JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
(Established by Govt. of A.P., ACT No.30 of 2008)
ANANTAPUR – 515 002 (A.P) INDIA

B.TECH. - COMPUTER SCIENCE & ENGINEERING (ARTIFICIAL INTELLIGENCE)
Course Structure (R20) – III & IV Year

Semester–V						
S.No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
1.		Software Engineering-for AI	3	0	0	3
2.		Machine Learning	3	0	0	3
3.		Deep Learning	3	0	0	3
4.		**Professional Elective Course – I** Big Data Technologies Computer Networks Robotics Process Automation	3	0	0	3
5.		Machine Learning Lab	0	0	3	1.5
6.		Deep Learning Lab	0	0	3	1.5
7.		**Skill oriented course – III** Advanced Web Application Development	1	0	2	2
8.		Evaluation of Community Service Project/ Internship				1.5
					Total	**21.5**

Open Elective-I

S.No	Course Code	Course Name	Offering Branch
1	20A01505	Building Technology	CE
2	20A02505	Electric Vehicles	EEE
3	20A03505	3D Printing Technology	ME
4	20A04505	Digital Electronics	ECE
5	20A27505	Computer Applications in Food Processing	FT
6	20A54501	Optimization Techniques	Mathematics
7	20A56501	Materials Characterization Techniques	Physics
8	20A51501	Chemistry of Energy Materials	Chemistry
9	20A52501	Academic Writing and Public Speaking	HSMC

Note:

1. A student is permitted to register for Honours or a Minor in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to their Minor from V Semester onwards.
2. A student shall not be permitted to take courses as Open Electives/Minor/Honours with content substantially equivalent to the courses pursued in the student's primary major.
3. A student is permitted to select a Minor program only if the institution is already offering a Major degree program in that discipline

Semester–VI						
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
1.		Natural Language Processing	3	0	0	3
2.		Applications of AI	3	0	0	3
3.		Cloud Computing	3	0	0	3
4.		**Professional Elective Course– II** Robotics Internet of Things Computer Vision	3	0	0	3
5.		Natural Language Processing Lab	0	0	3	1.5
6.		Applications of AI Lab	0	0	3	1.5
7.		Cloud Computing Lab	0	0	3	1.5
8.		**Skill oriented course - IV** Soft Skills	1	0	2	2
9.		**Mandatory Non-credit Course** Intellectual Property Rights & Patents	2	0	0	0
Total						**21.5**
Industry Internship (Mandatory) for 6 - 8 weeks duration during summer vacation						

Open Elective-II

S.No	Course Code	Course Name	Offering Branch
1	20A01704	Environmental Economics	CE
2	20A02605	Smart Electric Grid	EEE
3	20A03605	Non-Conventional sources of energy	ME
4	20A04704	Signal Processing	ECE
5	20A27605	Food Refrigeration and Cold Chain Management	FT
6	20A54701	Wavelet Transforms & its applications	Mathematics
7	20A56701	Physics Of Electronic Materials and Devices	Physics
8	20A51701	Chemistry of Polymers and its Applications	Chemistry
9	20A52702	English Literary Spectrum	HSMC

Semester-VII						
S.No.	**Course Code**	**Course Name**	**L**	T	**P**	**Credits**
1.		**Professional Elective Course– III** Recommender Systems Intelligent Information Retrieval Systems Knowledge Representation and Reasoning	3	0	0	3
2.		**Professional Elective Course– IV** Optimization Techniques in Machine Learning AI for Image Analysis Game Development	3	0	0	3
3.		**Professional Elective Course– V** Dev Ops Block Chain Technology and Applications Reinforcement Learning	3	0	0	3
4.		**Humanities Elective – II** Entrepreneurship and Incubation Management Science Enterprise Resource Planning	3	0	0	3
5.		**Skill oriented course – V** Conversational AI/AI chatbot	1	0	2	2
		Evaluation of Industry Internship				3
				Total		**23**

Open Elective-III

S.No	Course Code	Course Name	Offering Branch
1	20A01705	Cost Effective Housing Techniques	CE
2	20A02704	IOT Applications in Electrical Engineering	EEE
3	20A03704	Introduction to Hybrid and Electric Vehicles	ME
4	20A04705	Electronic Sensors	ECE
5	20A27704	Human Nutrition	FT
6	20A54702	Numerical Methods for Engineers	Mathematics
7	20A56702	Sensors And Actuators for Engineering	Physics
8	20A51702	Chemistry of Nanomaterials and Applications	Chemistry
9	20A52703	Indian Constitution	HSMC

Open Elective-IV

S.No	Course Code	Course Name	Offering Branch
1	20A01706	Health, Safety & Environmental management	CE
2	20A02705	Renewable Energy Systems	EEE
3	20A03705	Introduction to Composite Materials	ME
4	20A04706	Microcontrollers and Applications	ECE
5	20A27705	Waste and Effluent Management	FT
6	20A54703	Number theory & its Applications	Mathematics
7	20A56703	Smart Materials and Devices	Physics
8	20A51703	Green Chemistry and Catalysis for Sustainable	Chemistry
9	20A52704	Gender Studies	HSMC

Semester-VIII							
S.No.	**Course Code**	**Course Name**	**Category**	**L**	T	**P**	**Credits**
1.	20A31801	Full Internship & Project work	PR	-	-	-	12
						Total	**12**

COURSES OFFERED FOR HONOURS DEGREE IN XSE (AI)

S.No.	Code	Course Name	Contact Hours per week		Credits
			L	T	
1	20A31H01	Virtual and Augmented reality	3	1	4
2	20A31H03	Self aware AI	3	1	4
3	20A31H05	Ethics and privacy in AI	3	1	4
4	20A31H06	AI for Games	3	1	4
5		MOOC - I			2
6		MOOC - II			2

LIST OF MINORS OFFERED TO AI & DS

S.No.	Minor Title	Department offering the Minor
1.	Construction Technology	Civil Engineering
2.	Environmental Geotechnology	Civil Engineering
3.	Energy Systems	EEE
4.	3D Printing	ME
5.	Industrial Engineering	ME
7.	Internet of Things	ECE
8.	Food Science	Food Technology

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B.Tech CSE (AI)– III-I Sem

L	T	P	C
3	0	0	3

(20A31501) SOFTWARE ENGINEERING FOR AI

Course Objectives:

- Study the concepts of software engineering
- Understand the issues in development of AI software
- Explore the methods for AI software development
- Discuss the concepts of Machine learning and Expert systems
- Demonstrate the use of AI in Software development

Course Outcomes:

After completion of the course, students will be able to

- Understand the methods and issues in software engineering
- Apply the principles of Artificial Intelligence for Software engineering
- Design AI based software
- Apply the Algorithms of Machine learning in solving problems
- Design Expert systems

UNIT I **Introduction to Computer Software for AI, AI Problems and Conventional SE Problems, Software Engineering Methodology** Lecture Hrs 12

Computers and software systems, An introduction to Software engineering, Bridges and buildings versus software systems, The software crisis, A demand for more software power, Responsiveness to human users, Software systems in new types of domains, Responsiveness to dynamic usage environments, Software systems with self-maintenance capabilities, A need for Al systems

What is an AI problem, Ill-defined specifications, correct versus 'good enough' solutions, It's the HOW not the WHAT, the problem of dynamics, The quality of modular approximations, Context-free problems?

Specify and verify—the SAV methodology, the myth of complete specification, what is verifiable, Specify and test—the SAT methodology, testing for reliability, the strengths, the weaknesses, what are the requirements for testing, what's in a specification, Prototyping as a link

UNIT II **An Incremental and Exploratory Methodology, New Paradigms for System Engineering** Lecture Hrs 8

Classical methodology and AI problems, The RUDE cycle, how do we start, Malleable software, AI muscles on a conventional skeleton How do we proceed, how do we finish, The question of hacking, Conventional paradigms

Automatic programming, Transformational implementation, The "new paradigm" of Blazer, Cheatham and Green, Operational requirements of Kowalski, The POLITE methodology

UNIT III **Towards a Discipline of Exploratory Programming, Machine Learning: Much Promise, Many Problems** Lecture Hrs 8

Reverse engineering, Reusable software Design knowledge, Stepwise abstraction, The problem of decompiling, Controlled modification, Structured growth

Self-adaptive software, The promise of increased software power, The threat of increased software problems

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UNIT IV **Machine Learning and Expert Systems** Lecture Hrs 10

Practical machine learning examples, Multisession inductive programming, Expert Systems: The Success Story, Expert systems as Al software, Engineering expert systems, The lessons of expert systems for engineering Al software

UNIT V **AI into Practical Software** Lecture Hrs: 8

Support environments, Reduction of effective complexity, Moderately stupid assistance, An engineering toolbox, Self-reflective software, Overengineering software, Summary and What the Future Holds

Textbooks:

1) Derek Partridge, "Artificial Intelligence and Software Engineering", Glenlake Publishing Company, 1998.

Reference Books:

1) Charles Rich and Richard C. Waters, Readings in Artificial Intelligence and Sofrware Engineering, Morgan Kaufmann, 2014.

2) Farid Meziane & Sunil Vadera, "Artificial Intelligence Applications for Improved Software Engineering Development", Information Science Reference, 2009

Online Learning Resources:

1) Software Engineering: Software Engineering - Course (nptel.ac.in)

2) Software Engineering: Software Engineering Tutorial - javatpoint

3) Coursera: Saeed Aghabozorgi, IBM AI Engineering Professional Certificate course(s), https://www.coursera.org/professional-certificates/ai-engineer

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3	0	0	3

(20A31502T) MACHINE LEARNING

Course Objectives:

The course is introduced for students to

- Understand basic concepts of Machine Learning
- Study different learning algorithms
- Illustrate evaluation of learning algorithms

Course Outcomes (CO):

After completion of the course, students will be able to

- Identify machine learning techniques suitable for a given problem
- Solve the problems using various machine learning techniques
- Design application using machine learning techniques
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UNIT - I **Introduction to Machine Learning & Preparing to Model** Lecture 9Hrs

Introduction: What is Human Learning? Types of Human Learning, what is Machine Learning? Types of Machine Learning, Problems Not to Be Solved Using Machine Learning, Applications of Machine Learning, State-of-The-Art Languages/Tools in Machine Learning, Issues in Machine Learning

Preparing to Model: Introduction, Machine Learning Activities, Basic Types of Data in Machine Learning, Exploring Structure of Data, Data Quality and Remediation, Data Pre-Processing

UNIT - II **Modelling and Evaluation & Basics of Feature Engineering** Lecture 9Hrs

Introduction, selecting a Model, training a Model (for Supervised Learning), Model Representation and Interpretability, Evaluating Performance of a Model, Improving Performance of a Model

Basics of Feature Engineering: Introduction, Feature Transformation, Feature Subset Selection

UNIT - III **Bayesian Concept Learning & Supervised Learning: Classification** Lecture 10Hrs

Introduction, Why Bayesian Methods are Important? Bayes' Theorem, Bayes' Theorem and Concept Learning, Bayesian Belief Network

Supervised Learning: Classification: Introduction**,** Example of Supervised Learning**,** Classification Model**,** Classification Learning Steps**,** Common Classification Algorithms-*k*-Nearest Neighbour(*k*NN), Decision tree, Random forest model, Support vector machines

UNIT - IV **Supervised Learning: Regression** Lecture 10Hrs

Introduction, Example of Regression, Common Regression Algorithms-Simple linear regression, Multiple linear regression, Assumptions in Regression Analysis, Main Problems in Regression Analysis, Improving Accuracy of the Linear Regression Model, Polynomial Regression Model, Logistic Regression, Maximum Likelihood Estimation.

UNIT - V **Unsupervised Learning** Lecture 9Hrs

Introduction, Unsupervised vs Supervised Learning, Application of Unsupervised Learning, Clustering – Clustering as a machine learning task, Different types of clustering techniques, Partitioning methods, *K*-Medoids: a representative object-based technique, Hierarchical clustering, Density-based methods-DBSCAN

Finding Pattern using Association Rule- Definition of common terms, Association rule, The apriori algorithm for association rule learning, Build the apriori principle rules

Textbooks:

1. Machine Learning, Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, Pearson, 2019.

Reference Books:

1. EthernAlpaydin, “Introduction to Machine Learning”, MIT Press, 2004.
2. Stephen Marsland, “Machine Learning -An Algorithmic Perspective”, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series,2014.
1. Andreas C. Müller and Sarah Guido “Introduction to Machine Learning with Python: A Guide for Data Scientists”, Oreilly.

Online Learning Resources:

1. Andrew Ng, “Machine Learning Yearning”
2. https://www.deeplearning.ai/machine-learning- yearning/

1. Shai Shalev-Shwartz , Shai Ben-David, “Understanding Machine Learning: From Theory to Algorithms” , Cambridge University Press
https://www.cse.huji.ac.il/~shais/UnderstandingMachineLearning/index.html

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(20A31503T) DEEP LEARNING

Course Objectives:

- Demonstrate the major technology trends driving Deep Learning
- Build, train, and apply fully connected deep neural networks
- Implement efficient (vectorized) neural networks
- Analyse the key parameters and hyper parameters in a neural network's architecture

Course Outcomes:

After completion of the course, students will be able to

- Demonstrate the mathematical foundation of neural network
- Describe the machine learning basics
- Differentiate architecture of deep neural network
- Build a convolutional neural network
- Build and train RNN and LSTMs

UNIT I **Lecture 8Hrs**

Linear Algebra: Scalars, Vectors, Matrices and Tensors, Matrix operations, types of matrices, Norms, Eigen decomposition, Singular Value Decomposition, Principal Components Analysis.
Probability and Information Theory: Random Variables, Probability Distributions, Marginal Probability, Conditional Probability, Expectation, Variance and Covariance, Bayes' Rule, Information Theory. Numerical Computation: Overflow and Underflow, Gradient-Based Optimization, Constrained Optimization, Linear Least Squares.

UNIT II **Lecture 9Hrs**

Machine Learning: Basics and Under fitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood, Bayesian Statistics, Supervised and Unsupervised Learning, Stochastic Gradient Descent, Challenges Motivating Deep Learning. Deep Feed forward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and other Differentiation Algorithms.

UNIT III **Lecture 8Hrs**

Regularization for Deep Learning: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop and Manifold Tangent Classifier. Optimization for Training Deep Models: Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms.

UNIT IV **Lecture 9Hrs**

Convolutional Networks: The Convolution Operation, Pooling, Convolution, Basic Convolution Functions, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, Basis for Convolutional Networks.

UNIT V **Lecture 8Hrs**

Sequence Modeling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, Echo State Networks, LSTM, Gated RNNs, Optimization for Long-Term Dependencies, Auto encoders, Deep Generative Models.

Textbooks:

1. Ian Goodfellow, YoshuaBengio, Aaron Courville, “Deep Learning”, MIT Press,2016.
2. Josh Patterson and Adam Gibson, “Deep learning: A practitioner's approach”, O'Reilly Media, First Edition,2017.

Reference Books:

1. Fundamentals of Deep Learning, Designing next-generation machine intelligence algorithms, Nikhil Buduma, O’Reilly, Shroff Publishers,2019.
2. Deep learning Cook Book, Practical recipes to get started Quickly, DouweOsinga, O’Reilly, Shroff Publishers,2019.

Online Learning Resources:

- https://keras.io/datasets/
- http://deeplearning.net/tutorial/deeplearning.pdf
- https://arxiv.org/pdf/1404.7828v4.pdf
- https://www.cse.iitm.ac.in/~miteshk/CS7015.html
- https://www.deeplearningbook.org
- https://nptel.ac.in/courses/106105215

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3	0	0	3

(20A31504a) BIG DATA TECHNOLOGIES
(Professional Elective Course– I)

Course Objectives:

- Understand Big Data Analytics for different systems like Hadoop.
- Discuss the design of Hadoop File System.
- Explore different tools for analysing Big Data.
- Understand the importance of Big Data in comparison with traditional databases.

Course Outcomes (CO):

After completion of the course, students will be able to

- Outline the importance of Big Data Analytics
- Obtain knowledge about working of Hadoop File System.
- Analyze Big Data using different tools.
- Apply Hadoop map Reduce programming for handing Big Data

UNIT – I **Introduction to Big Data** Lecture 9Hrs

Introduction to Big Data. What is Big Data? Why Big Data is Important. Meet Hadoop Data, Data Storage and Analysis, Comparison with other systems, Grid Computing. A brief history of Hadoop. Apache Hadoop and the Hadoop Ecosystem. Linux refresher, VMWare Installation of Hadoop.

UNIT – II **HDFS Design** Lecture 9Hrs

The design of HDFS. HDFS concepts. Command line interface to HDFS. Hadoop File systems. Interfaces. Java Interface to Hadoop. Anatomy of a file read. Anatomy of a file writes. Replica placement and Coherency Model. Parallel copying with distcp, keeping an HDFS cluster balanced.

UNIT – III **Analyzing data with UNIX tools, Configuration API** Lecture 10Hrs

Introduction. Analyzing data with UNIX tools. Analyzing data with Hadoop. Java MapReduce classes (new API). Dataflow, combiner functions, Running a distributed MapReduce Job. Configuration API. Setting up the development environment. Managing configuration. Writing a unit test with MR Unit. Running a job in local job runner. Running on a cluster, Launching a job. The MapReduce WebUl.

UNIT – IV **Classic Map reduce** Lecture 9Hrs

Classic Map reduce. Job submission. Job Initialization. Task Assignment. Task execution Progress and status updates. Job Completion. Shuffle and sort on Map and reducer side. Configuration tuning. Map Reduce Types. Input formats. Output formats. Sorting. Map side and Reduce side joins.

UNIT – V **Hive** Lecture 8Hrs

The Hive Shell. Hive services. Hive clients. The meta store. Comparison with traditional databases. Hive QI. Hbasics. Concepts. Implementation. Java and Map reduce clients. Loading data, web queries.

Textbooks:

1. TomWhite, Hadoop,"TheDefinitiveGuide", 3rdEdition, O'ReillyPublications, 2012.
2. DirkdeRoos, Chris Eaton, George Lapis, PaulZikopoulos, TomDeutsch, "Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming
   1. Data", 1stEdition, TMH, 2012.

Reference Books:

1. Big Data and Health Analytics, Katherine Marconi, and Harold Lehmann.
1. Analytics in a Big Data World : The Essential Guide to Data Science and its Applications by Bartbaesens , Wiley publications.

Online Learning Resources:

1)Big Data Technologies: Big Data Technologies - Javatpoint.

2)Big Data Technologies- An Overview: Big Data Technology - an overview | ScienceDirect Topics.

3)Big Data Computing – NPTEL+

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L	T	P	C
3	0	0	3

(20A05501T) COMPUTER NETWORKS
(PROFESSIONAL ELECTIVE COURSE– I)

Course Objectives:

The course is designed to

- Understand the basic concepts of Computer Networks.
- Introduce the layered approach for design of computer networks
- Expose the network protocols used in Internet environment
- Explain the format of headers of IP, TCP and UDP
- Familiarize with the applications of Internet
- Elucidate the design issues for a computer network

Course Outcomes (CO):

After completion of the course, students will be able to

- Identify the software and hardware components of a computer network
- Design software for a computer network
- Develop new routing, and congestion control algorithms
- Assess critically the existing routing protocols
- Explain the functionality of each layer of a computer network
- Choose the appropriate transport protocol based on the application requirements

UNIT I **Computer Networks and the Internet** Lecture 8Hrs

What Is the Internet? The Network Edge, The Network Core, Delay, Loss, and Throughput in Packet-Switched Networks(Textbook 2), Reference Models, Example Networks, Guided Transmission Media, Wireless Transmission(Textbook 1)

UNIT II **The Data Link Layer, Access Networks, and LANs** Lecture 10Hrs

Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols (Textbook 1) Introduction to the Link Layer, Error-Detection and -Correction Techniques, Multiple Access Links and Protocols, Switched Local Area Networks Link Virtualization: A Network as a Link Layer, Data Center Networking, Retrospective: A Day in the Life of a Web Page Request (Textbook 2)

UNIT III **The Network Layer** Lecture 8Hrs

Routing Algorithms, Internetworking, The Network Layer in The Internet (Textbook 1)

UNIT IV **The Transport Layer** Lecture 9Hrs

Connectionless Transport: UDP(Text book 2), The Internet Transport Protocols: TCP, Congestion Control(Text book 1)

UNIT V **Principles of Network Applications** Lecture 8Hrs

Principles of Network Applications, The Web and HTTP, Electronic Mail in the Internet, DNS—The Internet's Directory Service, Peer-to-Peer Applications Video Streaming and Content Distribution Networks(Text book 2)

Textbooks:

1. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 5th Edition, PEARSON.
2. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", 6th edition, Pearson, 2019.

Reference Books:

1. Forouzan, Datacommunications and Networking, 5th Edition, McGraw Hill Publication.
2. Youlu Zheng, Shakil Akthar, "Networks for Computer Scientists and Engineers", Oxford Publishers, 2016.

Online Learning Resources:
https://nptel.ac.in/courses/106105183/25
http://www.nptelvideos.in/2012/11/computer-networks.html
https://nptel.ac.in/courses/106105183/3

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L	T	P	C
3	0	0	3

(20A31504c) ROBOTICS PROCESS AUTOMATION
Professional Elective Course– I

Course Objectives:

- Describe Intelligent Automation and its impact on the transformation of business
- Study the technologies and best practices used to enable process automation
- Identify areas where Intelligent Automation is applicable and formulate its value (quantify and qualify).

Course Outcomes (CO):

After completion of the course, students will be able to

- Outline the benefits of RPA and various platforms available on the market.
- Describe RPA, where it can be applied and how it's implemented.
- Identify and understand different types of variables, Image, Text and Data Tables Automation.
- Understand the Deployment of the Robot and to maintain the connection.
- Describe how to handle the User Events and various types of Exceptions and strategies.

UNIT I RPA Foundations & RPA Skills Lecture 8Hrs

What Is RPA? Flavors of RPA History of RPA, The Benefits of RPA, The Downsides of RPA, RPA Compared to BPO, BPM, and BPA, Consumer Willingness for Automation, The Workforce of the Future.

RPA Skills: On-Premise Vs. the Cloud, Web Technology, Programming Languages and Low Code, OCR (Optical Character Recognition),Databases,

APIs (Application Programming Interfaces), AI (Artificial Intelligence), Cognitive Automation, Agile, Scrum, Kanban, and Waterfall, DevOps, Flowcharts

UNIT II Process Methodologies & Planning Lecture 9Hrs

Lean, Six Sigma, How to Implement Six Sigma, Six Sigma Roles and Levels, Lean Six Sigma, Finding the Right Balance, Applying Lean and Six Sigma to RPA.

Planning: The Preliminaries, Use a Consulting Firm?

RPA Consulting: Some Case Studies, What to Automate? ROI for RPA, RPA Use Cases, The Plan

UNIT III RPA Vendor Evaluation & Center of Excellence (CoE) Lecture 8Hrs

Be Realistic, Check Out Third Parties, Minimum Capabilities, Who Is the User?, Funding, Ecosystem, Costs, Training and Education, Support, Best-of-Breed vs. End-to-End, Thought Leadership and Vision, Industry Expertise, Security, Monitoring, and Deployment, What Type of RPA?, The Design, Next-Generation Technologies

Center of Excellence (CoE): What Is the CoE? Why Have a CoE? Forming the Team, Business Analyst, Developer, RPA Solution Architect, RPA Supervisor, What Should a CoE Do? Communication, Change Management, CoE Case Study: Intuit

UNIT IV Bot Development, Deployment and Monitoring & Data Preparation Lecture 10Hrs
Preliminaries, Installation of UiPath, Getting Started, Activities, Flowcharts and Sequences, Log Message, Variables, Loops and Conditionals, For Each Loop, Do While Loop and While Loop, IF/THEN/ELSE Conditionals, Switch, Debug, Common UiPath Functions, The UiPath Orchestrator, Best Practices for Bot Development
Deployment and Monitoring: Testing, Going into Production, Monitoring, Security, Scaling
Data Preparation: Types of Data, Big Data, The Issues with Big Data, The Data Process, Types of Algorithms, The Perils of the Moonshot, Bias

UNIT V Open Source RPA, Process Mining & Future of RPA Lecture 9 Hrs
What Is Open Source Software?, The Business Model of Open Source?, The Pros and Cons of Open Source Software, Open RPA, UI. Vision, Robot Framework, Robocorp, Orchestra, TagUI
Process Mining: Old Way Vs. Process Mining, Backgrounder on Process Mining, How Process Mining Works, Celonis, ProM, Signavio, Fluxicon, ABBYY, The Future of Process Mining
Future of RPA: Consolidation and IPOs, Microsoft, Attended Automation, Vertical-Specific Companies, Hype Factor, Software-as-a-Service (SaaS) and Open Source, Chatbots, Artificial Intelligence, Privacy and Ethics.

Textbooks:
1. Tom Taulli, "The Robotic Process Automation Handbook", Apress, 2020

Reference Books:
1. Alok Mani Tripathi, "Learning Robotic Process Automation", March 2018
2. Robotic process and Cognitive Automation by, Mary C Lacity & Leslie P Willcocks, 2018.

Online Learning Resources:
1. https://www.uipath.com/rpa/robotic-process-automation
2. https://www.academy.uipath.com

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B.Tech CSE (AI)– III-I Sem

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0	0	3	1.5

(20A31502P) MACHINE LEARNING LAB

Course Objectives:

- Make use of Data sets in implementing the machine learning algorithms
- Implement the machine learning concepts and algorithms in any suitable language of choice.

Course Outcomes (CO):

After completion of the course, students will be able to

- Understand the Mathematical and statistical prospectives of machine learning algorithms through python programming
- Appreciate the importance of visualization in the data analytics solution.
- Derive insights using Machine learning algorithms

List of Experiments:

Note:

a. The programs can be implemented in either JAVA or Python.
b. For Problems 1 to 6 and 10, programs are to be developed without using the built-in classes or APIs of Java/Python.
c. Data sets can be taken from standard repositories (https://archive.ics.uci.edu/ml/datasets.html) or constructed by the students.

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the Back-propagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM 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. You can add Java/Python ML library classes/API in the program.
9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Projects

1. Predicting the Sale price of a house using Linear regression
2. Spam classification using Naïve Bayes algorithm
3. Predict car sale prices using Artificial Neural Networks
4. Predict Stock market trends using LSTM
5. Detecting faces from images

References:

1. Python Machine Learning Workbook for beginners, AI Publishing, 2020.
1.

Online Learning Resources/Virtual Labs:

1) Machine Learning A-Z (Python & R in Data Science Course) | Udemy
2) Machine Learning | Coursera

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech CSE (AI)– III-I Sem

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(20A31503P) DEEP LEARNING LAB

Course Objectives:

- Understand the context of Neural networks and deep learning.
- Introduce major Deep learning algorithms, the problem settings, and their applications to solve real world problems

Course Outcomes (CO):

After completion of the course, students will be able to

- Identify the Deep learning algorithms which are more appropriate for various types of learning tasks in various domains
- Implementing Deep learning algorithms and solve real-world problems.

List of Experiments:

1. Introduction of Keras.
2. Installing Keras and packages in Keras.
3. Train the model to add two numbers and report the result.
4. Train the model to multiply two matrices and report the result using keras.
5. Train the model to print the prime numbers using Keras
6. Recurrent Neural Network
   a. Numpy implement of a simple recurrent neural network
   b. Create a recurrent layer in keras
   c. Prepare IMDB data for movie review classification problem.
   d. Train the model with embedding and simple RNN layers.
   e. Plot the Results
7. Consider temperature-forecast as one the example for recurrent neural network and implement the following.
   a. Inspect the data of the weather dataset
   b. Parsing the data
   c. Plotting the temperature timeseries
   d. Plotting the first 10 days of the temperature timeseries
8. Long short-term memory network
   a. Implement LSTM using LSTM layer in keras
   b. Train and evaluate using reversed sequences for IMDB data
   c. Train and evaluate a bidirectional LSTM for IMDB data
9. Train and evaluate a Gated Recurrent Unit based model
   a. By using GRU layer
   b. By adding dropout and recurrent dropout to GRU layer.
   c. Train a bidirectional GRU for temperature prediction data
10. Convolutional Neural Networks
    a. Preparing the IMDB data
    b. Train and evaluate a simple 1D convent on IMDB Data
    c. Train and evaluate a simple 1D convent on temperature prediction data
11. Develop a traditional LSTM for sequence classification problem.

PROJECTS:

1)Write a program for Multilabel Movie Poster Classification.

2)Write a program for Predicting Bike-Sharing patterns

References:

1) Ian Goodfellow, Yoshua Bengio, Aaraon Courville, “Deep Learning (Adaptive Computation and Machine Learning series)”, MIT Press, 2016.

Online Learning Resources/Virtual Labs:
1)Introduction to Deep Learning Course | Introduction to Deep Learning Course (rses-dl-course.github.io)
2) Deep Learning | Introduction to Long Short Term Memory - GeeksforGeeks

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B.Tech CSE (AI)– III-I Sem

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1	0	2	2

(20A31505) ADVANCED WEB APPLICATION DEVELOPMENT

Skill Oriented Course - III

Course Objectives:

- Explore the programming aspects of Web
- Teach concepts related to client side and server-side programming
- Understand Full Stack Development

Course Outcomes (CO):

After completion of the course, students will be able to

- Develop Client-side applications
- Develop Server-side applications
- Connect to Databases
- Design comprehensive web applications

Activities:

Module 1:

Introduction, MERN Components: React, Node.js, Express, MongoDB, Tools and Libraries, Why MERN? JavaScript Everywhere, JSON Everywhere , Node.js Performance, The npm Ecosystem Isomorphic, It's Not a Framework!

Hello World: Server-Less Hello World, Server Setup, Build-Time JSX Compilation

Task: Create a simple Hello world web page using node.js and express.

Module 2:

React Components, Issue Tracker, React Classes, Composing Components, Passing Data Using Properties, Passing Data Using Children, Dynamic Composition.

React State, Async State Initialization, Event Handling, communicating from child to parent, Stateless Components, Designing Components: State vs. Props, Component Hierarchy, Communication, Stateless Components.

Task: Create the Issue Tracker Application: -

1. The user should be able to view a list of issues, with an ability to filter the list by various parameters.
2. The user should be able to add new issues, by supplying the initial values of the issue's fields.
3. The user should be able to edit and update an issue by changing its field values.
4. The user should be able delete an issue.
5. An issue should have following attributes: A title that summarizes the issue (freeform long text),An owner to whom the issue is assigned (freeform short text), A status indicator (a list of possible status values),Creation date (a date, automatically assigned),Effort required to address the issue (number of days, a number),Estimated completion date or due date (a date, optional)

Module 3:

Express REST APIs, REST: Resource Based, HTTP Methods as Actions, JSON ,Express: Routing, Handler Function, Middleware, The List API: Automatic Server Restart ,Testing. The Create API , Using the List API, Using the Create API, Error Handling.

Task : Create a Issues API to

1. Show the list of Issues which are sorted according to creation date.

2. To create the new Issue.
3. To delete the existing Issue title.
4. To update the existing Issue.

Module 4:
MongoDB Basics: Documents, Collections, Databases, Query Language, Installation, The mongo Shell, Shell Scripting, Schema Initialization, MongoDB Node.js Driver, Reading from MongoDB, Writing to MongoDB.

Task : Develop the Student Management API to store the student data into Database :-
1. To add the new students.
2. To remove the existing student.
3. To update the existing student details.
4. To list all the students.
5. To list all the students based on Roll Number or any unique ID or Age.
6. The student should have the following attributes:- Name , Date of Birth , Branch , Year of Study , Address , Roll Number or any unique ID.

Module 5:
Modularization and Webpack: Server-Side Modules, Introduction to Webpack, Using Webpack Manually, Transform and Bundle, Libraries Bundle, Hot Module Replacement, HMR using Middleware, Debugging, Server-Side ES2015, ESLint.
Routing with React Router : Routing Techniques, Simple Routing, Route Parameters, Route Query String, Programmatic Navigation, Nested Routes, Browser History.

Forms: More Filters in the List API, Filter Form, The Get API, Edit Page, UI Components: Number Input , Data Input, Update API , Using the Update API, Delete API, Using the Delete API.
React-Bootstrap: Bootstrap Installation, Navigation, Table and Panel, Forms: Grid-Based Forms, Inline Forms, Horizontal Forms, Alerts: Validations, Results , Modals.

Task: Develop the Student Management System website for the College.

1. The admins should be able to Sign In, Sign out from the website.
2. The admin should be able to see the Dashboard after successful sign in.
3. The Dashboard should contain the Add Student, Delete Student, Update Student, List Student.
4. The admin should able filter the students based on branch or Roll Number or Date of Birth.

Task: Develop the Bookstore Library Website:
1. It should contain the 2 interfaces: User and Admin Interface.
2. User should be able do the following:
   - browse books from the library
   - filter them based on category, author, publications etc.
   - Rent them for a specific duration
   - Like/Review them
3. Admin should be able do the following:
   - List/manage books
   - Track rented books and their availability
4. Deploy the application in Netlify.

References:

1. Vasan Subramanian , Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, APress, 2nd Edition, 2019.

Online Learning Resources/Virtual Labs:

1. https://nodejs.org/en/
2. https://expressjs.com/
3. https://www.mongodb.com/
4. https://reactjs.org/
5. https://www.netlify.com/

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B.Tech CSE (AI)– III-II Sem

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(20A31601T) NATURAL LANGUAGE PROCESSING

Course Objectives:

- Explain and apply fundamental algorithms and techniques in the area of natural language processing (NLP)
- Understand approaches to syntax and semantics in NLP.
- Understand current methods for statistical approaches to machine translation.
- Understand language modeling.
- Understand machine learning techniques used in NLP.

Course Outcomes (CO):

After completion of the course, students will be able to

- Understand the logic behind Natural languages
- Understand the significance of syntax and semantics of natural languages
- Process the Natural languages
- Verify the syntax and semantics of languages
- Design new natural languages

UNIT – I Introduction to Natural language Lecture 8Hrs

The Study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different Levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English Syntax.

UNIT - II Grammars and Parsing Lecture 8Hrs

Grammars and Parsing- Top- Down and Bottom-Up Parsers, Transition Network Grammars, Feature Systems and Augmented Grammars, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks, Bayes Rule, Shannon game, Entropy and Cross Entropy.

UNIT - III Grammars for Natural Language Lecture 9Hrs

Grammars for Natural Language, Movement Phenomenon in Language, Handling questions in Context Free Grammars, Hold Mechanisms in ATNs, Gap Threading, Human Preferences in Parsing, Shift Reduce Parsers, Deterministic Parsers.

UNIT - IV Interpretation and Modelling Lecture 9Hrs

Semantic Interpretation-Semantic & Logical form, Word senses & ambiguity, the basic logical form language, encoding ambiguity in the logical Form, Verbs & States in logical form, Thematic roles, Speech acts &embedded sentences, Defining semantics structure model theory.

Language Modelling-Introduction, n-Gram Models, Language model Evaluation, Parameter Estimation, Language Model Adaption, Types of Language Models, Language-Specific Modelling Problems, Multilingual and Cross lingual Language Modelling.

UNIT - V Machine Translation and Multilingual Information Lecture9 Hrs

Machine Translation Survey: Introduction, Problems of Machine Translation, Is Machine Translation Possible, Brief History, Possible Approaches, Current Status. Anusaraka or Language Accessor: Background, Cutting the Gordian Knot, The Problem, Structure of Anusaraka System, User Interface, Linguistic Area, Giving up Agreement in Anusaraka Output, Language Bridges.

Multilingual Information Retrieval - Introduction, Document Pre-processing, Monolingual Information Retrieval, CLIR, MLIR, Evaluation in Information Retrieval, Tools, Software and Resources.

Multilingual Automatic Summarization - Introduction, Approaches to Summarization, Evaluation, How to Build a Summarizer, Competitions and Datasets.

Textbooks:

1. James Allen, Natural Language Understanding, 2nd Edition, 2003, Pearson Education.
2. Multilingual Natural Language Processing Applications: From Theory to Practice-Daniel M.Bikel and Imed Zitouni, Pearson Publications.
3. Natural Language Processing, A paninian perspective, Akshar Bharathi, Vineet Chaitanya, Prentice –Hall of India.

Reference Books:

1. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.
2. Jurafsky, Dan and Martin, James, Speech and Language Processing, 2nd Edition, Prentice Hall, 2008.
3. Manning, Christopher and Henrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.

Online Learning Resources:
http://peterindia.net/AILinks.html

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B.Tech CSE (AI)– III-II Sem

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3	0	0	3

(20A31602T) APPLICATIONS OF AI

Course Objectives:

- To impart knowledge about Applications of Artificial Intelligence.
- To give understanding of the main abstractions and reasoning for intelligent systems.
- To enable the students to understand the basic principles of Artificial Intelligence in various applications

Course Outcomes:

Upon successful completion of the course, the students will be able to

- Understand and apply the principles of AI.
- Solve basic AI based problems.
- Define the concept of Artificial Intelligence.
- Apply AI techniques to real-world problems to develop intelligent systems.
- Select appropriately from a range of techniques when implementing intelligent systems.

UNIT I **AI for Driverless systems** Lecture 8 Hrs

Look: The MEMEX Reloaded, Inside a Search Engine, Google and the Mind, Deeper and Darker. **The Robotic chauffeur:** Getting to driverless, A Cure for the deadliest disease, Seven delaying Myths, The timeline.

A Driverless World: Friction-free personal mobility, Parking, Commuting, Take the pod – meet people, Anatomy of a Driverless cars: Highdefinition digital maps, Digital Cameras, Light detection and ranging(lidar), Radio Detection and Ranging (Radar), Ultrasonic sensors(sonars), Global positioning systems (GPS), The inner ear (IMU), Drive by wire.

UNIT II **AI for Marketing** Lecture 9 Hrs

Solving the Marketing Problem: - One-to-One Marketing, One-to-Many Advertising, The Four Ps, What Keeps a Marketing Professional Awake? The Customer Journey, We Will Never Really Know, How Do I Connect? Let Me Count the Ways, Why Do I Connect? Branding, Marketing Mix Modelling, Econometrics, Customer Lifetime Value, One-to-One Marketing—The Meme, Seat-of-the-Pants Marketing, Marketing in a Nutshell, What Seems to Be the Problem?

UNIT III **AI for Marketing continued** Lecture 9 Hrs

Using AI to Get Their Attention - Market Research: Whom Are We After? , Marketplace Segmentation, Raising Awareness, Social Media Engagement, In Real Life, The B2B World, Using AI to Persuade - The In-Store Experience, On the Phone, The Onsite Experience—Web Analytics, Merchandising, Closing the Deal, Back to the Beginning: Attribution.

UNIT IV **AI for Customers** Lecture 8 Hrs

Using AI for Retention - Growing Customer Expectations, Retention and Churn, Many Unhappy Returns, Customer Sentiment, Customer Service, Predictive Customer Service.

UNIT V **AI for Image processing** Lecture 8 Hrs

The role of medical image computing and machine learning in health care, Deep Learning and Machine Learning in Imaging: Basic Principles, how to develop Artificial Intelligence Applications, A Standardised Approach for preparing Imaging data for Machine Learning tasks in Radiology, Artificial Intelligence in Medicine: Validation and Study Design, Enterprise Imaging.

Textbooks:

1. Gautam Shroff "The Intelligent Web", OXFORD University Press, 2013.
2. Hod Lipson, and Melba kurman, "Driverless_ Intelligent cars and the Road Ahead", The MIT Press Cambridge, Massachusetts London, England, 2016.

Reference Books:

1. Jim Sterne "Artificial intelligence for Marketing", John Wiley & sons, 2017.
2. Erik R. Ranschaert, sergey Morozov, Paul R. Algra, "Artificial Intelligence in Medical Imaging, Springer Nature Switzerland AG, 2019.

Online Learning Resources:

1. Top 14 Artificial Intelligence (AI) Applications in 2022 | Simplilearn
2. Advanced AI: Deep Reinforcement Learning with Python | Udemy

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B.Tech CSE (AI)– III-II Sem

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(20A31603T) CLOUD COMPUTING

Course Objectives:

- To explain the evolving computer model called cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.

Course Outcomes (CO):

After completion of the course, students will be able to

- Ability to create cloud computing environment
- Ability to design applications for Cloud environment
- Design & develop backup strategies for cloud data based on features.
- Use and Examine different cloud computing services.
- Apply different cloud programming model as per need.

UNIT - I **Basics of Cloud computing** Lecture 8Hrs

Introduction to cloud computing: Introduction, Characteristics of cloud computing, Cloud Models, Cloud Services Examples, Cloud Based services and applications

Cloud concepts and Technologies: Virtualization, Load balancing, Scalability and Elasticity, Deployment, Replication, Monitoring, Software defined, Network function virtualization, Map Reduce, Identity and Access Management, services level Agreements, Billing.

Cloud Services and Platforms: Compute Services, Storage Services, Database Services, Application services, Content delivery services, Analytics Services, Deployment and Management Services, Identity and Access Management services, Open Source Private Cloud software.

UNIT - II **Hadoop and Python** Lecture 9Hrs

Hadoop MapReduce: Apache Hadoop, Hadoop Map Reduce Job Execution, Hadoop Schedulers, Hadoop Cluster setup.

Cloud Application Design: Reference Architecture for Cloud Applications, Cloud Application Design Methodologies, Data Storage Approaches.

Python Basics: Introduction, Installing Python, Python data Types & Data Structures, Control flow, Function, Modules, Packages, File handling, Date/Time Operations, Classes.

UNIT - III **Python for Cloud computing** Lecture 8Hrs

Python for Cloud: Python for Amazon web services, Python for Google Cloud Platform, Python for windows Azure, Python for MapReduce, Python packages of Interest, Python web Application Frame work, Designing a RESTful web API.

Cloud Application Development in Python: Design Approaches, Image Processing APP, Document Storage App, MapReduce App, Social Media Analytics App.

UNIT - IV **Big data, multimedia and Tuning** Lecture 8Hrs

Big Data Analytics: Introduction, Clustering Big Data, Classification of Big data Recommendation of Systems.

Multimedia Cloud: Introduction, Case Study: Live video Streaming App, Streaming Protocols, case Study: Video Transcoding App.

Cloud Application Benchmarking and Tuning: Introduction, Workload Characteristics, Application Performance Metrics, Design Considerations for a Benchmarking Methodology, Benchmarking Tools, Deployment Prototyping, Load Testing & Bottleneck Detection case Study, Hadoop benchmarking case Study.

UNIT - V **Applications and Issues in Cloud** Lecture 9 Hrs

Cloud Security: Introduction, CSA Cloud Security Architecture, Authentication, Authorization, Identity Access Management, Data Security, Key Management, Auditing.

Cloud for Industry, Healthcare &Education: Cloud Computing for Healthcare, Cloud computing for Energy Systems, Cloud Computing for Transportation Systems, Cloud Computing for Manufacturing Industry, Cloud computing for Education.

Migrating into a Cloud: Introduction, Broad Approaches to migrating into the cloud, the seven–step model of migration into a cloud.

Organizational readiness and Change Management in The Cloud Age: Introduction, Basic concepts of Organizational Readiness, Drivers for changes: A frame work to comprehend the competitive environment, common change management models, change management maturity models, Organizational readiness self – assessment.

Legal Issues in Cloud Computing: Introduction, Data Privacy and security Issues, cloud contracting models, Jurisdictional issues raised by virtualization and data location, commercial and business considerations, Special Topics.

Textbooks:

1. Cloud computing A hands-on Approach‖ By Arshdeep Bahga, Vijay Madisetti, Universities Press, 2016
2. Cloud Computing Principles and Paradigms: By Raj Kumar Buyya, James Broberg, Andrzej Goscinski, Wiley, 2016

Reference Books:

1. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, SThamaraiSelvi, TMH
2. Cloud computing A Hands-On Approach by Arshdeep Bahga and Vijay Madisetti.
3. Cloud Computing: A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Tata McGraw Hill, rp2011.
4. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2010.
5. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese, O ‘Reilly, SPD, rp2011.
6. Essentials of Cloud Computing by K. Chandrasekaran. CRC Press.

Online Learning Resources:

Cloud computing - Course (nptel.ac.in)

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B.Tech CSE (AI)– III-II Sem

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INTERNET OF THINGS

Course Objectives:

- To explain the evolving computer model called cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.

Course Outcomes (CO):

After completion of the course, students will be able to

- Ability to create cloud computing environment
- Ability to design applications for Cloud environment
- Design & develop backup strategies for cloud data based on features.
- Use and Examine different cloud computing services.
- Apply different cloud programming model as per need.

UNIT - I **Basics of Cloud computing** Lecture 8Hrs

Introduction to cloud computing: Introduction, Characteristics of cloud computing, Cloud Models, Cloud Services Examples, Cloud Based services and applications

Cloud concepts and Technologies: Virtualization, Load balancing, Scalability and Elasticity, Deployment, Replication, Monitoring, Software defined, Network function virtualization, Map Reduce, Identity and Access Management, services level Agreements, Billing.

Cloud Services and Platforms: Compute Services, Storage Services, Database Services, Application services, Content delivery services, Analytics Services, Deployment and Management Services, Identity and Access Management services, Open Source Private Cloud software.

UNIT - II **Hadoop and Python** Lecture 9Hrs

Hadoop MapReduce: Apache Hadoop, Hadoop Map Reduce Job Execution, Hadoop Schedulers, Hadoop Cluster setup.

Cloud Application Design: Reference Architecture for Cloud Applications, Cloud Application Design Methodologies, Data Storage Approaches.

Python Basics: Introduction, Installing Python, Python data Types & Data Structures, Control flow, Function, Modules, Packages, File handling, Date/Time Operations, Classes.

UNIT - III **Python for Cloud computing** Lecture 8Hrs

Python for Cloud: Python for Amazon web services, Python for Google Cloud Platform, Python for windows Azure, Python for MapReduce, Python packages of Interest, Python web Application Frame work, Designing a RESTful web API.

Cloud Application Development in Python: Design Approaches, Image Processing APP, Document Storage App, MapReduce App, Social Media Analytics App.

UNIT - IV **Big data, multimedia and Tuning** Lecture 8Hrs

Big Data Analytics: Introduction, Clustering Big Data, Classification of Big data Recommendation of Systems.

Multimedia Cloud: Introduction, Case Study: Live video Streaming App, Streaming Protocols, case Study: Video Transcoding App.

Cloud Application Benchmarking and Tuning: Introduction, Workload Characteristics, Application Performance Metrics, Design Considerations for a Benchmarking Methodology, Benchmarking Tools, Deployment Prototyping, Load Testing & Bottleneck Detection case Study, Hadoop benchmarking case Study.

UNIT - V **Applications and Issues in Cloud** Lecture 9 Hrs

Cloud Security: Introduction, CSA Cloud Security Architecture, Authentication, Authorization, Identity Access Management, Data Security, Key Management, Auditing.

Cloud for Industry, Healthcare &Education: Cloud Computing for Healthcare, Cloud computing for Energy Systems, Cloud Computing for Transportation Systems, Cloud Computing for Manufacturing Industry, Cloud computing for Education.

Migrating into a Cloud: Introduction, Broad Approaches to migrating into the cloud, the seven–step model of migration into a cloud.

Organizational readiness and Change Management in The Cloud Age: Introduction, Basic concepts of Organizational Readiness, Drivers for changes: A frame work to comprehend the competitive environment, common change management models, change management maturity models, Organizational readiness self – assessment.

Legal Issues in Cloud Computing: Introduction, Data Privacy and security Issues, cloud contracting models, Jurisdictional issues raised by virtualization and data location, commercial and business considerations, Special Topics.

Textbooks:

1. Cloud computing A hands-on Approach‖ By Arshdeep Bahga, Vijay Madisetti, Universities Press, 2016
2. Cloud Computing Principles and Paradigms: By Raj Kumar Buyya, James Broberg, Andrzej Goscinski, Wiley, 2016

Reference Books:

7. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, SThamaraiSelvi, TMH
8. Cloud computing A Hands-On Approach by Arshdeep Bahga and Vijay Madisetti.
9. Cloud Computing: A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Tata McGraw Hill, rp2011.
10. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2010.
11. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese, O ‘Reilly, SPD, rp2011.
12. Essentials of Cloud Computing by K. Chandrasekaran. CRC Press.

Online Learning Resources:

Cloud computing - Course (nptel.ac.in)

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B.Tech CSE (AI)– III-II Sem

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(20A31604a) ROBOTICS
(Professional Elective Course– II)

Course Objectives:
- Discuss the basics of Robotics
- Understand the working of Robots
- Demonstrate the building of Robots

Course Outcomes:
- Ability to process end effectors and robotic controls.
- Analyze Robot Transformations and Sensors
- Able to understand Robot cell design and applications

UNIT I **Introduction** Lecture 9 Hrs

Robot anatomy-Definition, law of robotics, History and Terminology of Robotics-Accuracy and repeatability of Robotics-Simple problems Specifications of Robot-Speed of Robot-Robot joints and links-Robot Classifications-Architecture of robotic systems

UNIT II **End Effectors and Robot Controls** Lecture 9 Hrs

Mechanical grippers-Slider crank mechanism, Screw type, Rotary actuators, cam type-Magnetic grippers-Vacuum grippers-Air operated grippers-Gripper force analysitims-Gripper design-Simple problems-Robot controls-Point to point control, Continuous path control, Intelligent robot Control system for robot joint-Control actions-Feedback devices-Encoder, Resolver, LVDTMotion Interpolations-Adaptive control.

UNIT III **Robot Transformations and Sensors** Lecture 9 Hrs

Robot Transformations and Sensors: Robot Kinematics-Types- 2D, 3D Transformation-Scaling, Rotation, Translation- Homogeneouscoordinates, multiple transformation-Simple problems. Sensors in robot – Touch Sensors-Tactile sensor – Proximity and range sensors – Robotic vision sensor-Force Sensor-Light sensors, Pressure sensors.

UNIT IV **Robot Cell Design and Applications** Lecture 8 Hrs

Robot work cell design and control-Sequence control, Operator interface, Safety monitoring devices in Robot-Mobile robot working principle, actuation using MATLAB, NXT Software Introductions-Robot applications Material handling, Machine loading and unloading, assembly, Inspection, Welding, Spray painting and undersea robot**.**

UNIT V **Micro/Nano Robotics System** Lecture 9 Hrs

Micro/Nanorobotics system overview-Scaling Effect-Top down and bottom up approach Actuators of Micro/Nano robotics system-Nano robot communication techniques-Fabrication of micro/nano grippers-Wall climbing micro robot working principles-Biomimetic robot-Swarm robot-Nano robot in targeted drug delivery system

Textbooks:

1.S.R. Deb, Robotics Technology and flexible automation, Tata McGraw-Hill Education.,2009

2. Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, Technology programming and Applications, McGraw Hill, 2012.

Reference Books:

1.Carl D. Crane and Joseph Duffy, Kinematic Analysis of Robot manipulators, Cambridge University press, 2008.

2. Fu. K. S., Gonzalez. R. C. & Lee C.S.G., "Robotics control, sensing, vision and intelligence", McGraw Hill Book co, 1987

3. Craig. J. J. "Introduction to Robotics mechanics and control", Addison- Wesley, 1999.

4. Ray Asfahl. C., "Robots and Manufacturing Automation", John Wiley & Sons Inc., 1985**.**

Online Learning Resources:

1. Robotics | Coursera
2. Introduction to robotics - Course (nptel.ac.in)

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B.Tech CSE (AI)– III-II Sem

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(20A31604b) INTERNET OF THINGS
(Professional Elective Course-II

Course Objectives:

- Students will be exposed to the interconnection and integration of the physical World and the cyber space.
- Discuss the key technologies involved and how they're integrated to form complete IoT systems

Course Outcomes:

- Able to understand the building blocks of Internet of things, characteristics and application areas of IoT
- Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Network
- Understand and be able to explain the role of big data, cloud computing and data analytics in a typical IoT system
- Design a simple IoT system made up of sensors, wireless network connection, data analytics and display/actuators, and write the necessary control software.
- Build and test a complete working IoT system

UNIT I Introduction to Internet of Things Lecture 8 Hrs

Introduction, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies.

UNIT II Domain Specific IoTs Lecture 8 Hrs

Introduction, Home Automation, cities, Environment, Retail, Agriculture, Industry, Health & Lifestyle.

UNIT III Lecture 9 Hrs

IoT and M2M

Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT.

IoT System Management with NETCONF-YANG

Need for IoT Systems Management, Simple Network Management Protocol (SNMP), Network Operator requirements, NETCONF, YANG, IoT System Management with NETCONF-YANG.

UNIT IV Lecture 9 Hrs

Developing Internet of Things, Introduction, IoT Design Methodology, Case Study on IoT System for Weather Monitoring.

UNIT V Lecture 9 Hrs

Case Studies Illustrating IoT Design: Introduction, Home Automation, Cities, Environment, Agriculture, Productivity Applications.

Advanced Topics: Introduction, Apache Hadoop, Using Hadoop Map Reduce for Batch Data Analysis.

Textbooks:

1. Internet of Things a Hands-on Approach by ArshdeepBahga and Vijay Madisetti. University Press,2014.

Reference Books:

1. Internet ofThings:Architecture,DesignPrinciplesandApplicationsbyRajKamalMCGraw Hill Edition,2017.
2. The Internet of Things key applications and protocols by Oliver Hersent, David Boswarthickand Omar Elloumi.WileyStudentEdition,2011.

Online Learning Resources:

Complete Guide to Build IOT Things from Scratch to Market | Udemy

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B.Tech CSE (AI)– III-II Sem

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3	0	0	3

(20A05604c) COMPUTER VISION
(Professional Elective Course– II)

Course Objectives:

The objective of this course is to understand the basic issues in computer vision and major approaches to address the methods to learn the Linear Filters, segmentation by clustering, Edge detection, Texture.

Course Outcomes:

After completing the course, you will be able to:

- Identify basic concepts, terminology, theories, models and methods in the field of computer vision,
- Describe known principles of human visual system,
- Describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition,
- Suggest a design of a computer vision system for a specific problem

UNIT I LINEAR FILTERS Lecture 8Hrs

Introduction to Computer Vision, Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing Filters as Templates, Technique: Normalized Correlation and Finding Patterns, Technique: Scale and Image Pyramids.

UNIT II EDGE DETECTION Lecture 9Hrs

Noise- Additive Stationary Gaussian Noise, Why Finite Differences Respond to Noise, Estimating Derivatives - Derivative of Gaussian Filters, Why Smoothing Helps, Choosing a Smoothing Filter, Why Smooth with a Gaussian? Detecting Edges-Using the Laplacian to Detect Edges, Gradient-Based Edge Detectors, Technique: Orientation Representations and Corners.

UNIT III TEXTURE Lecture 9Hrs

Representing Texture –Extracting Image Structure with Filter Banks, Representing Texture using the Statistics of Filter Outputs, Analysis (and Synthesis) Using Oriented Pyramids –The Laplacian Pyramid, Filters in the Spatial Frequency Domain, Oriented Pyramids,
Application: Synthesizing Textures for Rendering, Homogeneity, Synthesis by Sampling Local Models, Shape from Texture, Shape from Texture for Planes,

UNIT IV SEGMENTATION BY CLUSTERING Lecture 8Hrs

What is Segmentation, Human Vision: Grouping and Gestalt, Applications: Shot Boundary Detection and Background Subtraction. Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering. The Hough Transform, Fitting Lines, Fitting Curves

UNIT V RECOGNIZATIONBYRELATIONSBETWEENTEMPLATES Lecture 8Hrs

Finding Objects by Voting on Relations between Templates, Relational Reasoning Using Probabilistic Models and Search, Using Classifiers to Prune Search, Hidden Markov Models, Application: HMM and Sign Language Understanding, Finding People with HMM.

Textbooks:

David A. Forsyth, Jean Ponce, Computer Vision – A modern Approach, PHI, 2003.

Reference Books:

1. Geometric Computing with Clifford Algebras: Theoretical Foundations and Applications in Computer Vision and Robotics, Springer;1 edition,2001by Sommer.
2. Digital Image Processing and Computer Vision,1/e,by Sonka.
3. Computer Vision and Applications: Concise Edition (WithCD) by Jack Academy Press, 2000.

Online Learning Resources:

https://nptel.ac.in/courses/106105216
https://nptel.ac.in/courses/108103174

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech CSE (AI)– III-II Sem

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(20A31601P) NATURAL LANGUAGE PROCESSING LAB

Course Objectives:

- To introduce the students with the basics of NLP which will empower them for developing advanced NLP tools and solving practical problems in the field.

Course Outcomes (CO):

After completion of the course, students will be able to

- Understand approaches to syntax and semantics in NLP.
- Analyse grammar formalism and context free grammars
- Apply the statistical estimation and statistical alignment models
- Apply Rule based Techniques, Statistical Machine translation (SMT), word alignment, phrase-based translation
- Have the skills (experience) of solving specific NLP tasks, which may involve programming in Python, as well as running experiments on textual data.

List of Experiments:

1. Word Analysis
2. Word Generation
3. Morphology
4. N-Grams
5. N-Grams Smoothing
6. POS Tagging: Hidden Markov Model
7. POS Tagging: Viterbi Decoding
8. Building POS Tagger
9. Chunking
10. Building Chunker

Refer: https://nlp-iiith.vlabs.ac.in/List%20of%20experiments.html

References:

1. James Allen, Natural Language Understanding, 2nd Edition, 2003, Pearson Education.
2.Natural Language Processing, A paninian perspective, Akshar Bharathi, Vineet Chaitanya, Prentice –Hall of India.

Online Learning Resources/Virtual Labs:

1. Natural Language Processing in TensorFlow | Coursera

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech CSE (AI)– III-II Sem

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(20A31602P) APPLICATIONS OF AI LAB

Course Objectives:

- To have an appreciation for and understanding of both the achievements of AI and the theory underlying those achievements.
- To have an appreciation for the engineering issues underlying the design of AI systems
- To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language.
- To understand the basic issues of knowledge representation and blind and heuristic search, as well as an understanding of other topics such as minimax, resolution, etc. that play an important role in AI programs.

Course Outcomes:

After completion of the course, students will be able to

- Develop systems that process unstructured, uncurated data automatically using artificial intelligence (AI) frameworks and platforms.
- Determine the framework in which AI bots may function, including interactions with users and environments.
- Design and implement cognitive automation for different industries.

List of Experiments:

Design an application using machine learning algorithms that remember the edges of the buildings that it has learned, which allows for better visuals on the map, and recognition and understanding of house and building numbers. The application can also be taught to understand and identify changes in traffic flow so that it can recommend the route that avoids roadblocks and congestion.

1. Maps and Navigation

AI has drastically improved traveling. Instead of having to rely on printed maps or directions, you can now use Google Maps on your phone and type in your destination.

So how does the application know where to go? And what's more, the optimal route, road barriers, and traffic congestions? Not too long ago, only satellite-based GPS was available, but now, artificial intelligence is being incorporated to give users a much more enhanced experience.

2. Facial Detection and Recognition

A. Design an application that can be used for Face detection.
B. Design an application that can identify the face.

3. Text Editors or Autocorrect

A. Design an algorithm that can give autosuggestions in a word processor.
B. Design an algorithm to detect spelling and grammar errors in a text document.

4. Search and Recommendation Algorithms

Design a recommender system which keeps track of the previous shopping data of the user and recommends other products based on his interests.

5. Chatbots

A. Design an AI chatbot which provides information about your college.
B. Design an AI chatbot which permits the user to install a software of your choice

6. Digital Assistants

Design a Digital assistant of your choice. Example is the digital assistant which plays a song when you say play song xxx.mp3.

7. Social Media

Design an application which detects Fake news.

Design an application which finds most viewed news.

8. Image Processing

Design an application which detects the emotion of the person in an image.

References:

1. Gautam Shroff "The Intelligent Web", OXFORD University Press, 2013.
2. Hod Lipson, and Melba kurman, "Driverless_ Intelligent cars and the Road Ahead", The MIT Press Cambridge, Massachusetts London, England, 2016.
3. Erik R. Ranschaert, sergey Morozov, Paul R. Algra, "Artificial Intelligence in Medical Imaging, Springer Nature Switzerland AG, 2019.

Online Learning Resources/Virtual Labs:

1. AI and Improving the Customer Experience| Pega

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (AI & DS)– III-II Sem

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(20A31603P) CLOUD COMPUTING LAB

Course Objectives:

- Demonstrate application development using Cloud
- Explain features of Hadoop

Course Outcomes (CO):

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

- Configure various virtualization tools such as Virtual Box, VMware workstation.
- Design and deploy a web application in a PaaS environment.
- Learn how to simulate a cloud environment to implement new schedulers.
- Install and use a generic cloud environment that can be used as a private cloud.
- Manipulate large data sets in a parallel environment.

List of Experiments:

1. Install VirtualBox/VMware Workstation with different flavours of Linux or windows OS on top of windows operating systems.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create hello world app and other simple web applications using python/java.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch virtual machine using try stack (Online Open stack Demo Version)
8. Install Hadoop single node cluster and run simple applications like wordcount
9. Establish an AWS account. Use the AWS Management Console to launch an EC2 instance and connect to it.
10. Develop a Guestbook Application using Google App Engine
11. Develop a Serverless Web App using AWS
12. Design a Content Recommendation system using AWS
13. Design a Cloud based smart traffic management system
14. Design Cloud based attendance management system
15. Design E-learning cloud-based system
16. Using Amazon Lex build a Chatbot

References:

1. https://www.vmware.com/products/workstation-pro/workstation-pro-evaluation.html.
2. http://code.google.com/appengine/downloads.html
3. http://code.google.com/appengine/downloads.html

Online Learning Resources/Virtual Labs:

1. Google Cloud Computing Foundations Course - Course (nptel.ac.in)

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B.Tech CSE (AI)– III-II Sem

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(20A52401) SOFT SKILLS
(Skill Oriented course – IV)

Course Objectives:

- To encourage all round development of the students by focusing on soft skills
- To make the students aware of critical thinking and problem-solving skills
- To develop leadership skills and organizational skills through group activities
- To function effectively with heterogeneous teams

Course Outcomes (CO):

By the end of the program students should be able to

- Memorize various elements of effective communicative skills
- Interpret people at the emotional level through emotional intelligence
- apply critical thinking skills in problem solving
- analyse the needs of an organization for team building
- Judge the situation and take necessary decisions as a leader
- Develop social and work-life skills as well as personal and emotional well-being

UNIT I **Soft Skills & Communication Skills** **10 Hrs**

Introduction, meaning, significance of soft skills – definition, significance, types of communication skills - Intrapersonal & Inter-personal skills - Verbal and Non-verbal Communication

Activities:

Intrapersonal Skills- Narration about self- strengths and weaknesses- clarity of thought – self- expression – articulating with felicity

(The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources)

Interpersonal Skills- Group Discussion – Debate – Team Tasks - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic.

Verbal Communication- Oral Presentations- Extempore- brief addresses and speeches- convincing- negotiating- agreeing and disagreeing with professional grace.

Non-verbal communication – Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation

UNIT II **Critical Thinking** **10 Hrs**

Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open-mindedness – Creative Thinking

Activities:

Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues – placing the problem – finding the root cause - seeking viable solution – judging with rationale – evaluating the views of others - Case Study, Story Analysis

UNIT III **Problem Solving & Decision Making** **10 Hrs**

Meaning & features of Problem Solving – Managing Conflict – Conflict resolution –
Methods of decision making – Effective decision making in teams – Methods & Styles

Activities:

Placing a problem which involves conflict of interests, choice and views – formulating the problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision.

Case Study & Group Discussion

UNIT IV Emotional Intelligence & Stress Management 10 Hrs

Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self-Regulation – Stress factors – Controlling Stress – Tips

Activities:

Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude, sympathy, and confidence, compassion in the form of written or oral presentations.

Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates

UNIT V Leadership Skills 10 Hrs

Team-Building – Decision-Making – Accountability – Planning – Public Speaking – Motivation – Risk-Taking - Team Building - Time Management

Activities:

Forming group with a consensus among the participants- choosing a leader- encouraging the group members to express views on leadership- democratic attitude- sense of sacrifice – sense of adjustment – vision – accommodating nature- eliciting views on successes and failures of leadership using the past knowledge and experience of the participants, Public Speaking, Activities on Time Management, Motivation, Decision Making, Group discussion etc.

NOTE-:

1. The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes, epics, scriptures, autobiographies and literary sources which bear true relevance to the prescribed skill.
2. Case studies may be given wherever feasible for example for Decision Making- The decision of King Lear or for good Leadership – Mahendar Singh Dhoni etc.

Textbooks:

1. Personality Development and Soft Skills (English, Paperback, Mitra BarunK.)Publisher: Oxford University Press; Pap/Cdr edition (July 22, 2012)
2. Personality Development and Soft Skills: Preparing for Tomorrow, Dr Shikha KapoorPublisher : I K International Publishing House; 0 edition (February 28, 2018)

Reference Books:

1. Soft skills: personality development for life success by Prashant Sharma, BPB publications 2018.
2. Soft Skills By Alex K. Published by S.Chand
3. Soft Skills: An Integrated Approach to Maximise Personality Gajendra Singh Chauhan, Sangeetha Sharma Published by Wiley.
4. Communication Skills and Soft Skills (Hardcover, A. Sharma) Publisher: Yking books
5. SOFT SKILLS for a BIG IMPACT (English, Paperback, RenuShorey) Publisher: Notion Press
6. Life Skills Paperback English Dr. Rajiv Kumar Jain, Dr. Usha Jain Publisher: Vayu Education of India

Online Learning Resources:

1. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q
2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
3. https://youtu.be/-Y-R9hDl7lU
4. https://youtu.be/gkLsn4ddmTs
5. https://youtu.be/2bf9K2rRWwo
6. https://youtu.be/FchfE3c2jzc

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech CSE (AI)– III-II Sem **L T P C**

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(20A99601) INTELLECTUAL PROPERTY RIGHTS AND PATENTS
(Mandatory Non-Credit Course)

Course Objectives:

This course introduces the student to the basics of Intellectual Property Rights, Copy Right Laws, Cyber Laws, Trade Marks and Issues related to Patents. The overall idea of the course is to help and encourage the student for startups and innovations

Course Outcomes:

- Understand IPR law & Cyber law
- Discuss registration process, maintenance and litigations associated with trademarks
- Illustrate the copy right law
- Enumerate the trade secret law.

UNIT I

Introduction to Intellectual Property Law – Evolutionary past – Intellectual Property Law Basics – Types of Intellectual Property – Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement – Regulatory – Overuse or Misuse of Intellectual Property Rights – Compliance and Liability Issues.

UNIT II

Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of performers – Copyright Formalities and Registration – Limitations – Infringement of Copyright – International Copyright Law-Semiconductor Chip Protection Act.

UNIT III

Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.

UNIT IV

Introduction to Trade Mark – Trade Mark Registration Process – Post registration procedures – Trade Mark maintenance – Transfer of rights – Inter parties Proceedings – Infringement – Dilution of Ownership of Trade Mark – Likelihood of confusion – Trade Mark claims – Trade Marks Litigation – International Trade Mark Law.

UNIT V

Introduction to Trade Secrets – Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreement – Trade Secret Law – Unfair Competition – Trade Secret Litigation – Breach of Contract – Applying State Law. Introduction to Cyber Law – Information Technology Act – Cyber Crime and E-commerce – Data Security – Confidentiality – Privacy – International aspects of Computer and Online Crime.

Textbooks:

1. Deborah E.Bouchoux: “Intellectual Property”. Cengage learning, New Delhi
2. Kompal Bansal & Parishit Bansal “Fundamentals of IPR for Engineers”, BS Publications (Press)
3. Cyber Law. Texts & Cases, South-Western’s Special Topics Collections

References:

1. Prabhuddha Ganguli: ‘ Intellectual Property Rights” Tata Mc-Graw – Hill, New Delhi
2. Richard Stim: “Intellectual Property”, Cengage Learning, New Delhi.
3. R. Radha Krishnan, S. Balasubramanian: “Intellectual Property Rights”, Excel Books. New Delhi.
4. M. Ashok Kumar and Mohd. Iqbal Ali: “Intellectual Property Right” Serials Pub.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech CSE (AI)– IV-I Sem

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(20A31701a) RECOMMENDER SYSTEMS
(Professional Elective Course– III)

Course Objectives:

- To provide students with basic concepts and its application in various domain
- To make the students understand different techniques that a data scientist needs to know for analysing big data
- To design and build a complete machine learning solution in many application domains.

Course Outcomes:

After completion of the course, students will be able to

- Aware of various issues related to Personalization and Recommendations.
- Design and implement a set of well-known Recommender System approaches used in E-commerce and Tourism industry.
- Develop new Recommender Systems for a number of domains especially, Education, Health-care.

UNIT I **An Introduction to Recommender Systems, Neighborhood-Based Collaborative Filtering** Lecture 8Hrs

Introduction, Goals of Recommender Systems, Basic Models of Recommender Systems, Domain-Specific Challenges in Recommender Systems. Advanced Topics and Applications.

Introduction, Key Properties of Ratings Matrices, Predicting Ratings with Neighborhood-Neighborhood-Based Collaborative Filtering:

Based Methods, Clustering and Neighborhood-Based Methods, Dimensionality Reduction and Neighborhood Methods, Graph Models for Neighborhood-Based Methods,A Regression Modeling View of Neighborhood Methods

UNIT II **Model-Based Collaborative Filtering, Content-Based Recommender Systems** Lecture 9Hrs

Introduction, Decision and Regression Trees, Rule-Based Collaborative Filtering, Naive Bayes Collaborative Filtering, Using an Arbitrary Classification Model as a Black-Box, Latent Factor Models, Integrating Factorization and Neighborhood Models.

Content-Based Recommender Systems:

Introduction, Basic Components of Content-Based Systems, Preprocessing and Feature Extraction, Learning User Profiles and Filtering, Content-Based Versus Collaborative Recommendations, Using Content-Based Models for Collaborative Filtering, Summary.

UNIT III **Knowledge-Based Recommender Systems, Ensemble-Based and Hybrid Recommender Systems** Lecture 9Hrs

Introduction, Constraint-Based Recommender Systems, Case-Based Recommenders, Persistent Personalization in Knowledge-Based Systems, Summary.

Introduction, Ensemble Methods from the Classification Perspective, Weighted Hybrids, Switching Hybrids, Cascade Hybrids, Feature Augmentation Hybrids, Meta-Level Hybrids, Feature Combination Hybrids, Summary.

UNIT IV **Evaluating Recommender Systems, Context-Sensitive Recommender Systems** Lecture 8Hrs

Introduction, Evaluation Paradigms, General Goals of Evaluation Design, Design Issues in Offline Recommender Evaluation, Accuracy Metrics in Offline Evaluation, Limitations of Evaluation Measures, Limitations of Evaluation Measures.

Introduction, The Multidimensional Approach, Contextual Pre-filtering: A Reduction-Based Approach, Contextual Pre-filtering: A Reduction-Based Approach, Contextual Modeling.

UNIT V **Time- and Location-Sensitive Recommender Systems** Lecture 8Hrs

Introduction, Temporal Collaborative Filtering, Discrete Temporal Models, Location-Aware Recommender Systems, Location-Aware Recommender Systems Location-Aware Recommender Systems, Summary.

Textbooks:

1. Charu C. Aggarwal, "Recommender Systems", Springer,2016.

Reference Books:

1. Francesco Ricci, LiorRokach, "Recommender Systems Handbook", 2nd ed., Springer, 2015 Edition

Online Learning Resources:

1. Recommendation System -Understanding The Basic Concepts (analyticsvidhya.com)
2. Recommender Systems | Coursera

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech CSE (AI)– IV-I Sem

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(20A31701b) INTELLIGENT INFORMATION RETRIEVAL SYSTEMS
(Professional Elective Course– III)

Course Objectives:

- Teach how to retrieve information
- Discuss indexing and how to use it
- Demonstrate how to automate indexing

Course Outcomes:

After completion of the course, students will be able to

- Recognize the Boolean Model, Vector Space Model, and Probabilistic Model.
- Understand retrieval utilities.
- Understand different formatting tags
- Understand cross-language information retrieval
- Understand the clustering techniques
- Determine the efficiency.

UNIT I **Introduction** Lecture 8Hrs

Introduction to Information Retrieval Systems:

Definition of Information Retrieval System,Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses.

Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities

UNIT II **Cataloguing and Indexing, Data structure** Lecture 9Hrs

Cataloguing and Indexing:

History and objectives of Indexing, Indexing Process, Automatic Indexing, Information extraction.

Data structure:

Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models.

UNIT III **Automatic Indexing, Document and Term Clustering** Lecture 9Hrs

Automatic Indexing:

Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages.

Document and Term Clustering:

Introduction to Clustering, Thesaurus Generation, Manual Clustering Automatic Term Clustering, Complete Term Relation Method, Clustering Using Existing Clusters, One Pass Assignments, Item Clustering, hierarchy of Clusters.

UNIT IV **Automatic Indexing, Information visualization** Lecture 8Hrs

Automatic Indexing:

Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the INTERNET and Hypertext.

Information visualization:

Introduction to Information visualization, Cognition and perception, Information Visualization Technologies.

UNIT V **Text Search Algorithms, Multimedia Information Retrieval, Information System Evaluation** Lecture 8Hrs

Text Search Algorithms:

Introduction to Text Search techniques, software Text Search algorithms, Hardware Text Search Systems.

Multimedia Information Retrieval:
Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph retrieval, Imagery Retrieval, Video Retrieval.

Information System Evaluation:
Introduction to Information System Evaluation, Measures Used in System Evaluation, Measurement Example- TREC results.

Textbooks:

1. Information Storage and Retrieval Systems: Theory and Implementation by Gerald J. Kowalski, Mark T. Maybury, Springer, 2013.

Reference Books:

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
2. Modern Information Retrieval by Yates Pearson Education. 3. Information Storage & Retrieval by Robert Korfhage – John Wiley & Sons.

Online Learning Resources:

1. Information Retrieval Systems - an overview | ScienceDirect Topics
2. Information Retrieval (tutorialandexample.com)

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B.Tech CSE (AI)– IV-I Sem

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(20A31701c) KNOWLEDGE REPRESENTATION AND REASONING

(Professional Elective Course– III)

Course Objectives:

- To investigate the key concepts of knowledge representation (KR) techniques and different notations.
- To integrate the KR view as a knowledge engineering approach to model organizational knowledge.
- To introduce the study of ontologies as a KR paradigm and applications of ontologies.
- To understand various KR techniques.
- To understand process, knowledge acquisition and sharing of ontology.

Course Outcomes:

After completion of the course, students will be able to

- Analyze and design knowledge-based systems intended for computer implementation.
- Acquire theoretical knowledge about principles for logic-based representation and reasoning.
- Ability to understand knowledge- engineering process
- Ability to implement production systems, frames, inheritance systems and approaches to handle uncertain or in complete knowledge.

UNIT I Lecture 8Hrs

The Key Concepts: Knowledge, Representation, Reasoning, Why knowledge representation and reasoning, Role of logic.

Logic: Historical background, Representing knowledge in logic, Varieties of logic, Name, Type, Measures, Unity and diversity

UNIT II Lecture 9Hrs

Ontology: Ontological categories, Philosophical background, Top-level categories, describing physical entities, Defining abstractions, Sets, Collections, Types and Categories, Space and Time

UNIT III Lecture 9Hrs

Knowledge Representations: Knowledge Engineering, Representing structure in frames, Rules and data, Object-oriented systems, Natural language Semantics, Levels of representation

UNIT IV Lecture 8Hrs

Processes: Times, Events and Situations, Classification of processes, Procedures, Processes and Histories, Concurrent processes, Computation, Constraint satisfaction, Change

Contexts: Syntax of contexts, Semantics of contexts, First-order reasoning in contexts, Modal reasoning in contexts, Encapsulating objects in contexts.

UNIT V Lecture 8Hrs

Knowledge Soup: Vagueness, Uncertainty, Randomness and Ignorance, Limitations of logic, Fuzzy logic, Non-monotonic Logic, Theories, Models and the world, Semiotics

Knowledge Acquisition and Sharing: Sharing Ontologies, Conceptual schema, accommodating multiple paradigms, Relating different knowledge representations, Language patterns, Tools for knowledge acquisition

Textbooks:

1. Knowledge Representation *logical, Philosophical, and Computational Foundations* by JohnF. Sowa, Thomson Learning.
2. Knowledge Representation and Reasoning by Ronald J. Brachman, Hector J. Levesque, Elsevier

Reference Books:

1. Foundations of Knowledge Representation and Reasoning: 810 (Lecture Notes in Computer Science),by Gerhard Lakemeyer,28 June 1994

Online Learning Resources:

Knowledge Representation and Reasoning | ScienceDirect
Knowledge Representation & Reasoning In Artificial Intelligence -ProfessionalAI.com (professional-ai.com)

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B.Tech CSE (AI)– IV-I Sem

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(20A31702a) OPTIMIZATION TECHNIQUES IN AI
(Professional Elective Course– IV)

Course Objectives:

- Introduce to optimization techniques using both linear and non-linear programming.
- Discuss optimization though some techniques.

Course Outcomes:

After completion of the course, students will be able to

- Relate key concepts and applications of various optimization techniques
- Identify the appropriate optimization technique for the given problem
- Formulate appropriate objective functions and constraints to solve real life optimization problems

UNIT I **Lecture 8Hrs**

Statement of an optimization problems classification of optimization problem classical opti mization techniques

Single variable optimizations, Multi variable optimization, equality constrainst, inequality constrai nts, No constraints.

UNIT II **Lecture 9Hrs**

Graphical method for two dimensional problems – central problems of Linear Programming Definitions – Simples – Algorithm – Phase I and II of simplex Method Revised Simplex Method.

Simplex Multipliers -

Dual and Primal Dual Simplex Method Sensitivity Analysis Transportation problem and its solut ion – Assignment problem and its solution – Assignment problem and its solution by Hungarian method Karmakar's method statement, Conversion of the Linear Programming problem intothe required form, Algorithm.

UNIT III **Lecture 9Hrs**

NONLINEAR PROGRAMMING (ONE DIMENSIONAL MINIMIZATION: Introduction – Unrestricted search – Exhaustive search – interval halving method – Fibonacci method.

NON LINEAR PROGRAMMING: (UNCONSTRAINED OPRIMIZATION): - Introduction – Random search method – Uni variate method

Pattern search methods Hooke and jeeves method, simplex method- Gradient of a function – steep est descent method – Conjugate gradient method

NON-LINEAR PROGRAMMING – (CONSTRAINED OPTIMIZATION):

Introduction – Characteristics of the problem – Random search method – Conjugate gradient met hod

UNIT IV Lecture 8Hrs

DYNAMIC PROGRAMMING

Introduction – multistage decision processes– Principles of optimality – Computation procedures.

UNIT V Lecture 8Hrs

DECISIOIN MAKING

Decisions under uncertainty, under certainty and under risk – Decision trees – Expected Value of perfect information and imperfect information.

Textbooks:

1. Kalynamoy Deb, "Optimization for Engineering Design, Algorithms and Examples", Prentice Hall, 2004.
2. Hamdy A Taha, "Operations Research – An introduction", Pearson Education, 2002.

Reference Books:

1. Hillier / Lieberman, "Introduction to Operations Research", Tata McGraw Hill Publishing company Ltd, 2002.
2. Singiresu S Rao, "Engineering optimization Theory and Practice", New Age International, 1996.
3. Mik Misniewski, "Quantitative Methods for Decision makers", MacMillian Press Ltd., 1994.
4.Kambo N S, "Mathematical Programming Techniques", Affiliated East – West press, 1991.

Online Learning Resources:

1. Understanding Optimization Algorithms in Machine Learning | by Supriya Secherla | Towards Data Science
2. Optimization Techniques in Machine Learning | by Mlgomez | Medium

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B.Tech CSE (AI)– IV-I Sem

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(20A31702b) AI FOR IMAGE ANALYSIS
(Professional Elective Course– IV)

Course Objectives:

- Discuss the format of images
- Explore the APIs of python related to image processing

Course Outcomes:

After completion of the course, students will be able to

- Understand the format of different type of images
- Apply the functionality of python for image processing
- Relate machine learning and image processing

UNIT I **Image Formation& 3-D Imaging** Lecture 8Hrs

Introduction to Image Formation:
Introduction, World and camera coordinates, Ideal Imaging: Perspective Projection, Real Imaging, Radiometry of Imaging, Liner System Theory of Imaging, Homogeneous Coordinates
Introduction to 3-D Imaging: Basics, Depth from Triangulation, Depth from Time-of-Flight, Depth from Phase: Interferometry, Shape from Shading, Depth from Multiple Projections: Tomography

UNIT II **Image Processing** Lecture 9Hrs

Introduction to Image Processing:
Images, Pixels, Image Resolution, PPI and DPI, Bitmap Images, Lossless Compression, Lossy Compression, Image File Formats, **Color Spaces**: RGB, XYZ, HSV/HSL, LAB, LCH, YPbPr, YUV, YIQ, **Advanced Image Concepts:** Bezire Curve, Ellipsoid, Gamma Correction, Structural Similarity Index, Deconvolution, Homography, Convolution

UNIT III **Basics of Python and Scikit Image** Lecture 9Hrs

Basics of Python:
Variables and Data Types, Data Structures, Control Flow Statements, Conditional Statements, Functions
Scikit Image:
Uploading and Viewing an Image, Getting Image Resolution, Looking at Pixel Values, Converting Color Space, Saving an Image, Creating Basic Drawings, Doing Gamma Correction.
Rotating, Shifting, and Scaling Images, Determining Structural Similarity.

UNIT IV **Advanced Image Processing Using Open CV** Lecture 8Hrs

Blending Two Images, Changing Contrast and Brightness, Adding Text to Images, **Smoothing Images:** Median Filter, Gaussian Filter, Bilateral Filter.
Changing the Shape of Images, Effecting Image Thresholding, Calculating Gradients, Performing Histogram Equalization.

UNIT V **Image Processing Using Machine Learning & Real-Time Use Cases** Lecture 8Hrs

Feature Mapping Using the SIFT Algorithm, Image Registration Using the RANSAC Algorithm: estimate_ affine, residual lengths, processing the Images, The Complete code.
Image Classification Using Artificial Neural Networks, Image Classification Using CNNs,
Image Classification Using Machine Learning Approaches: Decision Trees,Support Vector Machines, Logistics Regression,Code,Important Terms
Introduction to Real-Time Use Cases:
Finding Palm Lines, Detecting Faces, Recognizing Faces, Tracking Movements, Detecting Lanes

Textbooks:

1. Digital Image Processing by **Rafael C. Gonzalez,4th Edition, 2018**
2. Hands-On Image Processing with Python: Expert techniques for advanced image analysis and effective interpretation of image data,by Sandipan Dey, 2018

Reference Books:

1. Digital Image Processing-Bernd Jahne,2005

Online Learning Resources:

1. How to Implement Artificial Intelligence for Solving Image Processing Tasks | Apriorit
2. Image Processing for Engineering and Science | Coursera

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B.Tech CSE (AI)– IV-I Sem

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(20A31702c) GAME DEVELOPMENT
(Professional Elective-IV)

Course Objectives:

- To learn the fundamentals of Game Development
- To understand the 3D Graphics, vertex and pixel shader scenes.
- To learn the various Py Game Development process and its design attributes.
- To interpret working knowledge in various game platforms.
- To familiarize various games using reinforcement learning.

Course Outcomes (CO):

After completion of the course, students will be able to

- Understand the need for Game development.
- Integrate various concepts and techniques of 3D Game design.
- Design and model interactive game.
- Design and develop games using reinforcement learning

UNIT I INTRODUCTION Lecture 8 Hrs

Elements of Game-Game Architecture-Application Layer-Game Logic-Game View for the Human Player-Game View for AI agents-Networked Game Architecture-Remote Game View-Remote Game Logic

UNIT II 3D GRAPHICS Lecture 8 Hrs

3D Graphics Basics- Pipeline-3D MATH 101-Vector Classes-Matrix Mathematics-Quaternion Mathematics. 3D Vertex and Pixel Shader: Vertex Shader Syntax-Compiling the vertex shader-The pixel shader-Rendering the shader, Helper Classes. 3D Scenes: Graph Basics-Special Scene Graph Nodes

UNIT III PYGAME AND 3D AND PYPLATFORMERS Lecture 10 Hrs

Installing Packages-Getting started with OpenGL-Adding the Py Game Library-Drawing the open GL-Basic Collision Detection Game-An introduction to Game Design-Introducing Py munk-Building a Game Framework-Developing Pyplatformers.

UNIT IV AUGMENTING A BOARD GAME WITH COMPUTER VISION Lecture 9 Hrs

Planning the checker application-setting up OpenCV and Other Dependencies-Supporting multiple versions of Open CV-Configuring Cameras-Working with Colors-Building the analyzer-Converting OpenCV images for wxPythonBuilding the GUI Application-Troubleshooting the projects.

UNIT V REINFORCEMENT LEARNING AND GAMES Lecture 9 Hrs

Intelligence and Games- Reinforcement Learning - Heuristic Planning - Adaptive Sampling-Deep Supervised Learning-Deep Reinforcement Learning.

Textbooks:

1. Mike “MrMike” McShaffry and David “Rez” Graham, “Game Coding Complete, Fourth Edition, 2012.”, Course Technology PTR, A part of Cengage Learning.
2. Alejandro Rodas de Paz, JosephHowse, “Python Game Programming by Example”, Packt Publishing,2015.
3. Learning to Play (Springer), Reinforcement Learning and Games by Aske Plaat,2020.

Reference Books:

1. Jeremy Gibson, "Introduction to Game Design, Prototyping, and Development: From Concept to Playable Game with Unity and C#", Addison-Wesley Professional, 2nd edition, 2016.
2. John Horton, "Learning Java by Building Android Games", Packt Publishing Limited, 1st edition, 2015. 3 Jorge Palacios, "Unity 5.x Game AI Programming Cookbook", Packt Publishing Limited, 1st edition, 2016

Online Learning Resources:

1. Game Design and Development with Unity 2020 | Coursera

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B.Tech CSE (AI)– IV-I Sem

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(20A31703a) DEV OPS
(Professional Elective Course– V)

Pre-requisite **Fundamentals of software development and maintenance**

Course Objectives:

- Understand collaboration and productivity by automating infrastructure and workflows
- Familiarize with continuous measuring applications performance

Course Outcomes:

After completion of the course, students will be able to

- Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT serviceability
- Describe Dev Ops &Dev Sec Ops methodologies and their key concepts
- Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models
- Set up complete private infrastructure using version control systems and CI/CD tools

UNIT I Lecture 8 Hrs

Dev Ops: An Overview, Dev Ops: Origins, Dev Ops: Roots, Dev Ops: Practices
Dev Ops: Culture.
Adopting Dev Ops: Developing the Playbook.
Developing a Business Case for a Dev Ops: Developing the Business Case

UNIT II Lecture 9 Hrs

Completing the Business Model Canvas, Customer Segments, Value Segments, Value Propositions, Channels, Customer Relationships, Revenue Streams, Key Resources, Key Activities, Key Partnerships, Cost Structures.
Dev Ops Plays for Optimizing the delivery Pipeline: Dev Ops as an optimization Exercise, Core Themes, The Dev Ops Plays, Specializing Core Plays

UNIT III Lecture 8 Hrs

Dev Ops Plays for Driving Innovation: Optimize to Innovate, The Uber Syndrome, Innovation and the Role of Technology, Core Themes, play: Build a Dev Ops Platform, play: Deliver Microservices Architectures, play: DevOps an API Economy, play: Organizing for Innovation.

UNIT IV Lecture 10 Hrs

Scaling Dev Ops for the Enterprise: Core Themes, play: Dev Ops Center of Competency, play: Developing Culture of Innovation at Scale, play: Developing a Culture of continuous Improvement, play: Team Models for Dev Ops, play: Standardization of Tools and Process, play: Security Considerations for Dev Ops, Play: Dev Ops and Outsourcing.

UNIT V Lecture 10 Hrs

Leading Dev Ops Adoption in the Enterprise: Play: Dev Ops as a transformation Exercise, play: Developing a Culture of Collaboration and Trust, play: Dev Ops Thinking for the Line of Business, play: starting with Pilot Projects, Play: Rearing Unicorns on an Aircrafts Carrier.
Appendix Case Study: Example Dev Ops Adoption Roadmap
Organization Background, Roadmap Structure, Adoption Roadmap.

Textbooks:

1. Sanjeev Sharma, The DevOps Adoption Playbook, Published by John Wiley & Sons, Inc.2017

Reference Books:

1. Sanjeev Sharma & Bernie Coyne, DevOps for Dummies, Published by John Wiley & Sons, Inc.
2. Michael Huttermann, DevOps for Developers, Apress publishers,2012.

Online Learning Resources:

1. Learning DevOps with Terraform Infrastructure Automation Course | Udemy

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(20A31703b) BLOCKCHAIN TECHNOLOGY AND APPLICATIONS

(Professional Elective Course– V)

Course Objectives:

- Understand how block chain systems (mainly Bit coin and Ethereum) work and to securely interact with them,
- Design, build, and deploy smart contracts and distributed applications,
- Integrate ideas from block chain technology into their own projects.

Course Outcomes (CO):

After completion of the course, students will be able to

- Demonstrate the foundation of the Block chain technology and understand the processes in payment and funding. Identify the risks involved in building Block chain applications.
- Review of legal implications using smart contracts.
- Choose the present landscape of Blockchain implementations and Understand Crypto currency markets
- Examine how to profit from trading crypto currencies.

UNIT - I Introduction Lecture 8Hrs

Introduction, Scenarios, Challenges Articulated, Blockchain, Blockchain Characteristics, Opportunities Using Blockchain, History of Blockchain. Evolution of Blockchain: Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Blockchain Evolution, Consortia, Forks, Public Blockchain Environments, Type of Players in Blockchain Ecosystem, Players in Market.

UNIT - II Blockchain Concepts Lecture 9Hrs

Blockchain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on blockchain, data storage on blockchain, wallets, coding on blockchain: smart contracts, peer-to-peer network, types of blockchain nodes, risk associated with blockchain solutions, life cycle of blockchain transaction.

UNIT - III Architecting Blockchain solutions Lecture 9Hrs

Architecting Blockchain solutions: Introduction, Obstacles for Use of Blockchain, Blockchain Relevance Evaluation Framework, Blockchain Solutions Reference Architecture, Types of Blockchain Applications. Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Blockchain Solutions, Architecture Considerations, Architecture with Blockchain Platforms, Approach for Designing Blockchain Applications.

UNIT - IV Ethereum Block chain Implementation Lecture 8Hrs

Ethereum Block chain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, My Ether Wallet, Ethereum Networks/Environments, Infura, Ether scan, Ethereum Clients, Decentralized Application, Metamask, Tuna Fish Use Case Implementation, Open Zeppel in Contracts

UNIT - V Hyper ledger Block chain Implementation Lecture 8Hrs

Hyperledger Blockchain Implementation, Introduction, Use Case – Car Ownership Tracking, Hyperledger Fabric, Hyperledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chain code Functions Using Client Application.

Advanced Concepts in Blockchain: Introduction, Inter Planetary File System (IPFS), Zero-Knowledge Proofs, Oracles, Self-Sovereign Identity, Blockchain with IoT and AI/ML Quantum Computing and Blockchain, Initial Coin Offering, Blockchain Cloud Offerings, Blockchain and its Future Potential.

Textbooks:

1. Ambadas, Arshad SarfarzAriff, Sham "Blockchain for Enterprise Application Developers", Wiley, 2020
2. Andreas M. Antonopoulos, "Mastering Bitcoin: Programming the Open Blockchain", O'Reilly, 2017

Reference Books:

1. Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc Graw Hill.
2. Blockchain: Blueprint for a New Economy, Melanie Swan, O'Reilly

Online Learning Resources:

https://github.com/blockchainedindia/resources

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(20A31703c) REINFORCEMENT LEARNING

Professional Elective – V

Pre-requisite **Machine Learning**

Course Objectives:

- To learn RL task formulation (action space, state space, environment definition)
- To learn Tabular based solutions (dynamic programming, Monte Carlo, temporal-difference)
- To learn Function approximation solutions (Deep Q-networks)
- To learn Policy gradient from basic (REINFORCE) towards advanced topics (proximal policy optimization, deep deterministic policy gradient, etc.)
- To learn Model-based reinforcement learning

Course Outcomes:

After completion of the course, students will be able to

- Formulate Reinforcement Learning problems
- Apply various Tabular Solution Methods to Markov Reward Process Problems
- Apply various Iterative Solution methods to Markov Decision Process Problems
- Comprehend Function approximation methods

UNIT I Lecture 8Hrs

Introduction

Course logistics and overview. Origin and history of Reinforcement Learning research. Its connections with other related fields and with different branches of machine learning.

Probability Primer

Brush up of Probability concepts - Axioms of probability, concepts of random variables, PMF, PDFs, CDFs, Expectation. Concepts of joint and multiple random variables, joint, conditional and marginal distributions. Correlation and independence

UNIT II Lecture 9Hrs

Markov Decision Process

Introduction to RL terminology, Markov property, Markov chains, Markov reward process (MRP). Introduction to and proof of Bellman equations for MRPs along with proof of existence of solution to Bellman equations in MRP. Introduction to Markov decision process (MDP), state and action value functions, Bellman expectation equations, optimality of value functions and policies, Bellman optimality equations.

Prediction and Control by Dynamic Programming

Overview of dynamic programming for MDP, definition and formulation of planning in MDPs, principle of optimality, iterative policy evaluation, policy iteration, value iteration, Banach fixed point theorem, proof of contraction mapping property of Bellman expectation and optimality operators, proof of convergence of policy evaluation and value iteration algorithms, DP extensions.

UNIT III Lecture 9Hrs

Monte Carlo Methods for Model Free Prediction and Control

Overview of Monte Carlo methods for model free RL, First visit and every visit Monte Carlo, Monte Carlo control, On policy and off policy learning, Importance sampling.

TD Methods

Incremental Monte Carlo Methods for Model Free Prediction, Overview TD(0), TD(1) and TD(λ), k-step estimators, unified view of DP, MC and TD evaluation methods, TD Control methods - SARSA, Q-Learning and their variants

UNIT IV Lecture 8Hrs

Function Approximation Methods

Getting started with the function approximation methods, Revisiting risk minimization, gradient descent from Machine Learning, Gradient MC and Semi-gradient TD(0) algorithms, Eligibility trace for function approximation, After states, Control with function approximation, Least squares, Experience replay in deep Q-Networks.

UNIT - V Lecture 8Hrs

Policy Gradients

Getting started with policy gradient methods, Log-derivative trick, Naive REINFORCE algorithm, bias and variance in Reinforcement Learning, Reducing variance in policy gradient estimates, baselines, advantage function, actor-critic methods.

Textbooks:

1. Sutton, Richard S., and Andrew G. Barto. Reinforcement learning: An introduction. MIT press, 2018.

2.Leon-Garcia, Alberto. Probability and random processes for electrical engineering. Pearson Education India, 1994

Reference Books:

1. Murphy, Kevin P. *Machine learning: a probabilistic perspective*. MIT press, 2012.

Online Learning Resources:

1. A brief introduction to reinforcement learning (freecodecamp.org)
2. Reinforcement learning - GeeksforGeeks

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(20A52701a) ENTREPRENEURSHIP & INCUBATION (HUMANITIES ELECTIVE II)

Course Objectives:

- To make the student understand about Entrepreneurship
- To enable the student in knowing various sources of generating new ideas in setting up of New enterprise
- To facilitate the student in knowing various sources of finance in starting up of a business
- To impart knowledge about various government sources which provide financial assistance to entrepreneurs/ women entrepreneurs
- To encourage the student in creating and designing business plans

Course Outcomes:

- Understand the concept of Entrepreneurship and challenges in the world of competition.
- Apply the Knowledge in generating ideas for New Ventures.
- Analyze various sources of finance and subsidies to entrepreneur/women Entrepreneurs.
- Evaluate the role of central government and state government in promoting Entrepreneurship.
- Create and design business plan structure through incubations.

UNIT I

Entrepreneurship - Concept, knowledge and skills requirement - Characteristics of successful entrepreneurs - Entrepreneurship process - Factors impacting emergence of entrepreneurship - Differences between Entrepreneur and Intrapreneur - Understanding individual entrepreneurial mindset and personality - Recent trends in Entrepreneurship.

UNIT II

Starting the New Venture - Generating business idea – Sources of new ideas & methods of generating ideas - Opportunity recognition - Feasibility study - Market feasibility, technical/operational feasibility - Financial feasibility - Drawing business plan - Preparing project report - Presenting business plan to investors.

UNIT III

Sources of finance - Various sources of Finance available - Long term sources - Short term sources - Institutional Finance – Commercial Banks, SFC's in India - NBFC's in India - their way of financing in India for small and medium business - Entrepreneurship development programs in India - The entrepreneurial journey- Institutions in aid of entrepreneurship development

UNIT IV

Women Entrepreneurship - Entrepreneurship Development and Government - Role of Central Government and State Government in promoting women Entrepreneurship - Introduction to various incentives, subsidies and grants – Export- oriented Units - Fiscal and Tax concessions available - Women entrepreneurship - Role and importance - Growth of women entrepreneurship in India - Issues & Challenges - Entrepreneurial motivations.

UNIT V

Fundamentals of Business Incubation - Principles and good practices of business incubation- Process of business incubation and the business incubator and how they operate and influence the Type/benefits of incubators - Corporate/educational / institutional incubators - Broader business incubation

environment - Pre-Incubation and Post - Incubation process - Idea lab, Business plan structure - Value proposition

Textbooks:

1. D F Kuratko and T V Rao, "Entrepreneurship**"** - A South-Asian Perspective – Cengage Learning, 2012. (For PPT, Case Solutions Faculty may visit : login.cengage.com)
2. Nandan H, " Fundamentals of Entrepreneurship", PHI, 2013

References:

1. Vasant Desai, "Small Scale Industries and Entrepreneurship", Himalaya Publishing 2012.
2. Rajeev Roy "Entrepreneurship", 2nd Edition, Oxford, 2012.
3. B.JanakiramandM.Rizwana‖ "Entrepreneurship Development: Text & Cases", Excel Books, 2011.
4. Stuart Read, Effectual "Entrepreneurship", Routledge, 2013.

E-Resources

1. Entrepreneurship-Through-the-Lens-of-enture Capital
2. http://www.onlinevideolecture.com/?course=mba-programs&subject=entrepreneurship
3. http://nptel.ac.in/courses/122106032/Pdf/7_4.pd
4. http://freevideolectures.com/Course/3514/Economics-/-Management-/-Entrepreneurhip/50

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B.Tech (AI)– IV-I Sem

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(20A52701b) MANAGEMENT SCIENCE
(HUMANITIES ELECTIVE-II)

Course Objectives:

- To provide fundamental knowledge on Management, Administration, Organization & its concepts.
- To make the students understand the role of management in Production
- To impart the concept of HRM in order to have an idea on Recruitment, Selection,Training & Development, job evaluation and Merit rating concepts
- To create awareness on identify Strategic Management areas & the PERT/CPM for better Project Management
- To make the students aware of the contemporary issues in management

Course Outcomes:

- Understand the concepts & principles of management and designs of organization in a practical world
- Apply the knowledge of Work-study principles & Quality Control techniques in industry
- Analyze the concepts of HRM in Recruitment, Selection and Training & Development.
- Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT.
- Create Modern technology in management science.

UNITI INTRODUCTION TO MANAGEMENT

Management - Concept and meaning - Nature-Functions - Management as a Science and Art and both. Schools of Management Thought - Taylor's Scientific Theory-Henry Fayol's principles - Eltan Mayo's Human relations - Systems Theory - **Organisational Designs** - Line organization - Line & Staff Organization - Functional Organization - Matrix Organization - Project Organization - Committee form of Organization - Social responsibilities of Management.

UNIT II OPERATIONS MANAGEMENT

Principles and Types of Plant Layout - Methods of Production (Job, batch and Mass Production), Work Study - Statistical Quality Control- Deming's contribution to Quality. **Material Management** - Objectives - Inventory-Functions - Types, Inventory Techniques - EOQ-ABC Analysis - Purchase Procedure and Stores Management - **Marketing Management** - Concept - Meaning - Nature-Functions of Marketing - Marketing Mix - Channels of Distribution - Advertisement and Sales Promotion - Marketing Strategies based on Product Life Cycle.

UNIT III HUMAN RESOURCES MANAGEMENT (HRM)

HRM - Definition and Meaning – Nature - Managerial and Operative functions - Evolution of HRM - Job Analysis - Human Resource Planning(HRP) - Employee Recruitment-Sources of Recruitment - Employee Selection - Process and Tests in Employee Selection - Employee Training and Development - On-the- job & Off-the-job training methods - Performance Appraisal Concept - Methods of Performance Appraisal – Placement - Employee Induction - Wage and Salary Administration

UNIT IV STRATEGIC & PROJECT MANAGEMENT

Definition& Meaning - Setting of Vision - Mission - Goals - Corporate Planning Process - Environmental Scanning - Steps in Strategy Formulation and Implementation - SWOT Analysis - **Project Management** - 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 (Simple problems).

UNIT V CONTEMPORARY ISSUES IN MANAGEMENT

The concept of Management Information System(MIS) - Materials Requirement Planning (MRP) - Customer Relations Management(CRM) - Total Quality Management (TQM) - Six Sigma Concept - Supply Chain Management(SCM) - Enterprise Resource Planning (ERP) - Performance Management - Business Process Outsourcing (BPO) - Business Process Re-engineering and Bench Marking - Balanced Score Card - Knowledge Management.

Textbooks:

1. A.R Aryasri, "Management Science", TMH, 2013
2. Stoner, Freeman, Gilbert, Management, Pearson Education, New Delhi, 2012.

References:

1. Koontz &Weihrich, "Essentials of Management", 6th edition, TMH, 2005.
2. Thomas N.Duening& John M.Ivancevich, "Management Principles and Guidelines", Biztantra.
3. Kanishka Bedi, "Production and Operations Management", Oxford University Press, 2004.
4. Samuel C.Certo, "Modern Management", 9th edition, PHI, 2005

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(20A52701c) ENTERPRISE RESOURCE PLANNING (HUMANITIES ELECTIVE-II)

Course Objectives:

- To provide a contemporary and forward-looking on the theory and practice of Enterprise Resource Planning
- To enable the students in knowing the Advantages of ERP
- To train the students to develop the basic understanding of how ERP enriches the
- Business organizations in achieving a multidimensional growth.
- Impart knowledge about the historical background of BPR
- To aim at preparing the students, technologically competitive and make them ready to self-upgrade with the higher technical skills.

Course Outcomes:

- Understand the basic use of ERP Package and its role in integrating business functions.
- Explain the challenges of ERP system in the organization
- Apply the knowledge in implementing ERP system for business
- Evaluate the role of IT in taking decisions with MIS
- Create reengineered business processes with process redesign

UNITI

Introduction to ERP: Enterprise – An Overview Integrated Management Information, Business Modeling, Integrated Data Model Business Processing Reengineering(BPR), Data Warehousing, Data Mining, On-line Analytical Processing(OLAP), Supply Chain Management (SCM), Customer Relationship Management(CRM),

UNITII

Benefits of ERP: Reduction of Lead-Time, On-time Shipment, Reduction in Cycle Time, Improved Resource Utilization, Better Customer Satisfaction, Improved Supplier Performance, Increased Flexibility, Reduced Quality Costs, Improved Information Accuracy and Design-making Capability

UNITIII

ERP Implementation Lifecycle: Pre-evaluation Screening, Package Evaluation, Project Planning Phase, Gap Analysis, Reengineering, Configuration, Implementation Team Training, Testing, Going Live, End-user Training, Post-implementation (Maintenance mode)

UNITIV

BPR: Historical background: Nature, significance and rationale of business process reengineering (BPR), Fundamentals of BPR. Major issues in process redesign: Business vision and process objectives, Processes to be redesigned, Measuring existing processes,

UNITV

IT in ERP: Role of information technology (IT) and identifying IT levers. Designing and building a prototype of the new process: BPR phases, Relationship between BPR phases. MIS - Management Information System, DSS - Decision Support System, EIS - Executive Information System.

Textbooks:

1. Pankaj Sharma. “Enterprise Resource Planning”. Aph Publishing Corporation, New Delhi, 2004.
2. Alexis Leon, “Enterprise Resource Planning”, IV Edition, Mc.Graw Hill, 2019

References:

1. Marianne Bradford “Modern ERP”, 3rd edition.
2. “ERP making it happen Thomas f. Wallace and Michael
3. Directing the ERP Implementation Michael w pelphrey

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B.Tech (AI)– IV-I Sem

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(20A31704) CONVERSATIONAL AI
(Skill Oriented Course-V)

Pre-requisite Artificial Intelligence

Course Objectives:

- Understand basic concepts in conversational AI
- Learn recent advances in conversational AI

Course Outcomes:

After completion of the course, students will be able to

- Develop a fair understanding of AI applications and to know where and how to apply these tools to improve productivity.
- Understand AI as a tool pretty much like they treat calculator as a tool for simple calculation
- Apply methods for different training and testing assistants
- Design classifier for voice assistants

UNIT I

Introduction to Chatbots, Setting Up the Developer Environment

What are chatbots? Journey of Chatbots, Rise of Chatbots, Messaging Platforms, Botframework, Local Installation

UNIT II Basics of Bot Building, Advanced Bot Building

Intents, Entities, Design principles, showing product results, saving messages, Building your own intent classifier

UNIT III Building Chatbots the easy way

Introduction to dialog flow, building a food ordering chatbot, deploying dialog flow chatbot on the web, Integrate dialog flow chatbot on Facebook messenger, Fulfilment

UNIT IV Building Chatbots the hard way

What is Rasa NLU? Training and building a chatbot from scratch, Dialog management using Rasa core, writing custom actions of chatbot, Data preparing for training the bot, Testing the bot

UNIT V Deploying your chatbot

First steps, Rasa's credential management, Deploying the chatbot on Facebook, Deploying the chatbot on slack, Deploying the chatbot on your own

Textbooks:

1. Rashid Khan, Anik Das "Build Better Chatbots", Apress, 2018.
2. Sumit Raj "Building Chatbots with Python", Apress, 2019.

Reference Books:

Conversational AI: Chatbots that workBy Andrew Freed,2021

Online Learning Resources:

Building AI Powered Chatbots Without Programming | Coursera

List of Experiments/Projects

1. Design a Chatbot to answer FAQs about your organization
2. Develop a Chatbot which delivers smooth customer experience via Facebook messenger
3. Create a chatbot which helps the students in opening a bank account
4. Design a chatbot which finds the diseases using symptoms provided by the user
5. Develop an e-commerce chatbot
6. Design a chatbot for the Tourism department
7. Design a Chatbot which helps the patients with Insomnia problem.

OPEN ELECTIVES

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B.Tech III-I Sem

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(20A01505) BUILDING TECHNOLOGY
(Open Elective-I)

Course Objectives:

- To know different types of buildings, principles and planning of the buildings.
- To identify the termite control measure in buildings, and importance of grouping circulation, lighting and ventilation aspects in buildings.
- To know the different modes of vertical transportation in buildings.
- To know the utilization of prefabricated structural elements in buildings.
- To know the importance of acoustics in planning and designing of buildings.

Course Outcomes (CO):

- Understand the principles in planning and design the buildings
- To get different types of buildings, principles and planning of the buildings
- To know the different methods of termite proofing in buildings.
- Know the different methods of vertical transportation in buildings.
- Know the implementation of prefabricated units in buildings and effect of earthquake on buildings.
- Know the importance of acoustics in planning and designing of buildings.

UNIT I

Overview of the course, basic definitions, buildings-types-components-economy and design-principles of planning of buildings and their importance. Definitions and importance of grouping and circulation-lighting and ventilation-consideration of the above aspects during planning of building.

UNIT II

Termite proofing: Inspection-control measures and precautions-lighting protectionof buildings-general principles of design of openings-various types of fire protection measures to be considered while panning a building.

UNIT III

Vertical transportation in a building: Types of vertical transportation-stairs-different forms of stairs-planning of stairs-other modes of vertical transportation –lifts-ramps-escalators.

UNIT IV

Prefabrication systems in residential buildings-walls-openings-cupboards-shelves etc., planning and modules and sizes of components in prefabrication. Planning and designing of residential buildings against the earthquake forces, principles, seismic forces and their effect on buildings.

UNIT V

Acoustics –effect of noise –properties of noise and its measurements, principles of acoustics of building. Sound insulation-importance and measures.

Textbooks:

1. Building construction by Varghese, PHI Learning Private Limited 2nd Edition 2015
2. Building construction by Punmia.B.C, Jain.A.K and Jain.A.K Laxmi Publications 11th edition 2016

Reference Books:

1. National Building Code of India, Bureau of Indian Standards
2. Building construction-Technical teachers training institute, Madras, Tata McGraw Hill.
3. Building construction by S.P.Arora and S.P.BrndraDhanpat Rai and Sons Publications, New Delh 2014 edition

https://nptel.ac.in/courses/105102206
https://nptel.ac.in/courses/105103206

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B.Tech III-I Sem

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(20A02505) ELECTRIC VEHICLES
(Open Elective-I)

Course Objectives:

- To get exposed to new technologies of battery electric vehicles, fuel cell electric vehicles
- To get exposed to EV system configuration and parameters
- To know about electro mobility and environmental issues of EVs
- To understand about basic EV propulsion and dynamics
- To understand about fuel cell technologies for EV and HVEs
- To know about basic battery charging and control strategies used in electric vehicles

Course Outcomes:

- Understand and differentiate between conventional and latest trends in Electric Vehicles
- Analyze various EV resources, EV dynamics and Battery charging
- Apply basic concepts of EV to design complete EV system
- Design EV system with various fundamental concepts

UNIT I INTRODUCTION TO EV SYSTEMS AND PARAMETERS

Past, Present and Future EV, EV Concept, EV Technology, State-of-the Art EVs, EV configuration, EV system, Fixed and Variable gearing, single and multiple motor drive, in-wheel drives, EV parameters: Weight, size, force and energy, performance parameters.

UNIT II EV AND ENERGY SOURCES

Electro mobility and the environment, history of Electric power trains, carbon emissions from fuels, green houses and pollutants, comparison of conventional, battery, hybrid and fuel cell electric systems

UNIT III EV PROPULSION AND DYNAMICS

Choice of electric propulsion system, block diagram, concept of EV Motors, single and multi motor configurations, fixed and variable geared transmission, In-wheel motor configuration, classification, Electric motors used in current vehicle applications, Recent EV Motors, Vehicle load factors, vehicle acceleration.

UNIT IV FUEL CELLS

Introduction of fuel cells, basic operation, model, voltage, power and efficiency, power plant system – characteristics, sizing, Example of fuel cell electric vehicle.

Introduction to HEV, brake specific fuel consumption, comparison of series, series-parallel hybrid systems, examples

UNIT V BATTERY CHARGING AND CONTROL

Battery charging: Basic requirements, charger architecture, charger functions, wireless charging, power factor correction.

Control: Introduction, modelling of electromechanical system, feedback controller design approach, PI controllers designing, torque-loop, speed control loop compensation, acceleration of battery electric vehicle

Textbooks:

1. C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., New York 2001.
2. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.

Reference Books:

1. Electric and Hybrid Vehicles Design Fundamentals, Iqbal Husain, CRC Press 2005.
2. Ali Emadi, Advanced Electric Drive Vehicles, CRC Press, 2015.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc22_ee53/preview

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-I Sem

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(20A03505a) 3D PRINTING TECHNOLOGY
(Open Elective-I)

Course Objectives:

- Familiarize techniques for processing of CAD models for rapid prototyping.
- Explain fundamentals of rapid prototyping techniques.
- Demonstrate appropriate tooling for rapid prototyping process.
- Focus Rapid prototyping techniques for reverse engineering.
- Train Various Pre – Processing, Processing and Post Processing errors in RP Processes.

Course Outcomes:

- Use techniques for processing of CAD models for rapid prototyping.
- Understand and apply fundamentals of rapid prototyping techniques.
- Use appropriate tooling for rapid prototyping process.
- Use rapid prototyping techniques for reverse engineering.
- Identify Various Pre – Processing, Processing and Post Processing errors in RP processes.

UNIT I Introduction to 3D Printing

Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP.

UNIT II Solid and Liquid Based RP Systems

Working Principle, Materials, Advantages, Limitations and Applicationsof Fusion Deposition Modelling (FDM), Laminated Object Manufacturing (LOM), Stereo lithography (SLA), Direct Light Projection System (DLP) and Solid Ground Curing (SGC).

UNIT III Powder Based & Other RP Systems

Powder Based RP Systems: Working Principle,Materials, Advantages, Limitations and Applications of Selective Laser Sintering (SLS), Direct Metal Laser Sintering (DMLS), Laser Engineered Net Shaping (LENS) and Electron Beam Melting (EBM).

Other RP Systems: Working Principle,Materials, Advantages, Limitations and Applications of Three Dimensional Printing (3DP), Ballastic Particle Manufacturing (BPM) and Shape Deposition Manufacturing (SDM).

UNIT IV Rapid Tooling & Reverse Engineering

Rapid Tooling: Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods.

Reverse Engineering (RE): Meaning, Use, RE – The Generic Process, Phases of RE Scanning, Contact Scanners and Noncontact Scanners, Point Processing, Application Geometric Model, Development.

UNIT V Errors in 3D Printing and Applications:

Pre-processing, processing and post-processing errors, Part building errors in SLA, SLS, etc.

Software: Need for software, MIMICS, Magics, SurgiGuide, 3-matic, 3D-Doctor, Simplant, Velocity2, VoXim, Solid View, 3DView, etc., software, Preparation of CAD models, Problems with STL files, STL file manipulation, RP data formats: SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP.

Applications: Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP.

Textbooks:

1. Chee Kai Chua and Kah Fai Leong, “3D Printing and Additive Manufacturing Principles and Applications” 5/e, World Scientific Publications, 2017.
2. Ian Gibson, David W Rosen, Brent Stucker, “Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing”, Springer, 2/e, 2010.

Reference Books:

1. Frank W.Liou, "Rapid Prototyping & Engineering Applications", CRC Press, Taylor & Francis Group, 2011.
2. Rafiq Noorani, **"**Rapid Prototyping: Principles and Applications in Manufacturing", John Wiley&Sons, 2006.

Online Learning Resources:

- NPTEL Course on Rapid Manufacturing.
- https://nptel.ac.in/courses/112/104/112104265/
- https://www.hubs.com/knowledge-base/introduction-fdm-3d-printing/
- https://slideplayer.com/slide/6927137/
- https://www.mdpi.com/2073-4360/12/6/1334
- https://www.centropiaggio.unipi.it/sites/default/files/course/material/2013-11-29%20-%20FDM.pdf
- https://lecturenotes.in/subject/197
- https://www.cet.edu.in/noticefiles/258_Lecture%20Notes%20on%20RP-ilovepdf-compressed.pdf
- https://www.vssut.ac.in/lecture_notes/lecture1517967201.pdf
- https://www.youtube.com/watch?v=NkC8TNts4B4

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B.Tech III-I Sem

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(20A04505) DIGITAL ELECTRONICS
(Open Elective Course- I)

Course Objectives:

- To provide the fundamental concepts associated with the digital logic and circuit design.
- To introduce the basic concepts and laws involved in the Boolean algebra and logic families and digital circuits.
- To familiarize with the different number systems, logic gates, and combinational and sequential circuits, memory elements utilized in the different digital circuits and systems.
- To introduce different digital logic families

Course Outcomes:

- Become familiar with the Boolean algebra, logic gates, logical variables, the truth table, number systems, codes, and their conversion from to others
- Learn the minimization techniques to simply the hardware requirements of digital circuits, implement it, design and apply for real time digital systems
- Understand the working mechanism and design guidelines of different combinational, sequential circuits, memory elements and their role in the digital system design.
- Understand different logic families and use the best combination of ICs during the design of a digital system

UNIT 1

DIGITAL FUNDAMENTALS: Number Systems - Decimal, binary, octal, Hexadecimal,1's and 2's complements,Codes - Binary, BCD, Excess 3, Gray, Alphanumeric codes, Booleantheorems. Logic gates: Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map Minimization.

UNIT II

COMBINATIONAL CIRCUITS: Half and Full Adders, Half and FullSubtractors, Binary Parallel Adder Carry look ahead Adder, BCD 'Adder, Multiplexer,Demultiplexer, MagniudeComparator, Decoder, Encoder, Priority Encoder.

UNIT III

SYNCHRONOUS SEQUENTIAL CIRCUITS: Flip flops - SR, JK, T, D, Master/Slave FF- operation and excitation tables, Triggering of FF, conversion of FF. Counters- Ripple Counters, Ring Counters, Shift registers, Universal Shift Register.

UNIT IV

MEMORY DEVICES: Basic memory structure - ROM, PROM, EPROM, EEPROM, EAPROM, RAM, Static and dynamic RAM.Programmable Logic Devices: Programmable Logic Array (PLA), Programmable Array Logic (PAL), Field Programmable Gate Arrays (FPGA).

UNIT V

Digital Logic Families: Logic levels,propagation delay, power dissipation, fan-out and fan-in, noise margin, RTL, TTL, ECL, CMOS.

Textbooks:

1. Modern Digital Electronics(Edition III) : R. P. Jarn; TMH
2. Digital Fundamentals: Thomas I. Floyd
3. Digital circuits and design: S. Salivahanan, and S. Anvzzhagan

References:

1. Digital Integrated Electronics: Taub & Schilling; MGH
2. Digital Design: Morris Mano; PHI.Course

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B.Tech III-I Sem

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(20A27505) COMPUTER APPLICATIONS IN FOOD TECHNOLOGY
(Open Elective-1)

Course Objectives:

- To know different software and applications in food technology.
- To understand the Chemical kinetics in food processing, Microbial distraction in thermal processing of food.
- To acquire knowledge on computer aided manufacturing and control of food machinery, inventory control, process control.

Course Outcomes:

- Students will gain knowledge on software in food technology, data analysis, Chemical kinetics, microbial distortion in thermal process
- Use of linear regression in analyzing sensory data, application of computer in some common food industries like, milk plant, bakery units & fruits vegetable plants.

UNIT I

Introduction to various software and their applications in food technology. Application of MS Excel to solve the problems of Food Technology, SPSS and JMP for data analysis, Pro-Engineering for design, Lab VIEW and SCADA for process control .

UNIT II

Chemical kinetics in food processing: Determining rate constant of zero order reaction First order rate constant and half-life of reactions. Determining energy of activation of vitamin degradation during food storage Rates of Enzymes catalyzed reaction. Microbial distraction in thermal processing of food. Determining decimal reduction time from microbial survival data, Thermal resistance factor, Z-values in thermal processing of food. Sampling to ensure that a lot is not contaminated with more than a given percentage Statistical quality control. Probability of occurrence in normal distribution. Using binomial distribution to determine probability of occurrence. Probability of defective items in a sample obtained from large lot

UNIT III

Sensory evaluation of food Statistical descriptors of a population estimated from sensory data obtained from a sample Analysis of variance**.** One factor, completely randomized design For two factor design without replication**.** Use of linear regression in analyzing sensory data. Mechanical transport of liquid food**.** Measuring viscosity of liquid food using a capillary tube viscometer . Solving simultaneous equations in designing multiple effect evaporator while using matrix algebra available in excel.

UNIT IV

Familiarization with the application of computer in some common food industries like, milk plant, bakery units & fruits vegetable plants, stating from the receiving of raw material up to the storage & dispatch of finished product.

UNIT V

Basic Introduction to computer aided manufacturing. Application of computers, instrumentation and control of food machinery, inventory control, process control etc.

Recommended books:

1. Computer Applications in Food Technology: Use of Spreadsheets in Graphical, Statistical and Process Analysis by R. Paul Singh, AP.
2. Manuals of MS Office.

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B.Tech III-I Sem

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(20A54501) OPTIMIZATION TECHNIQUES
(Open Elective- I)

Course Objectives:
This course enables the students to classify and formulate real-life problem for modeling as optimization problem, solving and applying for decision making.

Course Outcomes: Student will be able to

- formulate a linear programming problem and solve it by various methods.
- give an optimal solution in assignment jobs, give transportation of items from sources to destinations.
- identify strategies in a game for optimal profit.
- implement project planning.

UNIT I
Introduction to operational research-Linear programming problems (LPP)-Graphical method-Simplex method-Big M Method-Dual simplex method.

UNIT II
Transportation problems- assignment problems-Game theory.

UNIT III
CPM and PERT –Network diagram-Events and activities-Project Planning-Reducing critical events and activities-Critical path calculations.

UNIT IV
Sequencing Problems-Replacement problems-Capital equipment- Discounting costs- Group replacement.

UNIT V
Inventory models-various costs- Deterministic inventory models-Economic lot size-Stochastic inventory models- Single period inventory models with shortage cost.

Textbooks:

1. Operations Research , S.D. Sharma.
2. Operations Research, An Introduction, Hamdy A. Taha, Pearson publishers.
3. Operations Research, Nita H Shah, Ravi M Gor, Hardik Soni, PHI publishers

Reference Books:

1. Problems on Operations Research, Er. Prem kumar gupta, Dr.D.S. Hira, Chand publishers
2. Operations Research, CB Gupta, PK Dwivedi, Sunil kumar yadav

Online Learning Resources:
https://nptel.ac.in/content/storage2/courses/105108127/pdf/Module_1/M1L2slides.pdf
https://slideplayer.com/slide/7790901/
https://www.ime.unicamp.br/~andreani/MS515/capitulo12.pdf

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B.Tech III-I Sem

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(20A56501) MATERIALS CHARACTERIZATION TECHNIQUES
(Open Elective- I)

Course Objectives:

- To provide an exposure to different characterization techniques.
- To enlighten the basic principles and analysis of different spectroscopic techniques.
- To explain the basic principle of Scanning electron microscope along with its limitations and applications.
- To identify the Resolving power and Magnification of Transmission electron microscope and its applications.
- To educate the uses of advanced electric and magnetic instruments for characterization.

Course Outcomes: At the end of the course the student will be able

- To explain the structural analysis by X-ray diffraction.
- To understand the morphology of different materials using SEM and TEM.
- To recognize basic principles of various spectroscopic techniques.
- To study the electric and magnetic properties of the materials.
- To make out which technique can be used to analyse a material

UNIT I

Structure analysis by Powder X-Ray Diffraction: Introduction, Bragg's law of diffraction, Intensity of Diffracted beams, Factors affecting Diffraction, Intensities, Structure of polycrystalline Aggregates, Determination of crystal structure, Crystallite size by Scherrer and Williamson-Hall (W-H) Methods, Small angle X-ray scattering (SAXS) (in brief).

UNIT II

Microscopy technique -1 –Scanning Electron Microscopy (SEM)

Introduction, Principle, Construction and working principle of Scanning Electron Microscopy, Specimen preparation, Different types of modes used (Secondary Electron and Backscatter Electron), Advantages, limitations and applications of SEM.

UNIT III

Microscopy Technique -2 - Transmission Electron Microscopy (TEM): Construction and Working principle, Resolving power and Magnification, Bright and dark fields, Diffraction and image formation, Specimen preparation, Selected Area Diffraction, Applications of Transmission Electron Microscopy, Difference between SEM and TEM, Advantage and Limitations of Transmission Electron Microscopy.

UNIT IV

Spectroscopy techniques – Principle, Experimental arrangement, Analysis and advantages of the spectroscopic techniques – (i) UV-Visible spectroscopy (ii) Raman Spectroscopy, (iii) Fourier Transform infrared (FTIR) spectroscopy, (iv) X-ray photoelectron spectroscopy (XPS).

UNIT V

Electrical & Magnetic Characterization techniques: Electrical Properties analysis techniques (DC conductivity, AC conductivity) Activation Energy, Effect of Magnetic field on the electrical properties (Hall Effect). Magnetization measurement by induction method, Vibrating sample Magnetometer (VSM) and SQUID.

Textbooks:

1. Material Characterization: Introduction to Microscopic and Spectroscopic Methods –Yang Leng – John Wiley & Sons (Asia) Pvt. Ltd. 2008
2. Handbook of Materials Characterization -by Sharma S. K. - Springer

References:

1. Fundamentals of Molecular Spectroscopy – IV Ed. – Colin Neville Banwell and Elaine M. McCash, Tata McGraw-Hill, 2008.
2. Elements of X-ray diffraction – Bernard Dennis Cullity & Stuart R Stocks, Prentice Hall, 2001
3. Materials Characterization: Introduction to Microscopic and Spectroscopic Methods-Yang Leng-John Wiley & Sons
4. Characterization of Materials 2nd Edition, 3 Volumes-Kaufmann E N -John Wiley (Bp)

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B.Tech III-I Sem

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(20A51501) CHEMISTRY OF ENERGY MATERIALS
(Open Elective- I)

Course Objectives:

- To make the student understand basic electrochemical principles such as standard electrode potentials, emf and applications of electrochemical principles in the design of batteries.
- To understand the basic concepts of processing and limitations of fossil fuels and Fuel cells & their applications.
- To impart knowledge to the students about fundamental concepts of hydrogen storage in different materials and liquification method
- Necessasity of harnessing alternate energy resources such as solar energy and its basic concepts.
- To understand and apply the basics of calculations related to material and energy flow in the processes.

Course Outcomes:

- Ability to perform simultaneous material and energy balances.
- Student learn about various electrochemical and energy systems
- Knowledge of solid, liquid and gaseous fuels
- To know the energy demand of world, nation and available resources to fulfill the demand
- To know about the conventional energy resources and their effective utilization
- To acquire the knowledge of modern energy conversion technologies
- To be able to understand and perform the various characterization techniques of fuels
- To be able to identify available nonconventional (renewable) energy resources and techniques to utilize them effectively

UNIT I: Electrochemical Systems: Galvanic cell, standard electrode potential, application of EMF, electrical double layer, dipole moments, polarization, Batteries-Lead-acid and Lithium ion batteries.

UNIT II: Fuel Cells: Fuel cell working principle, Classification of fuel cells, Polymer electrolyte membrane (PEM) fuel cells, Solid-oxide fuel cells (SOFC), Fuel cell efficiency, Basic design of fuel cell,.

UNIT III: Hydrogen Storage: Hydrogen Storage, Chemical and Physical methods of hydrogen storage, Hydrogen Storage in metal hydrides, metal organic frame works (MOF), Carbon structures, metal oxide porous structures, hydrogel storage by high pressure methods. Liquifaction method.

UNIT IV: Solar Energy: Solar energy introduction and prospects, photo voltaic (PV) technology, concentrated solar power (CSP), Solar Fuels, Solar cells.

UNIT V: Photo and Photo electrochemical Conversions: Photochemical cells and applications of photochemical reactions, specificity of photo electrochemical cell, advantage of photoelectron catalytic conversions.

References:

1. Physical chemistry by Ira N. Levine
2. Essentials of Physical Chemistry, Bahl and Bahl and Tuli.
3. Inorganic Chemistry, Silver and Atkins
4. Fuel Cell Hand Book 7th Edition, by US Department of Energy (EG&G technical services and corporation)
5. Hand book of solar energy and applications by Arvind Tiwari and Shyam.
6. Solar energy fundamental, technology and systems by Klaus Jagar et.al.
7. Hydrogen storage by Levine Klebonoff

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B.Tech III-I Sem

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(20A52501) ACADEMIC WRITING AND PUBLIC SPEAKING
(Open Elective-I)

Course Objectives:

- To encourage all round development of the students by focusing on soft skills
- To make the students aware of critical thinking skills and problem-solving skills
- To develop leadership skills and organizational skills through group activities
- To function effectively with heterogeneous teams

Course Outcomes:

- Memorize various elements of Academic Writing
- Understand how to paraphrase sources and avoid plagiarism
- Demonstrate the knowledge in writing a Research paper
- Analyse different types of essays
- Judge the speeches of others and know the positive strengths of speakers
- Build confidence in giving an impactful presentation to the audience

UNIT I Introduction to Academic Writing

Introduction to Academic Writing – Essential Features of Academic Writing – Courtesy – Clarity – Conciseness – Correctness – Coherence– Completeness – Types – Descriptive, Analytical, Persuasive, Critical writing

Academic Journal Article

UNIT II

Art of condensation- summarizing and paraphrasing - Abstract Writing, Technical/Research/Journal Paper Writing – Conference Paper writing - Editing, Proof Reading - Plagiarism

UNIT III Essay & Book Report

Compare and Contrast – Argumentative Essay – Exploratory Essay – Features and Analysis of Sample Essays – Writing Book Report, Summarizing, Book Review-

UNIT IV Public Speaking

Introduction, Nature, characteristics, significance of Public Speaking – Presentation – 4 Ps of presentation – Stage Dynamics – Answering Strategies –Analysis of Impactful Speeches- Speeches for Academic events

UNIT V Public Speaking and Non-Verbal Delivery

Body Language – Kinesics – Oculesics – Proxemics – Haptics – Paralanguage

Textbooks:

3. Critical Thinking, Academic Writing and Presentation Skills: Mg University Edition Paperback – 1 January 2010 Pearson Education; First edition (1 January 2010)
4. A Course In Academic Writing Paperback – 1 January 2017Publisher : The Orient Blackswan; second edition (1 January 2017)

Reference Books:

1. A Handbook For Academic Writing and Composition Paperback – 1 January 2014 by Nzanmongi Jasmine PattonPublisher : Pinnacle Learning; 1st edition (1 January 2014)
2. Critical Thinking, Academic Writing and Presentation Skills: Mg University Edition Paperback – 1 January 2010Publisher : Pearson Education; First edition (1 January 2010) by Marilyn Anderson (Author)

3. Effective Academic Writing Second Edition: 1: Student Book: The Paragraph Paperback – Student Edition, 9 June 2014by Alice Savage (Author), Masoud Shafiei (Author)Publisher : Oxford University Press; Student, Workbook edition (9 June 2014)
4. A Course In Academic Writing Paperback – 1 January 2017 by Renu Gupta (Author) Publisher : The Orient Blackswan; Second edition (1 January 2017)

Online Learning Resources:

1. https://youtu.be/NNhTIT81nH8
2. phttps://www.youtube.com/watch?v=478ccrWKY-A
3. https://www.youtube.com/watch?v=nzGo5ZC1gMw
4. https://www.youtube.com/watch?v=Qve0ZBmJMh4

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

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(20A01704) ENVIRONMENTAL ECONOMICS
(Open Elective Course - II)

Course Objectives:

- To impart knowledge on sustainable development and economics of energy
- To teach regarding environmental degradation and economic analysis of degradation
- To inculcate the knowledge of economics of pollution and their management
- To demonstrate the understanding of cost benefit analysis of environmental resources
- To make the students to understand principles of economics of biodiversity

Course Outcomes :

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

- The information on sustainable development and economics of energy
- The information regarding environmental degradation and economic analysis of degradation
- The identification of economics of pollution and their management
- The cost benefit analysis of environmental resources
- The principles of economics of biodiversity

UNIT I

Sustainable Development: Introduction to sustainable development - Economy-Environment inter-linkages - Meaning of sustainable development - Limits to growth and the environmental Kuznets curve – The sustainability debate - Issues of energy and the economics of energy – Nonrenewable energy, scarcity, optimal resources, backstop technology, property research, externalities, and the conversion of uncertainty.

UNIT II

Environmental Degradation: Economic significance and causes of environmental degradation - The concepts of policy failure, externality and market failure - Economic analysis of environmental degradation – Equi –marginal principle.

UNIT - III

Economics of Pollution: Economics of Pollution - Economics of optimal pollution, regulation, monitoring and enforcement - Managing pollution using existing markets: Bargaining solutions – Managing pollution through market intervention: Taxes, subsidies and permits.

UNIT IV

Cost – Benefit Analysis: Economic value of environmental resources and environmental damage - Concept of Total Economic Value - Alternative approaches to valuation – Cost-benefit analysis and discounting.

UNIT V

Economics of biodiversity: Economics of biodiversity conservation - Valuing individual species and diversity of species -Policy responses at national and international levels. Economics of Climate Change – stern Report

Textbooks:

1. An Introduction to Environmental Economics by N. Hanley, J. Shogren and B. White Oxford University Press.(2001)
2. Blueprint for a Green Economy by D.W. Pearce, A. Markandya and E.B. Barbier Earthscan, London.(1989)

Reference Books:

1. Environmental Economics: An Elementary Introduction by R.K. Turner, D.W. Pearce and I. Bateman Harvester Wheatsheaft, London. (1994),
2. Economics of Natural Resources and the Environment by D.W. Pearce and R.K. Turner Harvester Wheat sheaf, London. (1990),

3. Environmental and Resource Economics: An Introduction by Michael S. Common and Michael Stuart 2nd Edition, Harlow: Longman.(1996),
4. Natural Resource and Environmental Economics by Roger Perman, Michael Common, Yue Ma and James Mc Gilvray 3rd Edition, Pearson Education.(2003),

Online Learning Resources:

https://nptel.ac.in/courses/109107171

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-II Sem

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(20A02605) SMART ELECTRIC GRID
(Open Elective Course-II)

Course Objectives:

- Understand recent trends in grids, smart grid architecture and technologies
- Analyze smart substations
- Apply the concepts to design smart transmission systems
- Apply the concepts to design smart distribution systems

Course Outcomes:

- Understand trends in Smart grids, needs and roles of Smart substations
- Design and Analyze Smart Transmission systems
- Design and Analyze Smart Distribution systems
- Analyze SCADA and DSCADA systems in practical working environment

UNIT I INTRODUCTION TO SMART GRID

Working definitions of Smart Grid and Associated Concepts – Smart Grid Functions – Traditional Power Grid and Smart Grid – New Technologies for Smart Grid – Advantages – Indian Smart Grid – Key Challenges for Smart Grid

UNIT II SMART GRID TECHNOLOGIES

Characteristics of Smart grid, Micro grids, Definitions, Drives, benefits, types of Micro grid, building blocks, Renewable energy resources, needs in smart grid, integration impact, integration standards, Load frequency control, reactive power control, case studies and test beds

UNIT III SMART SUBSTATIONS

Protection, Monitoring and control devices, sensors, SCADA, Master stations, Remote terminal unit, interoperability and IEC 61850, Process level, Bay level, Station level, Benefits, role of substations in smart grid, Volt/VAR control equipment inside substation

UNIT IV SMART TRANSMISSION SYSTEMS

Energy Management systems, History, current technology, EMS for the smart grid, Synchro Phasor Measurement Units (PMUs), Wide Area Monitoring Systems (WAMS), protection & Control (WAMPC), needs in smart grid, Role of WAMPC smart grid, Drivers and benefits, Role of transmission systems in smart grid

UNIT V SMART DISTRIBUTION SYSTEMS

DMS, DSCADA, trends in DSCADA and control, current and advanced DMSs, Voltage fluctuations, effect of voltage on customer load, Drivers, objectives and benefits, voltage-VAR control, VAR control equipment on distribution feeders, implementation and optimization, FDIR - Fault Detection Isolation and Service restoration (FDIR),faults, objectives and benefits, equipment, implementation

Textbooks:

1. Stuart Borlase, Smart Grids - Infrastructure, Technology and Solutions, CRC Press, 1e, 2013
2. Gil Masters, Renewable and Efficient Electric Power System, Wiley–IEEE Press, 2e, 2013.

Reference Books:

1. A.G. Phadke and J.S. Thorp, Synchronized Phasor Measurements and their Applications, Springer Edition, 2e, 2017.
2. T. Ackermann, Wind Power in Power Systems, Hoboken, NJ, USA, John Wiley, 2e, 2012.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc22_ee82/preview

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B.Tech IV-I Sem

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(20A03605c) NON – CONVENTIONAL SOURCES OF ENERGY
(Open Elective-II)

Course Objectives:

- To explain concept of various forms of renewable energy
- To outline division aspects and utilization of renewable energy sources for both domestics and industrial applications
- To analyse the environmental and cost economics of using renewable energy sources compared to fossil fuels.

Course Outcomes:

- Explain the basic concepts of solar radiation and solar collectors
- Develop Bio - Energy
- Explain the geothermal Energy
- Apply the principles of electrical technology to develop MHD power generator
- Utilize different wind parameters for design of rotor
- Make use of power curve for energy estimation

UNIT I

Principles of Solar Radiation:

Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics 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.

UNIT II

Solar Energy Collection & Storage

Solar Energy Collection: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

Solar Energy Storage and Applications:

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications solar heating technique, solar distillation and drying, photovoltaic energy conversion.

UNIT III

Wind Energy &Biomass

Wind Energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

Biomass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation and economic aspects.

UNIT IV

Geothermal Energy & Ocean Energy

Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India.

Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. **Tidal and wave energy:** Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT V

Direct Energy Conversion

Need for DEC, Carnot cycle, limitations, principles of DEC. Thermo-electric generators, Seebeck, Peltier and Joule Thomson effects, Figure of merit, materials, applications, MHD generators, principles,

dissociation and ionization, hall effect, magnetic flux, Fuel cells, principles, faraday's law's, thermodynamic aspects, selection of fuels and operating conditions.

Textbooks:

1. Tiwari and Ghosal, Renewable energy resources, Narosa Publishing House-2004.
2. G.D. Rai, Non-Conventional Energy Sources, Khanna Publications-1988.

Reference Books:

1. Twidell& Weir, Renewable Energy Sources, Routledge; 3/e, 2015.
2. Sukhatme S.P., Nayak.J.P, 'Solar Energy – Principle of Thermal Storage and collection", Tata McGraw Hill, 2008.
3. Sathyajith Mathew, Wind Energy Fundamentals, Resource Analysis and Economics, Springer Publications, 2006.
4. Wei Tong, Wind Power Generation and Wind Turbine Design, WIT Press, 2010.
5. Wind Power, Revised Edition: Renewable Energy for Home, Farm, and Business, Paul Gipe, Chelsea Green Publishing, 2004.
6. S.S. Rao, B.B. Parulekar, Energy Technology (Non Conventional, Renewable and Conventional), Khanna publications, 1994.

Online Learning Resources:

- https://nptel.ac.in/courses/103103206
- https://nptel.ac.in/courses/108108078
- https://onlinecourses.nptel.ac.in/noc21_ph33/preview
- https://nptel.ac.in/courses/121106014
- https://mrcet.com/downloads/digital_notes/EEE/31082020/IV-I%20SOLAR%20&%20WIND%20ELECTRICAL%20SYSTEMS%20DIGITAL%20NOTES%201.pdf
- https://www.vssut.ac.in/lecture_notes/lecture1428910296.pdf

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

L	T	P	C
3	0	0	3

(20A04704) SIGNAL PROCESSING
(Open Elective Course –II)

Course objectives:

- Understand, represent and classify continuous time and discrete time signals and systems, together with the representation of LTI systems.
- Ability to represent continuous time signals (both periodic and non-periodic) in the time domain, sdomain and the frequency domain
- Understand the properties of analog filters, and have the ability to design Butterworth filters
- Understand and apply sampling theorem and convert a signal from continuous time to discrete time or from discrete time to continuous time (without loss of information)
- Able to represent the discrete time signal in the frequency domain
- Able to design FIR and IIR filters to meet given specifications

Course Outcomes:

- Understand and explain continuous time and discrete time signals and systems, in time and frequency domain
- Apply the concepts of signals and systems to obtain the desired parameter/ representation
- Analyse the given system and classify the system/arrive at a suitable conclusion
- Design analog/digital filters to meet given specifications
- Design and implement the analog filter using components/ suitable simulation tools
- Design and implement the digital filter using suitable simulation tools, and record the input and output of the filter for the given audio signal

UNIT I

Signal Definition, Signal Classification, System definition, System classification, for both continuous time and discrete time. Definition of LTI systems

UNIT II

Introduction to Fourier Transform, Fourier Series, Relating the Laplace Transform to Fourier Transform, Frequency response of continuous time systems

UNIT III

Frequency response of ideal analog filters, Salient features of Butterworth filters Design and implementation of Analog Butterworth filters to meet given specifications

UNIT IV

Sampling Theorem- Statement and proof, converting the analog signal to a digital signal. Practical sampling. The Discrete Fourier Transform, Properties of DFT. Comparing the frequency response of analog and digital systems.

UNIT V

Definition of FIR and IIR filters. Frequency response of ideal digital filters

Transforming the Analog Butterworth filter to the Digital IIR Filter using suitable mapping techniques, to meet given specifications. Design of FIR Filters using the Window technique, and the frequency sampling technique to meet given specifications Comparing the designed filter with the desired filter frequency response

Textbooks:

1. ‘Signals and Systems’, by Simon Haykin and Barry Van Veen, Wiley.

References:

1. 'Theory and Application of Digital Signal Processing', Rabiner and Gold
2. ‘Signals and Systems’, Schaum’s Outline series
3. ‘Digital Signal Processing’, Schaum’s Outline series

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-II Sem

L	T	P	C
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(20A27605) FOOD REFRIGERATION AND COLD CHAIN MANAGEMENT
OPEN ELECTIVE II

Course Objectives:

- To know the equipment available to store perishable items for a long time
- To understand to increase the storage life of food items

Course Outcomes

By the end of the course, the students will

- Understand various principles and theories involved in refrigeration systems
- Understand the different equipment useful to store the food items for a long period.
- Understand how to increase the storage life of food items

UNIT I

Principles of refrigeration: Definition, background with second law of thermodynamics, unit of refrigerating capacity, coefficient of performance; Production of low temperatures: Expansion of a liquid with flashing, reversible/ irreversible adiabatic expansion of a gas/ real gas, thermoelectric cooling, adiabatic demagnetization; Air refrigerators working on reverse Carnot cycle: Carnot cycle, reversed Carnot cycle, selection of operating temperatures;

UNIT II

Air refrigerators working on Bell Coleman cycle: Reversed Brayton or Joule or Bell Coleman cycle, analysis of gas cycle, polytropic and multistage compression; Vapour refrigeration: Vapor as a refrigerant in reversed Carnot cycle with p-V and T-s diagrams, limitations of reversed Carnot cycle; Vapour compression system: Modifications in reverse Carnot cycle with vapour as a refrigerant (dry vs wet compression, throttling vs isentropic expansion), representation of vapor compression cycle on pressure- enthalpy diagram, super heating, sub cooling;

UNIT III

Liquid-vapour regenerative heat exchanger for vapour compression system, effect of suction vapour super heat and liquid sub cooling, actual vapour compression cycle; Vapour-absorption refrigeration system: Process, calculations, maximum coefficient of performance of a heat operated refrigerating machine, Common refrigerants and their properties: classification, nomenclature, desirable properties of refrigerants- physical, chemical, safety, thermodynamic and economical; Azeotropes; Components of vapour compression refrigeration system, evaporator, compressor, condenser and expansion valve;

UNIT IV

Ice manufacture, principles and systems of ice production, Treatment of water for making ice, brines, freezing tanks, ice cans, air agitation, quality of ice; Cold storage: Cold store, design of cold storage for different categories of food resources, size and shape, construction and material, insulation, vapour barriers, floors, frost-heave, interior finish and fitting, evaporators, automated cold stores, security of operations; Refrigerated transport: Handling and distribution, cold chain, refrigerated product handling, order picking, refrigerated vans, refrigerated display;

UNIT V

Air-conditioning: Meaning, factors affecting comfort air-conditioning, classification, sensible heat factor, industrial air-conditioning, problems on sensible heat factor; Winter/summer/year round air-conditioning, unitary air-conditioning systems, central air-conditioning, physiological principles in air-conditioning, air distribution and duct design methods; design of complete air-conditioning systems; humidifiers and dehumidifiers; Cooling load calculations: Load sources, product cooling, conducted heat, convicted heat, internal heat sources, heat of respiration, peak load; etc.

Textbooks:

1. Arora, C. P. “Refrigeration and Air Conditioning”. Tata MC Graw Hill Publishing Co.Ltd., New Delhi. 1993.

References:

1. Adithan, M. and Laroiya, S. C. “Practical Refrigeration and Air Conditioning”. Wiley Estern Ltd., New Delhi 1991

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-II Sem **L T P C**

3 0 0 3

(20A54701) WAVELET TRANSFORMS AND ITS APPLICATIONS
(Open Elective-II)

Course Objectives:

This course provides the students to understand Wavelet transforms and its applications.

Course Outcomes:

- Understand wavelets and wavelet expansion systems.
- Illustrate the multi resolution analysis ad scaling functions.
- Form fine scale to coarse scale analysis.
- Find the lattices and lifting.
- Perform numerical complexity of discrete wavelet transforms.
- Find the frames and tight frames using fourier series.

UNIT I Wavelets

Wavelets and Wavelet Expansion Systems - Wavelet Expansion- Wavelet Transform- Wavelet System- More Specific Characteristics of Wavelet Systems -Haar Scaling Functions and Wavelets - effectiveness of Wavelet Analysis -The Discrete Wavelet Transform the Discrete-Time and Continuous Wavelet Transforms.

UNIT II A Multiresolution Formulation of Wavelet Systems

Signal Spaces -The Scaling Function -Multiresolution Analysis - The Wavelet Functions - The Discrete Wavelet Transform- A Parseval's Theorem - Display of the Discrete Wavelet Transform and the Wavelet Expansion.

UNIT III Filter Banks and the Discrete Wavelet Transform

Analysis - From Fine Scale to Coarse Scale- Filtering and Down-Sampling or Decimating -Synthesis - From Coarse Scale to Fine Scale -Filtering and Up-Sampling or Stretching - Input Coefficients - Lattices and Lifting - -Different Points of View.

UNIT IV Time-Frequency and Complexity

Multiresolution versus Time-Frequency Analysis- Periodic versus Nonperiodic Discrete Wavelet Transforms -The Discrete Wavelet Transform versus the Discrete-Time Wavelet Transform- Numerical Complexity of the Discrete Wavelet Transform.

UNIT V Bases and Matrix Examples

Bases, Orthogonal Bases, and Biorthogonal Bases -Matrix Examples - Fourier Series Example - Sine Expansion Example - Frames and Tight Frames - Matrix Examples -Sine Expansion as a Tight Frame Example.

Textbooks:

1. C. Sidney Burrus, Ramesh A. Gopinath, “Introduction to Wavelets and Wavelets Transforms”,Prentice Hall, (1997).
2. James S. Walker, “A Primer on Wavelets and their Scientific Applications”, CRC Press, (1999).

Reference Books:

1. Raghuveer Rao, “Wavelet Transforms”, Pearson Education, Asia.

Online Learning Resources:

https://www.slideshare.net/RajEndiran1/introduction-to-wavelet-transform-51504915

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-II Sem

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3	0	0	3

(20A56701) PHYSICS OF ELECTRONIC MATERIALS AND DEVICES
(Open Elective-II)

Course Objectives:

- To impart the fundamental knowledge on various materials, their properties and applications.
- To provide insight into various semiconducting materials, and their properties.
- To enlighten the characteristic behavior of various semiconductor devices.
- To provide the basics of dielectric and piezoelectric materials and their properties.
- To explain different categories of magnetic materials, mechanism and their advanced applications.

Course Outcome: At the end of the course the student will be able

- To understand the fundamentals of various materials.
- To exploit the physics of semiconducting materials
- To familiarize with the working principles of semiconductor-based devices.
- To understand the behaviour of dielectric and piezoelectric materials.
- To identify the magnetic materials and their advanced applications.

UNIT I Fundamentals of Materials Science

Introduction, Phase rule, Phase Diagram, Elementary idea of Nucleation and Growth, Methods of crystal growth. Basic idea of point, line and planar defects. Concept of thin films, preparation of thin films, Deposition of thin film using sputtering methods (RT and glow discharge).

UNIT II Semiconductors

Introduction, charge carriers in semiconductors, effective mass, Diffusion and drift, Diffusion and recombination, Diffusion length. The Fermi level & Fermi-Dirac distribution, Electron and Hole in quantum well, Change of electron-hole concentration- Qualitative analysis, Temperature dependency of carrier concentration, Conductivity and mobility, Effects of temperature and doping on mobility, High field effects.

UNIT III Physics of Semiconductor devices

Introduction, Band structure, PN junctions and their typical characteristics under equilibrium and under bias, Construction and working principles of: Light emitting diodes, Heterojunctions, Transistors, FET and MOSFETs.

UNIT IV Dielectric Materials and their applications:

Introduction, Dielectric properties, Electronic polarizability and susceptibility, Dielectric constant and frequency dependence of polarization, Dielectric strength and dielectric loss, Piezoelectric properties.

UNIT V Magnetic Materials and their applications

Introduction, Magnetism & various contributions to para and dia magnetism, Ferro and Ferri magnetism and ferrites, Concepts of Spin waves and Magnons, Anti-ferromagnetism, Domains and domain walls, Coercive force, Hysteresis, Nano-magnetism, Super-paramagnetism – Properties and applications.

Textbooks

1. Principles of Electronic Materials and Devices- S.O. Kasap, McGraw-Hill Education (India) Pvt. Ltd., 3rd edition, 2007.
2. Electronic Components and Materials- Grover and Jamwal, Dhanpat Rai and Co.

Reference Books:

1. Solid State Electronic Devices -B.G. Streetman and S. Banerjee, PHI Learning, 6th edition
2. Electronic Materials Science- Eugene A. Irene, , Wiley, 2005
3. An Introduction to Electronic Materials for Engineers-Wei Gao, Zhengwei Li, Nigel Sammes, World Scientific Publishing Co. Pvt. Ltd., , 2nd Edition,2011
4. A First Course In Material Science- by Raghvan, McGraw Hill Pub.
5. The Science and Engineering of materials- Donald R.Askeland, Chapman& Hall Pub.

NPTEL courses links

https://nptel.ac.in/courses/113/106/113106062/
https://onlinecourses.nptel.ac.in/noc20_mm02/preview,
https://nptel.ac.in/noc/courses/noc17/SEM1/noc17-mm07

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-II Sem

L	T	P	C
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(20A52702) ENGLISH LITERARY SPECTRUM
(Open Elective-II)

Course Objectives:

- To introduce to Elizabethan drama and be able to appreciate the nuances of humor
- To familiarize with Victorian novel and industrialization
- To expose to the historical significance of ideas of different periods
- To give exposure to the vicissitudes of life through short stories to encourage all round development of the students by focusing on soft skills

Course Outcomes:

- Define various concepts related to British literature
- Understand humour and Elizabethan culture
- Demonstrate proficiency in oral communication through drama
- Analyse texts from a variety of theatrical perspectives and be tolerant and receptive to different ideas
- Appraise human values and aspirations
- Create written texts in a variety of literary genres and develop aesthetic sense to appreciate the beauty of life

UNIT I **Poetry**

1. Ode to a Grecian Urn- John Keats
2. To a Skylark- P.B.Shelley
3. Satan's Speech from Paradise Lost Book I- 140-170 lines- John Milton
4. My Last Duchess- Robert Browning

UNIT II Drama

1. Twelfth Night- William Shakespeare
   a) Elizabethan theatre
   b) Shakespearean tragedy
   c) Shakespearean Comedy
   d) Themes of Shakespearean Dramas

UNIT III Novel

1. Hard Times- Charles Dickens
a) Rise of the English Novel
b) Victorian Novel
c) Utilitarianism
d) Humanism

UNIT IV **Prose**

1. Of Studies – Francis Bacon
2. On Seeing People Off- A.G.Gardiner
3. Sweetness and Light- Mathew Arnold
4. I too have a Dream- Martin Luther King Junior

UNIT V **Short stories**

1. The Last Leaf- O.Henry
2. Useless Beauty- Guy de Maupassant
3. After the Dance – Leo Tolstoy
4. The Selfish Giant- Oscar Wilde

Textbooks:

1. The Oxford Book of English Verse by Christopher Ricks (Editor)
2. Twelfth Night (2010 edition): Oxford School Shakespeare (Oxford School Shakespeare Series)
   Hard Times (Penguin Classics)

Reference Books:

1. The Art of the Personal Essay: An Anthology from the Classical Era to the Present, Anchor Books Publication
2. Legois and Cazamian, A History of English Literature

Online Learning Resources:

Study.com
What Is Twelfth Night About? - Plot & Summary - Video & Lesson Transcript | Study.com

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem **L T P C**

3 0 0 3

(20A01705) COST EFFECTIVE HOUSING TECHNIQUES
(Open Elective Course - III)

Course Objectives:

- To understand the requirements of structural safety for future construction.
- To know about the housing scenario, housing financial systems land use and physical
- planning for housing and housing the urban poor
- To know the traditional practices of rural housing
- To know the different innovative cost effective construction techniques
- To know the alternative building materials for low cost housing.

Course Outcomes :

- To know the repair and restore action of earthquake damaged non engineered buildings and ability to understand the requirements of structural safety for future construction
- To know about the housing scenario, housing financial systems land use and physical planning for housing and housing the urban poor
- Apply the traditional practices of rural housing
- Understand the different innovative cost effective construction techniques
- Suggest the alternative building materials for low cost housing

UNIT I

a) **Housing Scenario :**Introducing - Status of urban housing - Status of Rural Housing
b) **Housing Finance**: Introducing - Existing finance system in India - Government role as facilitator - Status at Rural Housing Finance - Impedimently in housing finance and related issues
c) **Land use and physical planning for housing :**Introduction - Planning of urban land - Urban land ceiling and regulation act - Efficiency of building bye lass - Residential Densities
d) **Housing the urban poor :**Introduction - Living conditions in slums - Approaches and strategies for housing urban poor

UNIT II

Development and adoption of low cost housing technology

Introduction - Adoption of innovative cost effective construction techniques - Adoption of precast elements in partial prefatroices - Adopting of total prefactcation of mass housing in India- General remarks on pre cast rooting/flooring systems -Economical wall system - Single Brick thick loading bearing wall - 19cm thick load bearing masonry walls - Half brick thick load bearing wall – Fly-ash gypsum thick for masonry - Stone Block masonry - Adoption of precast R.C. plank and join system for roof/floor in the building

UNIT III

Alternative building materials for low cost housing

Introduction - Substitute for scarce materials – Ferro-cement - Gypsum boards - Timber substitutions - Industrial wastes - Agricultural wastes - alternative building maintenance

Low cost Infrastructure services:

Introduce - Present status - Technological options - Low cost sanitation - Domestic wall - Water supply, energy

UNIT IV

Rural Housing: Introduction traditional practice of rural housing continuous - Mud Housing technology Mud roofs - Characteristics of mud - Fire treatment for thatch roof - Soil stabilization - Rural Housing programs

UNIT V

Housing in Disaster prone areas:

Introduction – Earthquake - Damages to houses - Traditional prone areas - Type of Damages and Railways of non-engineered buildings - Repair and restore action of earthquake Damaged non-engineered buildings recommendations for future constructions. Requirement's of structural safety of thin precast roofing units against Earthquake forces Status of R& D in earthquake strengthening measures - Floods, cyclone, future safety

Textbooks:

1. Building materials for low – income houses – International council for building research studies and documentation.
2. Hand book of low cost housing by A.K.Lal – Newage international publishers.
3. Low cost Housing – G.C. Mathur by South Asia Books

Reference Books:

1. Properties of concrete – Neville A.m. Pitman Publishing Limited, London.
2. Light weight concrete, Academic Kiado, Rudhai.G – Publishing home of Hungarian Academy of Sciences 1963.
3. Modern trends in housing in developing countries – A.G. Madhava Rao, D.S. Rama chandra Murthy &G.Annamalai. E. & F. N. Spon Publishers

Online Learning Resources:

https://nptel.ac.in/courses/124107001

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem **L T P C**

3 0 0 3

(20A02704) IoT APPLICATIONS IN ELECTRICAL ENGINEERING
(Open Elective Course – III)

Course Objectives:

- Understand basics of Internet of Things and Micro Electro Mechanical Systems (MEMS) fundamentals in design and fabrication process
- Analyze motion less and motion detectors in IoT applications
- Understand about Analyze applications of IoT in smart grid
- Apply the concept of Internet of Energy for various applications

Course Outcomes:

- Understand the concept of IoT in Electrical Engineering
- Analyze various types of motionless sensors and various types of motion detectors
- Apply various applications of IoT in smart grid
- Design future working environment with Energy internet

UNIT I SENSORS

Definitions, Terminology, Classification, Temperature sensors, Thermoresistive, Resistance, temperature detectors, Silicon resistive thermistors, Semiconductor, Piezoelectric, Humidity and moisture sensors. Capacitive, Electrical conductivity, Thermal conductivity, time domain reflectometer, Pressure and Force sensors: Piezoresistive, Capacitive, force, strain and tactile sensors, Strain gauge, Piezoelectric

UNIT II OCCUPANCY AND MOTION DETECTORS

Capacitive occupancy, Inductive and magnetic, potentiometric - Position, displacement and level sensors, Potentiometric, Capacitive, Inductive, magnetic velocity and acceleration sensors, Capacitive, Piezoresistive, piezoelectric cables, Flow sensors, Electromagnetic, Acoustic sensors - Resistive microphones, Piezoelectric, Photo resistors

UNIT III MEMS

Basic concepts of MEMS design, Beam/diaphragm mechanics, electrostatic actuation and fabrication, Process design of MEMS based sensors and actuators, Touch sensor, Pressure sensor, RF MEMS switches, Electric and Magnetic field sensors

UNIT IV IoT FOR SMART GRID

Driving factors, Generation level, Transmission level, Distribution level, Applications, Metering and monitoring applications, Standardization and interoperability, Smart home

UNIT V INTERNET of ENERGY (IoE)

Concept of Internet of Energy, Evaluation of IoE concept, Vision and motivation of IoE, Architecture, Energy routines, information sensing and processing issues, Energy internet as smart grid

Textbooks:

1. Jon S. Wilson, Sensor Technology Hand book, Newnes Publisher, 2004
2. Tai Ran Hsu, MEMS and Microsystems: Design and manufacture, 1st Edition, Mc Grawhill Education, 2017
3. Ersan Kabalci and Yasin Kabalci, From Smart grid to Internet of Energy, 1st Edition, Academic Press, 2019

Reference Books:

1. Raj Kumar Buyya and Amir Vahid Dastjerdi, Internet of Things: Principles and Paradigms, Kindle Edition, Morgan Kaufmann Publisher, 2016
2. Yen Kheng Tan and Mark Wong, Energy Harvesting Systems for IoT Applications: Generation, Storage and Power Management, 1st Edition, CRC Press, 2019
3. RMD Sundaram Shriram, K. Vasudevan and Abhishek S. Nagarajan, Internet of Things, Wiley, 2019

Online Learning Resources:

1.https://onlinecourses.nptel.ac.in/noc22_cs96/preview
2. https://nptel.ac.in/courses/108108123
3. https://nptel.ac.in/courses/108108179

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem **L T P C**

3 0 0 3

(20A03704a) INTRODUCTION TO HYBRID AND ELECTRICAL VEHICLES

(Open Elective-III)

Course Objectives:

- Provide good foundation on hybrid and electrical vehicles.
- To address the underlying concepts and methods behind power transmission in hybrid and electrical vehicles.
- Familiarize energy storage systems for electrical and hybrid transportation.
- To design and develop basic schemes of electric vehicles and hybrid electric vehicles.

Course Outcomes:

- Explain the working of hybrid and electric vehicles
- Choose a suitable drive scheme for developing an hybrid and electric vehicles depending on resources
- Develop the electric propulsion UNIT and its control for application of electric vehicles
- Choose proper energy storage systems for vehicle applications
- Design and develop basic schemes of electric vehicles and hybrid electric vehicles

UNIT I Electric Vehicle Propulsion and Energy Sources

Introduction to electric vehicles, vehicle mechanics - kinetics and dynamics, roadway fundamentals propulsion system design - force velocity characteristics, calculation of tractive power and energy required, electric vehicle power source - battery capacity, state of charge and discharge, specific energy, specific power, Ragone plot. Battery modelling - run time battery model, first principle model, battery management system- soc measurement, battery cell balancing. Traction batteries - nickel metal hydride battery, Li-Ion, Li-polymer battery.

UNIT II Electric Vehicle Power Plant and Drives

Introduction electric vehicle power plants. Induction machines, permanent magnet machines, switch reluctance machines. Power electronic converters-DC/DC converters - buck boost converter, isolated DC/DC converter. Two quadrant chopper and switching modes. AC drives- PWM, current control method. Switch reluctance machine drives - voltage control, current control.

UNIT III Hybrid and Electric Drive Trains

Introduction hybrid electric vehicles, history and social importance, impact of modern drive trains in energy supplies. Hybrid traction and electric traction. Hybrid and electric drive train topologies. Power flow control and energy efficiency analysis, configuration and control of DC motor drives and induction motor drives, permanent magnet motor drives, switch reluctance motor drives, drive system efficiency.

UNIT IV Electric and Hybrid Vehicles - Case Studies

Parallel hybrid, series hybrid -charge sustaining, charge depleting. Hybrid vehicle case study –Toyota Prius, Honda Insight, Chevrolet Volt. 42 V systems for traction applications. Lightly hybridized vehicles and low voltage systems. Electric vehicle case study - GM EV1, Nissan Leaf, Mitsubishi Miev. Hybrid electric heavy-duty vehicles, fuel cell heavy duty vehicles.

UNIT V Electric and Hybrid Vehicle Design

Introduction to hybrid vehicle design. Matching the electric machine and the internal combustion engine. Sizing of propulsion motor, power electronics, drive system. Selection of energy storage technology, communications, supporting subsystem. Energy management strategies in hybrid and electric vehicles - energy management strategies- classification, comparison, implementation.

Textbooks:

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, 2/e, CRC Press, 2003.
2. Amir Khajepour, M. Saber Fallah, AvestaGoodarzi, Electric and Hybrid Vehicles: Technologies, Modeling and Control - A Mechatronic Approach, illustrated edition, John Wiley & Sons, 2014.
3. Mehrdad Ehsani, YimiGao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.

Reference Books:

1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.
2. John G. Hayes, G. Abas Goodarzi, Electric Powertrain: Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles, 1/e, Wiley-Blackwell, 2018.

Online Learning Resources:

- https://archive.nptel.ac.in/courses/108/103/108103009/
- https://www.youtube.com/watch?v=wypbLRe9xUg
- https://www.youtube.com/watch?v=q6BYr5-fq5U
- https://www.youtube.com/watch?v=3E1SXG7VkQk
- https://www.iare.ac.in/sites/default/files/IARE_HEV_LN_0.pdf
- https://nptel.ac.in/courses/108102121

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

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(20A04705) ELECTRONIC SENSORS
(Open Elective Course –III)

Course Objectives:

- Learn the characterization of sensors.
- Known the working of Electromechanical, Thermal, Magnetic and radiation sensors
- Understand the concepts of Electro analytic and smart sensors
- Able to use sensors in different applications

Course Outcomes:

- Learn about sensor Principle, Classification and Characterization.
- Explore the working of Electromechanical, Thermal, Magnetic, radiation and Electro analytic sensors
- Understand the basic concepts of Smart Sensors
- Design a system with sensors

UNIT I

Sensors / Transducers: Principles, Classification, Parameters, Characteristics, Environmental Parameters (EP), Characterization

Electromechanical Sensors: Introduction, Resistive Potentiometer, Strain Gauge, Resistance Strain Gauge, Semiconductor Strain Gauges -Inductive Sensors: Sensitivity and Linearity of the Sensor – Types-Capacitive Sensors: Electrostatic Transducer, Force/Stress Sensors Using Quartz Resonators, Ultrasonic Sensors

UNIT II

Thermal Sensors: Introduction, Gas thermometric Sensors, Thermal Expansion Type Thermometric Sensors, Acoustic Temperature Sensor ,Dielectric Constant and Refractive Index thermo sensors, Helium Low Temperature Thermometer ,Nuclear Thermometer ,Magnetic Thermometer ,Resistance Change Type Thermometric Sensors, Thermo emf Sensors, Junction Semiconductor Types, Thermal Radiation Sensors, Quartz Crystal Thermoelectric Sensors, NQR Thermometry, Spectroscopic Thermometry, Noise Thermometry, Heat Flux Sensors

UNIT III

Magnetic sensors: Introduction, Sensors and the Principles Behind, Magneto-resistive Sensors, Anisotropic Magneto resistive Sensing, Semiconductor Magneto resistors, Hall Effect and Sensors, Inductance and Eddy Current Sensors, Angular/Rotary Movement Transducers, Synchros.

UNIT IV

Radiation Sensors: Introduction, Basic Characteristics, Types of Photo resistors/ Photo detectors, Xray and Nuclear Radiation Sensors, Fibre Optic Sensors

Electro analytical Sensors: The Electrochemical Cell, The Cell Potential - Standard Hydrogen Electrode (SHE), Liquid Junction and Other Potentials, Polarization, Concentration Polarization, Reference Electrodes, Sensor Electrodes, Electro ceramics in Gas Media.

UNIT V

Smart Sensors: Introduction, Primary Sensors, Excitation, Amplification, Filters, Converters, Compensation, Information Coding/Processing - Data Communication, Standards for Smart Sensor Interface, the Automation Sensors –Applications: Introduction, On-board Automobile Sensors (Automotive Sensors), Home Appliance Sensors, Aerospace Sensors, Sensors for Manufacturing – Sensors for environmental Monitoring

Textbooks:

1. "Sensors and Transducers - D. Patranabis" –PHI Learning Private Limited., 2003.
2. Introduction to sensors- John veteline, aravindraghu, CRC press, 2011

References:

1. Sensors and Actuators, D. Patranabis, 2nd Ed., PHI, 2013.
2. Make sensors: Terokarvinen, kemo, karvinen and villeyvaltokari, 1st edition, maker media,2014.
3. Sensors handbook- Sabriesoloman, 2nd Ed. TMH, 2009

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

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(20A27704) HUMAN NUTRITION
(OPEN ELECTIVE-III)

Course Objectives:

- To get knowledge on Concepts and content of nutrition source and metabolic functions.
- To know about Balanced diets for various groups; Diets and disorders, recommended dietary allowances
- To learn about Epidemiology of under nutrition and over nutrition.
- To understand Nutrition and immunity.

Course Outcomes:

- To study the Salient features of Concepts and content of nutrition, Malnutrition, Nutrition education
- Assessment of nutritional status, disorders Food fad and faddism.

UNIT I

Concepts and content of nutrition: Nutrition agencies; Nutrition of community; Nutritional policies and their implementation; Metabolic function of nutrients. Nutrients: Sources, functions, digestion, absorption, assimilation and transport of carbohydrates, proteins and fats in human beings;

UNIT II

Water and energy balance: Water intake and losses; Basal metabolism- BMR; Body surface area and factors affecting BMR Formulation of diets: Classification of balanced diet; Balanced diets for various groups; Diets and disorders. Recommended dietary allowances (RDA); For various age group; According physiological status; Athletic and sports man; Geriatric persons

UNIT III

Malnutrition: Type of Malnutrition; Multi-factorial causes; Epidemiology of under nutrition and over nutrition; Nutrition and immunity.

UNIT IV

Nutrition education Assessment of nutritional status: Diet surveys; Anthropometry; Clinical examination; Biochemical assessment; Additional medical information

UNIT V

Blood constituents; Hormone types; Miscellaneous disorders Food fad and faddism. Potentially toxic substances in human food.

Textbooks:

1. Swaminathan M, Advanced Text Book on Food & Nutrition (Volume I and II) , The Bangalore Printing and Publishing Co.Ltd, Bangalore. 2006
2. Stewart Truswell, ABC of Nutrition (4th edition) , BMJ Publishing Group 2003, ISBN 0727916645.
3. Martin Eastwood, Principles of Human Nutrition , Blackwell Publishing, Boca Rotan

Reference:

1. Mike Lean and E. Combet ,Barasi's Human Nutrition – A Health Perspective , Second Edition CRC Press, London
2. Introduction to Human Nutrition, Micheal J. G., Susan A.L. Aedin C. and Hester H.V, Wiley-Blackwell Publication, UK 2009 , ISBN 9781405168076
3. Bogert L.J., Goerge M.B, Doris H.C., Nutrition and Physical Fitness, W.B. Saunders Company, Toronto, Canada

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

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(20A54702) NUMERICAL METHODS FOR ENGINEERS
(OPEN ELECTIVE-III)

Course Objectives:

This course aims at providing the student with the knowledge on various numerical methods for solving equations, interpolating the polynomials, evaluation of integral equations and solution of differential equations.

Course Outcomes:

- Apply numerical methods to solve algebraic and transcendental equations.
- Understand fitting of several kinds of curves.
- Derive interpolating polynomials using interpolation formulae.
- Solve differential and integral equations numerically.

UNIT I Solution of Algebraic & Transcendental Equations

Introduction-Bisection Method-Iterative method-Regula falsi method-Newton Raphson method. System of Algebraic equations: Gauss Jordan method-Gauss Siedal method.

UNIT II Curve Fitting

Principle of Least squares- Fitting of curves- Fitting of linear, quadratic and exponential curves.

UNIT III Interpolation

Finite differences-Newton's forward and backward interpolation formulae – Lagrange's formulae Gauss forward and backward formula, Stirling's formula, Bessel's formula

UNIT IV Numerical Integration

Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule

UNIT V Solution of Initial value problems to Ordinary differential equations

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Modified Euler's Method-Runge-Kutta Methods.

Textbooks:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Probability and Statistics for Engineers and Scientists, Ronald E. Walpole,PNIE.
3. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India

Reference Books:

1. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
2. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.

Online Learning Resources:

https://slideplayer.com/slide/8588078/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

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(20A56702) SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS
(OPEN ELECTIVE-III)

Course Objectives:

- To provide exposure to various kinds of sensors and actuators and their engineering applications.
- To impart knowledge on the basic laws and phenomenon behind the working of sensors and actuators
- To enlighten the operating principles of various sensors and actuators
- To educate the fabrication of sensors
- To identify the required sensor and actuator for interdisciplinary application

Course Outcomes:

- To recognize the need of sensors and actuators
- To understand working principles of various sensors and actuators
- To identify different type of sensors and actuators used in real life applications
- To exploit basics in common methods for converting a physical parameter into an electrical quantity
- To make use of sensors and actuators for different applications

UNIT I Introduction to Sensors and Actuators

Sensors: Types of sensors: temperature, pressure, strain, active and passive sensors, General characteristics of sensors (Principles only), Materials used and their fabrication process: Deposition: Chemical Vapor Deposition, Pattern: photolithography and Etching: Dry and Wet Etching.

Actuators: Functional diagram of actuators, Types of actuators and their basic principle of working: Hydraulic, Pneumatic, Mechanical, Electrical, Magnetic, Electromagnetic, piezo-electric and piezo-resistive actuators, Simple applications of Actuators.

UNIT II Temperature and Mechanical Sensors

Temperature Sensors: Types of temperature sensors and their basic principle of working: Thermo-resistive sensors: Thermistors, Resistance temperature sensors, Silicon resistive sensors, Thermo-electric sensors: Thermocouples, PN junction temperature sensors

Mechanical Sensors: Types of Mechanical sensors and their basic principle of working: Force sensors: strain gauges, tactile sensors, Pressure sensors: semiconductor, piezoresistive, capacitive, VRP.

UNIT III Optical and Acoustic Sensors

Optical Sensors: Basic principle and working of: Photodiodes, Phototransistors and Photo-resistors based sensors, Photomultipliers, Infrared sensors: thermal, PIR, thermopiles

Acoustic Sensors: Principle and working of Ultrasonic sensors, Piezo-electric resonators, Microphones.

UNIT IV Magnetic, Electromagnetic Sensors and Actuators

Motors as actuators (linear, rotational, stepping motors), magnetic valves, inductive sensors (LVDT, RVDT, and Proximity), Hall Effect sensors, Magneto-resistive sensors, Magneto-strictive sensors and actuators, Voice coil actuators (speakers and speaker-like actuators).

UNIT V Chemical and Radiation Sensors

Chemical Sensors: Principle and working of Electro-chemical, Thermo-chemical, Gas, pH, Humidity and moisture sensors.

Radiation Sensors: Principle and working of Ionization detectors, Scintillation detectors, Geiger-Mueller counters, Semiconductor radiation detectors and Microwave sensors (resonant, reflection, transmission)

Textbooks:

1. Sensors and Actuators – Clarence W. de Silva, CRC Press, 2nd Edition, 2015
2. Sensors and Actuators, D.A.Hall and C.E.Millar, CRC Press, 1999

Reference Books:

1. Sensors and Transducers- D.Patranabhis, Prentice Hall of India (Pvt) Ltd. 2003
2. Measurement, Instrumentation, and Sensors Handbook-John G.Webster, CRC press 1999
3. Sensors – A Comprehensive Sensors- Henry Bolte, John Wiley.
4. Handbook of modern sensors, Springer, Stefan Johann Rupitsch.
5. Principles of Industrial Instrumentation By D. Patranabhis

NPTEL courses links

https://onlinecourses.nptel.ac.in/noc21_ee32/preview

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

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(20A51702) CHEMISTRY OF NANOMATERIALS AND APPLICATIONS (OPEN ELECTIVE-III)

Course Objectives:

- To understand synthetic principles of Nanomaterials by various methods
- To characterize the synthetic nanomaterials by various instrumental methods
- To enumerate the applications of nanomaterials in engineering

Course Outcomes:

- Understand the state of art synthesis of nano materials
- Characterize nano materials using ion beam, scanning probe methodologies, position sensitive atom probe and spectroscopic ellipsometry.
- Analyze nanoscale structure in metals, polymers and ceramics
- Analyze structure-property relationship in coarser scale structures
- Understand structures of carbon nano tubes

UNIT I

Introduction: Scope of nanoscience and nanotecnology, nanoscience in nature, classification of nanostructured materials, importance of nano materials.

Synthetic Methods**:** Bottom-Up approach**:** Sol-gel synthesis, microemulsions or reverse micelles, co-precipitation method, solvothermal synthesis, hydrothermal synthesis, microwave heating synthesis and sonochemical synthesis.

UNIT II

Top-Down approach: Inert gas condensation, arc discharge method, aerosol synthesis, plasma arc technique, ion sputtering, laser ablation, laser pyrolysis, and chemical vapour deposition method, electrodeposition method, high energy ball milling.

UNIT III

Techniques for characterization: Diffraction technique, spectroscopy techniques, electron microscopy techniques for the characterization of nanomaterials, BET method for surface area analysis, dynamic light scattering for particle size determination.

UNIT IV

Studies of Nano-structured Materials: Synthesis, properties and applications of the following nanomaterials, fullerenes, carbon nanotubes, core-shell nanoparticles, nanoshells, self- assembled monolayers, and monolayer protected metal nanoparticles, nanocrystalline materials, magnetic nanoparticles and important properties in relation to nanomagnetic materials, thermoelectric materials, non-linear optical materials, liquid crystals.

UNIT V

Engineering Applications of Nanomaterials

Textbooks:

1. NANO: The Essentials: T Pradeep, MaGraw-Hill, 2007.
2. Textbook of Nanoscience and nanotechnology: B S Murty, P Shankar, Baldev Rai, BB Rath and James Murday, Univ. Press, 2012.

References:

1. Concepts of Nanochemistry; Ludovico Cademrtiri and Geoffrey A. Ozin & Geoffrey A. Ozin, Wiley-VCH, 2011.
2. Nanostructures & Nanomaterials; Synthesis, Properties & Applications: Guozhong Cao, Imperial College Press, 2007.
3. Nanomaterials Chemistry, C. N. R. Rao, Achim Muller, K.Cheetham, Wiley-VCH, 2007.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

L	T	P	C
3	0	0	3

(20A52703) CONSTITUTION OF INDIA

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and Election Commission of India.
- To understand the central-state relation in financial and administrative control

Course Outcomes:

- Understand historical background of the constitution making and its importance for building a democratic India.
- Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and local self-government
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

UNIT I

Introduction to Indian Constitution – Constitution -Meaning of the term - Indian Constitution- Sources and constitutional history - Features– Citizenship – Preamble - Fundamental Rights and Duties - Directive Principles of State Policy.

UNITII

Union Government and its Administration Structure of the Indian Union - Federalism - Centre-State relationship – President's Role, power and position - PM and Council of ministers - Cabinet and Central Secretariat –Lok Sabha - Rajya Sabha - The Supreme Court and High Court - Powers and Functions

UNIT III

State Government and its Administration - Governor - Role and Position -CM and Council of ministers - State Secretariat-Organization Structure and Functions

UNIT IV

Local Administration - District's Administration Head - Role and Importance - Municipalities - Mayor and role of Elected Representatives -CEO of Municipal Corporation Pachayati Raj - Functions– PRI – Zilla Parishath - Elected officials and their roles – CEO,Zilla Parishath - Block level Organizational Hierarchy - (Different departments) - Village level - Role of Elected and Appointed officials - Importance of grass root democracy

UNIT V

Election Commission - Election Commission- Role of Chief Election Commissioner and Election Commissionerate - State Election Commission -Functions of Commissions for the welfare of SC/ST/OBC and Women

Textbooks:

1. Durga Das Basu, " Introduction to the Constitution of India", Prentice – Hall of India Pvt. Ltd.. New Delhi
2. Subash Kashyap, "Indian Constitution", National Book Trust

References:

1. J.A. Siwach, "Dynamics of Indian Government & Politics".
2. H.M.Sreevai, "Constitutional Law of India", 4th edition in 3 volumes (Universal Law Publication)
3. J.C. Johari, "Indian Government andPolitics", Hans India
4. M.V. Pylee, "Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice", Hall of India Pvt. Ltd.. New Delhi

E-Resources:

1. nptel.ac.in/courses/109104074/8 2. nptel.ac.in/courses/109104045/
2. nptel.ac.in/courses/101104065/ 4. www.hss.iitb.ac.in/en/lecture-details, www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

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(20A01706) HEALTH, SAFETY AND ENVIRONMENTAL MANAGEMENT PRACTICES
(Open Elective Course-IV)

Course Objectives:

- To understand safety, health and environmental management.
- To be familiar with hazard classification and assessment, hazard evaluation and hazard . control, environmental issues and management
- To get exposed to accidents modeling, accident investigation and reporting, concepts of. HAZOP and PHA
- To be familiar with safety measures in design and process operations.
- To get exposed to risk assessment and management, principles and methods

Course Outcomes :

- To understand safety, health and environmental management.
- To be familiar with hazard classification and assessment, hazard evaluation and hazard.
- To get exposed to accidents modelling, accident investigation and reporting control, environmental issues and management
- To get concepts of HAZOP and PHA.
- To be familiar with safety measures in design and process operations.

UNIT I

Introduction to safety, health and environmental management - Basic terms and their definitions - Importance of safety - Safety assurance and assessment - Safety in design and operation - Organizing for safety.

UNIT II

Hazard classification and assessment - Hazard evaluation and hazard control.
Environmental issues and Management - Atmospheric pollution - Flaring and fugitive release - Water pollution - Environmental monitoring - Environmental management.

UNIT III

Accidents modelling - Release modelling - Fire and explosion modelling - Toxic release and dispersion Modelling

UNIT IV

Accident investigation and reporting - concepts of HAZOP and PHA.
Safety measures in design and process operations - Inserting, explosion, fire prevention, sprinkler systems.

UNIT V

Risk assessment and management - Risk picture - Definition and characteristics - Risk acceptance criteria - Quantified risk assessment - Hazard assessment - Fatality risk assessment - Risk management principles and methods.

Textbooks:

1. Process Safety Analysis, by Skelton. B, Gulf Publishing Company, Houston, 210pp., 1997.
2. Risk Management with Applications from Offshore Petroleum Industry, by TerjeAven and Jan Erik Vinnem, Springer, 200pp., 2007.

Reference Books:

1. Introduction to Safety and Reliability of Structures, by Jorg Schneider

2. Structural Engineering Documents Vol. 5, International Association for Bridge and Structural Engineering (IABSE), 138pp., 1997.
3. Safety and Health for Engineers, by Roger L. Brauer, John Wiley and Sons Inc. pp. 645-663, 2006.
4. Health, Safety and Environmental Management in Offshore and Petroleum Engineering, Srinivasan Chandrasekaran, John Wiley and Sons, 2016.

Online Learning Resources:

https://nptel.ac.in/courses/114106017

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

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(20A02705) RENEWABLE ENERGY SYSTEMS
(Open Elective Course – IV)

Course Objectives:

- Understand various sources of Energy and the need of Renewable Energy Systems.
- Understand the concepts of Solar Radiation, Wind energy and its applications.
- Analyze solar thermal and solar PV systems
- Understand the concept of geothermal energy and its applications, biomass energy, the concept of Ocean energy and fuel cells.

Course Outcomes:

- Understand various alternate sources of energy for different suitable application requirements
- Understand the concepts of solar energy generation strategies and wind energy system
- Analyze Solar and Wind energy systems
- Understand the basics of Geothermal Energy Systems, various diversified energy scenarios of ocean, biomass and fuel cells

UNIT I SOLAR ENERGY

Solar radiation - beam and diffuse radiation, solar constant, earth sun angles, attenuation and measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length. flat plate collectors, concentrating collectors, storage of solar energy-thermal storage.

UNIT II PV ENERGY SYSTEMS

Introduction, The PV effect in crystalline silicon basic principles, the film PV, Other PV technologies, Electrical characteristics of silicon PV cells and modules, PV systems for remote power, Grid connected PV systems.

UNIT III WIND ENERGY

Principle of wind energy conversion; Basic components of wind energy conversion systems; windmill components, various types and their constructional features; design considerations of horizontal and vertical axis wind machines: analysis of aerodynamic forces acting on wind mill blades and estimation of power output; wind data and site selection considerations.

UNIT IV GEOTHERMAL ENERGY

Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geo-pressured hot dry rock, magma. Advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India.

UNIT V MISCELLANEOUS ENERGY TECHNOLOGIES

Ocean Energy: Tidal Energy-Principle of working, performance and limitations. Wave Energy-Principle of working, performance and limitations.

Bio mass Energy: Biomass conversion technologies, Biogas generation plants, Classification, advantages and disadvantages, constructional details, site selection, digester design consideration

Fuel cell: Principle of working of various types of fuel cells and their working, performance and limitations.

Textbooks:

1. Stephen Peake, “Renewable Energy Power for a Sustainable Future”, Oxford International Edition, 2018.
2. G. D. Rai, “Non-Conventional Energy Sources”, 4th Edition, Khanna Publishers, 2000.

Reference Books:

1. S. P. Sukhatme, "Solar Energy",3rd Edition, Tata Mc Graw Hill Education Pvt. Ltd, 2008.
2. B H Khan , " Non-Conventional Energy Resources", 2nd Edition, Tata Mc Graw Hill Education Pvt Ltd, 2011.
3. S. Hasan Saeed and D.K.Sharma,"Non-Conventional Energy Resources",3rd Edition, S.K.Kataria& Sons, 2012.
4. G. N. Tiwari and M.K.Ghosal, "Renewable Energy Resource: Basic Principles and Applications", Narosa Publishing House, 2004.

Online Learning Resources:

1. https://nptel.ac.in/courses/103103206
2. https://nptel.ac.in/courses/108108078

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

L	T	P	C
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(20A03705b) INTRODUCTION TO COMPOSITE MATERIALS
(Open Elective-IV)

Course Objectives:

- Introduce composite materials and their applications.
- Build proper background for stress analysis in the design of composite structures.
- Familiarize various properties of composite materials.
- Focus on biodegradable composites.

Course Outcomes:

- Identify the practical applications of composites. (L3)
- Identify the polymer matrix composites. (L3)
- Classify of bio- degradable composites. (L2)
- Outline the various types of ceramic matrix materials. (L2)

UNIT I Introduction to composites

Fundamentals of composites – Definition – classification– based on Matrix – based on structure – Advantages and applications of composites - Reinforcement – whiskers – glass fiber – carbon fiber - Aramid fiber – ceramic fiber – Properties and applications.

UNIT II Polymer matrix composites

Polymers - Polymer matrix materials – PMC processes - hand layup processes – spray up processes – resin transfer moulding – Pultrusion – Filament winding – Auto clave based methods - Injection moulding – sheet moulding compound – properties and applications of PMCs.

UNIT III Metal matrix composites

Metals - types of metal matrix composites – Metallic Matrices. Processing of MMC – Liquid state processes – solid state processes – In-situ processes. Properties and applications of MMCs.

UNIT IV Ceramic matrix composites

Ceramic matrix materials – properties – processing of CMCs –Sintering - Hot pressing – Infiltration – Lanxide process – Insitu chemical reaction techniques – solgel polymer pyrolsis –SHS - Cold isostatic pressing (CIPing) – Hot isostatic pressing (HIPing). Properties and Applications of CCMs.

UNIT V Advances & Applications of composites

Advantages of carbon matrix – limitations of carbon matrix carbon fibre – chemical vapour deposition of carbon on carbon fibre perform. Properties and applications of Carbon-carbon composites. Composites for aerospace applications.Bio degradability, introduction of bio composites, classification, processing of bio composites, applications of bio composites - Mechanical, Biomedical, automobile Engineering.

Textbooks:

1. Chawla K.K, Composite materials, 2/e, Springer – Verlag, 1998.
2. Mathews F.L. and Rawlings R.D., Chapman and Hall, Composite Materials: Engineering and Science, 1/e, England, 1994.

Reference Books:

1. H K Shivanand, B V Babu Kiran, Composite Materials, ASIAN BOOKS, 2011.
2. A.B. Strong , Fundamentals of Composite Manufacturing, SME Publications, 1989.
3. S.C. Sharma, Composite materials, Narosa Publications, 2000.
4. Maureen Mitton, Hand Book of Bio plastics & Bio composites for Engineering applications, John Wiley publications, 2011.

Online Learning Resources:

- https://nptel.ac.in/courses/112104229
- https://nptel.ac.in/courses/112104168
- https://nptel.ac.in/courses/101104010
- https://nptel.ac.in/courses/105108124
- https://nptel.ac.in/courses/112104221

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

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(20A04706) MICROCONTROLLERS & APPLICATIONS
(Open Elective Course –IV)

Course Objectives:

- Describe the Architecture of 8051 Microcontroller and Interfacing of 8051 to external memory.
- Write 8051 Assembly level programs using 8051 instruction set.
- Describe the Interrupt system, operation of Timers/Counters and Serial port of 8051.
- Interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to 8051.

Course Outcomes:

- Understand the importance of Microcontroller and Acquire the knowledge of Architecture of 8051 Microcontroller.
- Apply and Interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to using 8051 I/O ports.
- Develop the 8051 Assembly level programs using 8051 Instruction set
- Design the Interrupt system, operation of Timers/Counters and Serial port of 8051

UNIT 1 8051 Microcontroller:
Microprocessor Vs Microcontroller, Embedded Systems, Embedded Microcontrollers, 8051 Architecture- Registers, Pin diagram, I/O ports functions, Internal Memory organization. External Memory (ROM & RAM) interfacing.

UNIT II
Addressing Modes, Data Transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Bit manipulation instructions. Simple Assembly language program examples to use these instructions.

UNIT III
8051 Stack, Stack and Subroutine instructions. Simple Assembly language program examples to use subroutine instructions.8051 Timers and Counters – Operation and Assembly language programming to generate a pulse using Mode-1 and a square wave using Mode- 2 on a port pin.

UNIT IV
8051 Serial Communication- Basics of Serial Data Communication, RS- 232 standard, 9 pin RS232 signals, Simple Serial Port programming in Assembly and C to transmit a message and to receive data serially.8051 Interrupts. 8051 Assembly language programming to generate an external interrupt using a switch.

UNIT V
8051 C programming to generate a square waveform on a port pin using a Timer interrupt. Interfacing 8051 to ADC-0804, DAC, LCD and Interfacing with relays and opto isolators, Stepper Motor Interfacing, DC motor interfacing, PWM generation using 8051.

Textbooks:

1. Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; “The 8051 Microcontroller and Embedded Systems – using assembly and C”, PHI, 2006 / Pearson, 2006.
2. Kenneth J. Ayala, “The 8051 Microcontroller”, 3rd Edition, Thomson/Cengage Learning.

References:

1. Manish K Patel, “The 8051 Microcontroller Based Embedded Systems”, McGraw Hill, 2014, ISBN: 978-93-329-0125-4.
2. Raj Kamal, “Microcontrollers: Architecture, Programming, Interfacing and System Design”, Pearson Education, 2005.

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B.Tech IV-I Sem

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(20A27705) WASTE AND EFFLUENT MANAGEMENT (OPEN ELECTIVE-IV)

Course Objectives:

- To understand the wastewater treatment process.
- To gain knowledge on waste disposal in various ways.
- To know about advances in wastewater treatment.

Course Outcomes:

- Acquires knowledge on technologies used for chemical and biological methods of waste water and effluent treatment

UNIT I

Wastewater Treatment an Overview: Terminology – Regulations – Health and Environment Concerns in waste water management – Constituents in waste water inorganic – Organic and metallic constituents. Process Analysis and Selection: Components of waste water flows – Analysis of Data – Reactors used in waste water treatment – Mass Balance Analysis – Modeling of ideal and non ideal flow in Reactors – Process Selection

UNIT II

Waste disposal methods – Physical, Chemical & Biological; Economical aspects of waste treatment and disposal. Treatment methods of solid wastes: Biological composting, drying and incineration; Design of Solid Waste Management System: Landfill Digester, Vermicomposting Pit.

UNIT III

Introduction: Classification and characterization of food industrial wastes from Fruit and Vegetable processing industry, Beverage industry; Fish, Meat & Poultry industry, Sugar industry and Dairy industry.

Chemical Unit Processes: Role of unit processes in waste water treatment chemical coagulation – Chemical precipitation for improved plant performance chemical oxidation – Neutralization – Chemical Storage

UNIT IV

Biological Treatment: Overview of biological Treatment – Microbial metabolism – Bacterial growth and energetics – Aerobic biological oxidation – Anaerobic fermentation and oxidation – Trickling filters – Rotating biological contractors – Combined aerobic processes – Activated sludge film packing.

UNIT V

Advanced Wastewater Treatment: Technologies used in advanced treatment – Classification of technologies. Removal of Colloids and suspended particles – Depth Filtration – Surface Filtration – Membrane Filtration- Absorption – Ion Exchange – Advanced oxidation process.

Textbooks:

1. Herzka A & Booth RG; “Food Industry Wastes: Disposal and Recovery”; Applied Science Pub Ltd. 1981,
2. Fair GM, Geyer JC & Okun DA; “Water & Wastewater Engineering”; John Wiley & Sons, Inc. 1986,

References:

1. GE; “Symposium: Processing Agricultural & Municipal Wastes”; AVI. 1973,
2. Inglett Green JH & Kramer A; “Food Processing Waste Management”; AVI. 1979,
3. Rittmann BE & McCarty PL; “Environmental Biotechnology: Principles and Applications”; Mc-Grow-Hill International editions2001,.
4. Bhattacharyya B C & Banerjee R; “Environmental Biotechnology”; Oxford University Press.
5. Bartlett RE; “ Wastewater Treatment; Applied Science” Pub Ltd.
6. G. Tchobanoglous, FI Biston, “Waste water Engineering Treatment and Reuse”: Mc Graw Hill, 2002.
7. “Industrial Waste Water Management Treatment and Disposal by Waste Water” 3rd Edition Mc Graw Hill 2008

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B.Tech IV-I Sem

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(20A54703) NUMBER THEORY AND ITS APPLICATIONS
(OPEN ELECTIVE-IV)

Course Objectives:

This course enables the students to learn the concepts of number theory and its applications to information security.

Course Outcomes:

- Understand number theory and its properties.
- Understand principles on congruences
- Develop the knowledge to apply various applications
- Develop various encryption methods and its applications.

UNIT I Integers, Greatest common divisors and prime Factorization

The well-ordering property-Divisibility-Representation of integers-Computer operations with integers-Prime numbers-Greatest common divisors-The Euclidean algorithm -The fundamental theorem of arithmetic-Factorization of integers and the Fermat numbers-Linear Diophantine equations

UNIT II Congruences

Introduction to congruences -Linear congruences-The Chinese remainder theorem-Systems of linear congruences

UNIT III Applications of Congruences

Divisibility tests-The perpetual calendar-Round-robin tournaments-Computer file storage and hashing functions. Wilson's theorem and Fermat's little theorem- Pseudo primes- Euler's theorem- Euler's p hi-function- The sum and number of divisors- Perfect numbers and Mersenne primes.

UNIT IV Finite fields & Primality, factoring

Finite fields- quadratic residues and reciprocity-Pseudo primes-rho method-fermat factorization and factor bases.

UNIT V Cryptology

Basic terminology-complexity theorem-Character ciphers-Block ciphers-Exponentiation ciphers-Public-key cryptography-Discrete logarithm-Knapsack ciphers- RSA algorithm-Some applications to computer science.

Textbooks:

1. Elementary number theory and its applications, Kenneth H Rosen, AT & T Information systems & Bell laboratories.
2. A course in Number theory & Cryptography, Neal Koblitz, Springer.

Reference Books:

1. An Introduction To The Theory Of Numbers, Herbert S. Zuckerman, Hugh L. Montgomery, Ivan Niven, wiley publishers
2. Introduction to Analytic number theory-Tom M Apostol, springer
3. Elementary number theory, VK Krishnan, Universities press

Online Learning Resources:

https://www.slideshare.net/ItishreeDash3/a-study-on-number-theory-and-its-applications

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

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(20A56703) SMART MATERIALS AND DEVICES
(OPEN ELECTIVE-IV)

Course Objectives:

- To provide exposure to smart materials and their engineering applications.
- To impart knowledge on the basics and phenomenon behind the working of smart materials
- To enlighten the properties exhibited by smart materials
- To educate various techniques used to synthesize and characterize smart materials
- To identify the required smart material for distinct applications/devices

Course Outcomes:

- to recognize the need of smart materials
- to understand the working principles of smart materials
- to know different techniques used to synthesize and characterize smart materials
- to exploit the properties of smart materials
- to make use of smart materials for different applications

UNIT I

Introduction: Historical account of the discovery and development of smart materials, Two phases: Austenite and Martensite, Temperature induced phase changes, Shape memory effect, Pseudoelasticity, One-way shape memory effect, Two-way shape memory effect.

UNIT II: Properties of Smart Materials: Physical principles of optical, Electrical, Dielectric, Piezoelectric, Ferroelectric, Pyroelectric and Magnetic properties of smart materials

UNIT III: Synthesis of smart materials: Solid state reaction technique, Chemical route: Chemical vapour deposition, Sol-gel technique, Hydrothermal method, Co-precipitaiton. Green synthesis, Mechanical alloying and Thin film deposition techniques: Chemical etching, Sol-gel, spray pyrolysis.

UNIT IV: Characterization techniques: X-ray diffraction, Raman spectroscopy (RS), Fourier-transform infrared reflection (FTIR), UV-Visible spectroscopy, Scanning electron microscopy (SEM), Transmission electron microscopy, Atomic force microscopy (AFM) and Differential Scanning Calorimetry (DSC).

UNIT V: Materials and Devices: Characteristics of shape memory alloys, Magnetostrictive, Optoelectronic, Piezoelectric, Metamaterials, Electro-rheological and Magneto-rheological materials and Composite materials.

Devices based on smart materials: Sensors & Actuators, MEMS and intelligent devices, Future scope of the smart materials.

Textbooks:

1. Encyclopaedia of Smart Materials- Mel Schwartz, John Wiley & Sons, Inc.2002
2. Smart Materials and Structures - M. V. Gandhi and B.S. Thompson, Champman and Hall, 1992

References:

1. Smart Materials and Technologies- M. Addington and D. L. Schodek, , Elsevier, 2005.
2. Characterization and Application of smart Materials -R. Rai, Synthesis, , Nova Science, 2011.
3. Electroceramics: Materials, Properties, Applications -A.J. Moulson and J.M. Herbert, 2nd Edn., John Wiley & Sons, 2003.
4. Piezoelectric Sensorics: Force, Strain, Pressure, Acceleration and Acoustic 1. Emission Sensors, Materials and Amplifiers, G. Gautschi, Springer, 2002.
5. Optical Metamaterials: Fundamentals and Applications -W. Cai and V. Shalaev, springer,2010.
6. Smart Materials and Structures - P. L Reece, New Research, Nova Science, 2007

NPTEL courses links

https://nptel.ac.in/courses/112/104/112104173/
https://nptel.ac.in/courses/112/104/112104251/
https://nptel.ac.in/content/storage2/courses/112104173/Mod_1_smart_mat_lec

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

L	T	P	C
3	0	0	3

(20A51703) GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT (OPEN ELECTIVE-IV)

Course Objectives:

- Learn an interdisciplinary approach to the scientific and societal issues arising from industrial chemical production, including the facets of chemistry and environmental health sciences that can be integrated to promote green chemistry and the redesign of chemicals, industrial processes and products.
- Understand the use of alternatives assessments that combine chemical, environmental health, regulatory, and business considerations to develop safer products.

Course Outcomes:

- Recognize and acquire green chemistry concepts and apply these ideas to develop respect for the inter connectedness of our world and an ethic of environmental care and sustainability.

UNIT I: PRINCIPLES AND CONCEPTS OF GREEN CHEMISTRY

Introduction, Green chemistry Principles, sustainable development and green chemistry, atom economy, atom economic: Rearrangement and addition reactions and un-economic reactions: Substitution, elimination and Wittig reactions, Reducing Toxicity. Waste - problems and Prevention: Design for degradation, Polymer recycling.

UNIT II: CATALYSIS AND GREEN CHEMISTRY

Introduction to catalysis, Heterogeneous catalysts: Basics of Heterogeneous Catalysis, Zeolites and the Bulk Chemical Industry, Heterogeneous Catalysis in the Fine Chemical and Pharmaceutical Industries, Catalytic Converters, Homogeneous catalysis: Transition Metal Catalysts with Phosphine Ligands, Greener Lewis Acids, Asymmetric Catalysis, Heterogenising the Homogenous catalysts, Phase transfer catalysis: Hazard Reduction, C–C Bond Formation, Oxidation Using Hydrogen Peroxide, Bio-catalysis and photo-catalysis with examples.

UNIT III: ORGANIC SOLVENTS: ENVIRONMENTALLY BENIGN SOLUTIONS

Organic solvents and volatile organic compounds, solvent free systems, supercritical fluids: Super critical carbondioxide, super critical water and water as a reaction solvent: water-based coatings, Ionic liquids as catalyst and solvent

UNIT IV: EMERGING GREENER TECHNOLOGIES AND ALTERNATIVE ENERGY SOURCES

Biomass as renewable resource, Energy: Fossil Fuels, Energy from Biomass, Solar Power, Other Forms of Renewable Energy, Fuel Cells, Chemicals from Renewable feedstocks: Chemicals from Renewable Feedstocks: Chemicals from Fatty Acids, Polymers from Renewable Resources, Some Other Chemicals from Natural Resources, Alternative Economies: The Syngas Economy, The Biorefinery, Design for energy efficiency: Photochemical Reactions: Advantages of and Challenges Faced by Photochemical Processes, Examples of Photochemical Reactions, Chemistry Using Microwaves: Microwave Heating, Microwave-assisted Reactions, Sonochemistry: Sonochemistry and Green Chemistry, Electrochemical Synthesis: Examples of Electrochemical Synthesis. Industrial applications of alternative environmentally benign catalytic systems for carrying out the important reactions such as selective oxidation, reduction and C-C bond formations (specific reactions).

UNIT V: GREEN PROCESSES FOR GREEN NANOSCIENCE

Introduction and traditional methods in the nanomaterials synthesis, Translating green chemistry principles for practicing Green Nanoscience. Green Synthesis of Nanophase Inorganic Materials and Metal Oxide Nanoparticles: Hydrothermal Synthesis, Reflux Synthesis, Microwave-Assisted Synthesis, Other methods for Green synthesis of metal and metal oxide nanoparticles, Green chemistry applications of Inorganic nanomaterials

Textbooks:

1. M. Lancaster, Green Chemistry an introductory text, Royal Society of Chemistry, 2002.
2. Paul T. Anastas and John C. Warner, Green Chemistry Theory and Practice, 4th Edition, Oxford University Press, USA

References:

1. Green Chemistry for Environmental Sustainability, First Edition, Sanjay K. Sharma and Ackmez Mudhoo, CRC Press, 2010.
2. Edited by Alvise Perosa and Maurizio Selva , Hand Book of Green chemistry Volume 8:Green Nanoscience, wiley-VCH, 2013.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (HSMC)– IV-I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

(20A52704) GENDER STUDIES
(OPEN ELECTIVE-IV)

HONOURS

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech CSE (AI)

L	T	P	C
3	1	0	4

(20A31H01) VIRTUAL REALITY AND AUGMENTED REALITY

Pre-requisite Fundamentals of Computer Graphics

Course Objectives:

The course is designed to

- Teach about human interaction with computers
- Demonstrate Virtual reality
- Introduce to the current state of VR Hardware and Software.
- Explain how to apply VR/MR/AR for various applications

Course Outcomes:

- After completion of the course, students will be able to
- Understand the fundamentals of VR, AR and MR
- Select appropriate software and hardware for developing VR Applications
- Design VR Applications
- Create game objects using Unity

UNIT I Introduction to Virtual Reality Lecture 8 Hrs

What is Virtual Reality, Modern VR experiences, History Repeats.
Unity: Virtually Everything for you, what is virtual reality to you, types of head-mounted displays: Desktop VR, Mobile VR, the difference between virtual reality and augmented reality, Applications vs Games, Types of VR experiences, and Technical skills that are important to VR.

UNIT II **Bird's-Eye View** Lecture 10 Hrs

Hardware, Software, Human Physiology and Perception.
Unity: Objects and Scale: Getting started with unity, creating a simple Diorama, Measurement tools, First Person Character: Understanding the Unity characters, Unity standard assets.

UNIT III **The Geometry of Virtual Worlds & Light and Optics** Lecture 8 Hrs

Geometric Models, Changing Position and Orientation, Axis-Angle Representations of Rotation, Viewing Transformations, Chaining the Transformations
Light and Optics: Basic behavior of light, lenses, Optical Aberrations**,** Human Eye, Cameras, and Displays

UNIT IV **The Physiology of Human Vision** Lecture 9 Hrs

From the Cornea to Photoreceptors, From Photoreceptors to the Visual Cortex, Eye Movements, Implications for VR

UNIT V **Motion in Real and Virtual Worlds** Lecture 8 Hrs

The Vestibular System, Physics in the Virtual World.
Audio: The Physics of Sound, the Physiology of Human Hearing, Auditory Perception

Textbooks:

1. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016
2. Unity Virtual reality Projects, Jonathan Linowes, PACKT Publishing.

Reference Books:

1. Gerard Jounghyun Kim, “Designing Virtual Systems: The Structured Approach”, 2005.
2. Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, “3D User Interfaces, Theory and Practice”, Addison Wesley, USA, 2005.

3. Oliver Bimber and Ramesh Raskar, “Spatial Augmented Reality: Merging Real and Virtual Worlds”, 2005.
4. Burdea, Grigore C and Philippe Coiffet, “Virtual Reality Technology”, Wiley Interscience, India, 2003.

Online Learning Resources:

1. Coursera: Virtual Reality Specialization
2. NPTEL course: Prof. Steven LaValle, Virtual Reality, IIT Madras

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech CSE (AI) **L T P C**
3 1 0 4

(20A31H02) SELF-AWARE AI

Pre-requisite **Artificial Intelligence**

Course Objectives:

The course is designed to

- To have an appreciation for and understanding of both the achievements of AI and the theory underlying those achievements. To have an appreciation for the engineering issues underlying the design of AI systems.
- To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language.

Course Outcomes:

After completion of the course, students will be able to

- Design user interfaces to improve human–AI interaction and real-time decision-making.
- Evaluate the advantages, disadvantages, challenges, and ramifications of human–AI augmentation.
- Design and develop symbiotic human–AI systems that balance the information processing power of computational systems with human intelligence and decision making.
- Design and evaluate conversational interfaces for different users and contexts of use.

UNIT I Lecture 8 Hrs

The secret of the automaton, self-driving cars and the darpa grand challenge, keeping within the lanes, yielding at intersections: the brain of a self-driving car.

UNIT II Lecture 10 Hrs

Netflix and the recommendation–engine challenge, ensembles of teams: the Netflix prize winners, teaching computers by giving them treats, how to beat Atari games by using neural networks.

Lecture 8 Hrs

UNIT III

Artificial neural networks' view of the world, looking under the hood of deep neural networks, neural networks that can hear, speak, and remember.

UNIT IV Lecture 9 Hrs

Understanding natural language (and jeopardy! questions), mining the best jeopardy! , brute-force search your way to a good strategy.

UNIT V Lecture 8 Hrs

Expert-level play for the game of go, real-time ai and star craft, five decades (or more) from now.

Textbooks:

1. Kevin Scott, "HOW SMART MACHINES THINK", The MIT Press, 2018.

Reference Books:

1.Dennis Rothman, Artificial Intelligence by Example: Develop machine intelligence from scratch using real artificial intelligence use cases, Packt Publisher, 2018

2.Laurence Moroney, AI and Machine Learning for Coders: A Programmers guide to artificial intelligence, O'Reilly, 2020

Online Learning Resources:

https://ai-for-all.in

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech CSE (AI & ML) **L T P C**

3 1 0 4

(20A31H03) ETHICS AND PRIVACY IN AI

Course Objectives:

The course is designed to

- To understand the need for ensuring ethics in AI
- To understand ethical issues with the development of AI agents
- To apply the ethical considerations in different AI applications
- To evaluate the relation of ethics with nature
- To overcome the risk for Human rights and other fundamental values

Course Outcomes:

After completion of the course, students will be able to

- Understand the ethical issues in the development of AI agents
- Learn the ethical considerations of AI with perspectives on ethical values
- Apply the ethical policies in AI based applications and Robot development
- To implement the AI concepts to societal problems by adapting the legal concepts by securing fundamental rights.
- This study will help to overcome the evil genesis in the concepts of AI.

UNIT I **Introduction, What Do We Need to Understand About Ethics?** Lecture 8 Hrs

Introduction: Artificial Intelligence and Ethics, Why Ethics in AI? Why Now?, Current Initiatives in AI and Ethics, Codes of Ethics in Context: Other Approaches to Ethical Questions in AI

What Do We Need to Understand About Ethics?: A Preliminary Plea: Ethics Is Not About 'Banning' Things, Normative Ethical Theories, Ethics and Empirical Evidence, So Why Do We Even Need Ethics?, So, With What Sort of Issues Is Ethics Concerned?, Who (orWhat) Is The Proper Object of Moral Concerns, and How Widely Should Our Concerns Extend?, Four Domains of Ethics: Self, Friend, Stranger, World, What Counts as Adequate Justification and Argumentin Ethics?, Moral Relativism, Moral Justification and AI, A Distributed Morality?, Moral Agents, Moral Motivation, AI, Codes of Ethics and the Law

UNIT II **Does AIRaise Any Distinctive Ethical Questions? Codes of Professional Ethics** Lecture 10 Hrs

Does AIRaise Any Distinctive Ethical Questions? Methodology: Focusing in on Ethical Questions, Many Ethical Issues in AI Are Shared with Other Rapidly Developing Technology, Ethical Questions Arise from AI's Typical Use to Enhance, Supplement, or Replace the Work of Humans, We Also Need to Consider the Methods of Production of AI, Hype in AI and Implications for Methodology in Ethics

Codes of Professional Ethics: Introduction: The Varieties of Ethical Codes, Professional Codes of Ethics Tendto Have Certain Commonalities, Codes of Ethics and Institutional Backing, The Context of Codes of Ethics, Can Codes of Ethics Make the Situation Worse? Yes

UNIT III **How AI Challenges Professional Ethics, Developing Codes of Ethics Amidst Fast Technological Change** Lecture 8 Hrs

How AI Challenges Professional Ethics: AI Professional Organizations and Companies, and the Nature of Its Development and Production, Gradients of Professional Power and Vulnerability in AI, A Third Layer of Complexity in Codes of Professional Ethics for AI: The Behaviour of Machines, The Authority of Any Resulting Codes.

Developing Codes of Ethics Amidst Fast Technological Change: Social, Cultural and Technological Change and Ethics, Social, Cultural, Economic and Technological Change: The Example of AI and Employment, Regulating for Whom? The Global Reach of AI, Universalism, and Relativism, Diversity in Participation as Part of the Solution.

UNIT IV **Some Characteristic Pitfalls in Considering the Ethics of AI, and What to Do About Them, Some Suggestions for How to Proceed** Lecture 9 Hrs

Some Characteristic Pitfalls in Considering the Ethics of AI, and
What to Do About Them: The Idealisation of Human and of Machine Agency, Building Ethics into AI and the Idealisation of Moral Agency, Replacing and Enhancing Human Agency, Boundaries and AI, Addressing the Increased Gradient of Vulnerability, Common Language, Miscommunication and the Search for Clarity.
Some Suggestions for How to Proceed: Organisations and Codes, Procedures for Drawing Up and Implementing Codes, The Content of Codes, Thinking About Ethical Issues in Developing and Implementing Codes of Ethics, Asilomar AI Principles

UNIT V **An Introduction to Privacy Aspects of Information and Communication Technologies, Data Mining in Large Databases** Lecture 8 Hrs

Introduction, Privacy and the Internet, Privacy in Databases, Privacy in Ubiquitous Computing.
Data Mining in Large Databases— Strategies for Managing the Trade-Off Between Societal Benefit and Individual Privacy: Introduction, Examples of data-collecting institutions and data users, Strategies for controlling privacy, Measures of the utility of published data sets and outputs.

Textbooks:

1. Paula Boddington," Towards a Code of Ethics for Artificial Intelligence", Springer.
2. Agusti Solanas & Antoni Martínez-Ballesté "Advances in Artificial Intelligence for Privacy Protection and Security" World Scientific

Reference Books:

1. "Oxford Handbook of Ethics of AI",MarkusD.Dubber frank pasquale sunit Das,oxford university press.

Online Learning Resources:

1. Coursera: Ethics of Artificial Intelligence
2. Coursera: Artificial Intelligence Privacy and Convenience