating Situation, Basic Negotiation Skills, Interpersonal Skills in Negotiation, Theories of Negotiation

UNIT-II

Types and Ethics in Negotiation
Types of negotiations, principles of negotiation, steps of negotiation, Win-Win negotiation, negotiation tactics, factors affecting success in negotiation.
Ethics: definition, applying ethical reasoning, approaches to ethical reasoning

UNIT-III

Strategies and multiple parties and teams Negotiation

Fundamentals of negotiation, effective strategies to develop negotiation skills, anchoring / BATNA, nature of multi-party negotiation. Differences between two party and multi-party negotiation. Managing multiparty negotiation. Inter-team negotiations

UINIT-IV

Improving Negotiation skills
Enhancing communication skills for effective listening, persuasion & relationship building, establishing trust-building relationships.

UNIT-V

Managing Negotiation
Managing different types of negotiations, cross-cultural challenges in negotiations, Industrial negotiation: Collective Bargaining, arbitration, origins of conflict, dispute resolution

Textbooks

1. Essentials of Negotiation, 5th Edition, Roy J Lewicki, Bruce Barry, and David M Saunders, McGraw Hill, 2020
2. Beverly DeMarr and Suzanne De Janasz (2013).Negotiation and Dispute Resolution, Prentice Hall, 2013.

References

1. .Malhotra, Deepak, Negotiating the Impossible: How to Break Deadlocks and Resolve ugly Conflicts (without money or muscle). Oakland, CA: Berrett-Koehler Publishers, 2016

Introduction to Machine Learning
Open Elective-III

BTech IV Year II Semester					Dept. of Civil Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
		L	T	P	C	CIE	SEE	Total
A58099	**OEC**	3	0	0	3	40	60	100

Course Objectives

1. Understand the basic concepts of machine learning systems
2. Apply and evaluate supervised machine learning algorithms
3. Apply and evaluate unsupervised learning algorithms for clustering tasks.
4. Understand and evaluate different types of these algorithms for better prediction.
5. Understand and Design Artificial Neural Networks computational model

Course Outcomes

At the end of this course, students will be able to:

CO 1: Understand the concepts of machine learning
CO 2: Design and evaluate different types of supervised learning algorithms
CO 3: Design and evaluate different types of unsupervised learning algorithms
CO 4: Design and evaluate strong learners for better real time prediction
CO 5: Design Artificial neural networks computational model

UNIT-I

Machine Learning: Introduction, Definition and Applications, Types of Machine Learning Models - Supervised, Unsupervised, Reinforcement learning, Applications, State-of-the-art Languages and Tools, Preparing to Model: Basic Types of Data, Exploring Structure, Data Quality and Remediation. Model Representation: Overfitting and Underfitting, Bias–variance trade-off
Feature Engineering: Feature Transformation, Feature Extraction and Feature Selection Process

UNIT-II

Supervised Learning: Applications. Classification and Regression Tasks, Evaluating performance of classification and regression models, Classification Algorithms: k-Nearest Neighbor, Decision Tree. Regression Algorithms: Simple Linear Regression, Multiple Linear Regression, Logistic Regression

UNIT-III

Unsupervised Learning: Applications, Clustering task, Different types of Clustering techniques: K-Means Clustering, K-medoids, Agglomerative Hierarchical Clustering, Evaluating performance of clustering models.

UNIT-IV

Bayesian Learning: Bayes' Theorem and Concept Learning: Brute-force algorithm, Consistent Learners, Bayes Optimal Classifier, Naïve Bayes Classifier, Bayesian Belief Networks
Ensemble Learning: Bootstrap Aggregation (Bagging) - Random Forest, Boosting - AdaBoost and Gradient Boost.

UNIT-V

Artificial Neural Networks: Understanding the Biological Neuron, Exploring the Artificial Neuron, Types of Activation Functions, Early Implementations of ANN. Architectures of Neural Network: Single-layer feed forward network, Multi-layer feed forward network, Competitive network, Recurrent Network. Learning Process in ANN. Back propagation algorithm

Text Books

1. Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, *Machine Learning*, 2019, Pearson
2. Tom M. Mitchell, —*Machine Learning*, McGraw-Hill Education (India) Private Limited, 2013

References

1. Andreas C. Müller, Sarah Guido, *Introduction to Machine Learning with Python*, O'Reilly Media, Inc, October 2016
2. Ethem Alpaydin — *Introduction to Machine Learning (Adaptive Computation and Machine Learning)*, The MIT Press 2004
3. Aurélien Géron, *Hands on Machine Learning with Scikit-Learn, Keras, and TensorFlow Concepts, Tools, and Techniques to Build Intelligent Systems*, O'Reilly Media, Inc 2019

Seminar

B. Tech IV Year II Semester					Dept. of Civil Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58201	**PROJ**	L	T	P	C	CIE	SEE	Total
		0	0	4	2	100	-	100

- The student shall collect the information on a specialized topic of their choice and prepare a technical report and present a seminar showing their understanding of the topic.
- It shall be evaluated by the committee consisting of Head of the Department, seminar supervisor and a senior faculty member.
- The seminar report shall be evaluated as CIE for 100 marks.

Course Objectives

To acquire knowledge of literature review, writing a comprehensive report and presenting a seminar.

Course Outcomes

At the end of the course the students will be able to

CO 1: Identify appropriate topic of relevance.
CO 2: Illustrate the literature on technical articles of selected topic
CO 3: Examine the innovations and methodologies from the literature
CO 4: Defend the innovative ideas and formulate the technical gaps in the research
CO 5: Write a comprehensive technical report and present a seminar.

Comprehensive Viva

B. Tech IV Year II Semester					Dept. of Civil Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58202	**PROJ**	L	T	P	C	CIE	SEE	Total
		0	0	0	2	-	100	100

- The comprehensive viva-voce shall be conducted by a committee consisting of the Head of the Department and two senior faculty members of the department.
- The comprehensive viva is intended to assess the students understanding of the courses studied during the B. Tech. program.
- The comprehensive viva-voce is evaluated as SEE for 100 marks.

Course Objectives

To test the subject knowledge gained by the students during their course of study

Course Outcomes

At the end of the course the students will be able to

CO 1: Review the subject knowledge of the courses
CO 2: Showcase the their understanding the various topics that they studied

Project Work

<table>
<tr><th colspan="5">B. Tech IV Year II Semester</th><th colspan="4">Dept. of Civil Engineering</th></tr>
<tr><td rowspan="1">Code</td><td>Category</td><td colspan="3">Hours / Week</td><td>Credits</td><td colspan="3">Marks</td></tr>
<tr><td rowspan="2">A58203</td><td rowspan="2">PROJ</td><td>L</td><td>T</td><td>P</td><td>C</td><td>CIE</td><td>SEE</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>20</td><td>10</td><td>50</td><td>50</td><td>100</td></tr>
</table>

- The project work is a work done on the topic of common interest of a group students.
- The project shall be evaluated for 100 marks, 50 marks shall be for CIE and 50 marks for the SEE.
- The CIE shall be based on two seminars given by each student on the topic of their project.
- The SEE shall be based on viva voce conducted by a committee consisting of (i) External examiner appointed by Dean (Examinations) on the recommendation of Chairperson, BOS, (ii) Head of the department, (iii) Supervisor of the project and (iv) a senior faculty member of the department.
- The evaluation of project work shall be conducted at the end of the IV Year II Semester.
- Broadly the report shall include: Introduction, Literature Review, Problem definition, Data collection and analysis, Results (Numerical / Experimental), Conclusions and discussions.

Course Objectives

To showcase an innovative idea on a chosen topic.

Course Outcomes

At the end of the course the students will be able to

CO 1: Understand the literature on a chosen topic
CO 2: Improve the communication skills of team members
CO 3: Use modern tools in the field of Civil Engineering
CO 4: Acquaint research methods and innovative tools to solve a problem

Department of Electrical & Electronics Engineering

BoS Meeting

Date:14-11-2022

The Members of the BoS,

EEE Department, Anurag University.

The BoS meeting of EEE department, Anurag University scheduled on 15/11/22 at 11.00 AM through online mode. I request all members of the BoS to attend the meeting in online.

Agenda Points of BoS meeting

Point-1: Approval to the IV B-Tech syllabus of R-20 regulation under Anurag University.

Point-2: To finalize panel of examiners for paper setting and evaluators for B.Tech, M.Tech and Ph.D examinations

Point-3: Any other matters with the permission of chair.

Thank You

Chairman BoS

Prof. L. Raja Sekhar Goud

Copy to:
PA to VC,
PA to Registrar,

Dean-SoE,
Dean-AP,
CEO Office.

ANURAG UNIVERSITY

(Formerly Anurag Group of Institutions)

Venkatapur (V), Ghatkesar (M), Medchal dist.

Department of Electrical and Electronics Engineering

Date: 15th November 2022

Minutes of Meeting

Agenda: To approve the Syllabus of IV BTech (EEE) –I and II semester Subjects of R20 Regulations.

List of BOS members present

S.No	Name	Designation	Present
1	Prof. L. Rajasekhar Goud	Professor, Chairman of BOS	present
2	Dr. T. Anil Kumar	HOD	present
3	Dr. M. Vinod Kumar	Professor	present
4	Dr. G. Yesuratnam	Professor	Absent
5	Dr. K. Siva Kumar	Assoc. Professor	present
6	Dr. Sudha Radhika	Asst. Professor	present
7	Mr. Chow Reddy	Product Development Engg	present
8	Dr. G. Venu Madhav	Assoc. Professor	present

9	Dr. C. Nagamani	Assoc. Professor	Absent
	Dr.P.Nagaraju Mandadi	Assoc. Professor	present
10	Mr. T. Dinesh	Asst. Professor	present
11	Mr. MD. Yaseen	Asst. Professor	present
12	Mrs. S. Saraswathi	Asst. Professor	Absent
13	Dr. P. Harish	Assoc. Professor	present
14	Mr. Ch. Srinivasa Rao	Assoc. Professor	present
15	Mr. Sai Preetham Sridhara	Alumni	present

The external BOS member are suggested the following modifications in the syllabus of few courses:

1.In **Power Systems Analysis** subject suggested to remove formation of Zbus from UNIT-1 and Per unit system of UNIT –III shall be included in the same unit(i.e. UNIT-1).

2. In **Power Semiconductor Drives** course suggested to compress UNIT-I, UNIT-II and UNIT-III into two units (i.e. I &II UNITS).

The external BOS members are suggested the modifications in the course syllabus of **Power Systems Analysis** and **Power Semiconductor Drives** and same are incorporated in the respective syllabus.

Program Structure and Syllabus of B. Tech IV-Year (I & II Semesters)

Electrical & Electronics Engineering

R20 Regulations

ANURAG UNIVERSITY

Venkatapur (V), Ghatkesar (M), Medchal-Malkajgiri (Dt.),
Hyderabad, Telangana, INDIA

info@anurag.edu.in; https://anurag.edu.in

IV YEAR I SEMESTER **COURSE STRUCTURE**

S. No.	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1	A57014	PCC	Power System Analysis	3	0	0	3
2	A57015	PCC	Power Semiconductor Drives	3	0	0	3
3	A57016	PEC-III	1. Electrical Distribution Systems	2	0	0	2
	A57017		2. Flexible Alternating Current Transmission System				
	A57018		3. Electromagnetic Waves				
4	A57019	PEC-IV	1. Electrical and Hybrid Vehicles	3	0	0	3
	A57020		2. Power System Dynamics and Control				
	A57021		3. HVDC Transmission Systems				
5	A57022	PEC-V	1. High Voltage Engineering	3	0	0	3
	A57023		2. Smart Grid Technologies				
	A57024		3. AI Techniques in Electrical Engineering				
6	A57025	PEC-VI	1. Utilization of Electrical Energy	3	0	0	3
	A57026		2. Electrical Energy Conservation and Auditing				
	A57027		3. Digital Control Systems				
7	A57203	PCC	Power Systems and Simulation Lab	0	0	3	1.5
8	A57204	PCC	Microprocessor & Microcontroller Lab	0	0	3	1.5
9	A57230	PCC	Industry Oriented Mini Project	0	0	4	2
TOTAL				**17**	**00**	**10**	**22**

IV YEAR II SEMESTER **COURSE STRUCTURE**

S.No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1	A58007	OE-II	1. Entrepreneurship Development.	2	1	0	3
	A58008		2. Project Management.				
	A58001		3. Technical and Business Communication.				
2	A58002	OE-III	1. Intellectual Property Rights.	2	1	0	3
	A58009		2. Internet of Things.				
	A58040		3. Nano Science and Nano Technology.				
3	A58201	PROJ	Seminar	0	0	4	2
4	A58202	PROJ	Comprehensive Viva Voce	0	0	0	2
5	A58203	PROJ	Project Work	0	0	20	10
TOTAL				**04**	**02**	**24**	**20**

Power System Analysis

B. Tech IV Year I Semester					Dept. of Electrical & Electronics Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57014	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

Course Objectives of PSA are:

1. To give idea for the formation of Y-bus by different methods.
2. To provide comprehensive coverage of the power flow solution of an interconnected system using Gauss-Seidal method, NR and Fast Decoupled methods during normal operation.
3. To study fault analysis and symmetrical component theory.
4. To study power system steady state stabilities.
5. To study power system transient state stabilities.

Course Outcomes:

At the end of this PSA course, students will be able to:

1. Formulate different network matrices.
2. Analyze different load flow study methods.
3. Describe different types of faults in power systems and perform short circuit analysis.
4. Explain the concepts of steady state stability and its significance.
5. Analyze the transient stability of power system.

Unit-I:

Power System Network Matrices

Graph theory: Definitions, Bus incidence Matrix, Y_{bus} formation by direct and singular transformation methods, Numerical Problems.

Per unit system representation. Per unit equivalent reactance network of three phase Power System, Numerical Problems.

Unit –II:

Power Flow Studies

Necessity of power flow studies- data for power flow studies- derivation of static load flow equations- load flow solution using Gauss Seidel Method: Acceleration Factor, load flow solution with and without P-V buses, Algorithm and Flowchart, Numerical load flow Solution for Simple Power systems (Max 3- buses): Determination of Bus Voltages, Injected Active and Reactive Powers (one iteration only) and finding line flows and losses for the given Bus Voltages.

Newton Raphson Method in Rectangular and Polar Co-ordinates form: Load flow solution with or without PV busses- Derivation of Jacobian Elements, Algorithm and Flowchart. Decoupled and Fast Decoupled Methods - Comparison of Different Methods

Unit-III:

Short Circuit Analysis

Symmetrical fault Analysis: Short circuit current and MVA Calculations, Numerical Problems.

Symmetrical Component Theory: Symmetrical Component Transformation, Positive, Negative and Zero sequence components: Voltages, Currents and Impedances.

Sequence Networks: Positive, Negative and Zero sequence Networks, Numerical Problems.

Unsymmetrical Fault Analysis: LG, LL, LLG faults with and without fault impedances, Numerical Problems.

Unit-IV:

Power System Steady State Stability Analysis

Elementary concepts of Steady State, Dynamic and Transient Stabilities.

Description of Steady State Stability Power limit, Transfer Reactance, Synchronizing Power Coefficient, Power angle curve and determination of steady state stability and methods to improve steady state stability.

Unit-V:

Power System Transient State Stability Analysis

Derivation of Swing Equation, Determination of Transient Stability by Equal Area Criterion. Application of EAC, Critical Clearing Angle calculation. Solution of swing equation, Point by point method, Methods to improve transient state stability.

Text Books:

1. Modern Power System Analysis- I. J. Nagrath and D. P. Kothari, Tata McGraw-Hill Publishing Company, 2nd edition, 2003.

2. Computer Techniques in Power System Analysis - M. A. Pai, TMH Publications, 2nd edition, 2006.

3. Electrical power systems - by C. L. Wadhwa, New Age International (P) Limited Publishers, 1998.

Reference Books:

1. Computer Methods in Power System Analysis - G. W. Stagg & A. H. El-Abiad, International Student Edition, 1968.
2. Power System Analysis - Grainger and Stevenson, Tata McGraw-Hill Publishing Company, 1st Edition, 2003.
3. Power System Analysis - Hadi Saadat, Tata McGraw-Hill Publishing Company, 2nd Edition, 2002.

Power Semiconductor Drives

B. Tech IV Year I Semester					Dept. of Electrical & Electronics Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57015	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

Course Objectives of PSD are:

1. To learn DC Drives control by 1-Φ and 3-Φ controlled converters.
2. To understand four quadrant operation of DC drives using Dual converters and choppers.
3. To know control of Induction Motors from stator side.
4. To learn about the control of Induction Motors from rotor side.
5. To gain knowledge about control of Synchronous Motor drive using various Inverters.

Course Outcomes:

At the end of this PSD course, students will be able to:

1. Explain the principle of operation of 1-Φ and 3-Φ rectifier fed separately excited DC motor with necessary equations and wave forms.
2. Describe the four quadrant operation of DC drives when driven by dual converters and choppers.
3. Illustrate the concepts of speed control of induction motor from stator and rotor side.
4. Explain the concepts of speed control of induction motor from rotor side.
5. Describe the speed control of Synchronous motor through self and separate control.

Unit – I:

Control of DC Motors by Single Phase Converters

DC Motors and their performance characteristics, Four quadrant operation a drive- Introduction to Thyristor controlled Drives, 1-Φ Semi and Fully controlled converters connected to separately excited D.C Motor – continuous current operation - Output Voltage and Current waveforms, Voltage, Speed and Torque expressions, Speed - Torque Characteristics- numerical Problems.

Control of DC Motors by Three Phase Converters

3-Φ Semi and Fully controlled converters connected to separately excited D.C Motor – continuous current operation - Output Voltage and Current waveforms, Voltage, Speed and Torque expressions, Speed - Torque Characteristics- numerical Problems.

Unit – II:

Four Quadrant Operation of DC Motors by Dual Converters & Choppers

Introduction to phase controlled four quadrant operation – Four quadrant operation of D.C motors by Dual Converters – Closed loop operation of DC motor in motoring mode (Block Diagram Only). Single quadrant, two quadrant and four quadrant chopper fed separately excited dc motors – Continuous current operation, Output voltage and current wave forms, Voltage, Speed and torque expressions, speed - torque characteristics – numerical Problems.

Unit – III:

Control of Induction Motors-From stator side: Variable Voltage Control of Induction Motor by 3-Φ AC Voltage Controllers – Motoring and Braking modes of Operation, Introduction to V/f control of Induction motors, V/f Control of Induction Motors by Voltage Source Inverter and Current Source Inverter, numerical problems.

UNIT-IV:

Control of Induction Motors -From rotor side: Static Rotor resistance control- Slip power recovery Schemes – Static Scherbius and Static Kramer Drives.

Unit – V:

Control of Synchronous Motors

Separate & Self-control of Synchronous Motors, Operation of self-controlled synchronous motors by Voltage Source Inverter and Current Source Inverter – Load commutated CSI fed Synchronous Motor Operation, Output Voltage and Current Waveforms, Speed - Torque characteristics, Applications and Advantages.

Text Books:

1. Fundamentals of electric Drives – G K Dubey, Narosa publications, 2nd edition, 2002.
2. Elements of Electric Drives – J. B. Gupta, Rajeev Manglik and Rohit Manglik, S. K. Kataria and Sons, 2011.

Reference Books:

1. Electric Motor Drives – Modeling, Analysis and Control – R. Krishnan, Pearson Prentice Hall, 2007.
2. Power Electronics Circuits, Devices and applications - M. H. Rashid, Pearson Education - Third Edition – First Indian reprint 2004.
3. Modern Power Electronic and AC Drives - B. K. Bose, Pearson Publications - 1st Edition.

Electrical Distribution Systems

B. Tech IV Year I Semester					Dept. of Electrical & Electronics Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57016	PEC-III	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60	100

Course Objectives:

Course Objectives of EDS are:

1. To Know the principles of design and operation of electric distribution systems and feeders.
2. To understand the basic design of distribution substations.
3. To gain knowledge on the purpose of distribution system protection and the principle of coordination between various protective devices
4. To illustrate compensation methods for voltage drops and pf improvements.
5. To learn different voltage control methods.

Course Outcomes:

At the end of this EDS course, students will be able to:

1. Explain the general concepts about distribution systems and feeders
2. Describe the layout of substations and perform system analysis of radial networks and 3-Φ balanced lines.
3. Demonstrate the necessity of protection of various distribution system devices and illustrate coordination of various protective devices.
4. Explain the importance of power factor improvement
5. Describe the principle of various voltage control methods.

Unit – I:

General Concepts

Introduction to distribution systems, Load modeling and characteristics. Coincidence factor, contribution factor, loss factor - Relationship between the load factor and loss factor. Classification of loads (Residential, commercial, Agricultural and Industrial) and their characteristics.

Distribution Feeders: Design Considerations of Distribution Feeders: Radial and loop types of primary feeders, voltage levels, feeder loading; basic design practice of the secondary distribution system.

Unit – II:

Substations

Location of Substations: Rating of distribution substation, service area within primary feeders. Benefits derived through optimal location of substations.

System Analysis: Voltage drop and power-loss calculations: Derivation for voltage drop and power loss in lines, manual methods of solution for radial networks, three phase balanced primary lines.

Unit – III:

Protection

Objectives of distribution system protection, types of common faults and procedure for fault calculations. Protective Devices: Principle of operation of Fuses; Circuit Reclosures; Line Sectionalizers, and Circuit Breakers.

Coordination: Coordination of Protective Devices: General coordination procedure.

Unit – IV:

Compensation for Power Factor Improvement

Capacitive compensation for power-factor control. Different types of power capacitors, shunt and series capacitors, effect of shunt capacitors (Fixed and switched), Power factor correction, capacitor allocation - Economic justification - Procedure to Determine the best capacitor location.

Unit – V:

Voltage Control

Voltage Control: Equipment for voltage control, effect of series capacitors, effect of AVB/AVR, line drop Compensation.

Text Books:

1. Electric Power Distribution system, Engineering – Turan Gonen, McGraw-Hill Book Company, 1986.
2. Electric Power Distribution – A. S. Pabla, Tata McGraw-Hill Publishing Company, 4th Edition, 1997.

Reference Books:

1. Electrical Power Distribution and Automation - S. Sivanagaraju, V. Sankar, Dhanpat Rai & Co., 2006.
2. Electrical Power Distribution Systems - V. Kamaraju, Tata McGraw-Hill Education, 2009.
3. Electrical Power Distribution and Automation by S. Ram Murthy, PHI Publications.

Flexible Alternating Current Transmission System

B. Tech IV Year I Semester					Dept. of Electrical & Electronics Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57017	PEC-III	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60	100

Course Objectives:

Course Objectives of FACTS are:

1. To study the characteristics of AC transmission and the effect of Shunt and Series Compensation
2. To learn the working principle of shunt devices and their operating characteristics
3. To know the difference between shunt and series FACT devices
4. To acquire the knowledge of VSC based series FACTS controllers
5. To study the application of FACTS devices for Power System Control.

Course Outcomes:

At the end of this FACTS course, students will be able to:

1. Understand the characteristics of AC transmission and the effect of Shunt and Series Compensation
2. Understand the working principle of shunt devices and their operating characteristics
3. Compare the difference between shunt and series FACT devices
4. Explain the application of FACTS devices
5. Identify the application of FACTS devices for Power System Control

Unit –I:

Transmission Lines and Series/Shunt Reactive Power Compensation

Basics of AC Transmission. Analysis of uncompensated AC transmission lines. Passive Reactive Power Compensation. Shunt and series compensation at the mid-point of an AC line. Comparison of Series and Shunt Compensation.

Unit –II:

Thyristor-based Flexible AC Transmission Controllers (FACTS)

Description and Characteristics of Thyristor-based FACTS devices: Static VAR Compensator (SVC), Thyristor Controlled Series Capacitor (TCSC), Thyristor Controlled Braking Resistor and

Single Pole Single Throw (SPST) Switch. Configurations/Modes of Operation, Harmonics and control of SVC and TCSC. Fault Current Limiter.

Unit –III:

Voltage Source Converter based shunt (FACTS) controllers

Voltage Source Converters (VSC): Six Pulse VSC, Multi-pulse and Multi-level Converters, Pulse-Width Modulation for VSCs. Selective Harmonic Elimination, Sinusoidal PWM and Space Vector Modulation. STATCOM

Unit –IV:

Voltage Source Converter based series (FACTS) controllers:

Principle of Operation, Reactive Power Control: Type I and Type II controllers, Static Synchronous Series Compensator (SSSC) and Unified Power Flow Controller (UPFC): Principle of Operation and Control. Working principle of Interphase Power Flow Controller. Other Devices: GTO Controlled Series Compensator. Fault Current Limiter.

Unit –V:

Application of FACTS

Application of FACTS devices for power-flow control and stability improvement. Simulation example of power swing damping in a single-machine infinite bus system using a TCSC. Simulation example of voltage regulation of transmission mid-point voltage using a STATCOM.

Text Books:

1. K. R. Padiyar, "FACTS Controllers in Power Transmission and Distribution", New Age International (P) Ltd. 2007.
2. R. C. Dugan, "Electrical Power Systems Quality", McGraw Hill Education, 2012.

References Books:

1. T. J. E. Miller, "Reactive Power Control in Electric Systems", John Wiley and Sons, New York, 1983.
2. G. T. Heydt, "Electric Power Quality", Stars in a Circle Publications, 1991
3. N. G. Hingorani and L. Gyugyi, "Understanding FACTS: Concepts and Technology of FACTS Systems", Wiley-IEEE Press, 1999.

Electromagnetic Waves

B. Tech IV Year I Semester					Dept. of Electrical & Electronics Engineering			
Code	Category	Hours / Week			Credits	Marks		
A57018	PEC-III	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60	100

Course Objectives:

Course Objectives of EMV are:

1. To learn the concepts of distributed elements in transmission lines and estimate voltage and current at any point on transmission line for different load conditions.
2. To study the solution to real life plane wave problems for various boundary conditions.
3. To provide field equations for the wave propagation in special cases such as lossy and low loss dielectric media.
4. To study the plane waves in different media interface to calculate phase and velocity in different media
5. To analyze TE and TM mode patterns of field distributions in a rectangular wave-guide. Understand and analyze radiation by antennas.

Course Outcomes:

At the end of this EMV course, students will be able to:

1. Analyze transmission lines and estimate voltage and current at any point on transmission line for different load conditions.
2. Provide solution to real life plane wave problems for various boundary conditions.
3. Analyze the field equations for the wave propagation in special cases such as lossy and low loss dielectric media.
4. Analyze the plane waves in different media interface to calculate phase and velocity in different media
5. Visualize TE and TM mode patterns of field distributions in a rectangular wave-guide. Understand and analyze radiation by antennas.

Unit-I:

Transmission Lines

Introduction, Concept of distributed elements, Equations of voltage and current, Standing waves and impedance transformation, Lossless and low-loss transmission lines, Power transfer on a transmission line, Analysis of transmission line in terms of admittances, Transmission line calculations with the help of Smith chart, Applications of transmission line, Impedance matching using transmission lines.

Unit-II:

Maxwell's Equations

Basic quantities of Electro magnetics, Basic laws of Electro magnetics: Gauss's law, Ampere's Circuital law, Faraday's law of Electromagnetic induction. Maxwell's equations, Surface charge and surface current, Boundary conditions at media interface.

Unit-III:

Uniform Plane Wave

Homogeneous unbound medium, Wave equation for time harmonic fields, Solution of the wave equation, Uniform plane wave, Wave polarization, Wave propagation in conducting medium, Phase velocity of a wave, Power flow and Poynting vector.

Unit-IV:

Plane Waves at Media Interface

Plane wave in arbitrary direction, Plane wave at dielectric interface, Reflection and refraction of waves at dielectric interface, Total internal reflection, Wave polarization at media interface, Brewster angle, Fields and power flow at media interface, Lossy media interface, Reflection from conducting boundary.

Unit-V:

Waveguides

Parallel plane waveguide: Transverse Electric (TE) mode, Transverse Magnetic (TM) mode, Cut-off frequency, Phase velocity and dispersion. Transverse Electromagnetic (TEM) mode, Analysis of waveguide-general approach, Rectangular waveguides.

Text Books:

1. R. K. Shevgaonkar, "Electromagnetic Waves", Tata McGraw Hill, 2005.
2. D. K. Cheng, "Field and Wave Electromagnetics", Addison-Wesley, 1989.

Reference Books:

1. M. N. O. Sadiku, "Elements of Electromagnetics", Oxford University Press, 2007.
2. C. A. Balanis, "Advanced Engineering Electromagnetics", John Wiley & Sons, 2012.
3. C. A. Balanis, "Antenna Theory: Analysis and Design", John Wiley & Sons, 2005.

Electrical and Hybrid Vehicles

B. Tech IV Year I Semester					Dept. of Electrical & Electronics Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57019	PEC-IV	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

Course Objectives of EHV are:

1. To learn about the comprehensive overview of hybrid Electrical Vehicles.
2. To present about the Hybrid Electrical Drive Trains.
3. To understand about the configuration and control of Trains.
4. To know about Energy Storage requirements in Hybrid & Electric Vehicles.
5. To illustrate about Energy Management Strategies.

Course Outcomes:

At the end of this EHV course, students will be able to:

1. Explain the importance of hybrid and electric vehicles.
2. Illustrate the drive-train topologies of electric vehicles & hybrid vehicles.
3. Demonstrate the configuration and control of various electrical machines used in electric drive-trains.
4. Choose proper Energy Storage systems for vehicles applications.
5. Identify various energy management strategies.

Unit- I:

Introduction:

Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, and mathematical models to describe vehicle performance.

Introduction to Hybrid Electric Vehicles: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

Unit- II:

Hybrid Electric Drive-Trains

Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis. Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.

Unit- III:

Electric Trains

Electric Propulsion unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

Unit- IV:

Energy Storage

Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices. Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems

Unit- V:

Energy Management Strategies

Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

Case Studies: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

Text Books:

1. Iqbal Hussein, Electric and Hybrid Vehicles, Design fundamentals, CRC Press 2003.
2. C. Mi, M. A. Masrur and D. W. Gao, “Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives”, John Wiley & Sons, 2011.

References Books:

1. James Lerminie, John Lowry, Electric Vehicle Technology, Explained Wiley, 2003.
2. S. Onori, L. Serrao and G. Rizzoni, “Hybrid Electric Vehicles: Energy Management Strategies”, Springer, 2015.
3. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, “Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design”, CRC Press, 2004.

Power System Dynamics and Control

B. Tech IV Year I Semester					Dept. of Electrical & Electronics Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57020	PEC-IV	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

Course Objectives of PSDC are:

1. To understand the concept of Control and Operation of Power System, Power System Dynamic Model.
2. To impart knowledge on modeling of Synchronous Machine Models, controllers.
3. To have knowledge on modeling of power system components.
4. To know the stability analysis of Power System.
5. To understand the planning measures of stability.

Course Outcomes:

At the end of this PSDC course, students will be able to:

1. Understand concept of Control and Operation of Power System.
2. Understand the Power System Dynamic Model to find solution with different technique.
3. Analyze the analysis of Synchronous Machine Models, excitation System, Speed Governing Model.
4. Discuss the modeling of Transmission Lines and Loads stability.
5. Analyze the angle stability and voltage of Power System.

Unit-I:

Introduction to Power System Operations

Introduction to power system stability. Power System Operations and Analysis of linear Dynamical Systems & Numerical Methods Control. Stability problems in Power System. Impact on Power System Operations and control.

Analysis of Linear Dynamical System and Numerical Methods

Analysis of dynamical System, Concept of Equilibrium, Small and Large Disturbance Stability. Modal Analysis of Linear System. Analysisusing Numerical Integration Techniques. Issues in Modeling: Slow and Fast Transients, Stiff System.

Unit-II:

Modeling of Synchronous Machines and Associated Controllers

Modeling of synchronous machine: Physical Characteristics. Rotor position dependent model. D-Q Transformation. Model with Standard Parameters. Steady State Analysis of Synchronous Machine. Short Circuit Transient Analysis of a Synchronous Machine. Synchronization of Synchronous Machine to an Infinite Bus. Modeling of Excitation and Prime Mover Systems. Physical Characteristics and Models. Excitation System Control. Automatic Voltage Regulator. Prime Mover Control Systems. Speed Governors.

Unit-III:

Modeling of Power System Components

Modeling of Transmission Lines and Loads. Transmission Line Physical Characteristics. Transmission Line Modeling. Load Models - induction machine model. Frequency and Voltage Dependence of Loads.

Unit-IV:

Stability Analysis

Angular stability analysis in Single Machine Infinite Bus System. Angular Stability in multi-machine systems – Intra-plant, Local and Inter-area modes. Frequency Stability: Centre of Inertia Motion. Load Sharing: Govern or droop. Single Machine Load Bus System: Voltage Stability. Introduction to Torsional Oscillations and the SSR phenomenon. Stability Analysis Tools: Transient Stability Programs, Small Signal Analysis Programs.

Unit-V:

Enhancing System Stability

Planning Measures. Stabilizing Controllers (Power System Stabilizers). Operational Measures-Preventive Control. Emergency Control.

Text Books:

1. K.R. Padiyar, "Power System Dynamics, Stability and Control", B. S. Publications, 2002.
2. P. Kundur, "Power System Stability and Control", McGraw Hill, 1995.

Reference Books:

1. P. Sauer and M. A. Pai, "Power System Dynamics and Stability", Prentice Hall, 1997
2. P.M .Anderson & A.A. Fouad, "Power System Control & Stability", IEEE Press
3. R. Ramanujam," Power System Dynamics", PHI publications.

HVDC Transmission Systems

B. Tech IV Year I Semester					Dept. of Electrical & Electronics Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57021	PEC-IV	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

Course Objectives of HVDC Transmission Systems are:

1. To understand the concepts of HVDC transmission, types of HVDC links, apparatus required for HVDC Transmission.
2. To get the Knowledge on analysis of various converters used in HVDC systems.
3. To study the concepts of Reactive power requirement and control in HVDC systems.
4. To introduce the concepts of Protection of various converters used in HVDC systems against over currents and voltages.
5. To gain the Knowledge on causes of harmonics and filter design concepts.

Course Outcomes:

At the end of this HVDC Transmission Systems course, students will be able to:

1. Classify different types of HVDC links, compare AC&DC Transmission systems.
2. Analyze various types of HVDC converters.
3. Identify the importance of reactive power control in HVDC systems and provide the solution for power flow problem in HVDC Network.
4. Categorize various types of converter faults and choose the type of protection scheme.
5. Investigate the causes of harmonics and design the suitable filter to mitigate concerned harmonics.

Unit – I:

Introduction to HVDC Transmission systems

Economics & Terminal equipment of HVDC transmission systems: Types of HVDC Links – Apparatus required for HVDC Systems – Comparison of AC &DC Transmission, Application of DC Transmission System – Planning & Modern trends in D.C Transmission.

Unit – II:

Analysis of HVDC Converters, Converter Control

Choice of Converter configuration – Analysis of Graetz – characteristics of 6 Pulse & 12 Pulse converters – Cases of two 3 phase converters in star –star mode – their performance.

Principal of DC Link Control – Converters Control Characteristics – Firing angle control – Current and extinction angle control.

Unit-III:

Reactive Power Control in HVDC & Power Flow Analysis

Reactive Power Requirements in steady state-Conventional control strategies-Alternate control strategies-sources of reactive power-AC Filters – shunt capacitors-synchronous condensers. Modeling of DC Links-DC Network-DC Converter-Controller Equations-Solution of DC load flow.

Unit-IV:

Converter Fault & Protection

Converter faults – protection against over current and over voltage in converter station – surge arresters – smoothing reactors – DC breakers –Audible noise-space charge field-corona effects on DC lines-Radio interference.

Unit –V:

Harmonics & Filters

Generation of Harmonics – Characteristics harmonics, calculation of AC Harmonics, Non-Characteristics harmonics, adverse effects of harmonics – Calculation of voltage & Current harmonics – Effect of Pulse number on harmonics.

Types of AC filters, Design of Single tuned filters –Design of High pass filters.

Text Books:

1. HVDC Transmission – S. Kamakshaiah and V. Kamaraju – TMH – 2011.
2. EHVAC and HVDC Transmission Engineering and Practice – S. Rao, Khanna Publishers, 1990.

Reference Books:

1. HVDC Transmission – J. Arrillaga, IEE, 2nd Edition, 1998.
2. Direct Current Transmission – E. W. Kimbark, Volume I, John Wiley & Sons, 1971.
3. Power Transmission by Direct Current – E. Uhlmann, B. S. Publications.
4. HVDC Power Transmission Systems: Technology and system Interactions – K. R. Padiyar, New Age International (P) Limited, 1990.

High Voltage Engineering

B. Tech IV Year I Semester					Dept. of Electrical & Electronics Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57022	PEC-V	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

Course Objectives of HVE are:

1. To know High Voltage Engineering & its applications.
2. To get the knowledge of dielectric materials.
3. To study the generation and measurement of high voltages and currents.
4. To understand the over voltage phenomena and insulation co-ordination.
5. To understand the need for testing high voltage equipment's for their withstanding capability.

Course Outcomes:

At the end of this HVE course, students will be able to:

1. Explain the concepts of high voltage technology and its applications.
2. Describe the properties and applications of gaseous, liquid and solid dielectrics.
3. Explain the concepts of generation and measurement of high voltages and currents.
4. Analyze the over voltage phenomena and insulation coordination.
5. Describe the methods of high voltage testing of materials and electrical apparatus.

Unit I:

Introduction to High Voltage Technology and Applications

Electric Field Stresses, Gas / Vaccum as Insulator, Liquid Dielectrics, Solids and Composites, Estimation and Control of Electric Stress, Numerical methods for electric field computation, Surge voltages, their distribution and control, Applications of insulating materials in transformers, rotating machines, circuit breakers, cable power capacitors and bushings.

Unit II:

Break Down in Gaseous, Solid and Liquid Dielectrics

Gases as insulating media, collision process, Ionization process, Townsend's criteria of breakdown in gases, Paschen's law. Liquid as Insulator, pure and commercial liquids, breakdown in pure and commercial liquids. Intrinsic breakdown, electromechanical breakdown, thermal breakdown,

breakdown of solid dielectrics in practice, Breakdown in composite dielectrics, solid dielectrics used in practice.

Unit III:

Generation and Measurements of High Voltages and Currents

Generation of High Direct Current Voltages, Generation of High alternating voltages, Generation of Impulse Voltages, Generation of Impulse currents, Tripping and control of impulse generators. Measurement of High Direct Current voltages, Measurement of High Voltages alternating and impulse, Measurement of High Currents-direct, alternating and Impulse, Oscilloscope for impulse voltage and current measurements.

Unit IV:

Over Voltage Phenomenon and Insulation Co-ordination

Natural causes for over voltages – Lightning phenomenon, Overvoltage due to switching surges, system faults and other abnormal conditions, Principles of Insulation Coordination on High voltage and Extra High Voltage power systems.

Unit V:

Non-Destructive and High Voltage Testing of Material and Electrical Apparatus

Measurement of D.C Resistivity, Measurement of Dielectric Constant and loss factor, Partial discharge measurements. Testing of Insulators and bushings, Testing of Isolators and circuit breakers, Testing of cables, Testing of Transformers, Testing of Surge Arresters, Radio Interference measurements.

Text Books:

1. High Voltage Engineering - M. S. Naidu and V. Kamaraju – TMH Publications, 3rd Edition, 2009.
2. High Voltage Engineering: Fundamentals - E. Kuffel, W. S. Zaengl, J. Kuffel, Elsevier publications, 2nd Edition, 2000.

Reference Books:

1. High Voltage Engineering - C. L. Wadhwa, New Age Internationals (P) Limited, 1997.
2. High Voltage Insulation Engineering - Ravindra Arora, Wolfgang Mosch, New Age International (P) Limited, 1995.
3. High Voltage Engineering, theory and Practice, Mazen Abdel Salan, Hussian Anis, Andan Ei Morshedy, Roshdy Radwan, Marcel Dekker, Taylor and Francis.

Smart Grid Technologies

<table>
<tr><th colspan="5">B. Tech IV Year I Semester</th><th colspan="4">Dept. of Electrical & Electronics Engineering</th></tr>
<tr><td>Code</td><td>Category</td><td colspan="3">Hours / Week</td><td>Credits</td><td colspan="3">Marks</td></tr>
<tr><td rowspan="2">A57023</td><td rowspan="2">PEC-V</td><td>L</td><td>T</td><td>P</td><td>C</td><td>CIE</td><td>SEE</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
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Course Objectives:

Course Objectives of SGT are:

1. To study the difference between conventional grids and smart grids and its self-healing capacity.
2. To know the importance of smart grid components in deployment of smart grids.
3. To know the importance of intelligent electronic devices and their applications for monitoring and protection.
4. To acquire knowledge on role of communication technologies in the deployment of sustainable smart grids.
5. To acquire knowledge on power quality issues of integrated smart grids for control and monitoring.

Course Outcomes:

At the end of this SGT course, students will be able to:

1. Explain the difference between conventional grids and smart grids and its self-healing capacity.
2. Demonstrate the importance of smart grid components in deployment of smart grids.
3. Illustrates the importance of intelligent electronic devices and their applications for monitoring and protection.
4. Understand the importance of communication infrastructure in deployment of smart grids.
5. Analyze power quality issues of integrated smart grids for control and monitoring.

Unit I:

Introduction to Smart Grid

Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Functions of Smart Grid, Opportunities & Barriers of Smart Grid, Difference between conventional & smart grid, Concept of Resilient & Self-Healing Grid, Present development & International policies in Smart Grid. Case study of Smart Grid. CDM opportunities in Smart Grid.

Unit II:

Smart Grid Technologies

Part 1: Introduction to Smart Meters, Real Time Prizing, Smart Appliances, Automatic Meter Reading (AMR), Outage Management System (OMS), Plug in Hybrid Electric Vehicles (PHEV), Vehicle to Grid, Smart Sensors, Home & Building Automation, Phase Shifting Transformers.

Unit III:

Smart Grid Technologies

Part 2: Smart Substations, Substation Automation, Feeder Automation. Geographic Information System (GIS), Phase Measurement Unit (PMU), Intelligent Electronic Devices (IED) & their application for monitoring & protection, Smart storage like Battery, SMES, Pumped Hydro, Compressed Air Energy Storage, Wide Area Measurement System (WAMS).

Unit IV:

Communication Technologies in Smart Grid

Classification of power system communication according to their functional requirements, Existing electric power system communication infrastructure and its limitation, Smart Grid communication system infrastructure, Standards for information exchange, Fiber Optical Networks, WAN based on Fiber optical networks, IP based Real Time data Transmission, Bluetooth, ZigBee, GPS, Wi-Fi, Wi-Max based communication, Wireless Mesh Network, Broadband over Power Line (BPL), IP based protocols.

Unit V:

Power Quality Management in Smart Grid

Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring.

Text Books:

1. Ali Keyhani, Mohammad N. Marwali, Min Dai "Integration of Green and Renewable Energy in Electric Power Systems", Wiley.
2. Clark W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response", CRC Press.
3. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", Wiley.

Reference Books:

1. Andres Carvallo, John Cooper, "The Advanced Smart Grid: Edge Power Driving Sustainability: 1", Artech House Publishers July 2011.
2. James Northcote, Green, Robert G. Wilson "Control and Automation of Electric Power Distribution Systems (Power Engineering)", CRC Press.
3. R. C. Dugan, Mark F. McGranghan, Surya Santoso, H. Wayne Beaty, "Electrical Power System Quality", 2nd Edition, McGraw Hill Publication.

AI Techniques in Electrical Engineering

B. Tech IV Year I Semester					Dept. of Electrical & Electronics Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
		L	T	P	C	CIE	SEE	Total
A57024	PEC-V	3	0	0	3	40	60	100

Course Objectives:

Course Objectives of AI Techniques in Electrical Engineering are:

1. To locate soft commanding methodologies, such as artificial neural networks, Fuzzy Logic and Genetic Algorithms.
2. To observe the concepts of feed forward neural networks and about feedback neural networks.
3. To practice the concept of fuzziness involved in various systems and comprehensive knowledge of fuzzy logic control and to design the fuzzy control
4. To analyze genetic algorithm, genetic operations and genetic mutations
5. To acquire knowledge on Applications of AI Techniques

Course Outcomes:

At the end of this AI Techniques in Electrical Engineering course, students will be able to:

1. Understand feed forward neural networks, feedback neural networks and learning techniques.
2. Analyze fuzziness involved in various systems and fuzzy set theory
3. Develop fuzzy logic control for applications in electrical engineering
4. Develop genetic algorithm for applications in electrical engineering.
5. Understand the Applications of AI Techniques

UNIT – I:

Artificial Neural Networks: Introduction-Models of Neural Network - Architectures – Knowledge representation – Artificial Intelligence and Neural networks – Learning process – Error correction learning – Hebbian learning – Competitive learning –– Supervised learning – Unsupervised learning – Reinforcement learning - learning tasks.

UNIT- II:

ANN Paradigms : Multi – layer perceptron using Back propagation Algorithm-Self – organizing Map – Radial Basis Function Network – Functional link, network – Hopfield Network.

UNIT – III:

Fuzzy Logic: Introduction – Fuzzy versus crisp – Fuzzy sets - Membership function – Basic Fuzzy set operations – Properties of Fuzzy sets – Fuzzy Cartesian Product – Operations on Fuzzy relations – Fuzzy logic – Fuzzy Quantifiers - Fuzzy Inference - Fuzzy Rule based system - Defuzzification methods.

UNIT – IV:

Genetic Algorithms: Introduction-Encoding – Fitness Function-Reproduction operators - Genetic Modeling – Genetic operators - Crossover - Single–site crossover – Two-point crossover – Multi point crossover-Uniform crossover – Matrix crossover - Crossover Rate - Inversion & Deletion – Mutation operator –Mutation – Mutation Rate-Bit-wise operators - Generational cycle-convergence of Genetic Algorithm.

UNIT–V:

Applications of AI Techniques: Load forecasting – Load flow studies – Economic load dispatch – Load frequency control – Single area system and two area system – Small Signal Stability (Dynamic stability) Reactive power control – speed control of DC and AC Motors.

TEXT BOOK:

1. S. Rajasekaran and G. A. V. Pai, "Neural Networks, Fuzzy Logic & Genetic Algorithms"- PHI, New Delhi, 2003.

REFERENCE BOOKS:

1. P. D. Wasserman, Van Nostrand Reinhold, "Neural Computing Theory & Practice" - New York, 1989.
2. Bart Kosko, "Neural Network & Fuzzy System" Prentice Hall, 1992.
3. G. J. Klir and T. A. Folger,"Fuzzy sets, Uncertainty and Information" - PHI, Pvt. Ltd, 1994.
4. D. E. Goldberg, "Genetic Algorithms" - Addison Wesley 1999.

Utilization of Electrical Energy

<table>
<tr><th colspan="5">B. Tech IV Year I Semester</th><th colspan="4">Dept. of Electrical & Electronics Engineering</th></tr>
<tr><td>Code</td><td>Category</td><td colspan="3">Hours / Week</td><td>Credits</td><td colspan="3">Marks</td></tr>
<tr><td rowspan="2">A57025</td><td rowspan="2">PEC-VI</td><td>L</td><td>T</td><td>P</td><td>C</td><td>CIE</td><td>SEE</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
</table>

Course Objectives:

Course Objectives of UEE are:

1. To understand the operating principles and characteristics of traction motors with respect to speed, temperature, loading conditions.
2. To acquaint with the different types of heating and welding techniques.
3. To study the basic principles of illumination and its measurement and to understand different types of lightning system including design.
4. To understand the basic principle of electric traction including speed–time curves of different traction services.
5. To acquaint with the different types of Tractive efforts & estimate specific energy consumption level at various modes of operation.

Course Outcomes:

At the end of this UEE course, students will be able to:

1. Analyze right drive for a particular application and able to design suitable schemes for Electrical welding, heating, drives, illumination and traction
2. Describe various methods of heating & welding of electrical equipment's.
3. Design Illumination systems for various applications.
4. Discuss about various Methods of braking system of electric traction and understand the speed-time characteristics of different services in traction systems.
5. Solve the mathematical aspects involved in tractive effort and specific energy consumption.

Unit – I:

Electric Drives

Type of electric drives, choice of motor, starting and running characteristics, speed control, temperature rise, types of industrial loads, continuous, intermittent and variable loads, load equalization, applications of electric drives.

Unit – II:

Electric Heating & Welding

Advantages and methods of electric heating, Resistance heating, Induction heating and Dielectric heating. Electric welding, Resistance and Arc welding, electric welding equipment, comparison between A.C. and D.C. Welding.

Unit – III:

Illumination Fundamentals & Methods

Introduction, terms used in illumination, laws of illumination, polar curves, Discharge lamps, MV, SV and LED lamps – comparison between tungsten filament lamps and fluorescent tubes, Basic principles of light control, Types and design of interior lighting and flood lighting.

Unit – IV:

Electric Traction – I

System of electric traction and track electrification. Review of existing electric traction systems in India. Special features of traction motor, methods of electric braking, plugging, rheostatic braking and regenerative braking. Mechanics of train movement. Speed-time curves for different services – trapezoidal and quadrilateral speed time curves.

Unit – V:

Electric Traction-II

Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight and coefficient of adhesive.

Text Books:

1. Utilization of Electric Energy – E. Openshaw Taylor, Orient Longman Private Limited, 1971.
2. Art & Science of Utilization of electrical Energy – Partab, Dhanpat Rai & Sons, 2nd edition, 1986.

Reference Books:

1. Generation, Distribution and Utilization of electrical Energy – C. L. Wadhwa, New Age International (P) Limited, Publishers, 1997.
2. Utilization of Electrical Power including Electric drives and Electric traction – by N. V. Suryanarayana, New Age International (P) Limited, Publishers, 1996.
3. Utilization of Electrical Power & Electrical traction – JB Gupta, SK Kataria & sons- eight edition

Electrical Energy Conservation and Auditing

B. Tech IV Year I Semester					Dept. of Electrical & Electronics Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57026	PEC-VI	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

Course Objectives of EEC & A are:

1. To gain knowledge to the students about current energy scenario, energy conservation audit and management.
2. To gain knowledge and skills support assessing the energy efficiency, energy auditing and energy management.
3. To study different techniques for maximizing the efficiency in electrical systems.
4. To obtain basic knowledge of various energy efficient technologies in electrical systems.
5. To learn different industrial applications for estimating the energy.

Course Outcomes:

At the end of this EEC & A course, students will be able to:

1. Explain present energy scenario.
2. Explain the concepts of Energy Management.
3. Apply the methods for improving energy efficiency in different Electrical Systems.
4. Differentiate the methods of improving energy efficiency in different Industrial Systems.
5. Use different energy efficient devices for various applications.

Unit-I:

Energy Scenario

Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, energy conservation and its importance, restructuring of the energy supply sector, energy strategy for the future, air pollution, climate change. Energy Conservation Act-2001 and its features.

Unit-II:

Energy Management & Audit

Definition, energy audit, need, types of energy audit. Energy management (audit) approach-understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel energy substitution, energy audit instruments. Material and Energy balance: Facility as an energy system, methods for preparing process flow, material and energy balance diagrams.

Unit-III:

Energy Efficiency in Electrical Systems

Electrical system: Electricity billing, electrical load management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors, performance assessment of PF capacitors, distribution and transformer losses. Electric motors: Types, losses in induction motors, motor efficiency, factors affecting motor performance, rewinding and motor replacement issues, energy saving opportunities with energy efficient motors.

Unit-IV:

Energy Efficiency in Industrial Systems

Compressed Air System: Types of air compressors, compressor efficiency, efficient compressor operation, Compressed air system components, capacity assessment, leakage test, factors affecting the performance and savings opportunities in HVAC, Fans and blowers: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities. Pumps and Pumping System: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities.

Cooling Tower: Types and performance evaluation, efficient system operation, flow control strategies and energy saving opportunities, assessment of cooling towers.

Unit-V:

Energy Efficient Technologies in Electrical Systems

Maximum demand controllers, automatic power factor controllers, energy efficient motors, soft starters with energy saver, variable speed drives, energy efficient transformers, electronic ballast, occupancy sensors, energy efficient lighting controls, energy saving potential of each technology.

Text Books:

1. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, General Aspects (available online)
2. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-3, Electrical Utilities (available online)

Reference Books:

1. S. C. Tripathy, "Utilization of Electrical Energy and Conservation", McGraw Hill, 1991. Success stories of Energy Conservation by BEE, New Delhi (www.bee-india.org.

Digital Control Systems

B. Tech IV Year I Semester					Dept. of Electrical & Electronics Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57027	PEC-VI	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

Course Objectives of DCS are:

1. To gain knowledge about Discrete representation of continuous system
2. To know about Discrete System analysis
3. To gain knowledge about stability of Discrete time system.
4. To acquire knowledge about state space approach for discrete time systems
5. To know about design of digital control system.

Course Outcomes:

At the end of this DCS course, students will be able to:

1. Demonstrate discrete representation of continuous system.
2. Apply the knowledge of Discrete System analysis.
3. Determine stability of discrete systems.
4. Apply state space approach for discrete systems.
5. Design a control system.

Unit I:

Discrete Representation of Continuous Systems

Basics of Digital Control Systems. Discrete representation of continuous systems. Sample and hold circuit. Mathematical Modeling of sample and hold circuit. Effects of Sampling and Quantization. Choice of sampling frequency, ZOH equivalent.

Unit II:

Discrete System Analysis

Z-Transform and Inverse Z Transform for analyzing discrete time systems. Pulse Transfer function. Pulse transfer function of closed loop systems. Mapping from s-plane to z plane. Solution of Discrete time systems. Time response of discrete time system.

Unit III:

Stability of Discrete Time System

Stability analysis by Jury test. Stability analysis using bilinear transformation. Design of digital control system with dead beat response. Practical issues with dead beat response design.

Unit IV:

State Space Approach for discrete time systems

State space models of discrete systems, State space analysis. Lyapunov Stability. Controllability, and observability analysis. Effect of pole zero cancellation on the controllability & observability.

Unit V:

Design of Digital Control System

Design of Discrete PID Controller, Design of discrete state feedback controller. Design of set point tracker. Design of Discrete Observer for LTI System. Design of Discrete compensator.

Text Books:

1. K. Ogata, "Digital Control Engineering", Prentice Hall, Englewood Cliffs, 1995.
2. M. Gopal, "Digital Control Engineering", Wiley Eastern, 1988.

Reference Books:

1. G. F. Franklin, J. D. Powell and M. L. Workman, "Digital Control of Dynamic Systems", Addison-Wesley, 1998.
2. B.C. Kuo, "Digital Control System", Holt, Rinehart and Winston, 1980.
3. Discrete Time Control Systems by K. Ogata, Dorling Kindersley Pvt. Ltd.

Power Systems and Simulation Lab

B. Tech IV Year I Semester					Dept. of Electrical & Electronics Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57203	PCC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	40	60	100

Course Objectives:

Course Objectives of PS & Simulation Lab are:

1. To understand generator and transformer protection system.
2. To understand the performance characteristics of various types of relays.
3. To use software packages to find solutions to Power System problems.
4. To perform load flow studies and short circuit analysis using appropriate software.
5. To study the design and modeling of transmission line parameters.

Course Outcomes:

At the end of this PS & Simulation Lab course, students will be able to:

1. Understand power industry practices for design, operation and planning.
2. Analyze the performance characteristics of various types of relays.
3. Use software packages to find solutions to Power System problems.
4. Apply knowledge of load flows for planning and future expansion of Power Systems.
5. Design and modeling of transmission line parameters

.List of Experiments

1. Performance and Testing of Transmission Line Model.
2. Determination of Transmission Line Parameters.
3. Characteristics of Over Current Relay.
4. Performance and Testing of Generator Protection System.
5. Develop MATLAB program for Y BUS formation and G-S Load Flow Analysis.
6. Develop MATLAB program for N-R and FDLF Load Flow Analysis.
7. Develop MATLAB program for Short Circuit Analysis.
8. Transient Stability Analysis for Single Machine connected to Infinite Bus by Point by Point Method.
9. Load Frequency Control of Multi Area Systems in MATLAB/SIMULINK.
10. Load Flow Analysis Using ETAP.
11. Short Circuit Analysis Using ETAP.
12. Transient Stability Analysis Using ETAP.

NOTE: - From the above any 10 Experiments have to be conducted

Microprocessor & Microcontroller Lab

B. Tech IV Year I Semester					Dept. of Electrical & Electronics Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
		L	T	P	C	CIE	SEE	Total
A57204	PCC	0	0	3	1.5	40	60	100

Course objectives:

1. To understand the fundamentals of assembly level programming of microprocessor.
2. To understand the concepts of Assembly language programming and its applications.
3. To learn to develop the assembly level programming using 8086 instruction set.
4. To learn to develop the assembly level programming using 8051 instruction set.
5. To learn to interface peripherals with 8086 and 8051.

Course outcomes:

At the end of this PS-II course, students will be able to:

1. Build a program on a microprocessor using instruction set of 8086.
2. Analyze the problems and apply a combination of hardware and software to address the problem.
3. Contrast how different I/O devices can be interfaced to processor and will explore several techniques of interfacing.
4. Experiment with standard microprocessor interfaces including GPIO, serial ports, digital-to-analog converters and analog-to-digital converters.
5. Design 8051 microcontroller interface with I/O peripherals.

List of Experiments:

The Following programs/experiments are to be written for assembler and execute the same with 8086 Microprocessor and 8051 microcontroller.

1. Programs for 16 bits arithmetic operations for 8086 (using Various Addressing Modes).

2. Program for sorting an array and to generate Fibonacci series for 8086.

3. Programs for string manipulations for 8086.

4. Program for digital clock design using 8086.

5. Interfacing ADC and DAC to 8086.

6. Parallel communication between two microprocessors using 8255.

7. Interfacing to 8086 and programming to control stepper motor using.

8. To interface Seven Segment Display using 8086

9. Programming using arithmetic, logic and bit manipulation instructions of 8051.

10. Program and verify Timer / Counter in 8051.

11. Program and verify Interrupt handling in 8051.

12. UART Operation in 8051.

13. LCD interface with 8051.

14. Keypad Interface with 8051.

LAB Note: Minimum of 12 experiments to be conducted.

Entrepreneurship Development

B. Tech IV Year II Semester					Dept. of Electrical & Electronics Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58007	OE-II	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives:

Course Objectives of ED are:

1. To provide insights into basic characteristics and process of entrepreneurship.
2. To develop a business idea and prepare a bankable project report.
3. To identify the methods to initiate ventures and the sources of finance.
4. To create awareness about the legal challenges of entrepreneurship and IPR.
5. To know and apply the various strategic and managerial concerns in the growth stage of the firms.

Course Outcomes:

At the end of this ED course, students will be able to:

1. Interpret concepts and process of entrepreneurship.
2. Apply idea development strategies and prepare a bankable project report.
3. Analyse various opportunities towards initiating ventures.
4. Recognize legal challenges of entrepreneurship.
5. Assess the strategic perspectives of entrepreneurship.

Unit- I:

Introduction

Introduction to Entrepreneurship – Characteristics, Qualities, Key Elements and Skills of an Entrepreneur, entrepreneurial stress, Corporate entrepreneurship, Entrepreneurial process.

Unit –II:

Business Plan Preparation

Search for business idea, project identification, project formulation and development, contents of business plan and Preparation of a Bankable Project Report.

Unit-III:

Launching Entrepreneurial Venture

Opportunities identification, Methods to initiate Ventures, Creating new ventures, Acquiring existing ventures, Franchising. Sources of finance, Forms of capital requirements, funding agencies and supporting institutions.

Unit IV:

Legal challenges of Entrepreneurship

Intellectual Property Protection – Patents, Copyrights, Trademarks and Trade Secrets. The challenges of new Venture Startups- Poor financial understanding, critical factors for new venture development, Evaluation process, Feasibility criteria approach.

Unit V:

Strategic perspectives in Entrepreneurship

Strategic planning- Strategic Action, Strategic Positioning, Business Stabilization, Building the adaptive firms, understanding the growth stage, unique managerial concern of growing ventures.

Text Books:

1. D F Kuratko and T V Rao "Entrepreneurship- A South-Asian Perspective "Cengage Learning, 2012
2. Vasant Desai, Small Scale Industries and Entrepreneurship, HPH, 2012.

References Books:

1. Rajeev Roy, Entrepreneurship, 2e, Oxford, 2012.
2. B.Janakiram and M.Rizwana, Entrepreneurship Development: Text& Cases, Excel Books, 2011.
3. Stuart Read, Effectual Entrepreneurship, Routledge, 2013.
4. Robert Hisrich et al, Entrepreneurship, 6e, TMH, 2012.
5. Nandan H, Fundamentals of Entrepreneurship, PHI, 2013
6. Shejwalkar, Entrepreneurship Development, Everest, 2011
7. Khanka, Entrepreneurship Development, S. Chand, 2012

Project Management

B. Tech IV Year II Semester					Dept. of Electrical & Electronics Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58008	OE-II	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives:

Course Objectives of PM are:

1. To understand the concept of Project Management.
2. To know about the different approaches to project screening and planning.
3. To explain about the factors of risk involved in project execution.
4. To understand about team leading and functional cooperation.
5. To know about the project performance and future trends in the project management.

Course Outcomes:

At the end of this PM course, students will be able to:

1. Explain about the life cycle and other concepts of Project Management.
2. Apply different approaches to project screening and planning
3. Analyze different risk factors in project execution
4. Estimate how to lead a team, to get functional cooperation
5. Build performance evaluation reports and future trends in project management.

Unit-I:

Introduction

Meaning, Need, Principles Project Lifecycle and its Phases, Project Management Research in brief, Project Management today, Organization strategy and structure and culture, Format of organization structure, Stake holder Management, Organization Culture, creating a culture for Project Management.

Unit-II:

Project Identification and Planning

Defining the project, Project Identification Process, Approaches to Project Screening and Selection, Project Planning, Work Breakdown Structure, Financial Module, Getting Approval and Compiling a Project Charter, setting up a Monitoring and Controlling Process.

Unit-III:

Project Execution

Initiating the Project, Controlling and Reporting Project Objectives, Conducting project evaluation, Risk, Risk Management Factors, Project Management, Four Stage Process, Risk Management an Integrated Approach, Cost Management, Creating a Project Budget.

Unit-IV:

Leading Project Teams

Building a Project Team, Characteristics of an effective Project Team, achieving Cross- Functional Co-operation, Virtual Project Teams, Conflicts Management, Negotiations.

Unit-V:

Performance Measurement and Evaluation

Monitoring Project Performances, Project Control Cycles, and Earned Value Management, Human factors in Project Evaluation and Control, Project Termination, Types of Project Terminations, Project Follow-up. Current and Future Trends in Project Management.

Text Books:

1. Gray, Larson, Project Management, Tata McGraw Hill, 2015
2. Jeffery K. Pinto, Project Management, Pearson Education,2015

References Books:

1. Enzo Frigenti, Project Management, Kogan, 2015
2. R. Panneerselvam & P. Senthil Kumar, Project Management, PHI, 2015
3. Thomas M. Cappels, Financially Focused Project Management, SPD, 2008.

Technical and Business Communication Skills

B. Tech IV Year II Semester					Dept. of Electrical & Electronics Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58001	OE-II	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Introduction

The course is intended to expose the students to learn and practice the five communication skills thinking, listening, speaking reading, and writing in English, the global language of communication. It reflects some of the approaches in English language teaching and learning currently in practice around the world.

Objective:

Course Objectives of T & BCS are:

To help the students to develop effective communication skills in all communicative contexts for professional advancement.

Course Outcomes:

At the end of this T & BCS course, students will be able to:

1. communicate technical and business correspondence
2. reflect on the themes discussed
3. recognize ethical implications of technical communication in professional contexts
4. identify the contemporary issues in engineering from environmental, societal, economic, and global perspectives
5. demonstrate ethical decisions in complex situations

UNIT-I:

E-World & E-Communication

E-language - E-governance - E-commerce/E-business - E-banking - E-waste

UNIT-II:

Business Establishment & Infrastructure Development

Power Supply - Industrial Park - Business Correspondence: Follow-up letters - Acceptance & Rejections - Persuasive letters - Resignation letters

UNIT-III:

Technology and Society

Robot Soldiers - For a Snapshot of a Web - Placing an order - Proposal Writing - Patents & Rights (National & International) - Intellectual Property - Nanotechnology

UNIT-IV:

Ethics in Business Communication

Ethical issues involved in Business Communication - Ethical dilemmas facing managers - Ethical Code & Communication - Standards in Daily Life - Total Quality Management - World University Ranking

UNIT-V:

Management Information System

Corporate Governance - Business Process Outsourcing - Project Management Communication - Marketing Communication

Textbooks:

1. English and Communication Skills for Students of Science and Engineering by S P Dhanavel. Orient Black Swan. 2009.

Reference Books:

1. Business Communication (Second Edition) by Meenakshi Raman & Prakash Singh by Oxford University Press. 2012.
2. Language and Communication skills for Engineers by Sanjay Kumar & Pushp Lata by Oxford University Press. 2018.
3. Business Communication by Anjali Kalkar, et.al. Orient BlackSwan. 2010.
4. Technical Communication by Paul V. Anderson. Cengage. 2014.
5. Engineering Communication by Charles W. Knisely & Karin I. Knisely. Cengage. 2015.

Intellectual Property Rights

B. Tech IV Year II Semester					Dept. of Electrical & Electronics Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58002	OE-III	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives:

Course Objectives of IPR are:

1. To understand the concepts of Intellectual Property Rights and related agencies.
2. To know about the purpose and functions of Trademarks in competitive environment
3. To explain the process of Patent and Copyrights and related procedures
4. To know the Trade Secret Law and its protection from Unfair practices.
5. To get knowledge on the overview of International Intellectual Property Scenario.

Course Outcomes:

At the end of this IPR course, students will be able to:

1. Explain the concepts of Intellectual Property Rights and related agencies.
2. Describe the purpose and functions of Trademarks in Competitive Environment
3. Analyze the process of Patent and Copyrights and related procedures
4. Explore the Trade secret law and its protection from Unfair practices
5. Explain the overview of International Intellectual Property Scenario

Unit -I:

Introduction to Intellectual Property

Introduction, Types of Intellectual Property, International Organization, Agencies and Treaties, Importance of Intellectual Property Rights.

Unit -II:

Trademarks

Purpose and Function of Trademarks, Acquisition of Trademarks Rights, Protectable Matter, Selecting and Evaluating Trade Mark, Trade Mark Registration Processes.

Unit-III:

Law of Copy Rights & Patents

Fundamental of Copy Rights Law, Originality of Material, Rights of Reproduction, Rights to Perform the Work Publicly, Copy Right Ownership Issues, Copy Right Registration, Notice of Copy Right, International Copy Right law. Foundation of Patent Law, Patent Searching Process, Ownership Rights & Transfer.

Unit- IV:

Trade Secrets & Unfair Competition

Trade Secret Law, Determination of Trade Secret Status, Liability for Misappropriation Right of Trade Secrets, Protection for Submission, Trade Secret Litigation. Misappropriation Right of Publicity, False Advertising.

Unit- V:

New Development & International Overview on Intellectual Property

New Developments in Trade Mark Law, Copy Right Law, Patent Law, and Intellectual Property Audits. International Trade Mark Law, Copy Right Law, International Patent Law, International Development in Trade Secrets Law.

Text Books:

1. Deborah. E. Bouchoux, Intellectual Property Rights, Cengage learning
2. Prabuddha Gangulli, Intellectual Property Rights Unleashing the knowledge economy, Tata McGraw Hill Publishing Company Ltd.

References Books:

1. Khushdeep Dharni and Neeraj Pandey, Intellectual Property Rights, PHI Learning Pvt. Ltd.
2. Vivien Irish, Intellectual Property Rights for Engineers, 2nd edn, IET, 2005
3. Carlos Alberto Primo Braga, Carsten Fink, Claudia Paz Sepulveda, Intellectual Property Rights and Economic Development, World Bank Publications, 2000

Internet of Things

B. Tech IV Year II Semester					Dept. of Electrical & Electronics Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58009	OE-III	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives:

Course Objectives of IOT are:

1. To understand the basics of Internet of Things.
2. To get an idea of some of the application areas where Internet of Things can be applied.
3. To understand the middleware for Internet of Things.
4. To understand the concepts of Web of Things.
5. To understand the concepts of Cloud of Things with emphasis on Mobile cloud computing.

Course Outcomes:

At the end of this IOT course, students will be able to:

1. Identify and design the new models for market strategic interaction.
2. Design business intelligence and information security for WoB.
3. Analyze various protocols for IoT.
4. Design a middleware for IoT.
5. Analyze and design different models for network dynamics.

Unit I:

Introduction to Internet of Things (IoT)

Definition and characteristics of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels and Deployment Templates.

Unit II :

Domain Specific IoTs

Introduction, Home Automation, cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyle.

IoT and M2M

Introduction to M2M, Difference between IoT and M2M, SDN and NFV to IoT. Basics of IoT System Management with NETCOZF

YANG NETCONF, YANG, SNMP NETOPEER

Unit III:

Developing Internet of Things:

IoT Platform Design Methodology, Introduction, IoT Design Methodology, Case Study on the IoT System for Whether Monitoring, Motivation for using Python.

Unit IV:

IoT Systems

Logical Design using Python, Introduction, Installing Python, Python Data Types and Data Structures, Control Flow and Functions, Modules , Packages, File Handling, Date/Time Operations, Classes, Python packages of Internet of Things, JSON, XML, HTTP, Lib and URL lib, SMTP lib.

Unit V:

IoT Physical Device and Endpoints

What is an IoT Device, Exemplary Device: Raspberry P_i about Raspberry Board, Linux on Raspberry P_i, Raspberry P_i Interfaces, Serial, SPI, I2C. Programming Raspberry P_i with Python, Other IoT Devices.

Text Books:

1. Arshdeep Bahga and Vijay Madisetti, Internet of Things A Hands –on approach, Universities Press, 2015.

Reference Books:

1. Honbo Zhou, The Internet of Things in the Cloud: A Middleware Perspective, CRC Press, 2012
2. Dieter Uckelmann, Mark Harrison, Florian Michahelles, Architecting the Internet of Things, Springer – 2011
3. David Easley and Jon Kleinberg, Networks, Crowds, and Markets: Reasoning About a Highly Connected World, Cambridge University Press, 2010
4. Olivier Hersent, Omar Elloumi and David Boswarthick, The Internet of Things: Applications to the Smart Grid and Building Automation, Wiley, 2012

Nano Science and Nano Technology

B. Tech IV Year II Semester					Dept. of Electrical & Electronics Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58040	OE-III	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives:

Course Objectives of NSNT are:

1. To provide the most exciting and novel properties at nanoscale regime.
2. To explain the interdisciplinary issues in Nano scale science and technology.
3. To discuss about the basics of nanotechnology.
4. To classify and explain the various properties of nanomaterials.
5. To describe the various methods for synthesis of nanomaterials and their applications.

Course Outcomes:

At the end of this NSNT course, students will be able to:

1. Explain the concepts and applications of nanotechnology and the growth techniques of nano materials.
2. Apply the materials in the nano scale.
3. Discuss about Synthesis Techniques of nano materials.
4. Classify the different characterization techniques of nano materials.
5. Explain the applications in the fields of automobiles, textiles and energy.

Unit I:

Introduction:

History and Scope, Can Small Things Make a Big Difference?

Quantum confinement, Surface area to Volume ratio, Classification of Nanostructured Materials, Fascinating Nanostructures, Applications of Nanomaterials, Nature: The Best of Nanotechnologist, Challenges and Future Prospects.

Unit II:

Unique Properties of Nanomaterials: Microstructure and Defects in Nanocrystalline Materials:

Dislocations, Twins, stacking faults and voids, Grain Boundaries, triple and disclinations.

Effect of Nano-dimensions on Materials Behavior: Elastic properties, Melting Point, Diffusivity, Grain growth characteristics, enhanced solid solubility.

Magnetic Properties: Soft magnetic nano crystalline alloy, Permanent magnetic nanocrystalline materials, Giant Magnetic Resonance, Electrical Properties, Optical Properties, Thermal Properties and Mechanical Properties.

Unit III:

Synthesis Routes: Bottom up approaches:

Physical Vapor Deposition, Inert Gas Condensation, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Sol-gel method, Self-assembly,

Top down approaches: Mechanical alloying, Nano-lithography.

Consolidation of Nano powders: Shock wave consolidation, Hot isostatic pressing and Cold isostatic pressing Spark plasma sintering.

Unit IV:

Tools to Characterize nanomaterials:

X-Ray Diffraction (XRD), Small Angle X-ray Scattering (SAXS), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM), Scanning Tunneling Microscope (STM), Field Ion Microscope (FEM), Three-dimensional Atom Probe (3DAP), Nano indentation.

Unit V:

Applications of Nanomaterials:

Nano-electronics, Micro- and Nano-electromechanical systems (MEMS/NEMS), Nano sensors, Nano catalysts, Food and Agricultural Industry, Cosmetic and Consumer Goods, Structure and Engineering, Automotive Industry, Water-Treatment and the environment, Nano-medical applications, Textiles, Paints, Energy, Defense and Space Applications, Concerns and challenges of Nanotechnology.

Text Books:

1. Text Book of Nano Science and Nano Technology – B.S. Murthy, P. Shankar, Baldev Raj, B.B. Rath and James Munday, University Press-IIM.
2. Introduction to Nanotechnology – Charles P. Poole, Jr., and Frank J. Owens, Wley India Edition, 2012.

References Books:

1. Nano: The Essentials by T. Pradeep, McGraw- Hill Education.
2. Nanomaterials, Nanotechnologies and Design by Michael F. Ashby, Paulo J. Ferreira and Daniel L. Schodek
3. Transport in Nano structures- David Ferry, Cambridge University press 2000
4. Nanofabrication towards biomedical application: Techniques, tools, Application and impact– Ed. Challa S.,S. R. Kumar, J. H. Carola.
5. Carbon Nanotubes: Properties and Applications- Michael J. O'Connell.
6. Electron Transport in Mesoscopic systems - S. Dutta, Cambridge University press.

B. TECH IV YEAR I SEMESTER

S. No	Course Code	Category	Course	Hours per week L	T	P	Credits
1	A57028	PCC	Computer Aided Design & Manufacturing	3	0	0	3
2	A57029	PCC	Robotics	3	0	0	3
3	A57030	PCC	Mechanical Measurements	3	0	0	3
4	A57031 A57032 A57033	PEC-III	1. Mechanical Vibrations 2. Micro Electro Mechanical Systems (MEMS) 3. Fuel Cells and Hydrogen Storage	3	0	0	3
5	A57034 A57035 A57036	PEC - IV	1. CNC Technology and Additive Manufacturing 2. Precision Engineering 3. Power Plant Engineering	3	0	0	3
6	A57037 A57038 A57039	PEC-V	1. Operations Research 2. Maintenance and Safety Engineering 3. 3.Computational Fluid Dynamics	3	0	0	3
7	A57205	PCC	Computer Aided Design & Manufacturing Lab.	0	0	2	1
8	A57206	PCC	Mechanical Measurements & Robotics Lab.	0	0	2	1
9	A57230	PROJ	Industry Oriented Mini Project	0	0	4	2
			TOTAL	18	0	8	22

B. TECH IV YEAR II SEMESTER

S. No	Course Code	Category	Course	Hours per week L	T	P	Credits
1	A58011	OEC-II	1. Introduction to Entrepreneurship	2	1	0	3
	A58008		2. Project Management				
	A58012		3. Language and Life Skills				
2	A58013	OEC-III	1. Fundamentals to Internet of Things	2	1	0	3
	A58014		2. Disaster Preparedness and Planning				
	A58015		3. Digital Marketing				
3	A58201	PROJ	Seminar	0	0	4	2
4	A58202	PROJ	Comprehensive Viva-voce	0	0	0	2
5	A58203	PROJ	Project Work	0	0	20	10
Total				4	2	24	20

List of Open Electives offered by the Department of Mechanical Engineering for other Departments in IV B.Tech –II Semester
Introduction to Heat Transfer
Introduction to Machines and Mechanisms
Green Technologies
Hybrid Electric Vehicles
Smart Materials

COMPUTER AIDED DESIGN & MANUFACTURING

B. Tech IV Year I Semester					Dept. of Mechanical Engineering			
Code	Category	Hours/Week			Credits	Marks		
A57028	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

The objectives of this course are to:

1. impart knowledge on product cycle, architecture of CAD system and solve geometric transformations
2. develop equation for Bezier curve, B-Spline curve and understand surface modeling
3. emphasize and apply numerical control and group technology
4. understand the importance of computers in QC, identify contact and non-contact inspection methods
5. understand CAD standards and computer integrated manufacturing systems

Course Outcomes

After completion of this course, the students will be able to:

1. explain the basic structure of product cycle and solve geometric transformations
2. apply the concepts of various curves for the solid modeling techniques
3. explain NC control and apply group technology
4. illustrate CAQC and inspection methods
5. understand the concepts of utility of data exchange formats and basics of CIMS

Unit I

Introduction - Fundamentals of Computer Graphics – Computers in industrial Manufacturing, Product cycle – Computer Aided Design – CAD system architecture – sequential and concurrent engineering – Basic structure, CPU, Memory types, input devices, display devices, hard copy devices, storage devices

Computer Graphics - Raster scan graphics – Coordinate system – Database structure for graphics modeling – Transformation of geometry, 2D & 3D Geometric Transformations – Translation, Scaling, Rotation, Reflection, mathematics of projections, clipping, and hidden surface removal

Unit II

Geometric Modeling - Geometric modeling – Representation of curves, Bezier curves – Techniques of surface modeling, surface patch, Coons, Solid modeling techniques - CSG and B-rep.

Unit III

Numerical Control - NC, NC modes, NC elements, NC machine tools – structure of CNC machine tools – Features of Machining center, turning center

Group Technology – Part family, coding and classification – production flow analysis – advantages and limitations – Computer Aided Processes Planning – retrieval type and generative type

Unit IV

Computer Aided Quality Control - Terminology in quality control – Computer in QC, contact inspection methods, noncontact inspection methods – optical, noncontact, inspection methods– non optical, computer aided testing - integration of CAQC with CAD/CAM

Unit V

CAD Standards - Graphical Kernel System (GKS) – standards for exchange images –Open Graphics Library (OpenGL) – Data exchange standards – IGES, STEP

Computer Integrated Manufacturing Systems - Types of Manufacturing systems – Machinetools and related equipment – computer control systems – human labor in the manufacturing systems – CIMS benefits

Text Books

1. CAD / CAM / A Zimmers & P.Groover / Prentice Hall India Learning Private Limited
2. CAD / CAM Theory and Practice / Ibrahim Zeid / McGraw Hill Education
3. CAD / CAM / CIM / Radhakrishnan and Subramanian / New Age Publications

Reference Books

1. CAD/CAM Principles and Applications / Rao / McGraw Hill Education
2. Automation, Production Systems & Computer Integrated Manufacturing / Mikell P. Groover / Pearson Education Limited
3. Computer Aided Design and Manufacturing / Lalit Narayan / Prentice Hall India Learning Private Limited
4. Principles of Computer Aided Design and Manufacturing / Farid Amirouche / Pearson Education Limited
5. Computer Graphics Principles and Practice / Foley, Van Dam, Feiner and Hughes, 2nd Ed. / Addison Wesley, 2000
6. Geometric Modelling / Martenson, E. Micheal / John Wiley & Sons, 1995
7. Computer Graphics using open GL / Hill Jr, F.S. / Pearson Education, 2003
8. Production Drawing Practice / P.N. Reddy, Taj Reddy and C. Srinivas Rao / The HI-TECH Publishers,2002

ROBOTICS

B. Tech IV Year I Semester					Dept. of Mechanical Engineering			
Code	**Category**	**Hours/Week**			**Credits**	**Marks**		
A57029	PCC	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	0	0	3	40	60	100

Course Objectives

The objectives of this course are to:

1. identify various robot structures, its anatomy and different types of end effectors
2. understand kinematic analysis of different robot configurations
3. learn differential kinematics using Jacobians
4. understand Dynamic Analysis and Trajectory planning

Course Outcomes

5. identify Actuators and Feedback Sensing devices

At the end of this course, students will be able to:

1. summarize the structure of a robot and different considerations in gripper selections
2. deduce equations for robot kinematics using D-H conventions
3. compute differential kinematics problems using Jacobians
4. analyze dynamic forces of robots & different methods of trajectory planning
5. illustrate different types of actuators and feedback devices used in robots and theirapplications

Unit I

INRODUCTION: Automation and Robotics – An over view of Robotics – Classification by coordinate system and control systems – Components of the industrial Robotics – Degrees of freedom – End effectors, Mechanical, Magnetic, Vacuum cup and other types of grippers – General consideration on gripper selection and design.

Unit II

MOTION ANALYSIS: Basic rotation matrices – Composite rotation matrices – Euler Angles

–Equivalent Angles – Homogeneous transformations and problems.

MANIPULATOR KINEMATICS: D-H notations – Joint coordinates and World coordinates

– Forward and Inverse kinematics problems.

Unit III

DIFFERENTIAL KINEMATICS: Differential kinematics of planar and spherical manipulators – Jacobians problems.

Unit IV

ROBOT DYNAMICS: Lagrange Euler formulations – Newton Euler formulations – Problemson Planar two link manipulators.

TRAJECTORY PLANNING: Joint space scheme – Cubic polynomial fit – Avoidance of obstacles – Types of motions – Slew motion, joint interpolated motion, straight line motion and problems.

Unit V

ROBOT ACTUATORS: Actuators – Pneumatic, Hydraulic and Electric – DC servo motorsand stepper motors.

FEED BACK COMPONENTS: Position sensors, Potentiometers, Resolvers, Encoders,Velocity sensors, Tactile sensors.

APPLICATIONS OF ROBOTS: Robot Applications – Manufacturing, Material handling, Assembly inspection, Spray painting, Welding, Medical and Space Explorations.

Text Books

1. Introduction to Robotics / S. K. Saha / McGraw Hill
2. Industrial Robotics / Groover M. P. / Pearson Edu.
3. Introduction to Robotic Mechanics and control / JJ Craig / Pearson, 3rd edition

Reference Books

1. Robotics / Fu K.S. / McGraw Hill
2. Robotic Engineering / Richard D. Klafter / Prentice Hall
3. Robot Analysis and intelligence / Asada and Slotine / Wiley inter Science
4. Robot Dynamics & Control / Mark W. Spong and M.Vidyasagar / John Wiley & sons (ASIA) Pvt. Ltd.
5. Robotics and control / Mittal R. K. and Nagrath I. J. / TMH

MECHANICAL MEASUREMENTS

B. Tech IV Year I Semester					Dept. of Mechanical Engineering			
Code	Category	Hours/Week			Credits	Marks		
A57030	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

The objectives of this course are to:

1. study the measurement systems and measuring devices
2. select appropriate measuring device for temperature and pressure measurement
3. know the principles of fluid flow, liquid level and humidity measuring devices
4. understand the theory of transducers and transmitting devices with associated parameters

Course Outcomes

5. learn the principles of force and strain measuring devices

At the end of this course, students will be able to:

1. measure displacement using various instruments
2. select appropriate instruments for measuring temperature and pressure
3. measure fluid properties like rate of flow, liquid level and humidity
4. determine speed, acceleration with vibrations using different instruments
5. analyze the strain and forces using measuring devices

Unit I

Measurement systems and basic concepts of measurement methods: Introduction to measurement and measuring instruments – Significance of measurement – Generalized measurement system and its functional elements – Static and dynamic characteristics of measuring device – Errors in measurement – Classification of errors

Transducers – Classification of transducers – Advantages of each type transducers
Measurement of displacement: Theory and construction of various transducers to measure displacement – Piezo electric, inductive capacitance, resistance, ionization and photo electrictransducers

Unit II

Measurement of temperature: Introduction – Temperature scale – Classification of temperature measuring instruments – Working principle of different temperature measuring instruments –Thermometer, thermocouple, electrical resistance thermistor, optical pyrometer and total radiation pyrometer

Measurement of pressure: Introduction – Units – Classification of pressure measuring instruments – Working principle of low and high-pressure measurement – McLeod gauge, thermal conductivity gauge, ionization gauge, pirani gauge, diaphragm gauge, manometers, bourdon tube pressure gauge, bellows

Unit III

Measurement of fluid flow: Measurement of fluid velocity – Hot wire anemometry, laser doppler anemometer, turbine flow meter, ultrasonic flow meter, rotameter

Measurement of liquid level: Direct method – Slight glass level gauge, float gauge – Indirect method – Bubbler method, capacitance level gauge, gamma ray liquid level sensor, ultrasonic liquid level gauge

Measurement of Humidity: Definitions – Humidity, absolute humidity, specific humidity, relative humidity, wet bulb temperature, dry bulb temperature, dew point temperature –Humidity measuring instruments – Sling psychrometer, absorption psychrometer, dew point meter, hygrometer

Unit IV

Measurement of speed: Mechanical Tachometers – Hand speed indicator, revolution counter and timer, tachoscope, centrifugal tachometer – Electrical tachometers – Tachogenerator, photoelectric tachometer, eddy current tachometer, capacitive tachometer, stroboscope

Measurement of acceleration and vibration: Different simple instruments – Principles of seismic instruments – Vibrometer and accelerometer using this principle

Unit V

Strain Measurement: Stress-strain relationships – Electrical strain gauge – Gauge factor – Tension – Compression resistance strain gauge cell – Strain gauge rosettes – Rectangular rosettes, delta rosettes, T-delta rosettes

Measurement of force, torque and power: Proving ring – Load cell – Torsion meter – Mechanical torsion meter, Electrical torsion meter – Dynamometers – Prony break dynamometer, Rope break dynamometer, Eddy current dynamometer

Text Books

1. Measurement Systems: Applications & Design / D.S Kumar / Anuradha Agencies
2. Instrumentation, Measurement & Analysis / B.C.Nakra & K.K.Choudhary / McGrawHill Education
3. Mechanical Measurement and Instrumentation / Er.R.K.Rajput / Katson Books, 2013

Reference Books

1. Instrumentation and Control systems / S.Bhaskar / Anuradha Agencies
2. Experimental Methods for Engineers / J.P.Holman / McGraw Hill Education
3. Mechanical and Industrial Measurements / R.K Jain / Khanna Publishers
4. Mechanical Measurements / Sirohi and Radhakrishna / New Age International Publishers
5. Instrumentation & Mechanical Measurements / A.K.Tayal / Galotia Publications

MECHANICAL VIBRATIONS

B. Tech IV Year I Semester					Dept. of Mechanical Engineering			
Code	**Category**	**Hours/Week**			**Credits**	**Marks**		
A57031	PEC-III	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	0	0	3	40	60	100

Course Objectives

The objectives of this course are to:

1. recognize the importance of free vibration analysis in machine parts
2. identify the significance of forced vibration analysis
3. evaluate the critical speeds of shafts with and without damping
4. illustrate the mode shapes of two degree of freedom system
5. evaluate the vibratory responses of multi-degree of freedom systems to various excitations

Course Outcomes

At the end of this course, students will be able to:

1. gain the need and importance of free vibrations in machine parts
2. analyze the vibrations when machine parts are subjected to various forces.
3. estimate the critical speeds of shafts with and without damping
4. construct the mode shapes of free and forced vibrations of damped and undamped twodegrees of freedom systems
5. compare and contrast vibratory responses of single and multi-degrees of freedom systems to various excitations

Unit I

Single Degree of Freedom Systems- Free vibrations: Undamped- differential equation- solution-Torsional vibrations-Energy method. Damped – types-viscous dampers- dry friction or coulomb damping-solid or structural damping.

Unit II

Single Degree of Freedom Systems- Forced vibrations: Introduction-forced vibration with constant harmonic excitation- forced vibration with rotating and reciprocating unbalance-forced vibration due to excitation of support-Energy dissipating by damping- forced vibration with coulomb damping and viscous damping-vibration isolation and transmissibility.

Unit III

Critical Speed of Shafts: Critical speeds without and with damping – Secondary critical speeds

Two Degree of Freedom Systems: Principal modes – Undamped and damped free and forcedvibrations – Undamped vibration absorbers

Unit IV

Multi Degree of Freedom Systems: undamped and damped free and forced vibrations- Eigen value problem and orthogonality- Response by modal analysis.

Unit V

Vibration Measuring Instruments: Vibrometers – Velocity meters – Accelerometers

Text Books

1. Mechanical Vibrations /G.K.Groover / Nem Chand and Brothers
2. Elements of Vibrations analysis / Meirovitch/ McGraw Hill Education
3. Mechanical Vibrations / V.P.Singh-Dhanpatrai& Co.

Reference Books

1. Mechanical Vibrations / SS Rao / Pearson Education Limited
2. Mechanical Vibrations /RaoV.Dukkipati and J.Srinivas / Prentice Hall India Learning Private Limited
3. Mechanical Vibrations / J B K Das / Sapna Publications
4. Vibration problems in Engineering /S.P.Timoshenko / John Wiley & Sons
5. Mechanical Vibrations / S Graham Kelly/ Schaum's Outlines / McGraw Hill Education

MICRO ELECTRO MECHANICAL SYSTEMS (MEMS)

B. Tech IV Year I Semester				Dept. of Mechanical Engineering.				
Code	Category	Hours/Week			Credits	Marks		
A57032	PEC-III	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

The objectives of this course are to:

1. gain knowledge of MEMS technology
2. learn the different MEMS materials and their properties
3. study the different manufacturing processes used in MEMS technology
4. impart the fundamental working principles of different micro sensors and actuators
5. understand the importance of MEMS technology in various industries

Course Outcomes

At the end of this course, students will be able to:

1. apply the knowledge of MEMS in manufacturing industry
2. identify type of sensors and actuators used for microsystems
3. illustrate the basic working principle of MEMS
4. distinguish the various micromachining techniques
5. choose the appropriate MEMS technique for specific application

Unit I

Introduction to microsystems – History of MEMS – Overview of microelectronics manufacture and Microsystems technology – Definition – MEMS materials – Laws of scaling – multi disciplinary nature of MEMS – Survey of materials central to micro engineering – MEMS Materials & their Properties – Applications of MEMS in various industries

Unit II

Micro sensors and actuators – Working principle of Microsensors – micro actuation techniques – micro sensors – types – Working principle of Micro actuators – Types of Micro- actuators: micropump, micromotors, micro valves, microgrippers, micro-accelerometers

Unit III

MEMS Operating principles - Mechanics – Dynamics, Electrostatics – Advanced MEMS Operating Principles for Sensing and Actuation including Piezo resistive, Piezoelectric, Thermo-Mechanical – Micro fluidics – Flow, Heat and Mass Transfer for Small Scales – Electrokinetics

Unit IV

Micromachining of MEMS - Microelectronic Technologies For MEMS – Micromachining Technology – Surface, Bulk Micromachining – Other Micromachining Techniques – LIGA, SLIGA – Wafer Bonding – Chemical, Mechanical Polishing – Bonding – Micro-stereolithography

Unit V

Applications of MEMS - Automotive Industry – Mechanical – Optical – Biomedical – Chemical Transducers – Optical MEMS – Bio MEMS – Plastic MEMS – Energy Harvesting – NEMS devices – Multi Disciplinary Applications – Future Developments

Text Books

1. "MEMS and Micro systems Design and Manufacture" / Tai Ran Hsu / Tata McGraw Hill, New Delhi, 2006
2. "An Introduction to Micro Electromechanical Systems Engineering" / Maluf N. Norwood, MA: / Artech House, 2000
3. "MEMS" / N.P. Mahalik / Tata McGraw-Hill, New Delhi, 2007

Reference Books

1. "Microsystem Design" / Stephen D. Senturia / Kluwer Academic Publishers, 1st Ed., 2001
2. "Fundamentals of Microfabrication" / Marc Madou / CRC Press, 1st Ed., 1997
3. "Microsensors — Principles and Applications" / Julian W. Gardner / John Wiley and Sons, inc., NY, 1st Ed., 1994
4. "Sensor Technology and Devices" / LjubisaRistic / Artech House, 1994
5. "Fundamentals of Micro fabrication" / Marc Madou / CRC press, 2002
6. "Electromechanics and MEMS" / Thomas B. Jones / Cambridge University Press, 2001
7. "Foundations of MEMS" / Chang Liu / Pearson Education Inc., 2006

FUEL CELLS AND HYDROGEN STORAGE

B. Tech IV Year I Semester					Dept. of Mechanical Engineering.			
Code	Category	Hours/Week			Credits	Marks		
		L	T	P	C	CIE	SEE	Total
A57033	PEC-III	3	0	0	3	40	60	100

Course Objectives

The objectives of this course are to:

1. extend concepts of thermodynamics for a fuel cell operation
2. examine the causes of diminished performance of a fuel cell
3. know the components, construction and working of a fuel cell
4. compare low temperature and high temperature fuel cells
5. maximize production and storage capacities of hydrogen and list out applications of

Course Outcomes

fuel cells

After completion of this course, the students will be able to:

1. understand fundamentals and thermodynamic concepts of a fuel cell
2. identify irreversible losses in a fuel cell and model its performance
3. study components, classification and characterization of a fuel cell
4. distinguish between low temperature and high temperature fuel cells
5. assess theoretically, efficient methods of production and storage of hydrogen andappraise applications of fuel cells.

Unit I

Introduction and Fundamentals of fuel cell: Necessity of fuel cell – Overview – History; Principle of fuel cell technology – Basic electrochemistry for all fuel cells – classification of fuel cells

Thermodynamics of the fuel cell: Gibb's free energy – reversible and irreversible losses – Thermodynamic efficiency of Fuel cell – Nernst equation – Effect of temperature, pressure and concentration on Nernst potential – Concepts of Standard electrode potentials and Electrochemical potential

Unit II

Irreversible losses in fuel cell: Types of polarization – Activation polarization – Concentration polarization – Ohmic polarization – Surface reactions – Oxygen electrodes – Hydrogen electrodes; Overall performance modeling of fuel cell: current – voltage predictions

Unit III

Components of fuel cell: Electrolytes – Catalysts, current collector, bipolar plate – Air depolarized cells – Biochemical fuel cells – Regenerative cells – Micro fuel cells. Fuel cell operation: Supply of fuel – Electrical arrangement – Removal of products – Materials for battery construction

Fuel cell characterization: Necessity of characterization – Possible ways of characterization –

In–situ characterization and Ex–situ characterization

Unit IV

Low temperature fuel cells: Hydrogen-oxygen fuel cells – alkaline and polymeric membrane types – Active catalyst and its dispersion – Heat and mass transfer – Construction and design – Limiting problems; Low temperature fuel cells of other types – methanol fuel cell and hydrocarbon fuel cell

High temperature fuel cells: Advantages – Molten electrolyte fuel cell – Solid electrolyte fuel cell – Construction – Comparison of low and high temperature fuel cells

Unit V

Hydrogen Storage: Hydrogen production and purification – Hydrogen storage technologies – Commercialization issues

Application of fuel cell systems: Large scale power generation – Power plant for vehicles – Domestic power – Fuel cells in space – Fuel cell economics – Future trends in fuel cells

Text Books

1. Fuel Cells And Hydrogen / Hacker Viktor and Shigenori Mitsushima / Elseveir Publications
2. Fuel Cell Technology / Nigel Sammes / Springer Publications
3. Fuel Cell Technology Handbook / Gregor Hoogers / CRC Press Publications

Reference Books

1. Principles of Fuel Cells / Xianguo Li / CRC Press Publications
2. Recent Trends in Fuel Cell Science and Technology / S Basu / Springer Publications
3. Nanomaterials for Solid State Hydrogen Storage / Robert A Varin / Springer Publications
4. Fuel Cell Projects for the Evil Genius / Gavin Harper / McGraw–Hill Education TAB Publications
5. World Fuel Cells / G Weaver / Elsevier Publications

CNC TECHNOLOGY AND ADDITIVE MANUFACTURING

B. Tech IV Year I Semester					Dept. of Mechanical Engineering			
Code	**Category**	**Hours/Week**			**Credits**	**Marks**		
A57034	PEC-IV	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	0	0	3	40	60	100

Course Objectives

The objectives of this course are to:

- learn the fundamentals of CNC machines for manufacturing a product
- implement CNC programs for turning, milling and grinding machining operations
- explain importance of PLCs and microcontrollers in CNC systems
- provide necessary knowledge of additive manufacturing processes
- discuss the benefits of various 3D printing techniques

Course Outcomes

After completion of this course, the students will be able to:

- identify different axes, machine zero, home position, systems and controls of different CNC machines
- develop the suitable APT program for CNC machine and understand the importance of DNC system in industry
- provide necessary knowledge of a PLC and microcontroller for CNC machines
- outline the importance of additive manufacturing in industry 4.0
- contrast the capabilities of 3D printing techniques

Unit I

Computer Numerical Control (CNC): Classification and advantage of CNC Machines, CNC machine structure – Guide ways – Feed drives – Spindles, Open loop and Closed loop CNC system. Tooling for CNC Machines – Interchangeable tooling system, preset and qualified tools – coolant fed tooling system – modular fixturing – quick change tooling system – automatic head changers.

Unit II

Computer Aided Programming: – Introduction – APT programming – Examples APTprogramming problems (2D machining only) – Introduction to CAD/CAM software – Automatic Tool Path generation

DNC Systems and Adaptive Control – Introduction, types of DNC systems, advantages and disadvantages of DNC – Adaptive control for optimization, Adaptive control with constraintsfor machining processes like turning and grinding.

Unit III

Programming Logic Controllers (PLC'S): Introduction, hardware components of PLC,system, basic structure, principle of operations – Internal relays and counters – applications of PLCs in CNC Machines.

Micro Controllers: Introduction, hardware components, I/O ports, external memory, counters, timers and serial data I/O interrupts –Applications and programming of micro controllers

Unit IV

Additive Manufacturing: Introduction, need for 3D Printing, historical development. Fundamentals of 3D Printing, 3D Printing Process Chain, Advantages and Limitations of 3D Printing, Role of 3D Printing in Industry 4.0, Comparison between 3D Printing and CNC Machining.

Unit V

3D Printing Techniques: Working Principle, Processes, Applications, Advantages of Fused Deposition Modeling (FDM), Stereo Lithography (SLA), Selective Laser Sintering (SLS), Selective Laser Melting (SLM).

Text Books

1. Computer Control of Manufacturing Systems / Yoramkoren / Mc McGraw Hill Education
2. Mechatronics / HMT / McGraw Hill Education
3. Additive Manufacturing Technologies: 3D Printing, Rapid prototyping and Direct Digital Manufacturing – Ian Gibson, David W Rosen, Brent Strucker, Springer, Second Edition, 2010

Reference Books

1. CAD/CAM / Michel P.Groover / McGraw Hill Education
2. Machining and CNC Technology / Michael Fitz Patrick / McGraw Hill Education
3. Numerical Control and Computer Aided Manufacturing / T.K.Kundra, P.N.Rao, N.K. Tewari / Tata McGraw-Hill Publishing Company Ltd.
4. "3D Printing and Additive Manufacturing Principles and Applications", Chee Kai Chua, Kah Fai Leong, Fifth Edition, World Scientific
5. Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping and Rapid Tooling, D.T. Pham, S.S. Dimov, Springer 2001.

PRECISION ENGINEERING

B. Tech IV Year I Semester					Dept. of Mechanical Engineering			
Code	Category	Hours/Week			Credits	Marks		
A57035	PEC-IV	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

The objectives of this course are to:

1. familiarize with the terminology of precision engineering
2. provide and enhance the technical knowledge in precision manufacturing and errorcontrol
3. create the awareness about new trends in manufacturing and its precise control
4. understand the striving need for precision and application
5. learn about the advanced concepts of precision manufacturing and ultra-

Course Outcomes

precisionmeasuring methods

After completion of this course, the students will be able to:

1. assign tolerances using principles of dimensional chains for individual features of a part or assembly.
2. develop a group of datums created by combining more than one individual datum
3. assign process capability indexes and tolerance grades of machining
4. analysis of various types of tolerance charting techniques
5. describe the mechanism of metal processing and nano physical processing

Unit I

Concepts of Accuracy: Introduction – Concept of Accuracy of Machine Tools – Spindle and Displacement Accuracies – Accuracy of numerical Control Systems – Errors due to Numerical Interpolation Displacement Measurement System and Velocity Lags

Geometric Dimensioning and Tolerancing: Tolerance Zone Conversions – Surfaces, Features, Features of Size, Datum Features – Datum Oddly Configured and Curved Surfaces asDatum Features, Equalizing Datums –Datum Feature of Representation – Form Controls, Orientation Controls – Logical Approach to Tolerancing

Unit II

Datum Systems: Design of freedom, Grouped Datum Systems – different types, two and three mutually perpendicular grouped datum planes; Grouped datum system with spigot and recess, pin and hole; Grouped Datum system with spigot and recess pair and tongue – slot pair – Computation of Translational and rotational accuracy, Geometric analysis and application

Unit III

Tolerance Analysis: Process Capability – Mean, Variance, Skewness, Kurtosis – Process Capability Metrics – Cp, Cpk – Cost aspects – Feature Tolerances – Geometric Tolerances – Surface finish – Review of relationship between attainable tolerance grades and different machining process – Cumulative effect of tolerances sure fit law – normal law and truncated normal law

Unit IV

Tolerance Charting Techniques: Operation Sequence for typical shaft type of components, Preparation of Process drawings for different operations, Tolerance worksheets and centrally analysis, Examples. Design features to facilitate machining; Datum Features – functional and manufacturing. Components design – Machining considerations, Redesign for manufactured, Examples

Unit V

Fundamentals of Nanotechnology: System of nanometer accuracies – Mechanism of metal Processing – Nano physical processing of atomic bit units – Nanotechnology and Electrochemical atomic bit processing

Measuring Systems Processing: In processing or in-situ measurement of position of processing point –Post process and on machine measurement of dimensional features and surface-mechanical and optical measuring systems

Text Books

1. Precision Engineering in Manufacturing / Murthy R. L., / New Age International (P) Limited, 1996.
2. Geometric Dimensioning and Tolerancing / James D. Meadows / Marcel Dekker Inc.1995.
3. Nano Technology / Norio Taniguchi / OxfordUniversity Press, 1996.

Reference Books

1. Nakazawa, H. / Principles of Precision Engineering / Oxford University Press, 1994
2. Venkatesh V.C. and Izman S., /Precision Engineering‖ / Tata McGraw Hill, 2007
3. Engineering Design – A systematic Approach / Matousek / Blackie & Son Ltd, London
4. Kalpakjian S., / Manufacturing Engineering and Technology. / 3rd Ed. Addision / Wesley Publishing Co.,New York, 2001
5. Institute of Physics Publishing/ Bristol and Philadelphia / Bristol, BSI 6BE U.K.

POWER PLANT ENGINEERING

B. Tech IV Year I Semester					Dept. of Mechanical Engineering			
Code	Category	Hours/Week			Credits	Marks		
A57036	PEC-IV	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

The objectives of this course are to:

1. know the working of different combustion, fuel and ash handling equipment used in steam power plants
2. detail the basic working principles of I.C. engine and gas turbine power plants
3. understand the hydroelectric power plants
4. summarize different types of nuclear reactors and direct energy conversion systems
5. focus on the non-conventional energy sources, power plant economics

Course Outcomes

andenvironmental considerations

After completion of this course, the students will be able to:

1. appraise the working of coal handling, combustion and ash handling equipment of steam power plant
2. elaborate the Plant lay-out, auxiliaries and classification of IC engine and Gas turbine power plants
3. discuss the significance and classification of hydro-electric power plants
4. describe the working of various nuclear reactors and direct energy conversion systems
5. illustrate non-conventional energy sources, power plant economics and environmentalconsiderations

Unit I

Introduction to the sources of energy – Resources and development of power in India

Steam power plant: Plant layout – Concepts of binary cycles and cogeneration – Working of different circuits – Fuel handling equipment – Types of coals – Coal handling: choice of handling equipment, coal storage – Ash handling systems

Combustion: Properties of coal – Overfeed and underfeed fuel beds – Types of stokers: traveling grate stokers, spreader stokers, retort stokers – Pulverized fuel burning system and its components – Cyclone furnace, design and construction – Dust collectors – Cooling towers and heat rejection – Corrosion – Feed water treatment

Unit II

Internal combustion engine power plant: Introduction – Plant layout with auxiliaries – Super charging

Gas turbine power plant: Introduction – Classification – Construction – Layout withauxiliaries – Combined cycle power plants and comparison

Unit III

Hydro electric power plant: Water power – Hydrological cycle – Site selection – Flow measurement – Drainage area characteristics – Hydrographs – Storage and pondage – Classification of dams and spill ways – Classification of Plants – Typical Layouts – Plant auxiliaries – Plant operation – Pumped storage plant

Unit IV

Nuclear power station: Nuclear fuel – Breeding and fertile materials – Nuclear reactor and its operation – Types of Reactors: pressurized water reactor (PWR), boiling water reactor (BWR), sodium-graphite reactor, fast breeder reactor (FBR), homogeneous reactor, gas cooled reactor-Radiation hazard and shielding – Radioactive waste disposal

Direct energy conversion: Fuel cells – Thermoelectric and thermo ionic power generation – Magneto hydro dynamic (MHD) power generation

Unit V

Power from non-conventional sources: Utilization of Solar-Collectors – Principle of working – Wind energy – Types: horizontal axis wind turbine (HAWT), vertical axis wind turbine (VAWT) – Tidal energy

Power plant economics and environmental considerations: Types of costs: capital cost, investment of fixed charges, operating costs – General arrangement of power distribution – Load curves: load duration curve, definitions of connected load, maximum demand, demand factor, average load, load factor, diversity factor – Related numerical problems – Effluents frompower plants and impact on environment – Methods of power plant pollution control

Text Books

1. A Course in Power Plant Engineering / Arora and S Domkundwar / Dhanpatrai & Co.
2. Power Plant Engineering / P K Nag / Tata McGraw-Hill Publishing Company Ltd.
3. A Text book of Power Plant Engineering / R K Rajput / Laxmi Publications

Reference Books

1. Power Plant Engineering / P C Sharma / S K Kataria Publications
2. Power plant Engineering / Ramalingam KK / Scitech Publishers
3. An Introduction to Power Plant Technology / G D Rai / Khanna Publications
4. Power plant Engineering / Hegde / Pearson Publications
5. An Introduction to Thermal Power Plant Engineering / P K Das and A K Das / Notion Press

OPERATIONS RESEARCH

B. Tech IV Year I Semester					Dept. of Mechanical Engineering			
Code	Category	Hours/Week			Credits	Marks		
A57037	PEC-V	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

The objectives of this course are to:

1. understand linear programming models in practical applications
2. familiarize the transportation problems by using different methods
3. learn the Johnson method for processing of jobs and machines and replacement policyconcepts in industry
4. know the concepts of game theory and inventory control techniques to classify inventory
5. acquaint with the concepts of queuing methods and simulation tools for optimization

Course Outcomes

After completion of this course, the students will be able to:

1. solve linear programming and simplex method problems in real time applications
2. adapt the assignment method for optimum resource allocation and transportation methodwith optimum transportation cost for industry applications
3. analyze sequencing and replacement models and apply them for optimization
4. apply game theory for optimal decision making and inventory models to optimize the cost
5. formulate different real life probabilistic situations using Monte Carlo simulation technique and apply queuing theory concepts in industry

Unit I

Linear Programming Problem – Introduction to Operations Research – Linear Programming –Mathematical Formulation – Graphical method – Simplex method – Big M-method – Duality

Unit II

Transportation Problem – Introduction – Formulation – Solution of the balanced and unbalanced transportation problem (Min and Max) – Northwest Corner rule, row minima method, column minima method, least cost method, Vogel's approximation method – Optimality test – MODI method

Assignment problem – Applications – Minimization and Maximization of balanced and unbalanced assignment problems for optimal solution – Travelling salesman problems

Unit III

Sequencing – Basic concepts – Problems with n jobs and 2 machines – n jobs and 3 machines problem – 2 jobs and m machines problem

Replacement -Replacement of items that deteriorate with time – No changes in the value of money – changes in the value of money – Items that fail completely – Individual replacement and group replacement policies

Unit IV

Inventory - Basic terminology used in Inventory – Models with deterministic demand – model

(a) demand rate uniform and production rate infinite, model (b) demand rate non-uniform and production rate infinite, model (c) demand rate uniform and production rate finite
Game theory -Basic terminology used in game theory – Minimax and Maximin principle – problems with saddle point and without saddle point – Dominance principle - Graphical solution

– Algebraic method

Unit V

Queuing -Introduction to queuing theory – terminologies – classification of queuing models – single server problems – multi server problems

Simulation - Basic concepts – phases of simulation – applications – advantages and disadvantages – Random number generation – Monte Carlo Simulation applied to inventory and queuing problems

Text Books

1. Operations Research: Theory and Applications / J.K Sharma, 5th Edition / Macmillan Publishers India ltd 2009
2. Operations Research / S. Kalavathy, 4th Edition / Vikas Pubilcations House Pvt Ltd.
3. Introduction to Operations Research / Frederic S. Hillier, Gerald J. Lieberman, Bodhibrata Nag, PreetamBasu, 10th Edition / Mc Graw Hill publications

Reference Books

1. Operations Research / Prem Kumar Gupta, D.S Hira / S. Chand and Company Ltd.
2. Operations Research by P. Rama Murthy / 2nd Edition / New Age International Publishers
3. Operations Research / Sudhir Kumar Pundir / CBS Publications
4. Operations Research An Introduction / H.A. Taha / PHI, 2008
5. Principles of Operations Research / H.M. Wagner / PHI, Delhi, 1982
6. Introduction to Optimization: Operations Research / J.C. Pant / Jain Brothers, Delhi, 2008

MAINTENANCE AND SAFETY ENGINEERING

B. Tech IV Year I Semester					Dept. of Mechanical Engineering			
Code	**Category**	**Hours/Week**			**Credits**	**Marks**		
A57038	PEC-V	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	0	0	3	40	60	100

Course Objectives

The objectives of this course are to:

1. impart the fundamental concepts of maintenance and maintenance management
2. learn the steps involved in establishing a maintenance plan and designing a maintenanceprogram
3. discuss the importance of inventory, safety stock and spares in maintenance
4. identify the safety problems in maintenance

Course Outcomes

5. identify causes of failures of an engineering system and learn corrective steps

After completion of this course, the students will be able to:

1. analyze the need for maintenance and maintenance management
2. distinguish the types of maintenance and their uses
3. estimate the safety stock and spare part quantity
4. develop the guidelines to improve the safety in maintenance
5. assess the reliability, reliability networks and its analysis

Unit I

Introduction: Need for maintenance – Facts and figures – Modern maintenance – Problem and maintenance strategy for the 21st Century engineering maintenance – Objectives and maintenance in equipment life cycle – Terms and definitions

Maintenance Management and Control: Manual Maintenance – Facility Evaluation – Elements of Effective Maintenance Management, Maintenance Management Control indices

Unit II

Types of Maintenance: Classification of maintenance – Preventive maintenance – Elements of preventive maintenance program – Establishing preventive maintenance program – PM program evaluation and improvement – PM measures – Corrective maintenance – Types, steps, downtime components and measures

Unit III

Inventory Control in Maintenance: Inventory control objectives and Basic inventory decisions – Two Bin inventory control and safety stock – Spares determination factors – Sparescalculation methods

Maintenance Costing: Reasons for Maintenance Costing – Maintenance budget preparation methods and steps – Maintenance labor cost estimation – Material cost estimation – Equipment life cycle Maintenance cost estimation

Unit IV

Quality in Maintenance: Needs for Quality maintenance processes – Maintenance work quality – Post maintenance testing

Safety in Maintenance: Reasons for safety problems in maintenance – Guidelines to improve Safety in Maintenance Work – Safety officer's role in maintenance work – Maintenance personal safety – Survey the plant for locations and hazards – Safety and human behavior – Education and training in safety – Prevention causes and cost of accident – Safety audit – Planning for safety – Firefighting equipment – Accident reporting – Investigations – Safety trials

Unit V

Reliability, Reliability Centered Maintenance (RCM): Goals and principles – RCM process,RCM program components – RCM benefits and reasons for its failures – Reliability versusMaintenance – Reliability measures – Reliability networks – Reliability analysis techniques

Maintainability: Maintainability importance and objective – Maintainability in Systems life cycle – Maintainability design characteristics – Maintainability functions and measures – Common maintainability design errors

Text Books

1. Engineering Maintenance a Modern Approach / B.S. Dhillon / C.R.C Press
2. Reliability, Maintenance and Safety Engineering / Dr. A.K Gupta / Laxmi Publications
3. Introduction To Maintenance Engineering / Mohammed Ben-Daya, Udaykumar, D.N. Prabhakar Murthy / WILEY Publication

Reference Books

1. Maintenance Engineering & Management / R.C.Mishra, K.Pathak / PHI Learning Private Limited
2. Reliability Engineering / Elsayed .A / WILEY Publication
3. Safety Engineering / Ganguly and Changeria.M / Chetan publication
4. Industrial Maintenance / Er.H.P. Garg / S. Chand & Company Ltd.
5. Industrial Safety Management / L.M.Deshmukh / McGraw Hill Education

COMPUTATIONAL FLUID DYNAMICS

B. Tech IV Year I Semester					Dept. of Mechanical Engineering			
Code	Category	Hours/Week			Credits	Marks		
A57039	PEC-V	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives

The objectives of this course are to:

1. know the concepts of FDM, FEM and FVM in the context of CFD
2. develop skills in implementing concepts of FDM and solve problems in explicit and implicit methods
3. calculate errors and stability by hyperbolic and elliptic equations in the areas of fluid flow and heat transfer
4. appraise stream flow and summarize vorticity, boundary layer and buoyancy
5. apply different techniques to solve CFD problems

Course Outcomes

After completion of this course, the students will be able to:

1. solve a physical problem by numerical methods, differentiate between FDM, FEM and FVM and understand the concept of CFD
2. implement concepts of finite difference equations and solve problems by explicit and implicit methods
3. analyze errors, find the stability by hyperbolic and elliptic equations and review fluid flow and heat transfer governing equations
4. analyze stream flow and formulate vorticity, boundary layer and buoyancy
5. solve simple CFD problems by different techniques

Unit I

Introduction: Methods to solve a physical problem – Numerical methods – Brief comparison between FDM, FEM & FVM – Applied numerical methods – Finite difference methodapplications in steady heat conduction in a rectangular geometry, heat conduction and convection, transient heat conduction and convective heat transfer

Unit II

Finite Differences: Discretization, consistency, stability and fundamentals of fluid flow modeling – Introduction to elementary finite difference quotients, implementation aspects of finite-difference equations, consistency, explicit and implicit methods

Unit III

Errors and Stability Analysis: Introduction – First order wave equation, stability of hyperbolicand elliptic equations – Fundamentals of fluid flow modeling – Conservative property – The upwind scheme

Review of Equations Governing Fluid Flow and Heat Transfer: Introduction – Conservationof mass Newton's second law of motion – Expanded forms of Navier-stokes equations, conservation of energy principle, special forms of the Navier stokes equations

Unit IV

Steady Flow: Dimensional form of momentum and energy equations, Navier-stokes equation, and conservative body force fields – Stream function – Vorticity formulation – Boundary layer theory, buoyancy driven convection and stability

Unit V

Simple CFD Techniques: Viscous flows – Conservation from space marching relocation techniques – Artificial viscosity – The alternating direction implicit techniques, pressure correction technique, computer graphic techniques used in CFD – Quasi one dimensional flow through a nozzle, turbulence models, standard and high Reynolds number models and their applications

Text Books

1. An Introduction to Computational Fluid Dynamics: The Finite Volume Method / Versteeg. H.K., and Malalasekera W / Longman Publications
2. Computational Fluid Flow and Heat Transfer / Muralidhar.K and Sundararajan T / Narosa Publishing House, New Delhi
3. Computational Fluid Dynamics / J Chung / Cambridge University Press India

Reference Books

1. Numerical Heat Transfer and Fluid Flow / Patankar. S.V / Taylor and Francis
2. Computational Fluid Mechanics and Heat Transfer / Ronnie Anderson / CRC Press
3. Computational Aerodynamics and Fluid Dynamics An Introduction / Jean-Jacques Chattot / Springer
4. Essential Computational Fluid Dynamics / Olegzikanov / Wiley Publications India
5. Introduction to Computational Fluid Dynamics / Pradip Niyogi, S.K. Chakrabartty/ M.K. Laha / Pearson Education Limited

COMPUTER AIDED DESIGN & MANUFCATURING LAB

B.Tech IV Year I Semester					Dept. of Mechanical Engineering			
Code	Category	Hours/Week			Credits	Marks		
A57205	PCC	L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	50	100

Course Objectives

The objectives of this Lab are to:

1. impart the knowledge of drafting 3D models
2. create solid models associated with all the necessary dimensions
3. analyze 2D trusses and beams through ANSYS software
4. apply the Knowledge of Finite element analysis to 2D components
5. compile CNC programming for turning and milling operations

Course Outcomes

At the end of this Lab students will be able to:

1. draft the solid models using necessary software
2. model the 3D components using appropriate software
3. differentiate the shear force and bending moment diagrams for beams
4. analyze the 2D components both statically and dynamically
5. develop the simulation of CNC programming for milling and turning operations

List of Experiments

SECTION I

Part Modeling:

a) Generation of various 3D Models through – protrusion, revolve, shell sweep, creation of various features – Study of parent child relation – Feature based and Boolean based modeling, surface and assembly modeling – study of various standard translators – Design of simple components – **2 Exercises**

SECTION II

(a) Design and Determination of deflection and stresses for 2D trusses – **1 Exercise**

(b) Design and Determination of deflections and stresses for cantilever, simply supported 2D and 3D beams subjected to various loads – **2 Exercises**

(c) Design and Determination of deflections, Plane stress and Plane strain for axisymmetric components – **1**

Exercise

(d) Steady state heat transfer analysis of plane components – **1 Exercise**
(e) Steady state transient heat transfer analysis of plane components – **1 Exercise**

SECTION III

(a) Simulation of CNC part program for Step turning and Taper turning components–**2 Exercises**
(b) Simulation of CNC part program for Profile milling components – **1 Exercise**
(c) Simulation of CNC part program for facing of simple components –**1 Exercise**

Software available in the CAD & M Lab:

1. Auto CAD
2. Pro-E
3. Solid Works
4. ANSYS
5. Master CAM

Note: Any10 experiments to be conducted

(Section I and Section III are mandatory, any four from Section II)

Reference Books

1. CAD / CAM Theory and Practice / Ibrahim Zeid / Tata McGraw Hill Education (P) Ltd, New Delhi, India
2. Computer Numerical Control Operations and Programming / Jon Stenerson and Kelly Curronpul / New age Publication
3. CAD/CAM (Theory & Concepts) : Theory and Concept Paperback / Sareen Kuldeep, Grewal Chandandeep / S. Chand & Company Ltd.
4. Computer Numerical Control Concepts and Programming / Warren S Seames, Thomson N.Y / Delmar Publishers
5. CAD / CAM / CIM Theory and Practice / Radhakrishnan, Subramanian (2009) / New Age International Pvt. Ltd, New Delhi, India
6. Engineering Analysis with ANSYS Software Paperback / Tadeusz Stolarski, Y.Nakasone, S. Yoshimoto
7. SOLIDWORKS 2018: A Power Guide for Beginners and Intermediate Users Paperback / CADARTEFIX
8. Pro/Engineer Wildfire 5.0 for Designers Text Book / Cad CamTechnologies

MECHANICAL MEASUREMENTS & ROBOTICS LAB

B.Tech IV Year I Semester					Dept. of Mechanical Engineering			
Code	Category	Hours/Week			Credits	Marks		
A57206	PCC	L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	50	100

Course Objectives

The objectives of this course are to give hands on experience in operating the various test rigs,acquire the required data and to:

1. make use of the various measuring devices
2. select appropriate temperature and pressure measurement devices
3. select the principle and methods to measure various physical parameters
4. explore kinematics involved in 6 DOF robotic arm
5. execute robot operations like palletizing by generating program

Course Outcomes

At the end of this course, students will be able to demonstrate the hands on experience inconducting various experiments and to:

1. apply the concepts and methods for measuring displacement
2. select and identify the application of temperature and pressure measurement
3. measure speed, flow, stress, and vibrations with suitable instruments
4. compare the direct and indirect kinematic analysis of robotic arm
5. execute pick & place and palletizing operation

List of Experiments

Part-A: Mechanical Measurements Lab

Study and Calibration of:

1. LVDT transducer for displacement measurement
2. capacitive transducer for angular displacement
3. thermocouple (J – type and K – type) for temperature measurement
4. resistance temperature detector for temperature measurement
5. pressure gauges
6. McLeod gauge for low pressure
7. a rotameter for flow measurement
8. photo and magnetic speed pickups for the measurement of speed
9. vibration amplitude at various loads using seismic pickup.
10. strain gauge for load measurement

Part B: Robotics Lab

1. Study and evaluate the robot end effector position for given joint variables of a 6 DOF Manipulator
2. Study and evaluate the robot joint variables of a 6 DOF Manipulator
3. Perform experiment on teaching the robot for predefined trajectory using axis control
4. Conduct the experiment and instructing the robot for palletizing operations (Pick and place operation)

Note: Any 12 Experiments need to be performed by taking minimum 8 experimentsfrom Part – A and Minimum 2 experiments from Part – B.

Reference Books

1. Measurement Systems: Applications & Design / D.S. Kumar / Anuradha Agencies
2. Instrumentation Measurement & Analysis / B. C. Nakra and K. K. Choudhary / McGraw Hill Education
3. Introduction to Robotics / S. K. Saha / McGraw Hill
4. Experimental Methods for Engineers / J. P. Holman / McGraw Hill Education
5. Mechanical Measurements / Sirohi and Radhakrishna / New Age International Publisher
6. Instrumentation & Mechanical Measurements / A. K. Tayal / Galotia Publications
7. Robotics / Fu K.S. / McGraw Hill
8. Robotic Engineering / Richard D. Klafter / Prentice Hall

INTRODUCTION TO ENTREPRENEURSHIP

B. Tech IV Year II Semester					Dept. of Mechanical Engineering			
Code	Category	Hours/Week			Credits	Marks		
A58011	OEC-II	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

The objective of this course is to familiarize the student with entrepreneurship, the issues involved in it, the potential of entrepreneurship and intrapreneurship, the legal environment and statutory issues and explore various funding opportunities.

Course Outcomes

1. Interpret the concepts of Entrepreneurship and Intrapreneurship.
2. Apply the opportunity identification techniques
3. Differentiate needs of different segments
4. Develop business model and MVP
5. Recognize organizational forms, IPR concerns and funding opportunities forstartups.

Unit I

Introduction to Entrepreneurship: Entrepreneurship and Intrapreneurship, Business Incubators, Rural entrepreneurship, Social Entrepreneurship, women entrepreneurs, Role of entrepreneurs in economic development, Types of entrepreneurs. Entrepreneurial mind set andstress, Causes of failure.

Unit II

Opportunity identification: Myths and realities of entrepreneurship, Opportunity identification, Problem worth solving, idea generation techniques, Design thinking.

Unit III

Customer analysis: Market segmentation, consumer persona, Product market fit, Unique Value proposition

Unit IV

Business model and MVP: Business model canvas, MVP, Risks and assumptions, Importance of financial planning.

Unit V

Organizational forms Funding Opportunities: Organizational forms - Partnership, Soleproprietorship, Corporation. Intellectual Property Rights- Copyrights, Trademarks, Patents.Law vs. Ethics, Informal capital- Friends and Family, Angels, Venture Capitalists, Idea/ Patent,Growth strategies.

Text Books

1. Vasant Desai, YayatiNayak, Entrerpreneurship, Himalaya Publishing House,2018
2. D.F.Kuratko and T.V.Rao Entrepreneurship- Cengage Learning,2012

Reference Books

1. Dhruv Nath, Sushanto Mitra, Funding Your Startup: And Other Nightmares, 2020
2. Rajeev Roy, Entrepreneurship, Oxford University Press, 2/e, 2012
3. V Srinivasa Rao, Lean Digital Thinking: Digitalizing Businesses in a New World Order, Bloomsbury India, 2021
4. S.K.Mohanty, Fundamentals of Entrepreneurship, PHI, 1/e,2005
5. MOOCS by Wadhwani Foundation.

PROJECT MANAGEMENT

B. Tech IV Year II Semester					Dept. of Mechanical Engineering			
Code	Category	Hours/Week			Credits	Marks		
A58008	OEC-II	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

The course is designed to help the student understand the concepts of project management, explain how to identify the projects and planning, analyze how to execute the projects, assess how to lead the team and evaluation of projects and to explain the performance measurement and evaluation of the projects

Course Outcomes

After completion of this course, the students will be able to:

- Explain the phases of project life cycle.
- Identify the projects and planning the projects
- Know the project evaluation process
- Appreciate the role of teams in project management
- Discuss the recent trends in project management.

Unit I

Introduction

Introduction to project management, need for project management, project management principles. Project lifecycle, project management phases in lifecycle, project management research in brief, project management today, organization structure, stake holder management, creating a culture for project management.

Unit II

Project Identification and Planning

Project identification process, defining the project, approaches to project screening and selection, project planning, work breakdown structure, financial module, getting approval and compiling a project charter, setting up a monitoring and controlling process.

Unit III

Project Execution

Initiating the project, controlling and reporting project objectives, conducting project evaluation, risk, role of risk management, project management, risk management an integrated approach, cost management, creating a project budget.

Unit IV

Leading Project Teams

Building a project team, characteristics of an effective project team. Achieving cross-functional co-operation, virtual project teams, conflict management, negotiations

Unit V

Performance Measurement and Evaluation

Monitoring project performances, Project control cycles, Earned Value management, Human factors in project evaluation and control. Project termination, types of project terminations, project follow-up. Current and future trends in project management.

Text Books

1. Jeffery K. Pinto, Project Management – Achieving Competitive Advantage, Pearson Education,2019

Reference Books

2. Clifford Gray and Erik Larson, Project Management, Tata McGraw Hill Edition, 6e,2014.
3. R. Panneerselvam & P. Senthilkumar, Project Management, PHI, 2015
4. Thomas M.Cappels, Financially Focused Project Management, SPD,2008.
5. Guide to Project Management Body of Knowledge (PMBOK® Guide) of Project Management Institute, USA.

LANGUAGE AND LIFE SKILLS

B. Tech IV Year II Semester					Dept. of Mechanical Engineering			
Code	**Category**	**Hours/Week**			**Credits**	**Marks**		
A58012	OEC-II	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		2	1	0	3	40	60	100

Introduction

In today's global world, language is the weapon for success in both personal and professional life. It is highly essential to master the language for survival and to improve quality of life.

Course Objectives

The course helps to train the students to attain the skills set to manage life and career.

Course Outcomes

After completion of this course, the students will be able to:

1. evaluate and accept the self for all positive changes
2. demonstrate assertiveness
3. manage emotions
4. develop emotional intelligence
5. depicting the positive thought process

Prescribed Textbook:

Wadkar, Alka. *Life Skills for Success.* Sage Publications India Pvt Ltd. 2016.

Unit I

Respecting Oneself

Self-esteem - Being Assertive - Recognising and overcoming various Behavioural Traits -Self Management - Consequences of being disorganized

Unit II

Understanding the World Around:

Fallacies, Misconceptions - Paradoxes - Cultural Apathies - Distortions - Attributions -ConflictResolution - Anger Management

Unit III

Positive and Pro-Active Thinking:

Nature and Significance - Being Pro-Active - Effective Thought Patterns - Logical Thinking -Flexibility and Adaptability

Unit IV

Emotions and Emotional Development

Nature & Biology of Emotions - Expression of Emotions - Gender & Emotions - Emotional Abuse - Emotional Competence

Unit V

Social Skills:

Decency in Social Media - Limit Realization in Public and Social Networking - Relating to others in Virtual World - Constructive Criticism - Awareness of Legal Issues

Reference Books

1. Englewood Cliffs, A. Bandora. *Social Learning Theory.* NJ: Prentice Hall. 1977.
2. Hurlock, E. B. *Developmental psychology.* New Delhi: McGraw Hill. 1979.
3. Murry, H.A. *Explorations in Personality*. New York: Oxford University Press. 1938.
4. Rani, Nirupa. K and Mohanraj, Jayashree.et. al. *Step by Step: Learning Language Life Skills* Pearson. 2012.
5. *Real English: A Multi-Skill Language Course with Values and Life skills*. VivaEducation Publication. 2013.

FUNDAMENTALS OF INTERNET OF THINGS

B. Tech IV Year II Semester					Dept. of Mechanical Engineering			
Code	Category	Hours/Week			Credits	Marks		
A58013	OEC-III	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

1. Differentiate Physical and Logical Design of IoT
2. Categorize Application of Internet of Things
3. Identify Raspberry Pi Board GPIO Header
4. Construct simple codes in Arduino IDE
5. Compare Actuators and Sensors

Course Outcomes

At the end of this course students will be able to:

1. Identify physical and logical design of IoT
2. Understand Domain Specific IoTs
3. Implement code using Raspberry Pi Board
4. Develop an IoT Application using Arduino Uno board
5. Develop an IoT Applications using sensor and actuators

Unit I

Introduction to IoT: Defining IoT, Characteristics of IoT, Physical design of IoT, Logical designof IoT, Functional blocks of IoT, Communication models & APIs. (T1, Chapter 1)

Unit II

Domain specific applications of IoT: Home automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and lifestyle. (T1, Chapter 2)

Unit III

IoT Physical Device and Endpoints: What is an IoT Device, Exemplary Device: Raspberry Pi About Raspberry Board, Linux on Raspberry Pi, Raspberry Pi Interfaces, Serial, SPI, I2C. Programming Raspberry Pi with Python, Other IoT Devices. (TB-1,Ch-7) (T1, Chapter 7)

Unit IV

Programming Arduino: Introduction, Arduino Boards, Programming-variables, if, loops, functions, digital inputs and outputs, the serial monitor, arrays and strings, analog inputs and outputs, using libraries, Arduino data types and commands. Programming Arduino Uno with

Arduino- Controlling LED with Arduino, interfacing an LED and Switch with Arduino and Interfacing a light sensor (LDR) with Arduino. (T2, Chapter 1)

Unit V

Actuators-Characteristics, Types of Actuators. Sensors-characteristics, types of sensors. (T3, Chapter 6, 7)

Text Books

T1. Arshdeep Bahga and Vijay Madisetti, Internet of Things - A Hands-on Approach, Universities Press, 2015.

T2. Simon Monk, Programming Arduino Next Steps: Going Further with Sketches, SecondEdition,2019.

T3. Saeed B. Niku, Introduction to Robotics Analysis, Application, Pearson Education Asia,2001.

Reference Books

R1.The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press).

R2. Matt Richardson & Shawn Wallace, Getting Started with Raspberry Pi, O'Reilly (SPD), 2014.

R3. R.K.Mittal and I J Nagrath, Robotics and Control, TMH, 2003.

DISASTER PREPAREDNESS AND PLANNING

B. Tech. IV Year II Semester					Dept. of Mechanical Engineering			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58014	OEC-III	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

1. To know the concept, definition and terminology of the Disaster Management.
2. To know the classification and occurrence of disasters in India and elsewhere.
3. To know and analyse the socio-economic, environmental aspects of disasters impacts.
4. To know the pre, post and emergency management mitigation strategies.
5. To know the environment of vulnerable disaster areas

Course Outcomes

At the end of the course the students will be able to

CO 1: To acquire knowledge of disaster Management.

CO 2: To acquaint with different disasters in India and other parts of the world.

CO 3: To classify, assess the magnitude and intensity of various impacts of disasters.

CO 4: To learn the management methods.

CO 5: Learn effective sustainable environmental modification techniques.

UNIT-I

Introduction: Concepts and definitions: disaster, hazard, vulnerability, risk, capacity, impact, prevention, mitigation.

UNIT-II

Disasters: Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills etc); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility

UNIT-III

Disaster Impacts:

Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; globaland national disaster trends; climate-change and urban disasters.

UNIT-IV

Disaster Risk Reduction (DRR):

Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disasterrisk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

UNIT-V

Disasters, Environment And Development

Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Textbooks

1. H.K. Gupta, Disaster Management - - University Press, India, 2003.
2. Singh B.K, Handbook of Disaster Management: techniques and Guidelines -., Rajat, Publications, 2008

References

1. PardeepSahni, Disaster Mitigation: Experiences and Reflections -
2. PradeepSahni, Disaster Risk Reduction in South Asia, Prentice Hall, 2004.

NPTEL

1. https://nptel.ac.in/courses/105104183/

DIGITAL MARKETING

B. Tech IV Year II Semester					Dept. of Mechanical Engineering			
Code	**Category**	**Hours/Week**			**Credits**	**Marks**		
A58015	OEC-III	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		2	1	0	3	40	60	100

Course Objectives

The objectives of this course are to:

1. provide basic knowledge about Digital marketing
2. create awareness social media marketing
3. explore the concept of Affiliate marketing
4. study the key elements in analytics in digital marketing
5. explain the strategies in integrating digital marketing.

Course Outcomes

At the end of this course, students will be able to:

1. Describe the scope of Digital Marketing.
2. Recognize and apply Social Media marketing strategies for consumer engagement.
3. Identify the concepts of affiliate marketing.
4. Assess the role of analytics in digital marketing
5. Understand integrative digital and social media strategies

Unit I

Introduction: Evolution of Digital Marketing, Importance, Scope, The Digital Consumer, Online Communities, Digital marketing Landscape, Search Engine Marketing, Search Engine Optimization.

Unit II

Social Media Marketing: Social Media Marketing – Facebook, LinkedIn, Twitter, YouTube, Customer Engagement, Google Ad words, PPC, Online Display Advertising.

Unit III

Affiliate Marketing: Affiliate marketing, Affiliate Marketing Networks, Promoting theAffiliate Products, Blogging, Content Marketing & Content Marketing Strategies.

Unit IV

Analytics: CRM & CX in Digital Marketing-Digital Marketing, Data and Analytics - Social Listening-Web Analytics, Social media analytics

Unit V

Integrating Digital & Social Media: - Email Marketing, Mobile Marketing-Integrating Digitaland Social Media - Strategies, Putting together the digital marketing strategy-5 stages.

Text Books

1. Ian Doodson, The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaigns, Wiley, 2016
2. Simon Kingsnorth, Digital Marketing Strategy: An Integrated Approach to Online Marketing, Kogan Page Publishers, 2019

Reference Books

1. Daniel Rowles, Digital Branding: A Complete Step-by-Step Guide to Strategy, Tactics and Measurement, Kogan Page Publishers, 2014
2. Social Media Marketing for Beginners: Create successful campaigns, Gain more Fans, and boost sales from any Social Network by F.R. Media, 2/e, June 2014
3. Jan Zimmerman and Deborah Ng, Social Media Marketing All in One For Dummies , 2012

DEPRTMENT OF MECHANICAL ENGINEERING

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Minutes of Meeting of Mechanical Engineeringheld on 9th Nov, 2022

The meeting of all BoS members - **Mechanical Engineering,** Anurag University, was held on9th Nov, 2022 at 10:00 A.M.

The following members were Present/Absent for the meeting:

S. No.	Name & Details of Members	Designation	Present/ Absent
1	Dr.T.Krishnaiah Associate Professor, Dept. of Mechanical Engineering, A.U.	Chairperson	Present
2	Dr.S.Madhu Professor & Head, Dept. of Mechanical Engineering, A.U.	Head of Mech. Engg. & Member	Present
7	Dr.P.Ravikanth Raju Associate Professor, Dept. of Mechanical Engineering, A.U.	Member	Present
8	Dr.Md.Sikindar Baba Associate Professor, Dept. of Mechanical Engineering, A.U.	Member	Present
9	Dr.L.Venugopal Associate Professor, Dept. of Mechanical Engineering, A.U.	Member	Absent
10	Mr. K. Srinivasa Chalapathi Associate Professor, Dept. of Mechanical Engineering, A.U.	Member	Present

The Agenda of the meeting is as follows:

1. To put forward the course structure and syllabi for IVth B. Tech I & II semesters ofR20 regulations for academic council approval.
2. To frame the course structure and syllabi for next regulations.
3. To discuss on the possibilities of renaming options for Mechanical Engineeringdomain.

At the start of the meeting, Chairperson welcomed Hon'ble members of the Board ofStudies.

With the permission of the chairperson, the proceedings of BoS started.

Minutes:

1. It is advised to involve the subject experts to review the course content of all courses in IV B.Tech Ist & IInd Semesters, for any suggestions and modifications to be made.
2. Under Professional Elective - V CNC Technology and Programming can be renamed with tentative title CNC Technology and Additive manufacturing. The course content from both CNC Technology & Programming and Additive Manufacturing would probably be included in this.
3. ***To inform all departments about the courses offered by the mechanical engineeringdepartment under IV-II open elective courses, it has been agreed to send out a circular.***
4. It is decided to continue with the same name for the mechanical engineering domain after considering all the repercussions.
5. To frame the Course Structure and Syllabi for next regulations can be done once the AICTE approved curriculum for Mechanical Engineering is completed and released.

ANURAG UNIVERSITY

Department of Electronics and Communication Engineering

Board of Studies Meeting 2022

Minutes of the meeting

Date: 19th November 2022

The Board of Studies meeting of Department of Electronics and Communication Engineering has been convened on 19.11.2022 at 2:00 pm in 'E' Block Auditorium with the following BoS members:-

- Prof.S.Sathees Kumaran, Chairperson, HOD/ECE
- Dr.P.Chandrasekhar, Professor,OU and BoS External member
- Dr.Gajendranath Choudary,IIT,Hyderabad and BoS External member
- Mr.Venu Gopal, Alumni and BoS External member
- Prof.M.Narayana, Professor, AU and BoS Coordinator
- Dr.D.Haripriya, Associate Professor, AU and BoS Internal member
- Dr.D.Narendhar Singh, Assistant Professor, AU and BoS Internal member

The agenda of the BoS meeting are:

1. To verify inclusion of modifications and corrections approved in previous BoS meeting held on 15 March2022.
2. To approve modifications in R20 Course Curriculum structure of R-2020 IV B.Tech.ECE
3. To approve the Syllabus of R20 IV B.Tech.ECE (I and II Semester)
4. To approve the modifications in the list and syllabus of Open Electives.

Agenda No.1:- As Compliance of Previous BoS meeting minutes corresponding modification have been included.

Agenda No.2:-The approved Curriculum of R20 IV B.Tech ECE has been discussed for modifications and corrections. The proposals and approvals by the BoS members are listed below:

- the course with title 'Cellular and Mobile Communications (CMC)'is shifted from Professional Elective (PE-III) to Professional Core (PC) in order to enhance communication content in the curriculum by including order-of-the-day requirement.

- Machine Learning and Artificial Neural Networks (ML &ANN) is made PE in place of Cellular and Mobile Communications (CMC).
- Corresponding lab for PC course CMC a laboratory is included with Matlab based 12 experiments as a replacement of ML &ANN Lab.
- In the place of CAD for VLSI Circuits under PE-III, as its contents are repetition of previous courses another VLSI Course ‘Analog VLSI Design’ is included, which is shifted from PE-V.
- In order to include a Communication course under PE-III, a new course ‘Advanced Communications & Networks’ is introduced and ‘Adaptive Signal Processing’ course is shifted from PE-III to PE-V.
- Open Elective list is modified based on the courses offered by other departments to our ECE students and is presented and approved.

Agenda No.3:- The syllabi of new Theory Course and Practical course of R20 IV B.Tech ECE courses have been discussed and approved.

1. Advanced Communications & Networks
2. Cellular & Mobile Communication Laboratory

Agenda No.4:- The modifications in the list and syllabus of Open Electives have been discussed and approved outcome of the discussions are listed below.

A: Open Electives offered by other departments to ECE students

1. “Disaster Preparedness and Planning”, this Open Elective Course offered by Civil Engineering Department
2. “Fundamentals of Python Programming”, this Open Elective Course offered by Computer Science Engineering Department
3. “Introduction to Deep Learning”, this Open Elective Course offered by Artificial Intelligence Department
4. “Green Technologies”, this Open Elective Course offered by Mechanical Engineering Department

B: Open Electives offered by ECE department to other department students

1.“Digital Electronics and Microprocessors” as “Fundamentals of Digital Electronics and Microprocessors”, offered by ECE Department.

2. “Digital Image Processing” as “Basic Principles of Digital Image Processing”, offered by ECE Department.

3.“Embedded systems & IoT” as “Introduction to Embedded Systems”, offered by ECE Department.

4.“Introduction to Autonomous Systems” as “Introduction to Drones”, offered by ECE Department.

The following BoS members approved the above minutes of meeting in absentia.

1.Dr. M. Chakravarthy, Scientist-G, DLRL and BoS External member.

2.Prof. N. Mangal Gouri, Professor and Special Invitee.

IV YEAR I SEMESTER **6T+2L**

S. No	Course Code	Category	Course Title	L	T	P	Credits
1	A57040	PC	Microwave & Radar Engineering	3	0	0	3
2	A57041	PC	Cellular & Mobile Communication	2	1	0	3
3	A57042	PE	**Professional Elective –II** 1. Digital Image Processing	3	0	0	3
	A57043		2. Software Defined Radio				
	A57044		3. Low power VLSI				
4	A57045	PE	**Professional Elective –III** 1. Machine Learning & Artificial Neural Networks	3	0	0	3
	A57046		2. Analog VLSI Design				
	A57047		3. Advanced Communications & Networks				
5	A57048	PE	**Professional Elective –IV** 1. Antenna Theory & Design	3	0	0	3
	A57049		2. Optical Communication				
	A57050		3. Bio-Medical Signal Processing and Telemedicine				
6	A57051	PE	**Professional Elective-V** 1. Adaptive Signal Processing	3	0	0	3
	A57052		2. Organic and Flexible Electronics				
	A57053		3. Satellite Communication				
7	A57207	PC	Microwave & Digital Communication Lab	0	0	2	1
8	A57208	PC	Cellular & Mobile Communication Lab	0	0	2	1
9	A57230	PROJ	Industry Oriented Mini Project	0	0	4	2
Total				**17**	**01**	**08**	**22**

IV YEAR II SEMESTER

<table>
<tr><th>S. No</th><th>Course Code</th><th>Category</th><th>Course Title</th><th>L</th><th>T</th><th>P</th><th>Credits</th></tr>
<tr><td rowspan="3">1</td><td>A58002</td><td rowspan="3">OE</td><td><u>Open Elective –II</u>
1. Intellectual Property Rights</td><td rowspan="3">2</td><td rowspan="3">1</td><td rowspan="3">0</td><td rowspan="3">3</td></tr>
<tr><td>A58016</td><td>2. Python Programming</td></tr>
<tr><td>A58014</td><td>3. Disaster Preparedness and Planning</td></tr>
<tr><td rowspan="3">2</td><td>A58017</td><td rowspan="3">OE</td><td><u>Open Elective –III</u>
1. Introduction to Deep Learning</td><td rowspan="3">2</td><td rowspan="3">1</td><td rowspan="3">0</td><td rowspan="3">3</td></tr>
<tr><td>A58001</td><td>2. Technical and Business Communication Skills</td></tr>
<tr><td>A58018</td><td>3. Green Technologies</td></tr>
<tr><td>3</td><td>A58201</td><td>PROJ</td><td>Seminar</td><td>0</td><td>0</td><td>4</td><td>2</td></tr>
<tr><td>4</td><td>A58202</td><td>PROJ</td><td>Comprehensive Viva -Voce</td><td>0</td><td>0</td><td>0</td><td>2</td></tr>
<tr><td>5</td><td>A58203</td><td>PROJ</td><td>Project Work</td><td>0</td><td>0</td><td>20</td><td>10</td></tr>
<tr><td colspan="4">Total</td><td>4</td><td>2</td><td>24</td><td>20</td></tr>
</table>

A57040 Microwave and Radar Engineering

Prerequisite: Electromagnetic Theory and Transmission Lines.

Course Objectives:

- To develop knowledge on waveguides, waveguide components and their applications radar fundamentals and analysis of the radar signals
- To understand and analyze the operation of microwave tubes like klystron, magnetron TWT etc. and different radars like CW radar, pulse radar, MTI radar etc.
- To analyze the operation of microwave solid state devices and radar systems like tracking radars
- To understand the concepts of microwave junctions, scattering parameters and detection of radar signals in presence of noise
- To analyze microwave test bench for measuring different parameters like attenuation, power, VSWR etc. and the radar receivers

Unit-I: Rectangular waveguides and waveguide components:

Introduction to microwaves - characteristic features, advantages and applications. Waveguide basic concepts, TE and TM mode equations in rectangular waveguides. Microwave power flow and power losses, illustrative problems.

Waveguide components and applications: Construction and working of microwave components - coupling mechanisms, waveguide windows, tuning screws and posts, waveguide attenuators and phase shifters, waveguide multiport junctions. [Text Book-1]

Unit-II: Scattering matrix and Microwave tubes:

Scattering matrix for E plane and H plane tees, magic tee, directional coupler, Illustrative problems.

Microwave tubes: Limitations and losses of conventional tubes at microwave frequencies. Basic construction and operation - two cavity klystron, reflex klystron, TWT and Magnetron, (Qualitative treatment only) Illustrative Problems. [Text Book-2]

Unit -III: Microwave Solid State Devices and Measurements:

Classification, construction and working of TEDs and ATDs – gunn diode. Introduction to Avalanche

Transit Time Devices – IMPATT & TRAPATT.

Microwave measurements: Set up of microwave bench, precautions, microwave power measurement – bolometer, measurement of attenuation, frequency, low and high VSWR and impedance. [Text Book-2]

Unit -IV: Radar Principles and Types:

Introduction to Radars - radar range equation, radar frequencies and applications, PRF, unambiguous range, radar cross section, integration of radar pulses. Construction and working of CW radar, CW radar with non-zero IF, FM CW radar, MTI and pulse doppler radar, delay Line canceller, blind speeds, staggered PRFs. [Text Book-3]

Unit-V: Tracking Radar and Radar Receivers:

Tracking with radar, basic principle and operation of sequential lobbing, conical scan, monopulse tracking radar – amplitude comparison monopulse (one- and two- coordinates).

Radar Receivers: Noise figure and noise temperature, duplexers – branch type and balanced type, circulators as duplexers. [Text Book-3]

Text Books:

1. Microwave Devices and Circuits – Samuel Y. Liao, Pearson, 3rd Edition, 2003.
2. Micro Wave and Radar Engineering – M. Kulkarni, Umesh Publications, 2008.
3. Introduction to Radar Systems-Merrill I. Skolnik, Third Edition, Mcgraw-Hill, 2001

References:

1. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
2. Microwave Circuits and Passive Devices – M.L. Sisodia and G.S.Raghuvanshi, Wiley Eastern Ltd., New Age International Publishers Ltd., 2012.
3. Microwave Engineering Passive Circuits – Peter A. Rizzi, PHI, 1999.
4. Elements of Microwave Engineering – R. Chatterjee, Affiliated East-West Press Pvt. Ltd., New Delhi, 2016.

Course Outcomes:

After completing the course, students will be able to

- Describe the significance of waveguides, microwave components, radar fundamentals and signals
- Analyze the working and characteristics of microwave tubes and different radars
- Explain and analyze operations of microwave solid state devices and radar systems
- Apply and analyze concepts of microwave junctions, scattering parameters for different components and radar signals detection
- Analyze and evaluate microwave measurements and radar receiver

A57041 Cellular & Mobile Communication

Prerequisite: Analog Communication Systems and Digital Communication

Course Objectives:

- To illustrate the working principles and standardization of modern cellular communication systems to the students.
- To enable the student understand the concept of frequency reuse, handoff, channel assignment strategies and system capacity in cellular networks.
- To analyze the impact of fading on signal propagation in cellular networks
- To explore the principles of different equalization and diversity techniques
- To understand the concept of multiplexing and multiple access techniques used in communication networks

Unit-I: Introduction to Cellular Mobile Radio Systems (Text Book1): Limitations of Conventional Mobile Telephone Systems, Electromagnetic Spectrum, Wireless Communication Systems, How a Cellular Telephone Call is made, Comparative Study of Cellular Communication Networks- 2G, 3G, 4G, 5G, and Their Standardizations

Unit-II: Elements of Cellular Radio System Design (Text Book1): Operation of Cellular Systems, Concept of Frequency reuse, Channel Assignment Strategies, Handoff and Its types, Handoff Strategies, Interference and System Capacity, Trunking and Grade of Service, Improving Coverage and Capacity in Cellular Systems - Cell Splitting, Sectoring, Microcell Zone Concept.

Unit-III: Mobile Radio Propagation (Text Book1, Text book 2):

Large Scale Fading: Introduction to Radio Wave Propagation, Free Space Propagation Model, Radio Propagation Mechanisms- Concept Reflection, Diffraction, and Scattering in brief, Phase Difference Between Direct and Reflected Paths, Path Loss Models: Log-distance Path Loss model, Log-normal Shadowing, Okumura model, Hata model

Small Scale Fading and Multipath: Small-Scale Multipath Propagation, Parameters of Mobile Multipath Channels, Types of Small Scale Fading, Rayleigh and Ricean Distribution

Unit–IV: Equalization and Diversity (Text Book1): Brief introduction to ISI and Eye diagram, Fundamentals of Equalization, Linear Equalizer, Non-linear Equalizer- Decision Feedback Equalizer, Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Algorithm for Adaptive Equalizer- Zero Forcing (ZF) Algorithm, Least Mean Square (LMS) Algorithm, Diversity Techniques- Space Diversity, Polarization Diversity, Frequency Diversity, Time Diversity, Mathematical Derivation of Selection Diversity Improvement

Unit–V: Multiplexing and Multiple Access Techniques (Text Book1): Introduction to Multiplexing- Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM), Wavelength Division Multiplexing (WDM), Introduction to Multiple Access- Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA), Space Division Multiple Access (SDMA), Capacity of Cellular TDMA and CDMA networks

Text Books:

1. Wireless Communications - Theodore. S. Rapport, Pearson education, 2nd Edition, 2002

2. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2rd Edition, 2006

References :

1. Principles of Mobile Communications – Gordon L. Stuber, Springer International 2nd Edition, 2001

2. Modern Wireless communications- Simon Haykin, Michael Moher, Pearson Education, 2005

3. Wireless Communications and Networking, Vijay Garg, Elsevier Publications, 2007

4. Wireless Communications – Andrea Goldsmith, Cambridge University Press, 2005

Course outcomes:

After completing the course, students will be able to

- Understand the advantages, disadvantages, applications and standardization of different wireless communication technologies.
- Provide algorithms for designing and planning of cellular networks.
- Analyze the impact of fading in designing any cellular networks.
- Identify equalization and diversity techniques for designing efficient receivers
- Provide ideas in cellular network management

A57042 Digital Image Processing

Prerequisite: Signals and Systems and Digital Signal Processing

Course objectives:

- To understand the fundamentals of digital image processing.
- To design and implement Spatial and frequency domain filtering
- To evaluate the different denoising techniques
- To apply segmentation techniques to isolate the object
- To build various compression algorithms

Unit-I: Digital Image Fundamentals & Image Transforms:
Digital image fundamentals, sampling and quantization, relationship between pixels. Image transforms: 2-D FFT, properties, Walsh transform, Hadamard Transform, Discrete Cosine transform, Haar transform.

Unit-II: Image Enhancement:
Image Enhancement in Spatial Domain: Introduction, image enhancement in spatial domain, enhancement through point processing, types of point processing operations, histogram manipulation, linear and non-linear gray level transformation, local or neighborhood operation, median filter. Image enhancement frequency domain: Filtering in frequency domain, obtaining frequency domain filters from spatial filters. Generating filters directly in the frequency domain, low-pass (smoothing) and high pass (sharpening) filters in frequency domain.

Unit-III: Image Restoration:
Degradation model, Algebraic approach to restoration, Inverse filtering, least mean square filters, Constrained Least Squares Restoration.

Unit-IV: Image Segmentation and Morphological Image Processing:
Image Segmentation: Detection of discontinuities, edge linking and boundary detection, thresholding, region oriented segmentation.

Morphological Image Processing: Dilation and erosion, structuring element decomposition, the strel function. combining dilation and erosion: opening and closing, the hit or miss transformation.

Unit-V: Image Compression:
Redundancies and their removal methods, fidelity criteria, image compression models, source encoder and decoder. Error free compression, lossy compression, JPEG 2000 standards.

Text Books:

1. Rafael C. Gonzalez. Richard E. Woods, *"Digital Image Processing",* Third Edition, Pearson Education, 2008.
2. S. Jayaraman, S. Esakkirajan, T. Veerakumar , "*Digital Image Processing*" , Tata McGraw Hill, 2010.

References:

1. Rafael C. Gonalez, Richard E. Woods and Steven L. Eddings, "*Digital Image Processing using MATLAB*" , Second Edition, Tata McGraw Hill, 2010
2. A.K. Jain , "*Fundamentals of Digital Image Processing*" , Prentice Hall India, 2015
3. Somka, Hlavac, Boyle, "*Digital Image Processing and Computer Vision*" , Cengage learning (Indian edition), 2008.
4. Adrian low , "*Introductory Computer vision Imaging Techniques and Solutions*" , Second Edition, 2008
5. John C. Russ, J. Christian Russ, "*Introduction to Image Processing & Analysis*" , CRC Press, 2010

Course Outcomes:

After completing the course, students will be able to

- Acquire the fundamental knowledge in digital image processing
- Analyze the images in frequency domain and time domain
- Evaluate the existing techniques in image denoising
- Perform various morphological operations like opening and closing
- Categorize different compression techniques

B.Tech-ECE IV-Year-I-Semester **L/ T/ P** **C**

3 / 0 / 0 **3**

A57043 Software Defined Radio

Prerequisite: Analog Communication Systems, Digital Communication, Digital Signal Processing

Course Objectives:

- To identify the software and hardware requirements for designing a SDR network
- To explore the front end technology of SDR network
- To develop algorithms for signal processing in SDR network
- To design a SDR Network

Unit-I: Introduction to Software Defined Radio:

What is SDR - Definition of SDR, software radio (SR), adaptive intelligent SR, digital radio, multiband, and multimode. Architectural perspectives for SDR - radio implementer plane, network operator plane., SR Concepts, characteristics and benefits of SR, design principles of SR. (Text book-1,2)

Unit-II: Radio Frequency Translation for Software Defined Radio:

Requirements and specifications - transmitter specifications, receiver specifications. receiver design considerations - basic design considerations, receiver architectures - direct conversion architecture, multiple conversion architecture, low IF architecture., adjacent channel power ratio (ACPR) and noise power ratio (NPR), receiver signal budget. An approach to receiver design, transmitter design considerations: filtering analogies between receiver and transmitter, transmitter architectures- direct conversion, multiple conversion., candidate architectures for SDR: zero IF receivers, problems with zero IF architecture.

Unit-III: Data Conversion in Software Defined Radio:

The importance of data converters in SDR, converter architectures: analog to digital (A/D) converter- flash converter, multistage converter, sigma-delta converter. Digital to analog (D/A) converter- string converter., converter performance impact on SDR - noise sources, signal to noise ratio (SNR) of data converter, spurious impact on performance, digital to analog converter specification.

Unit-IV: Digital Hardware for Software Defined Radio:

Baseband component technologies, DSP processors: architectures - von Neumann and Harvard archituctures., DSP sotware developmemt cycle, field programmable gate arrays- applications of FPGA in SDR, design principles using FPGA, SDR baseband processing - -limitations of conventional IC Technologies.trade-offs of conventional IC technologies: limitations of microprocessor, DSP and ASIC implementations.

Unit-V: Software Technology for Software Defined Radio:

Overview of Vanu system, the importance of software in SR, Software download for mobile terminals - why software download, downloading technologies for SDR, security for download, software architectures for download., architecture of digital enhanced cordless telecommunications (DECT) reconfigurable demonstrator.

Text Books:

1. Walter Tuttlebee, "*Software Defined Radio: Enabling Technologies*", 1st Edition, John Wiley & Sons, 2003.
2. Jeffrey Hugh Reed, "*Software Radio: A Modern Approach to Radio Engineering*", 1st Edition, Prentice Hall Professional, 2002.

References:

1. Paul Burns, "*Software Defined Radio for 3G*",1st Edition, Artech House, 2003.
2. Markus Dillinger, Kambiz Madani, and Nancy Alonistioti, "*Software Defined Radio: Architectures, Systems and Functions*", 1st Edition, John Wiley & Sons, 2005.

Course Outcomes:

After completing the course, students will be able to

- Understand the principles of SDR.
- Understand the concept of multirate processing, A/D and D/A converter used in signal processing of SDR.
- Understand the design specifications of transmitter and receiver for SDR network
- Understand digital hardware required for SDR network .
- Understand the software technology for SDR network.

B.Tech-ECE IV-Year-I-Semester **L/T/P C**

3/0/0 3

A57044 Low Power VLSI Design

Prerequisite: VLSI design

Course Objectives:

- To understand the necessity of low power circuit design and various sources of power dissipation in CMOS transistors
- To learn the various low power techniques like voltage scaling, architectural level approach and switched capacitance minimization approach
- To apply the low power technique for adder and multiplier design implementation
- To design and analysis of low power RAM and ROM memory cell

Unit-I: Introduction to low power design:

Need for low power circuit design, sources of power dissipation – Switching power dissipation, short circuit power dissipation, leakage power dissipation, glitching power dissipation, short channel effects –drain induced barrier lowering and punch through, surface scattering, velocity saturation, impact ionization, hot electron effect.

Unit-II: Low-Power Design Approaches:

Low-power design through voltage scaling – VTCMOS circuits, MTCMOS circuits, architectural level approach –pipelining and parallel processing approaches.switched capacitance minimization approaches: system level measures, circuit level measures, mask level measures.

Unit-III: Low-Voltage Low-Power Adders:

Introduction, Standard Adder Cells, CMOS Adder Architectures – ripple carry adders, carry look-ahead adders, carry select adders, carry save adders, low-voltage low-power design techniques –trends of technology and power supply voltage, low-voltage low-power logic styles.

Unit-IV: Low-Voltage Low-Power Multipliers:

Introduction, overview of multiplication, types of multiplier architectures-braun multiplier, baugh-wooley multiplier, booth multiplier, wallace tree multiplier.

Unit-V: Low-Voltage Low-Power Memories:

Basics of ROM, low-power ROM technology, future trend and development of ROMs, Basics of SRAM, memory cell, precharge and equalization circuit, low-power SRAM technologies, basics of DRAM, self-refresh circuit, future trend and development of DRAM.

Text Books:

1. Sung-Mo Kang, Yusuf Leblebici, "*CMOS Digital Integrated Circuits Analysis and Design*", New York: McGraw-Hill, Second Edition, 2011.

2. Yeo, Kiat-Seng, and Kaushik Roy," *Low voltage, low power VLSI subsystems*", McGraw-Hill, Inc., 2004.

References:

1. Ming-BO Lin, "*Introduction to VLSI Systems: A Logic, Circuit and System Perspective*", CRC Press, First Edition, 2012.

2. AnanthaChandrakasan, "*Low Power CMOS Design*", IEEE Press/Wiley International, First Edition, 1998.

3. Kaushik Roy, Sharat C. Prasad, "*Low Power CMOS VLSI Circuit Design*", John Wiley & Sons, First Edition, 2009.

4. Gary K. Yeap, "*Practical Low Power Digital VLSI Design*", Kluwer Academic Press, 2002.

5. A. Bellamour, M. I. Elamasri, "*Low Power CMOS VLSI Circuit Design*",Kluwer Academic Press, 1995.

6. Siva G. Narendran, AnathaChandrakasan, "*Leakage in Nanometer CMOS Technologies*" Springer, Third Edition, 2005.

Course Outcomes:

After completing the course, students will be able to

- Understand about the sources of power dissipation and necessity of low power circuit design
- Analyze the low power technique in different levels of circuits
- Design the low power adder with various low power techniques
- Apply various low power architectures for low power multiplier implementation
- Analyze the future trend and development of RAM and ROM cell for low power design

3/0/0 3

A57045 Machine Learning & Artificial Neural Networks

Prerequisite: Introduction to Probability Theory & Statistics

Course Objectives:

- Understand the challenges, applications and models of Machine Learning
- Apply and evaluate supervised machine learning algorithms for classification and regression tasks
- Apply and evaluate unsupervised learning algorithms for clustering tasks
- Understand the Ensemble learning, apply and evaluate different type of these algorithms for better prediction.
- Understand the Artificial Neural Networks computational model

Unit-I: Introduction to Machine Learning

What is machine learning, why machine learning, types of machine learning models, challenges of machine learning, applications of machine learning, essential libraries and tools, generalization overfitting and underfitting, bias–variance trade-off, metrics

Unit-II: Supervised Learning

Classification and regression, linear regression: single and multiple, logistic regression, k-nearest neighbour, naive bayes classifier, decision tree, support vector machine

Unit-III: Unsupervised Learning and Pre-processing

Types of unsupervised learning, challenges in unsupervised learning, applications of unsupervised learning, pre-processing and scaling, clustering, K-Means Clustering, agglomerative clustering, comparing and evaluating the clustering algorithms.

Unit-IV: Ensemble Learning and Random Forest

Voting classifiers, bagging and pasting, random patches and random subspaces, random forest, boosting-AdaBoost and Gradient Boost.

Unit-V: Artificial Neural Networks

Introduction, understanding the biological neuron, exploring the artificial neuron, types of activation functions, early implementations of ANN, architectures of neural network: single-layer & multi-layer feed forward ANNs, recurrent network, learning process in ANN, backpropagation

Text Books:

1. Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das "*Machine Learning*", Pearson Education India, 2018.

2. Aurélien Géron, "*Hands-on Machine Learning with Scikit-Learn, Keras, and TensorFlow Concepts,Tools, and Techniques to Build Intelligent Systems*" O'Reilly Media, Inc, 2017.

References:

1. Andreas C. Müller, Sarah Guido, "*Introduction to Machine Learning with Python*", O'Reilly Media, Inc, October 2016.
2. Tom M. Mitchell, "*Machine Learning*", McGraw-Hill Education (India) Private Limited, 2013.
3. Ethem Alpaydin, "*Introduction to Machine Learning (Adaptive Computation and Machine Learning*)", The MIT Press, 2004.
4. Stephen Marsland, "*Machine Learning: An Algorithmic Perspective*", CRC Press, 2009.

Course Outcomes:

After completing the course, students will be able to

- Understand the essentials of feature engineering, state-of-art tools and concepts of machine learning
- Design and evaluate different types of supervised learning algorithms for classification and regression tasks.
- Design and evaluate different types of unsupervised learning algorithms for clustering tasks.
- Design and evaluate strong learners for better real time prediction ensemble learning algorithms
- Design Artificial Neural Networks computational model.

B.Tech-ECE IV-Year-I-Semester L/T/P C

3/0/0 3

A57046 Analog VLSI Design

Prerequisite: Electronic Circuit Analysis, Pulse & Integrated Circuits

Course objectives:

- To provide in-depth understanding of the analog circuits and building blocks
- To Understand the MOSFET models, small signal analysis
- To provide a basic knowledge on current mirror and amplifier design
- To understand the operation and analysis of comparators

Unit-I: Introduction to analog designand Basic MOS device physics:

Need of analog design and Complementary MOS (CMOS), Level of abstraction, robust analog design.

Basic MOS device physics:Metal-oxide-semiconductor (MOS) switch, MOS structure, symbols, threshold voltage, derivation of V-I characteristics, body effect, channel length modulation, subthreshold conduction.

Unit-II: MOS device Models:

MOS device capacitances, Small signal model, NMOS versus PMOS devices. Passive and Active current mirrors:basic current mirrors, cascade current mirrors, active current mirrors, large signal analysis, small signal analysis, common mode properties.

Unit-III: Single stage and differential amplifiers:

Common-source stage with resistive load, diode connected load, current source load, source follower, common gate stage.

Differential amplifiers: single-ended and differential operation, basic differential pair: qualitative and quantitative analysis, common - mode response, differential pair with MOS loads.

Unit-IV: Operational Amplifiers:

General considerations- performance parameters, One stage op-amp, Two stage op-amp, gain boosting, comparison, input range limitations, slew rate, power supply rejection.

Unit-V:Comparators:

Comparator specifications, using an op-amp for a comparator, charge-injection errors, latched comparators, example of CMOS comparators.

Text Books:

1. Behzad Razavi, *"Design of analog CMOS integrated circuits"*, Mc - Graw Hill international edition 2001.
2. Tony Chan Carusone, David A. Johns, Kenneth W. Martin *"Analog integrated circuit design",* Wiley, 2nd Edition.

Reference Books:

1. Philip E. Allen and Douglas R. Holberg, *"CMOS analog circuit design"*, oxford university Press, international 2nd edition/Indian edition, 2010.
2. Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, *"Analysis and design of analog integrated circuits",* Wiley India, 5th Edition, 2010.
3. Baker, Li and Boyce, *"CMOS: Circuit design, layout and simulation"*, PHI.

Course outcomes:

After completing the course, students will be able to

- Understand the MOS fundamentals, analog and basic building blocks design.
- Know the, small signal models and analysis of MOSFET based circuits such as current mirrors
- Analyze and design analog circuits such as single stage and differential amplifiers.
- Analyze and design of operational amplifiers and the performance parameters
- To design of comparators using operational amplifiers.

IV-Year B.Tech-ECE-I-Semester **L/T/P C**
3/0/0 3

A57047 Advanced Communications and Networks

Prerequisite: Analog Communication Systems and Digital Communications

Course Objectives:

- To illustrate the working principles and standardization of modern cellular communication systems to the students.
- To enable the student understand the concept of frequency reuse, handoff, channel assignment strategies and system capacity in cellular networks.
- To analyze the impact of fading on signal propagation in cellular networks
- To explore the principles of different equalization and diversity techniques
- To understand the concept of multiplexing and multiple access techniques used in communication networks

Unit-I: Orthogonal Frequency Division Multiplexing (OFDM):

Basic Principles of Orthogonality, Single vs Multicarrier Systems, OFDM Block Diagram and Its Explanation, OFDM Signal Mathematical Representation, Selection parameter for Modulation, Pulse shaping in OFDM Signal and Spectral Efficiency, Windowing in OFDM Signal and Spectrum, Synchronization in OFDM, Channel Estimation, Limitations in OFDM, FFT Point Selection Constraints in OFDM

Unit-II: Multiple Input Multiput Output (MIMO):

Introduction, Space Diversity, System Based on Space Diversity, Smart Antenna system and MIMO, MIMO Based System Architecture, MIMO Exploits Multipath, Space – Time Processing, Antenna Consideration for MIMO, MIMO Channel Modelling, MIMO Channel Measurement, MIMO Channel Capacity, Cyclic Delay Diversity (CDD), Space Time Coding, Advantages and Applications of MIMO in Present Context, MIMO Applications in 3G Wireless System and Beyond

Unit-III:Wireless LANs/IEEE 802.11x:

Introduction to IEEE802.11x Technologies, Evolution of wireless LANs, IEEE 802.11 Design Issues, IEEE 802.11 Services, IEEE 802.11 MAC Layer operations, IEEE 802.11 Layer1, IEEE 802.11 a/b/g Higher Rate Standards, Wireless LAN Security, Computing Wireless Technologies, Typical WLAN Hardware

Unit–IV: Wireless PANs/IEEE 802.15x:

Introduction to IEEE 802.15x Technologies: Wireless PAN Applications and Architecture, IEEE 802.15.1 Physical Layer Details, Bluetooth Link Controllers Basics, Bluetooth Link Controllers Operational States, IEEE 802.15.1 Protocols and Host Control Interface. Evaluation of IEEE 802.15 Standards

Unit–V: Broad Band Wireless MANs/IEEE 802.16x:

Introduction to WMAN/IEEE 802.16x Technology, IEEE 802.16Wireless MANs, IEEE 802.16 MAC Layer Details, IEEE 802.16 Physical Layer Details, IEEE 802.16 Physical Layer Details for 2-11 GHz, IEEE 802.16 Common System Operations.

Text Books:

1. Gary J. Mullett, "Introduction to Wireless Telecommunications Systems and Networks", CENGAGE
2. Upena Dalal, "Wireless Communication", Oxford University Press, 2009

References :

1. Ke-Lin Du & M N S Swamy, "Wireless Communication System", Cambridge University Press, 2010
2. Gottapu Sasibhusan Rao, "Mobile Cellular Communication", PEARSON

Course outcomes:

After completing the course, students will be able to

- Understand the advantages, disadvantages, applications and standardization of different wireless communication technologies.
- Provide algorithms for designing and planning of cellular networks.
- Analyze the impact of fading in designing any cellular networks.
- Identify equalization and diversity techniques for designing efficient receivers
- Provide ideas in cellular network management

B.Tech-ECE IV-Year-I-Semester **L/T/ P C**

3/0/0 3

A57048 Antenna Theory & Design

Prerequisite: Electromagnetics and Transmission Lines

Course Objectives:

- To understand the applications of the electromagnetic waves in free space.
- To learn the working principles of various types of basic and advanced antennas
- To discuss the major applications of antennas with an emphasis on how antennas are employed to meet electronic system requirements.
- To understand the concepts of different Antennas.

Unit-I: Antenna Basics:

Introduction, basic antenna parameters-patterns, beam area, radiation intensity, beam efficiency, directivity-gain - resolution, antenna apertures, effective height. Fields from oscillating dipole, field zones, antenna theorem. Half wave dipole – current distributions, field components, radiated power, radiation resistance, beam width, directivity, effective area and effective height, related problems

Unit-II: Antenna Arrays:

Point Sources-Definition, patterns, arrays of 2 isotropic sources- different cases, principle of pattern multiplication, uniform linear arrays – broadside, end fire arrays. Derivation of their characteristics and comparison, BSA's with non-uniform amplitude distributions-general considerations and binomial arrays, illustrated problems

Unit-III: VHF, UHF and Microwave Antennas - I:

Arrays with parasitic elements, Yagi - Uda arrays, folded dipoles & their characteristics. Helical antennas- helical geometry, helix modes, practical design considerations for nonfoliar helical antennas in axial mode and normal modes. Horn antennas-types, fermat's principle, optimum horns, design considerations of pyramidal horns, related problems.

Unit-IV: VHF, UHF and Microwave Antennas - II:

Micro strip antennas- advantages and limitations, rectangular patch antennas-geometry and parameters, characteristics of micro strip antennas. Impact of different parameters on characteristics paraboloidal reflectors-geometry, pattern characteristics, feed methods, reflector types-related features. Illustrative problems. Lens antennas – introduction, geometry of non-metallic dielectric lenses, zoning, tolerances, and applications.

Unit-V: Antenna Measurements:

Reciprocity, sources of errors, pattern measurement arrangement, directivity measurement, gain measurements by comparison, absolute and 3-antenna methods. Introduction to turnstile antenna.

Text Books:

1. John D. Kraus, Ronald J. Marhefka and Ahmad S. Khan, *"Antennas and wave propagation*, TMH 4th Edition., Indian edition 2010.

2. C.A. Balanis, *"Antenna Theory and Design"*, John Wiley & Sons, 3rd ed., 2005.

References:

1. E.C. Jordan and K.G. Balmain, *"Electromagnetic Waves and Radiating Systems",* PHI, 2nd ed., 2000.

2. K.D. Prasad, *"Antennas and Wave Propagation",* SatyaPrakashan, Tech India Publications, New Delhi, 2001.

3. E.V.D. Glazier and H.R.L. Lamont, *"Transmission and Propagation - The Services Text Book of Radio, volume 5"*, Standard Publishers Distributors, Delhi.

4. F.E. Terman *"Electronic and Radio Engineering",* McGraw-Hill, 4th edition, 1955.

5. John D. Kraus, *"Antennas",* McGraw-Hill International Edition Second Edition, 1988.

Course Outcomes:

After completing the course, students will be able to

- Apply Maxwell's equations to calculate fields from dynamic current distributions.
- Analyze various antenna types and its radiating systems
- Design antenna system including shape of antenna, feed property, given radiation pattern, gain operating frequency, transmitted / received power.
- Compare different design parameters of different antennas
- Illustrate techniques for measuring antenna parameters

B.Tech-ECE IV-Year-I-Semester **L/T/P** **C**

3/0/0 **3**

A57049 Optical Communication

Prerequisite: Applied Physics, Electronic Devices & Circuits

Course Objectives:

- To realize the significance of optical fiber communications.
- To understand the construction and characteristics of optical fiber cable.
- To develop the knowledge of optical signal sources and power launching.
- To identify and understand the operation of various optical detectors.
- To understand the design of optical systems and wave length division multiplexing.

Unit-I: Optical Fiber Construction & Materials:

Historical development, the general system, advantages of optical fiber communications, optical fiber wave guides – introduction, ray theory transmission, total internal reflection, acceptance angle, numerical aperture, skew rays. cylindrical fibers – modes, v-number, mode coupling, step index fibers, graded index fibers. single modes fibers – cut off wavelength, mode field diameter, effective refractive index. fiber materials – glass, halide, active glass, chalgenide glass, plastic optical fibers.

Unit-II: **Signal Distortion & Connectors**:

Signal distortion in optical fibers – attenuation, absorption, scattering and bending losses, core and cladding losses. Capacity determination, group delay, types of dispersion – material dispersion, wave – guide dispersion, polarization mode dispersion, intermodal dispersion. Pulse broadening. Optical fiber Connectors – Connector types. Fiber splicing – splicing techniques, splicing single mode fibers. Fiber alignment and joint loss.

Unit-III: Optical Sources & Detectors:

Light Emitting Diodes (LED's), structures, materials, quantum efficiency, power modulation, power bandwidth product. injection laser diodes – modes, threshold conditions, external quantum efficiency, laser diode rate equations, resonant frequencies. reliability of light emitting diodes (LED) & Injection Laser Diodes (ILD). Source to fiber power launching – output patterns, power coupling, power launching, equilibrium numerical aperture, laser diode to fiber coupling. Transmission distance, line coding in optical links, physical principles of pin and avalanche photo diodes (apd), detector response time, temperature effect on avalanche gain, comparison of photo detectors.

Unit-IV: Receivers & Wavelength Division Multiplexing:

Necessity, principles, types of wave length division multiplexing (WDM), measurement of attenuation and dispersion, eye pattern. Optical receiver operation – Fundamental receiver operation, digital signal transmission, error sources, receiver configuration, digital receiver performance, probability of error, quantum limit, analog receivers.

Unit-V: Optical system design:

Considerations, component choice, multiplexing. Point – to – point links, system considerations, link power budget with examples. Overall fiber dispersion in multimode and single mode fibers, rise time budget with examples.

Text Books:

1. Gerd Keiser, *"Optical Fiber Communications"* , McGraw Hill International edition, 3 rd edition, 2000.
2. John M. Senior, *"Optical Fiber Communications"*, PHI, 2nd edition, 2002.

References:

1. D.K.Mynbaev, S.C.Gupta and Lowell L.Scheiner, "*Fiber Optic Communications"*, Pearson Education, 2005.
2. S. C. Gupta, "*Text Book on Optical Fiber Communication and Its Applications"*, PHI, 2005.
3. Govind P Agarwal, *"Fiber Optic Communication Systems"*, 3rd edition,, John Wiley, 2004.
4. Joseph C. Palais, *"Fiber Optic Communication Systems",* 4th edition, Pearson Education, 2004.

Course Outcomes:

After completing the course, students will be able to

- Explain and analyze the constructional parameters of optical fibers.
- Design an optical system.
- Estimate the losses due to attenuation, absorption, scattering and bending
- Compare various optical detectors and choose suitable one for different applications
- Analyze analogue and digital links. describe the various criteria power loss wavelength to be considered for point-to-point link in digital link system

B.Tech-ECE IV-Year-I-Semester **L/T/ P C**

3/0/0 3

A57050 Biomedical Signal Processing and Telemedicine

Prerequisite: Signals and Systems and Digital Signal Processing

Course Objectives:

- To understand the fundamentals of discrete-time signals and systems for biomedical signal analysis
- To learn about various types of wavelet transforms that are used to describe, analyze and process biomedical signals
- To analyze and preprocess the EEG signal using spectral analysis, segmentation and filters
- To apply the methods to extract relevant information from EMG signals
- To develop various methods for extracting the ECG signal feature extraction and heart rate variability analysis

Unit-I: Fundamentals of Discrete-Time Signals and Systems:

Concepts of systems and signals, sampling process, impulse response, discrete transfer function. Wavelets: Continuous wavelet transform, discrete wavelet transform, reconstruction, recursive multi resolution decomposition, Types of wavelets-Haar wavelet, Daubechies wavelet, Biorthogonal wavelet, Coiflet wavelet.

Unit-II: The Electro Encephalo Gram (EEG):

Applications, signal processing, modeling and artifacts nonparametric and model-based spectral analysis, eeg segmentation, joint time-frequency analysis, evoked potential modalities, noise characteristics, noise reduction by ensemble averaging and linear filtering, single-trail analysis and adaptive analysis using basis functions.

Unit-III: Electro Myo Gram (EMG): The electrical activity of muscles, amplitude estimation in the surface EMG, spectral analysis of the surface EMG, conduction velocity estimation, modelling the EMG, EMG signal decomposition.

Unit-IV: Electrocardiogram (ECG): Heart rhythms, heartbeat morphologies, noise and artifacts, baseline wander, power line interference, muscle noise filtering, QRS detection, wave delineation, data compression, heart rate variability, acquisition and rr interval conditioning, spectral analysis of heart rate variability.

Unit-V: Introduction of Telemedicine:

History of telemedicine, block diagram of telemedicine system, definition of telemedicine, tele health, tele care, origin & development of telemedicine, scope, benefits and limitation of telemedicine.

Text Books:

1. Willis J. Tompkins, "*Biomedical Digital Signal Processing*", Prentice-Hall, first edition, 1993.
2. Leif Sornmo and Pablo Laguna,"*Bioelectrical Signal Processing in Cardiac and Neurological Applications*", Academic Press, 2005

Reference Books:

1. Rangaraj M. Rangayyan, Akay Metin(Editor), "*Biomedical Signal Analysis: A Case Study Approach*", Wiley Interscience John Willey & Sons,INC., Second Edition, 2015.
2. Roberto Cristi, "*Modern Digital Signal Processing*", 2004.
3. James V. Stone, "*Independent Component Analysis: A Tutorial Introduction*", MIT Press,2004

Course Outcomes:

After completing the course, students will be able to

- Learn discrete fourier transform, fast-Fourier transform and z-transform to analyze the biomedical signals for medical applications
- Understand various wavelet transforms to analyze the biomedical signals for medical applications
- Apply spectral analysis, segmentation and filtering for EEG diagnosis.
- Analyze EMG for estimating the amplitude and conduction velocity.
- Utilize the preprocessing techniques and extract the features of ECG signal for diagnosis.

B.Tech-ECE IV-Year-I-Semester **L/T/ P C**

3/0/0 3

A57051 Adaptive Signal Processing

Prerequisite: 1. Signals and Systems and Digital Signal Processing

Course Objectives:

- To learn and able to visualize the domain of adaptive signal processing
- To identify a random process and formulate to extract desired information
- To develop algorithms meeting application specific performance criteria
- Toverify the adaptive algorithms in software or hardware

Unit-I: Introduction to Adaptive Systems:

Review of digital signal processing, adaptive System - definitions, characteristics, applications. Adaptive linear combiner – description, weight vectors. desired response performance function – gradient and mean square error.

Unit-II: Wiener Filters:

Linear optimum filtering – Minimum mean-square error,Wiener- Hopf equations, multiple linear regression model, steepest-descent algorithm. Linear prediction – forward linear prediction, Levinson-Durbin algorithm. Kalman filter, extended kalman filter.

Unit-III: Least Mean Square (LMS) Adaptive Filters:

LMS algorithm, LMS adaptation algorithm and applications. Method of least squares – data windowing, normal equations and linear least square filters, recursive least squares algorithm.

Unit-IV: Frequency Domain Filters:
Frequency domain adaptive filters, adaptive lattice filters, adaptive infinite impulse response filtering, blind adaptive filtering, Haykin cost functions. Higher-order statistics.

Unit-V: Applications of Adaptive Signal Processing:

Adaptive modeling and system identification,inverse adaptive modeling, deconvolution and equalization, adaptive control systems, adaptive interference canceling - canceling noise, canceling periodic interference, canceling interference in ECG signals.

Text Books:

1. B. Widrow and S. D. Sterns, "*Adaptive Signal Processing*", Pearson Education , 2nd Indian reprint, 2002.
2. Simon Haykins, "*Adaptive Filter Theory*", Pearson Education, Fifth Edition, 2013.

Reference Books:

1. J. Benesty, Y. Huang," *Adaptive Signal processing: Applications to Real World Problems*", Springer, 2003.

2. D. G. Manolakis, V.K. Ingle, S.M. Kogon, "*Adaptive Signal Processing*", McGraw-Hill , 2000.

3. John. R. Triechler, C. Richard Johnson (Jr), Michael. G. Larimore, "*Theory and Design of Adaptive Filters*", Prentice Hall India Private Limited, 2004.

Course Outcomes:

After completing the course, students will be able to

- Devise filtering solutions for optimising the cost function indicating error in estimation of parameters and appreciate the need for adaptation in design.
- Evaluate the performance of various methods for designing adaptive filters through estimation of different parameters of stationary random process clearly considering practical application specifications.
- List and apply the various mathematical models to adaptive signal processing
- Design and implement filtering solutions for applications such as channel equalization, interference cancelling and prediction considering present day challenges.
- Use computer-based simulation tools to understand the theoretical concepts of adaptive signal processing in various communication applications.

B.Tech-ECE IV-Year-I-Semester **L/T/P C**

3/0/0 3

A57052 Organic and Flexible Electronics

Prerequisite: Applied Physics, Engineering Chemistry and Electronic Devices & Circuits

Course Objectives:

- To gain a fundamental understanding to the field of organic and printed electronics.
- Introduction to advanced electronics materials and their potential impact
- Introduction to sophisticated characterisation techniques and advanced electronics devices
- To understand the basic concepts for integration of thin-film devices on flexible platforms and the advantages and disadvantages of emerging technology.
- To provide students with a broad overview of organic electronic materials and devices with emphasis of research and practical applications.

Unit-I: Introduction to Organic and Flexible Electronics

Introduction to flexible and organic electronics, their materials systems, background, trends, emerging technologies, general applications. [Textbook-1]

Unit-II: Organic Semiconducting Materials

Review of inorganic semiconductors, properties. Review of organic semiconductor: Conjugated small molecules and polymers, electronic structure, hybridization of atomic orbitals, molecular orbitals, charge injection and transport. [Textbook-1]

Unit-III: Thin Films Processing Techniques

Thin-film Deposition and Processing Methods: Evaporation Methods-CVD, PECVD, PVD, Coating Techniques-Spin Coating, Slot-die coating, Blade Coating. Printing Technique: Inject printing, Screen Printing, Gravure printing. [Textbook-1&2]

Unit-IV: Characterization Techniques for Flexible Electronics

Structural Characterisation: Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Forced Microscopy (AFM), X-ray Diffraction (XRD). Spectroscopic Characterisation: Infra-Red (IR), UV-visible and Raman. [Textbook-1&2]

Unit-V: Organic and Flexible Electronics Devices: Review of PN junction diodes, Metal Oxide Semiconductor Field Effect Transistors (MOSFETs), Organic Thin-film transistors (OTFTs), Organic Light-emitting Diodes (OLEDs), Organic Solar cells (OSCs) and their electrical measurements. [Textbook-1&2]

Text Books:

1. Giovanni Nisato, Donald Lupo and Simone Ganz, "*Organic and Printed Electronics Fundamental and Applications*", Taylor & Francis, 1st Edition, 2016.
2. Stergios Logothetidis, "*Handbooks of Flexible Organic Electronics- Materials Manufacturing and applications*" Elsevier, 2015.

Reference Books:

1. Zhenan Bao and Jason Locklin, "*Organic Field-Effect Transistors*" CRC Press, 1st Edition, 2007.
2. Ioannis Kymissis, "*Organic Field-Effect Transistors: Theory, Fabrication and Characterization*", 1st Edition, Springer, 2009.
3. Qiquan Qiao, "*Organic Solar Cells: Materials, Devices, Interfaces, and Modeling*", 1st Edition, CRC Press, 2015.

Course Outcomes:

After completing the course, students will be able to

- To know about flexible electronics and its possibilities in the industry.
- To understand about various organic materials and their electronics products.
- To understand about different fabrication and characterization methods used in this field.
- To understand about characterization techniques for flexible electronics
- To understand the opportunities and advancements in this advanced field of electronics.

3/0/0 3

A57053 Satellite Communication

Prerequisite: Analog Communication Systems and Digital Communications

Course Objectives:

- To acquire foundation in orbital mechanics and launch vehicles for satellites.
- To gain basic knowledge of link design of satellite.
- To understand multiple access systems and earth station technology
- To understand the concepts of satellite navigation and GPS.

Unit-I: Introduction:

Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency Allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

Orbital Mechanics and Launchers: Orbital Mechanics, Look Angle determination, Orbital

Perturbations, Orbit determination, Launches and Launch vehicles, Orbital Effects in Communication Systems Performance.

Unit-II: Satellite Subsystems:

Attitude and Orbit Control System, Telemetry, Tracking, Command and Monitoring, Power Systems, Communication Subsystems, Satellite Antennas, Equipment Reliability and Space Qualification.

Satellite Link Design: Basic Transmission Theory, System Noise Temperature and Gain of Antenna to Temperature of Antenna (G/T) ratio, Design of Down Links, Up Link Design, Design of Satellite Links for Specified Carrier signal to Noise Signal (C/N), System Design Examples.

Unit-III: Multiple Access:

Frequency Division Multiple Access (FDMA), Intermodulation, Calculation of Carrier signal to Noise Signal (C/N), Time Division Multiple Access (TDMA), Frame Structure, Examples, Satellite Switched TDMA Onboard Processing, Demand Assigned Multiple Access (DAMA), Code Division Multiple Access (CDMA), Spread Spectrum Transmission and Reception.

Earth Station Technology: Introduction, Transmitters, Receivers, Antennas, Tracking Systems, Terrestrial Interface, Primary Power Test Methods.

Unit-IV:Low Earth Orbit and Geo-Stationary Satellite Systems:

Orbit Considerations, Coverage and Frequency Consideration, Delay & Throughput Considerations, System Considerations, Operational Non-Geo-Stationary Satellite Orbit (NGSO) Constellation Designs.

Unit-V:Satellite Navigation & Global Positioning System:

Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers and Codes, GPS Receiver Operation, GPS Coarse Acquisition (C/A) Code Accuracy, Differential GPS, Very Small Aperture Terminal (VAST), Mobile Satellite services: GSM, Direct Broadcast Satellites (BDS), Direct to Home Broadcast (DTH), Specialized Services-Video Conferencing, Internet.

Text Books:

1. Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, *"Satellite Communications"*, Wiley Publications, 2nd Edition, 2003.
2. Dennis Roddy, *" Satellite Communications"*, McGraw Hill, 4th Edition, 2009.

Reference Books:

1. M. Richharia, *Satellite Communications*: Design Principles, BS Publications, 2nd Edition, 2003.
2. D.C Agarwal, *Satellite Communication*, Khanna Publications, 5th Ed.
3. K.N. Raja Rao, *Fundamentals of Satellite Communications*, PHI, 2004
4. Wilbur L. Pritchard, Robert A Nelson and Henri G. Suyderhoud, *Satellite Communications Engineering,* 2nd Edition, Pearson Publications, 2003.

Course Outcomes:

After completing the course, students will be able to

- Understand basic concepts and frequency allocations for satellite communication, orbital mechanics and launch vehicles.
- Envision the satellite sub systems and design satellite links for specified C/N.
- Understand the various multiple access techniques for satellite communication systems and earth station technologies.
- Know the underlying concepts of state-of-the-art LEO, GEO Stationary Satellite Systems and satellite navigation

0/0/2 1

A57207 Microwave & Digital Communications Lab

Course objectives:

- To establish in micro wave bench and understand, analyze the functionality of different microwave components and devices
- To understand and analyze the functionality of different optical components and devices
- To operate and characterized the behaviour of micro wave and optical sources
- To measure and evaluate different micro wave parameters and quantities
- To measure and evaluate different optical parameters and antennas.

Note: Minimum of 12 Experiments to be conducted

PART –A: Microwave Engineering (Any 6 Experiments):

1. Reflex Klystron Characteristics
2. Gunn Diode Characteristics
3. Directional Coupler Characteristics
4. VSWR Measurement
5. Measurement of Waveguide Parameters
6. Measurement of Impedance of a given load
7. Measurement of Scattering parameters of a Magic Tee
8. Measurement of Scattering parameters of a Circulator
9. Attenuation Measurement
10. Microwave Frequency Measurements.

PART-B: **Digital Communications Lab (Any 6 Experiments):**

1. PCM Generation and Detection
2. Differential Pulse Code Modulation
3. Delta Modulation
4. Time Division Multiplexing of 2 Band Limited Signals
5. Frequency shift Keying: Generation and Detection
6. Phase Shift Keying: Generation and Detection
7. Amplitude Shift Keying: Generation and Detection
8. Study of the Spectral characteristics of PAM, QAM

9. DPSK: Generation and Detection
10. QPSK: Generation and Detection

Requirements:

1. Klystron power supplies
2. Gun Power supplies
3. Reflex Klystron benches
4. Gunndiode benches
5. Optical trainer kits
6. CROs
7. Function Generators
8. Multimeters

Digital Communication Lab
CRO: 0-20MHz ;0-60MHz
Function Generators:0-1MHz
Experimental Kits

Course outcomes:

After completing the course, students will be able to

- Establish and evaluate microwave test bench, microwave components and devices
- Describe and evaluate different optical components and devices
- Operate and analyze the characteristics of micro wave and optical sources
- Measure and evaluate different micro wave parameters and quantities
- Measure and evaluate different optical parameters and antennas

0/0/2 1

A57208 Cellular & Mobile Communication Lab

Course Objectives:

- To understand the characteristics of small scale and large scale fading
- To analyse the impact of fading on the performance of different modulation techniques
- To observe the impact of Inter Symbol Interference (ISI) with Eye diagram
- To analyse the performance of equalization and diversity techniques in cellular networks
- To observe the performance of different multiple access techniques

List of Experiments (Any Ten Experiments are to be performed)

1. To analyse the characteristics of Friis free space path loss model, Log distance path loss model, Hata path loss model
2. To study different small scale fading parameters such as Power delay profile, Doppler spectrum, Frequency correlation function
3. To analyse the PDFs of Rayleigh and Rician fading channel
4. To analyse the performance of BPSK and QAM modulation techniques under Rayleigh fading channel
5. To analyse the performance of BPSK modulation technique with different diversity combining schemes
6. To observe the performance of 2x2 Multiple Input and Multiple Output (MIMO) technique under AWGN channel
7. To estimate the channel capacity of Single Input and Single Output (SISO) and Multiple Input and Multiple Output (MIMO) communication networks
8. To observe the impact of Inter Symbol Interference (ISI) with Eye diagram
9. To analyse the performance of Zero Forcing (ZF) and Minimum Mean Square Error (MMSE) equalisation techniques
10. To analyse the performance of Code Division Multiple Access (CDMA) technique
11. To simulate Time Division Multiplexing (TDM) and Frequency Division Multiplexing (FDM)
12. To simulate Orthogonal Frequency Division Multiplexing (OFDM) multicarrier technique

Course Outcomes:

After completing the course, students will be able to

- Estimate the behaviour of cellular networks in different network scenarios
- Analyse the error rate of modulation techniques under fading channels
- Explore the efficacy of diversity techniques in cellular networks
- Provide solutions to design receivers that can handle the effects of ISI
- Analyse the impact of multi-carrier modulation and multiple access techniques in cellular networks

B.Tech-ECE IV-Year-II-Semester **L/T/P C**

2/1/0 3

A58002 Intellectual Property Rights

Course Objective:

The course aims to help the student understand the concept of Intellectual Property Rights and helps the student to appreciate the purpose and function of a trademark and the process involved in getting copyright, patent and related issues. The student is introduced to the importance of trade Secret and Geographical Indications.

Unit-I: Introduction to IPR:

Concept of intellectual property rights, importance of intellectual property rights. Types of intellectual property, international agencies, and treaties.

Unit-II: Trademarks:

Concept of trademarks, purpose, and function of trademarks. Acquisition of trademark rights, protectable matter, selecting and evaluating trademark, trademark registration processes.

Unit-III: Law of Copyrights:

Concept of copyright right, fundamentals of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration.

Unit-IV: Law of patents:

Introduction to patent, foundation of patent law, patent searching process, ownership rights and transfer.

Unit-V: Trade Secrets & Geographical Indication:

Law pertaining to trade secrets, determination of trade secrets. Trade secret litigation. Unfair competitions. Geographical Indication, concept of geographical indication, importance of geographical indication, new development of intellectual property rights.

Textbooks:

1. Deborah. E. Bouchoux,*"Intellectual property right"*, 5/e,cengage learning, 2018.
2. Neeraj Pandey, *"Intellectual property right"*, PHI, 2019.

Reference Books:

1. Ramakrishna Chintakunta and M. Geethavani,
2. Prabuddha Ganguli,*"Intellectual Property Right:Unleashing the Knowledge Economy"*, 2/e, 2017 Tata Mc Graw Hill Publishing company Ltd.

Course Outcomes:

After Completing the course, students will be able to

- Explain the concepts of intellectual property rights and related agencies.
- Describe the purpose and functions of a trademark in a competitive environment.
- Analyze the process of copyright and procedure.
- Understand the process of patent and patent issues.
- Explore the trade secret and geographical indications of its protection from unfair practices.

IV-Year B.Tech-ECE-II-Semester **L/T/P C**
2/1/0 3

A58016 Python Programming

Pre requisites
None

Course Objectives
1. Understand the basics and function of Python Programming Language.
2. Understand the string operation and sequences used in Python Programming Languages.
3. Understand the data structures used in Python Programming Languages.
4. Know the classes and objects in Python Programming Language.
5. Use the reusability concepts in Python Programming Language.

Course Outcomes
At the end of this Data Structures course, students will be able to:

6. Apply control structures, functions and packages in Problem Solving. (L3)
7. Analyze various String handling functions and data structures(L4)
8. Model the object-oriented problems with classes and objects (L4)
9. Solve the problems by using Inheritance and polymorphism (L3)
10. Illustrate programs on Exception Handling and various packages(L3)

Unit-I
Introduction to Python:
Features of Python Language, Data Types, Operators, Expressions, Control Statement, Standard I/O Operations.
Functions and Modules:
Declaration and Definition Function Calling, More on Defining Functions, Recursive Functions, Modules, Packages in Python, Doc Strings.

Unit-II
Strings and Regular Expressions:
String Operations, Built-in String Methods and Functions, Comparing Strings, function in Regular Expression.
Sequence: List, Tuples, Dictionaries, Sets.

Unit-III
Introduction to Object Oriented Programming: Features of OOP,Merits and demerits of Object Oriented Programming Languages,Applications of OOP
Implementation of classes and objects in Python:
Classes and Objects, Class Method and Self Argument. The __init__Method, Class Variables and Object Variables, The __del__Method, Public and Private Data Members, Private Methods, Built-in Functions to Check, Get, Set and Delete Class Attributes, Garbage Collection (Destroying Objects).

Unit-IV

Implementation of Inheritance in Python:
Inheriting Classes in Python, Types of Inheritance, Abstract Classes and Interfaces, Meta class,
Implementation of Operator Overloading in Python:
Introduction, Implementing Operator Overloading, Overriding Methods
Exception Handling in Python:
Introduction, Exception hierarchy, Handling Exception, Multiple Except Blocks and Multiple Exceptions, Finally Block.

Unit-V

Python NumPy: NumPy ND array, Data Types, Functions of NumPy Array, NumPy Array Indexing, Mathematical Functions on Arrays in NumPy
Python Pandas: Pandas Features, Dataset in Pandas, Data Frames, Manipulating the Datasets, Describing a Dataset, group by Function, Filtering, Missing Values in Pandas, Concatenating Data Frames. Import data from csv file.
Introduction to Matplotlib:, Plot, Scatterplot, Introduction to Tkinter ,Date and Time Packages

Text Books

1.ReemaThareja,Python Programming using Problem Solving Approach, First Edition,Oxford Higher Eduction,2017

2.James Payne, Beginning Python using Python 2.6 and Python 3,1st Edition

Reference Books

1. Charles Dierach, Introduction to Computer Science using Python, 2013
2. https://www.programiz.com/python-programming
3. https://www.javatpoint.com/python-tutorial
4. https://www.geeksforgeeks.org/python-programming-language/

2/1/0 3

A58014 Disaster Preparedness And Planning

Course Objectives

- To know the concept, definition and terminology of the Disaster Management.
- To know the classification and occurrence of disasters in India and elsewhere.
- To know and analyze the socio-economic, environmental aspects of disasters impacts.
- To know the pre, post and emergency management mitigation strategies.
- To know the environment of vulnerable disaster areas

Unit-I: Introduction: Concepts and definitions: disaster, hazard, vulnerability, risk, capacity, impact, prevention, mitigation.

Unit-II: Disasters: Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills etc); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility

Unit-III:Disaster Impacts:

Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate-change and urban disasters.

Unit-IV: Disaster Risk Reduction (DRR):

Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster

Management Authority.

Unit-V: Disasters, Environment And Development

Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods

.

Textbooks

1. H.K. Gupta, Disaster Management - - University Press, India, 2003.
2. Singh B.K, Handbook of Disaster Management: techniques and Guidelines -., Rajat, Publications, 2008

References

1. Pardeep Sahni, Disaster Mitigation: Experiences and Reflections -
2. Pradeep Sahni, Disaster Risk Reduction in South Asia, Prentice Hall, 2004.

Course Outcomes

After Completing the course, students will be able to

- Acquire knowledge of disaster Management.
- Acquaint with different disasters in India and other parts of the world.
- Classify, assess the magnitude and intensity of various impacts of disasters.
- Learn the management methods.
- Learn effective sustainable environmental modification techniques.

B.Tech-ECE IV-Year-II-Semester **L/T/ P C**

2/1/0 3

A58017 Introduction to Deep Learning

Course Objectives

- To understand the concept of Deep Learning
- To understand various CNN Architectures
- To learn various RNN model
- To familiarize the concept of Autoencoder
- To apply Transfer Learning to solve problems

Course Outcomes

At the end of this course, students will be able to:

- Understand the fundamental issues and basics of deep learning
- Understand the concept of CNN to apply it in the Image classification problems
- Analyze the various RNN methods for sequence of input and Generative model for image generation
- Analyze the working of various the Autoencoders methods
- Use Transfer Learning to solve problems with high dimensional data including image and speech

UNIT-I

Deep Learning: Fundamentals, Building Block of Neural Networks, Layers, MLPs, Forward pass, backward pass, class, trainer and optimizer, The Vanishing and Exploding Gradient Problems, Difficulties in Convergence, Local and Spurious Optima, Momentum, learning rate Decay, Dropout, Cross Entropy loss function.

UNIT-II

Deep Learning: Activation functions, initialization, regularization, batch normalization, model selection, ensembles. **Convolutional neural networks**: Fundamentals, architectures, striding and padding, pooling layers, CNN -Case study with MNIST, CNN vs Fully Connected.

UNIT-III

RNN: Handling Branches, Layers, Nodes, Essential Elements-Vanilla RNNs, GRUs, LSTM, video to text with LSTM models.

UNIT-IV

Autoencoders and GAN: Basics of auto encoder, comparison between auto encoder and PCA, variational auto encoders, denoising auto encoder, sparse auto encoder, vanilla auto encoder, Multilayer autoencoder. Convolutional autoencoder, regularized auto encoder. GAN, Image generation with GAN.

UNIT-V

Transfer Learning- Types, Methodologies, Diving into Transfer Learning, Challenges

Text Books

1. Seth Weidman, “Deep Learning from Scratch”, O'Reilly Media, Inc.,2019
2. Ian Goodfellow, Yoshua Bengio and Aaron Courville,“Deep Learning”, MIT Press, 2015
3. Dipanjan Sarkar,Raghav Bali, “Transfer Learning in Action”, Manning Publications,2021

References

1. Giancarlo Zaccone, Md. Rezaul Karim, Ahmed Menshawy "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017.
2. Antonio Gulli, Sujit Pal, "Deep Learning with Keras", Packt Publishers, 2017.
3. Francois Chollet, "Deep Learning with Python", Manning Publications, 2017.

A58001 Technical and Business Communication Skills

Introduction

The course is intended to expose the students to learn and practice the five communication skills thinking, listening, speaking reading, and writing in English, the global language of communication. It reflects some of the approaches in English language teaching and learning currently in practice around the world.

Objective

To help the students to develop effective communication skills in all communicative contexts for professional advancement

Unit-I: E-World & E-Communication:

E-language - E-governance - E-commerce/E-business - E-banking - E-waste

Unit-II: Business Establishment & Infrastructure Development:

Power Supply - Industrial Park - Business Correspondence: Follow-up letters - Acceptance & Rejections - Persuasive letters - Resignation letters

Unit-III: Technology and Society:

Robot Soldiers - For a Snapshot of a Web - Placing an order - Proposal Writing - Patents & Rights (National & International) - Intellectual Property - Nanotechnology

Unit-IV: Ethics in Business Communication:

Ethical issues involved in Business Communication - Ethical dilemmas facing managers - Ethical Code & Communication - Standards in Daily Life - Total Quality Management - World University Ranking

Unit-V: Management Information System:

Corporate Governance - Business Process Outsourcing - Project Management Communication - Marketing Communication

Text Books:

1. Anderson, V. Paul" *Technical Communication",* Cengage. 2014.

2. Kalkar, Anjali. et.al. "*Business Communication*", Orient Black Swan. 2010.

References:

1.Anderson, V. Paul" *Technical Communication",* Cengage. 2014.
2.Kalkar, Anjali. et.al. "*Business Communication*", Orient Black Swan. 2010.
3.Knisely, W. Charles. and Knisely, I. Karin," *Engineering Communication",* Cengage. 2015.
4.Kumar, Sanjay. and Pushp Lata" *Language and Communication skills for Engineers",* Oxford University Press. 2018.
5.Raman, Meenakshi and Singh, Prakash," *Business Communication",* (Second Edition.). Oxford University Press. 2012.

Course outcomes:

After completing the course, students will be able to:

- communicate technical and business correspondence
- reflect on the themes discussed
- recognize ethical implications of technical communication in professional contexts
- identify the contemporary issues in engineering from environmental, societal, economic, and global perspectives
- demonstrate ethical decisions in complex situations

A58018 Green Technologies

Course Objectives:

- familiarize with the terminology of solar radiation and solar energy collection techniques
- know the different methods of solar energy storage and types of wind mills
- study the principles of bio-conversion, methods of harnessing Geothermal and Ocean energy
- study the benefits of green systems and improved processes over current systems and processes
- acquaint with features and benefits of green buildings

Unit-I: Introduction:

SOLAR RADIATION: Role and potential of new and renewable sources – The solar energy option – Environmental impact of solar power – Structure of the sun – The solar constant – Extraterrestrial and terrestrial solar radiation – Solar radiation on titled surface – Instruments for measuring solar radiation and sun shine, solar radiation data – Photo voltaic energy conversion – types of PV cells

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors – Classification of concentrating collectors – Orientation – Advanced collectors

Unit-II:

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods – Sensible heat, latent heat and stratified storage, solar ponds – solar applications: solar heating/cooling technique, solar distillation and drying, solar cookers – Central power tower concept and solar chimney

WIND ENERGY: Sources and potentials – Horizontal and vertical axis windmills – Types of winds – Wind data measurement

Unit-III:BIO-MASS: Principles of bioconversion – Anaerobic/aerobic digestion – Types of biogas digesters – Gas yield – Combustion characteristics of biogas – Utilization for cooking, bio fuels – Economic aspects

GEOTHERMAL ENERGY: Resources – Types of wells – Methods of harnessing the energy – potential in India

OCEAN ENERGY: OTEC – Principles of utilization – Setting of OTEC plants – Thermodynamic cycles – Tidal and wave energy: Potential and conversion techniques – Mini-hydel power plants and their economics

Unit-IV:ENERGY EFFICIENT SYSTEMS AND PROCESSES:

SYSTEMS: Fuel cells – Principle, thermodynamic aspects – Selection of fuels & working of various types of fuel cells – Environmental friendly and Energy efficient compressors and pumps
PROCESSES: Environmental impact of the current manufacturing practices and systems – Benefits of green manufacturing systems – Selection of recyclable and environment friendly materials in manufacturing – Design and implementation of efficient and sustainable green production systems with examples like environmental friendly machining, vegetable based cutting fluids, alternate casting and joining techniques, zero waste manufacturing

Unit-V: SUSTAINABLE MATERIALS FOR BUILDINGS: Definition – Features and benefits – Sustainable site selection and planning of buildings for maximum comfort – Environmental friendly building materials like bamboo, timber, rammed earth, hollow blocks, lime & lime pozzolana cement, agro materials and industrial waste, Ferro cement and Ferro-concrete, alternate roofing systems, paints to reduce heat gain of the buildings – Energy management

Text books:

1. Sukhatme S.P. and J.K.Nayak,"*Solar Energy – Principles of Thermal Collection and Storage*", TMH
2. Khan B.H, *"Non-Conventional Energy Resources"*,Tata McGraw Hill, New Delhi, 2006
3. J. Paulo Davim, "*Green Manufacturing Processes and Systems*", Springer 2013.

References:

1. K.S Jagadeesh, B.V Venkata Rama Reddy and K.S Nanjunda Rao, *" Alternative Building Materials and Technologies ,*New age international
2. D.Yogi Goswami, Frank Krieth & John F Kreider*, " Principles of Solar Engineering",* Taylor & Francis
3. G.D Roy, *"Non-conventional Energy Source"*,Standard Publishers.
4. Gregor Hoogers, *"Fuel Cell Technology –Hand Book ",* BSP Books Pvt. Ltd.

Course Outcomes:

After completing the course, students will be able to:

- understand the basic concepts of solar radiation, measurement and its collection
- identify the different solar energy storage techniques and its applications and methods of taping wind energy
- know the biogas production methods, its applications as fuel, the potential of geothermal and ocean energy in India and methods to tap those energies
- understand the environmental impact by the current systems and manufacturing processes and benefits of green systems and improved processes

- discover various building materials, their features and benefits in the context of green buildings