

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY**CIRCULAR NO.SU/Engg./B.Tech./70/2022**

It is hereby inform to all concerned that, the syllabi prepared by the Board of Studies & recommended by the Dean, Faculty of Science & Technology, **the Academic Council at its meeting held on 01 November 2021 has accepted revised following syllabus of Bachelor of Technology Third Year (Vth & VIth semester) in accordance with Choice Based Credit & Grading System as per guidelines of AICTE as appended herewith.**

Sr.No.	Syllabi as per CBC & GS
[1]	B.Tech. [Civil Engineering],
[2]	B.Tech. [Mechanical Engineering],
[3]	B.Tech. [Plastic and Polymer Engineering],
[4]	B.Tech. [Electronics and Telecommunication Engineering],
[5]	B.Tech. [Electrical Engineering],
[6]	B.Tech. [Computer Science & Engineering].
[7]	B.Tech.[Agricultural Engineering]

This is effective from the Academic Year 2021-22 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO.SU/2022/ 6330-38
Date:- 07.01.2022.

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*Deputy Registrar,
Academic Section*

Copy forwarded with compliments to :-

- 1] **The Principal of all concerned Colleges,**
Dr. Babasaheb Ambedkar Marathwada University,
- 2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

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- 1] **The Director, Board of Examinations & Evaluation, Dr.BAMU,A'bad.**
- 2] The Section Officer,[Engg.Unit] Examination Branch,Dr.BAMU,A'bad.
- 3] The Programmer [Computer Unit-1] Examinations, Dr.BAMU,A'bad.
- 4] The Programmer [Computer Unit-2] Examinations, Dr.BAMU,A'bad.
- 5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.BAMU,A'bad.
- 6] The Public Relation Officer, Dr.BAMU,A'bad.
- 7] The Record Keeper, Dr.BAMU,A'bad.

**Dr. Babasaheb Ambedkar Marathwada University,
Aurangabad-431004**



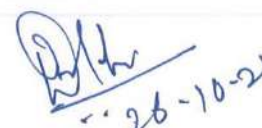
**Revised Syllabus of Third Year (TY)
Bachelor of Technology
Computer Science and Engineering
(V & VI Semester)**

Under Choice Based Credit System (CBCS)

Under Faculty of Science and Technology

(Effective from 2021-22 and onwards)

Syllabus Structure w.e.f. 2021-2022 (Choice Based Credit System)														
TY B. Tech. (Computer Science and Engineering)														
Semester-V														
Course Code	Course Name	Teaching Scheme (Hours/Week)			Examination Scheme and Marks							Credits		
		Theory	Tutorial	Practical	MSE-I	MSE-II	TA	ESE	TW	PR/OR	Total	TH	TUT	TW/PR
CSE301	Software Engineering	3	-	-	15	15	10	60	-	-	100	3	-	-
CSE302	Design and Analysis of Algorithms	3	-	-	15	15	10	60	-	-	100	3	-	-
BSH303	Managerial Economics, Finance & Costing	3	-	-	15	15	10	60	-	-	100	3	-	-
CSE341-CSE343	Professional Elective Course-II	3	-	-	15	15	10	60	-	-	100	3	-	-
	Open Elective-I	3	-	-	15	15	10	60	-	-	100	3	-	-
CSE321	Lab: Software Engineering	-	-	2	-	-	-	-	-	25	25	-	-	1
CSE322	Lab: Design and Analysis of Algorithms	-	-	2	-	-	-	-	-	25	25	-	-	1
CSE323-325	Lab: Professional Elective Courses-II	-	-	2	-	-	-	-	25	-	25	-	-	1
CSE326	Minor Project	-	-	2	-	-	-	-	25	-	25	-	-	1
CSE327	Lab: Introduction to MEAN Stack	-	-	2	-	-	-	-	-	25	25	-	-	1
CSE328	Lab: Experiential/ Problem Based Learning	-	-	2	-	-	-	-	25	-	25	-	-	1
		15	-	12	75	75	50	300	75	75	650	15	-	6
Semester-VI														
Course Code	Course Name	Teaching Scheme (Hours/Week)			Examination Scheme and Marks							Credits		
		Theory	Tutorial	Practical	MSE-I	MSE-II	TA	ESE	TW	PR/OR	Total	TH	TUT	TW/PR
CSE351	Operating System	3	-	-	15	15	10	60	-	-	100	3	-	-
CSE352	ANN and Fuzzy Logic	3	-	-	15	15	10	60	-	-	100	3	-	-
CSE353	Formal Languages & Automata Theory	3	-	-	15	15	10	60	-	-	100	3	-	-
CSE391-393	Professional Elective Course-III	3	-	-	15	15	10	60	-	-	100	3	-	-
	Open Elective-II	3	-	-	15	15	10	60	-	-	100	3	-	-
CSE371	Lab: Operating System	-	-	2	-	-	-	-	-	25	25	-	-	1
CSE372	Lab: ANN and Fuzzy Logic	-	-	2	-	-	-	-	-	25	25	-	-	1
CSE373	Lab: Open-Source Technologies	-	-	2	-	-	-	-	-	25	25	-	-	1
CSE374	Major Project-I	-	-	4	-	-	-	-	-	50	50	-	-	2
CSE375	Lab: Cloud Computing	-	-	2	-	-	-	-	25	-	25	-	-	1
	Mandatory Non-Credit Course (Audit Course)	2												
		17	-	12	75	75	50	300	25	125	650	15	-	6
MSE- Mid Semester Exam, ESE- End Semester Examination, TH-Theory, OR- Oral, TA-Teacher Assessment, TW- Term Work, PR- Practical, Tut- Tutorial														

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Professional Elective Courses-II (Semester-V)

Group A	Group B	Group C
CSE341: Software Testing	CSE342: Digital Image Processing	CSE343: Distributed System

Professional Elective Courses-III (Semester-VI)

Group A	Group B	Group C
CSE391: Modeling and Simulation	CSE392: Pattern Recognition	CSE393: Wireless Networks

List of Open Elective-I (Semester V)

Sr. No.	Offered by Department	Name of Course	Course Code
1.	Agricultural Engineering	Statistical Methods in Engineering	AED331
2.	Civil Engineering	Environmental Impact Assessment	CED331
3.	Computer Science and Engineering	Artificial Intelligence and its Applications	CSE331
4.	Electrical Engineering	Special Purpose Machines	EED331
5.	Electronics and Telecommunications Engineering	Electronic Product Design	ETC331
6.	Mechanical Engineering	Operations Research	MED331
7.	Plastic and Polymer Engineering	Introduction to Nanotechnology	PPE331

List of Open Elective-II (Semester VI)

Sr. No.	Offered by Department	Name of Course	Course Code
1.	Agricultural Engineering	Fundamentals of Bioenergy	AED381
2.	Civil Engineering	Solid Waste Management	CED381
3.	Computer Science and Engineering	Information & Cyber Security	CSE381
4.	Electrical Engineering	Electrical Materials	EED381
5.	Electronics and Telecommunications Engineering	Internet of Things	ETC381
6.	Mechanical Engineering	Industry 4.0	MED381
7.	Plastic and Polymer Engineering	Polymer Recycling and Waste Management	PPE381

Mandatory Non-Credit Course (Audit Course) (Semester VI)

Sr. No.	Offered by Department	Course	Course code
1.	First Year	German Language	BSH807
2.	First Year	Japanese Language	BSH808
3.	Civil Engineering	Professional Ethics and Constitution of India	CED801
4.	Computer Science and Engineering	Green Computing	CSE801
5.	Electronics and Telecommunications Engineering	Smart Cities	ETC801
6.	Mechanical Engineering	Research Methodology	MED801
7.	Plastic and Polymer Engineering	Industrial Safety and Management	PPE801

[Signature]
28.10.21

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Computer Science and Engineering) Semester V	
Course Code: CSE301 Course: Software Engineering Teaching Scheme: Theory: 3Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15Marks Mid Semester Examination-II: 15Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3Hrs
Prerequisite	Database, Data Structure, Object Oriented Concepts
Objectives	1. To learn and understand the principles of Software Engineering 2. To be acquainted with methods of capturing, specifying, visualizing, and analyzing software requirements. 3. To apply Design and Testing principles to S/W project development. 4. To understand project management through life cycle of the project. 5. To understand software quality attributes.
Unit-I	Introduction to Software Engineering, Software Process Models: Software Engineering Fundamentals: Nature of Software, Software Engineering Principles, The Software Process, Software Myths. Process Models: A Generic Process Model, Prescriptive Process Models: The Waterfall, Incremental Process(RAD), Evolutionary Process, Unified Process, Concurrent. Advanced Process Models & Tools: Agile software development: Agile methods, Plan-driven and agile development, Extreme programming Practices, Testing in XP, Pair programming. Introduction to agile tools: JIRA, Kanban. (6 Hrs)
Unit-II	Software Requirements Engineering& Analysis: Requirements Engineering: User and system requirements, Functional and non-functional requirements, Types & Metrics, A spiral view of the requirements engineering process. Software Requirements Specification (SRS): The software requirements Specification document, The structure of SRS, Ways of writing a SRS, structured & tabular SRS for an insulin pump case study, Requirements elicitation & Analysis: Process, Requirements validation, Requirements management. (6 Hrs)
Unit-III	Design Process & quality, Design Concepts, The design Model, Pattern-based Software Design. Architectural Design : Design Decisions, Views, Patterns, Application Architectures, Modeling Component level Design: component, Designing class based components, conducting component-level design, User Interface Design: The golden rules, Interface Design steps & Analysis, Design Evaluation, Case Study: Web App Interface Design. (6 Hrs)
Unit-IV	Project Management: Process, Metrics, Estimations & Risks Project Management Concepts: The Management Spectrum, People, Product, Process, Project, The W5HH Principle, Metrics in the Process and Project Domains, Software Measurement : size & function oriented metrics(FP & LOC), Metrics for Project and Software Quality, Project Estimation : Observations on Estimation, Project Planning Process, Software Scope and feasibility, Resources: Human Resources, Reusable software, Environmental Resources. Software Project Estimation,

	Decomposition Techniques, Empirical Estimation Models: Structure, COCOMO II, Estimation of Object-oriented Projects, Specialized Estimation (6 Hrs)				
Unit-V	Project Scheduling: Basic Concepts, Defining a Task Set for the Software Project, Defining Task Network, Scheduling with time-line charts, Schedule tracking Project Risk Management : Risk Analysis & Management: Reactive versus Proactive Risk Strategies, Software Risks, Risk Identification, Risk Projection, Risk Refinement, Risk Mitigation, Risks Monitoring and Management, The RMMM plan for case study project (6 Hrs)				
Unit-VI	Software Configuration Management: The SCM repository, SCM process, Configuration management for WebApps. Maintenance & Reengineering: Software Maintenance, Software Supportability, Reengineering, Business Process Reengineering, Software Reengineering, Reverse Engineering, Restructuring, Forward Engineering. Introduction to Software Testing: Principles of Testing, Testing Life Cycle, Phases of Testing, Types of Testing, (6 Hrs)				
Text:	Sr. No.	Title	Author	Publication	Edition
	1	Software Engineering: A Practitioner's Approach	Roger Pressman	McGraw Hill, ISBN 0-07-337597-7	7 th
	2	Software Engineering	Ian Sommerville	Addison and Wesley, ISBN 0-13-703515-2	2 nd
Textbooks/ Reference Books	1	Fundamentals of Software Engineering	Carlo Ghezzi,	Prentice Hall India, ISBN-10: 0133056996	1 st
	2	Fundamentals of Software Engineering	Rajib Mall	Prentice Hall India, ISBN-13: 978-8120348981	1 st
	3	An Integrated Approach to Software Engineering.	Pankaj Jalote	Springer, ISBN 13: 9788173192715	3 rd
	4	Handbook of Software Engineering and Knowledge Engineering	S K Chang	World Scientific, Vol I, II, ISBN: 978-981-02-4973-1	1 st
	5	Handbook of Software	Tom Halt	Clanye	1 st

		Engineering		International, ISBN-10: 1632402939	
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Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Computer Science and Engineering) Semester V					
Course Code: CSE302 Course: Design and Analysis of Algorithms Teaching Scheme: Theory: 03 Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration):03 Hrs		
Prerequisite	Data Structure				
Objectives	1. To learn the concept of Algorithm 2. To learn the concept of efficiency and performance of algorithm 3. To learn the different criteria to determine best solution for a given problem 4. To learn the various techniques of writing algorithm 5. To apply these concepts to various areas of computer science				
Unit-I	Introduction What is algorithm? Algorithm Specification-Pseudocode, Conventions, Performance Analysis- space and time complexities, Growth of function – Big-Oh, Omega, theta notation. Code Tuning techniques. (6 Hrs)				
Unit-II	Divide And Conquer: General method, Binary search, Finding maximum and minimum, Merge sort, Quick sort, Selection, Insertion sort, Strasson's Matrix multiplication (6 Hrs)				
Unit-III	The greedy Method : General method, Optimal storage on tape, Knapsack problem ,Job sequencing with deadlines, Optimal merge patterns, minimum spanning tree, Single source shortest path, Activity Selection Problem (6 Hrs)				
Unit-IV	Dynamic programming : General method, Multistage graph, All pair shortest path, Optimal binary search tree, String Editing, 0/1 knapsack, traveling sales person problem, longest increasing subsequences (6 Hrs)				
Unit-V	Basic search and traversing techniques: The techniques for Binary tree and Graphs, Code optimization, connected components and Spanning tree, Bi-connected components and DFS (6 Hrs)				
Unit-VI	Backtracking: General method , 8 queen problem, sum of subsets, graph coloring, Hamiltonian cycle (6 Hrs)				
Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Fundamentals of Computer Algorithm	Elias Horwittz, Sartaj Sahani	Galgotia Publication.	4 th
	2.	The Design and analysis of	Aho, Hopcroft Ullman	Addison	4 th

	Computer Algorithm		s Wesely	
3.	Introduction to Algorithms	T Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest	McGra w-Hill	3 rd

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester V	
Course Code: BSH303 Course: Managerial Economics, Finance and Costing Teaching Scheme: Theory: 3 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs
Prerequisite	Basic knowledge of concepts of economics.
Objectives	On the completion of this course, the learner will be able to 1. Correlate various micro and macro-economic variables and solve numerical problems 2. Analyse, interpret the financial statements, and decide upon the health of a firm. 3. Appreciate and illustrate Economic/Industrial/Trade policies and their implications and Role played by various financial institutions/banks. 4. Apply costing and accounting and costing practices in solving real life problems
Unit I	Managerial Economics Part-I: Introduction- Economics, basic concepts - utility, wealth, welfare, price, markets, and opportunity cost. Micro - and macro- economics, economics of growth and development. (4 Hrs)
Unit II	Managerial Economics Part-II: Demand and supply analysis: Law and elasticity of demand and supply. Demand function. Market structure - competition, monopoly, oligopoly and imperfect competition. Market imperfections and state interventions. Role of government; monetary, fiscal and trade policies, BOP, industrial policy; instruments of government policy; taxation, incentives, budget. Theory of firm: Production and Cost analysis for short run and long run. Cost-Output Relationship: Cost Function, Cost-Output relationships in Short Run and Long Run. Revenue Analysis and Pricing Policies. (8 Hrs)
Unit III	Finance Part-I: Introduction, Basic business function, sources of finance and their relative importance. Long and short term finance. Fund allocation, alternative uses of finance. Time value of money. Analysis of financial statements –Ratio analysis using balance sheet, profit and loss account. Capital budgeting decisions- type, nature and evaluation criteria: NPV, IRR, Payback. (6 Hrs)
Unit IV	Finance Part-II: Working capital management. Financial markets; money markets, bill market, discount houses, call loan market, etc., Capital markets; mutual funds, stock markets, industrial banks, world bank, UTI, IDBI, ICICI, SEBI and state finance corporations. (6 Hrs)
Unit V	Costing Part-I: Cost classification: Cost ascertainment; allocation, apportionment, absorption of overheads and non-production cost; overhead analysis, absorption methods, general considerations. Job costing; factory job costing, contract cost. Unit costing; output and operating cost, simple process costing, normal and abnormal losses in process, waste, scrap, bye-and joint products. Marginal costs and breakdown

	charges.					(6 Hrs)
Unit VI	Costing Part-II: Cost planning and control, standard cost and budgetary control, setting standards, variance analysis. Cost reduction; tools, techniques and productivity. Depreciation; causes and significance, methods of providing for depreciation, book values, taxes and depreciation.					(6 Hrs)
Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition	
	1	Economics	Paul Samuelson and William Nordhaus	Tata McGraw Hill.	2005	
	2	Financial Management	Prasanna Chandra	McGraw Hill.	10 th	
	3	Cost Accounting	Jawaharlal	Tata McGraw Hill (TMH).	3 rd	
	4	Finance Sense - Text and Cases	Prasanna Chandra	Tata McGraw Hill	4 th	
	5	Managerial Economics	Varshney and Maheshwari	Sultan Chand and Sons, New Delhi	22 nd	
	6	Indian Economy	Ruddar Datt and Sundaram	S.Chand Publication	72 nd	
	7	Financial institutions and markets	L.M. Bhole and Jitendra Mahakud	McGraw Hill Education.	6 th	
	8	Managerial Economics	Paul Keat, Philip Young and Sreejata Banerjee	Pearson Publication	7 th	
Web Resources:	1	www.nptel.ac.in				

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Computer Science and Engineering) Semester V					
Course Code: CSE341 Course: Professional Elective Courses-II (Software Testing) Teaching Scheme: Theory: 03 Hrs / week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration):03 Hrs		
Prerequisite	Basics of Software Engineering				
Objectives	1. To understand the importance of software testing 2. To understand software bug detection and resolution techniques				
Unit-I	Software Testing Background: Infamous software error case studies: Disney's Lion king, Intel bug, The Y2K Bug, Software bug, bugs occurrence, The cost of bugs, What exactly does a software tester do?, What makes a good software tester? (6 Hrs)				
Unit-II	The Software Development Process: Product components, software project staff, and software development life cycle models: Big bang model, Code and fix model, Waterfall model, spiral model. (6 Hrs)				
Unit-III	The Realities Of Software Testing: Testing Axioms: Risk based exercise, The Pesticide paradox, Product specifications are never fail, Software Testing Terms and definitions: Precision and accuracy, Verification and validation, Quality and reliability. (6 Hrs)				
Unit-IV	Testing Tactics: Software testing fundamentals, Black box and white box testing, Basis path testing: Flow graph notation, Independent program paths, Deriving test cases, Graph matrices. Black box testing: Graph based testing methods, Equivalence Partitioning, Boundary value analysis. (6 Hrs)				
Unit-V	Automated Testing And Test Tools :Test tools: Viewers and monitors, Drivers, Stubs, Stress and load tools, Analysis tools. Random Testing: Dumb Monkeys, Semi-smart monkeys, smart monkeys, Realities of using test tools and automation (6 Hrs)				
Unit-VI	Software Quality Management: Software testing, Software reviews, Formal technical reviews, Test management and organizational structures, Capability Maturity model(CMM), ISO 9000 quality standards, The SQA plan. (6 Hrs)				
Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Software Testing	Ron Patton	SAMS Publication	2 nd
	2.	Software Engineering	Roger Pressman	Mc-Graw Hill publication	2 nd

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Computer Science and Engineering) Semester V	
Course Code: CSE342 Course: Professional Elective Courses-II (Digital Image Processing) Teaching Scheme: Theory: 03 Hrs / week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 03 Hrs
Prerequisite	Computer Graphics, Fourier Transform.
Objectives	1. To study the Digital Image Processing concepts. 2. To study the different Image processing algorithms to achieve desired result. 3. To study applications in image processing.
Unit-I	Introduction to Image processing Digital image, Fundamental steps in digital image processing, Components of an image processing system, Image sensing and acquisition, Image sampling and quantization, Basic relationship between pixels: Neighbors of a pixel, Adjacency, Connectivity, Regions and Boundaries, Distance Measures. (6 Hrs)
Unit-II	Intensity Transformation and Filtering Basics of intensity transformation and filtering, Basic intensity transformation functions, Histogram processing, Histogram equalization, Discrete Fourier transform(DFT), Discrete cosine transform, Fundamentals of spatial filtering, Smoothing spatial filters, Sharpening spatial filters, Basics of filtering in the frequency domain, Image smoothing using frequency domain filters, Image sharpening using frequency domain filters. (6 Hrs)
Unit-III	Image Compression Fundamentals: Coding Redundancy, Spatial and temporal Redundancy, Irrelevant Information, Measuring image Information, Fidelity Criteria, Image compression Model, Some Basic Compression Methods: Lossless Compression methods-Huffman coding, LZW coding, Run- Length Coding, Lossy Compression methods: Block Transform Coding, Image File formats: BMP, GIF, TIFF, JPEG, PNG. (6 Hrs)
Unit-IV	Image Segmentation Fundamentals : Point , Line and Edge Detection, Detection of Isolated Points, Line Detection, Edge Models, Basic Edge detection, Thresholding, Region-Based Segmentation Methods: Region Growing, Region Splitting and Merging. (6 Hrs)
Unit-V	Morphological Image Processing and Color Image Processing Morphological Image Processing: Preliminaries, Erosion and Dilation, Opening and Closing The Hit-or-Miss Transformation, Basic Morphological Algorithms: Boundary Extraction, Hole Filling. Color Image Processing: Color Fundamentals and Color Models: RGB color model, CMY and CMYK color

	models, HSI color model, Basics of Full-Color Image Processing, Color Transformations: Formulation, color complements, color slicing, Tone and color corrections. (6 Hrs)				
Unit-VI	Representation and Description Representation, Boundary Descriptors: Simple descriptors, Shape Numbers, Fourier descriptors, Statistical Moments, Regional Descriptors: Simple descriptors, Topological descriptors. (6 Hrs)				
Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1	Digital Image Processing	Rafael Gonzalez Richard Woods	Pearson Education.	3 rd
	2	Digital Image Processing using MATLAB	Rafael C Gonzalez, Richard E Woods	Pearson Education	1 st
	3	Digital Image Processing	Anil K Jain	PHI	3 rd
	4	Digital Image Processing	William K. P.	Mc Graw Hill	3 rd
	5	Digital Image Processing and Analysis	B. Chanda, D. Dutta Majumder	B Chanda & D Dutta Majumder	2 nd

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Computer Science and Engineering) Semester V	
Course Code: CSE343 Course: Professional Elective Courses-II (Distributed Systems) Teaching Scheme: Theory: 03 Hrs / week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 03 Hrs
Prerequisites	Fundamentals of Operating System
Objectives	1. To understand the fundamentals of distributed environment in complex application. 2. To get comprehensive knowledge of the architecture of distributed systems. 3. To make students aware about security issues and protection mechanism for distributed environment.
Unit-I	Introduction: Examples of distributed systems, Trends in distributed systems, Focus on Resource Sharing, Challenges. System Models: Physical models, Architectural Models, Fundamental Models. Case Study: The World Wide Web (6 Hrs)
Unit-II	Communication Inter-process Communication: Introduction, The API for the Internet Protocols, External Data Representation and Marshalling, Multicast Communication, Network Virtualization: Overlay Networks, Case Study: MPI Remote Invocation: Request-reply Protocols, Remote Procedure Call, Remote Method Invocation, Case Study: Java RMI Indirect Communication: Group Communication, Publish-subscribe Systems, Message Queues, Shared Memory approaches. (6 Hrs)
Unit-III	Middleware : Distributed Objects and Components: Introduction, Distributed Objects, Case Study: CORBA. From Objects to Components, Case Studies: Enterprise JavaBeans and Fractal. Web Services: Introduction, Web Services, SERVICE Descriptions and IDL for Web Services, A directory service for use with web services, XML security, Coordination of web services, Applications of Web Services. Peer-To-Peer Systems: Introduction, Peer-to-peer middleware, Routing overlays Application, Case Study: Squirrel. (6 Hrs)
Unit-IV	Distributed Computing: Theoretical Foundation for Distributed System: Limitation of Distributed system, Differences between Distributed systems and Parallel systems, Models of distributed computation- Interleaving Model, Happened before Model, Potential Causality Model, Shared memory Temporal ordering of events, Logical clocks and Vector Clocks (Definition and algorithm) Mutual Exclusion using Time stamps, Lamport's Algorithm for Mutual exclusion (6 Hrs)
Unit-V	Distributed Shared Memory: Distributed Shared Memory (DSM): General architecture of DSM systems, Design and implementation of DSM, Granularity,

	structure of shared memory space, consistency models, Replacement Strategy, Thrashing, approaches to DSM, and Advantages of DSM Distributed Objects and Remote Invocation: Communication between distributed objects, Remote procedure call, Events and notifications. (6 Hrs)				
Unit-VI	Hadoop : Case study- Hadoop - A distributed programming framework, Building blocks of Hadoop, Setting up SSH for Hadoop cluster, Running Hadoop, Working with Files in HDFS, Anatomy of MapReduce program, Writing basic MapReduce programs (6 Hrs)				
Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Editi on
	1	Distributed Systems – Concept and Design	George Coulouris, Jean Dollimore, Tim Kindberg, & Gordon Blair	Pearson Education.	4 th
	2	Distributed Systems – Principles and Paradigms	Andrew S. Tanenbaum & Maarten van Steen	PHI	2 nd
	3	Elements of Distributed Computing	Vijay K. Garg	Wiley Publication	-

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of T. Y. B. Tech. (All) Semester V					
Course Code: AED 331 Course: Open Elective Course-I (Statistical Methods in Engineering) Teaching Scheme: Theory: 03 Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration):03 Hrs		
Prerequisite	Basics of Statistics and Probability Distribution				
Objectives	1. To introduce different techniques involved in statistical analysis 2. To learn and practice various statistical methods for data analysis				
Unit-I	Sampling Distribution: Population and Sample, Sampling Distribution, Standard Error Sampling Distribution of Means, Sampling Distribution of Variance, Sampling Distribution of Proportions 6 Hrs				
Unit-II	Theory of Estimation: Estimation Theory, Point Estimation – Basic Concept & Notion, Interval Estimation – Interval Estimation for Large Samples, Confidence Limits for Mean, Proportion, Standard Deviation, Difference of Means, Difference of Proportions 6 Hrs				
Unit-III	Testing of Hypothesis: Statistical Hypothesis, Tests of Significance, Null Hypothesis, Alternative Hypothesis, Types of Errors in Testing of Hypothesis, Level of Significance, Critical Region, One-Tailed and Two-Tailed Tests, Critical Values and Critical Region, P-value of Test Statistic, Procedure for testing of hypothesis 6 Hrs				
Unit-IV	Large Sample Tests: Sampling of Attributes – Test for Single Proportion, Test of Significance for Difference of Proportions, Sampling of Variables - Test of Significance for a Single Mean 6 Hrs				
Unit-V	Non- Parametric Tests: Parametric Tests and Non-Parametric Tests, Sign Test, Wilcoxon Signed-Rank Test, Mann-Whitney Test 6 Hrs				
Unit-VI	Analysis of Variance (ANOVA): Introduction, Analysis of Variance, Assumptions for ANOVA test, One-Way Classification 6 Hrs				
Textbook/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Statistics for Engineers and Scientists	William Navidi	McGraw	4 th Edition
	2.	Probability & Statistics for Engineers & Scientists	Walpole, Myers, Myers Ye	Prentice Hall	9 th Edition
	3.	Fundamentals of Statistics	S.C. Gupta	Himalaya Publishing House	7 th Edition
	4.	Statistical Methods	S. P. Gupta	Sultan Chand & Sons	1 st Edition

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester V	
Course Code: CED331 Course: Open Elective-I (Environmental Impact Assessment) Teaching Scheme: Theory: 03 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks Term Work: 00 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 03 Hrs
Prerequisite	Environmental Engineering
Objectives	1. Student would overview the concepts, methods, issues and various forms and stages of EIA process. 2. Student will be able to examine the development of EIA in India and highlight the diversity of approach and impact of the EIA process.
Unit-I	Introduction and Evolution of EIA: Introduction to Environmental Impact Assessment, Origin of EIA, Stages in EIA, thorough discussion of steps in EIA. Establishments of Procedure: Legislative Option, Project Screening for EIA, Public Participation in EIA process. (6 Hrs)
Unit-II	Impact assessment: Background information, IA methods, environmental impact assessment methodology, documentation and selection process, environmental indices and indicators for describing affected environment, Life cycle assessment. (6 Hrs)
Unit-III	Air and noise environment: Prediction and assessment of impact for air and noise environment, Basic information of air quality, identification of type and quantity of air pollutant, existing air quality and air quality standards, impact prediction and assessment, mitigation. Basic information of noise, existing noise levels and standards, prediction of noise levels and assessment of impact, mitigations. (6 Hrs)
Unit-IV	Water and soil environment: Prediction and assessment of impact for water and soil environment, Basic information of water quality (Surface water and ground water), water quality standards, identification of impact, prediction of impact and assessment, mitigations. Background information of soil environment, soil and ground water standards, prediction and assessment of impact for ground water and soil, mitigations. (6 Hrs)
Unit-V	Decision Methods for Evaluation of Alternative: Public participation in environmental decision making, Regulatory requirements, environmental impact assessment process, objectives of public participation, verbal communication in EIA studies. (6 Hrs)

Unit-VI	Environmental Impact Assessment Report: Rapid and Comprehensive EIA, general structure of EIA document, Environmental management plan; post environmental monitoring. ~~Latest EIA notification by Ministry of Environment and Forest (Govt. of India):~~ Provisions in the EIA notification, Procedure for public hearing, post environmental monitoring, Procedure for obtaining Environmental clearance for construction projects. (6 Hrs)				
Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Environmental Impact Assessment	Canter R.L.,	Mc Graw Hill International	Edition, 1997.
	2.	Environmental Impact Assessment Theory and Practice	Peter Watten (Eds.)	Unwin Hyman	London (1988)
	3.	Environmental Impact Assessment	R.R. Barthwal	New Age International Publishers	1 st
	4.	Environmental Impact Analysis Handbook	John G. Rau and David C. Wooten	McGraw Hill Book Company	1 st

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad					
(Faculty of Science & Technology)					
Syllabus of Third Year B. Tech. (All) Semester V					
Course Code: CSE331 Course: Open Elective Course-I (Artificial Intelligence and its Applications) Teaching Scheme: Theory: 03 Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration):03 Hrs		
Prerequisite	Data Structures and Algorithms				
Objectives	1. To introduce different techniques involved defining and simulating an intelligence. 2. To learn and practice various Artificial Intelligence methods, algorithms, and knowledge representation schemes.				
Unit-I	Introduction: Artificial Intelligence, AI Problems and AI techniques, solving problems by searching, Problem formulation. Application of AI techniques in different branches of engineering, Basic Sciences, Medical Science and equipment, Economy and Finance (6 Hrs)				
Unit-II	Searching techniques in AI: DFS, BFS, Uniform cost search, Depth Limited Search, Iterative Deepening, Bidirectional search, Comparing Different Techniques. (6 Hrs)				
Unit-III	Heuristic functions: Hill Climbing, Simulated Annealing, Best First Search, A*, IDA*, SMA*, Crypto-Arithmetic Problem. (6 Hrs)				
Unit-IV	Agents and Environments: Structure of Intelligent agents, Types of Agents, Agent Environments PEAS representation for an Agent. A Knowledge Based Agent, Environment, Types of Environments WUMPUS WORLD Environment, Case Study: Automated Taxi, Vacuum Cleaner (6 Hrs)				
Unit-V	Expert Systems: Concept of an Expert System. Characteristics of an Expert System, Components of expert System, Concept of Knowledge Base, Components of Knowledge base, Knowledge Representation methods. Case Study: DENDRAL, MYCIN, PXDES, CaDeT (6 Hrs)				
Unit-VI	Propositional Logic: Introduction, First Order Predicate Logic, Forward and Backward Chaining, Resolution., Introduction to PROLOG and LISP (6 Hrs)				
Textbooks/ Reference books	Sr. No.	Title	Author	Publication	Edition
	1.	Artificial Intelligence: A Modern Approach	Stuart Russell and Peter Norvig	Pearson Education	2 nd
	2.	Artificial Intelligence	Elaine Rich, Kevin Knight, Shivshankar B Nair	McGraw Hill,	3 rd
	3.	Artificial Intelligence	Elaine Rich, Kevin Knight	TataMcGraw Hill	2 nd

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester V	
Course Code: EED331 Course: Open Elective-I (Special Purpose Machines) Teaching Scheme: Theory: 3 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs
Prerequisite	They should have basic knowledge about all basic laws and construction / working principle of DC and AC motors and generators,
Objectives	1. To differentiate between generalized machines and control machines. 2. To understand principle and working of different control machines. 3. To be able to identify and implement control machines.
Unit-I	Hysteresis Motors: Magnetic field production & nature of torque, Applications. Reluctance Motors: F. H. P. Reluctance motors, switched reluctance motors, Principle of working & operation, Applications. (6 Hrs)
Unit-II	Control Motors: D C servomotors, transfer function of Armature and field-controlled motors their applications, Construction of F. H. P. Induction two-phase servomotors, production of torque, Torque-speed curves-characteristics & features-dynamic equations, Methods of control, Applications. Numerical on DC and AC servos. (6 Hrs)
Unit-III	Eddy Current Devices: Construction & operation of eddy current couplings & dynamometers, merits & limitations. (4 Hrs)
Unit-IV	Tacho-Generators: Basic requirements of tacho-generators, Ideal characteristics, classification. i) D.C. Tacho Generators: Output characteristics, Deviation from no load Characteristics, Dead-zone, Tooth ripples, Temperature effect, Accuracy class. ii) Induction Tacho-generators: Operating principle, Output characteristics, Equivalent circuit, Reasons for deviation from desired characteristics, Corrective means, Advantages. iii) A. C. Tacho-generators: Construction & operation, Output characteristics, non-linearities & tooth ripples, Advantages over other tacho-generators. Dynamic characteristics of techno-generators, Applications of tacho-generators. (8 Hrs)
Unit-V	Synchro & Synchro Transformers: Different types of single phase & three-phase synchro, Differential synchro, Synchro-indicators, Their constructional features, Characteristics & applications, Synchro transformers principle, Characteristics error, applications of synchro transformers. (6 Hrs)

Unit-VI	Linear Motors: Construction, Theory of operation of a linear induction motor, System with two-dimensional & three-dimensional field patterns, Performance of linear induction motors, Effect of variation in the air gap, Effect of width & thickness of the reaction plate, Thrust of linear induction motors, Applications.				
Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	'Electrical Machine and Power Electronics'	Bhimbhra P. S	Tata McGraw Hill Publication.	2 nd
	2.	'Modern control Engineering'	Ogata K.	Prentice Hall.	2 nd
	3.	Principles of Electrical Machines	V.K. Mehta	Chand Publication	2 nd
	4.	Electrical Machines	Ashfaq Hussain	Dhanpat rai	3 rd
	5.	Electrical Machines	Nagnath Kothari	TATA McGraw Hill.	5 th
	6.	Electrical Technologies	Edward Hughes Elbs	Pearson Education	2 nd

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester V					
Course Code: ETC331 Course: Open Elective-I (Electronic Product Design) Teaching Scheme: Theory: 03Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 03Hrs		
Prerequisite	• Students should be familiar with Circuit design and PCB design				
Objectives	1. To understand the stages of product (hardware/ software) design and development. 2. To be acquainted with methods of PCB design and different tools used for PCB Design. 3. To understand the importance of testing in product design cycle. 4. To understand the processes and importance of documentation.				
Unit-I	Introduction to Electronic product Design: Product development basics, Product development stages, Redundancy, Ergonomics and Aesthetic Design consideration. (6 Hrs)				
Unit-II	Packaging, Noise and Heat management: Introduction to product packaging ,Noise in electronic circuits, Grounding, Shielding, Enclosure Sizing ,Thermal management (6 Hrs)				
Unit-III	Fundamentals of PCB and PCB design: Important terms related to PCB, Types of PCBs, PCB Design elements, PCB design Steps, Requirements of artwork, Layout rules, Grounding, Shielding, Design issues related to supply and ground conductors (6 Hrs)				
Unit-IV	Software Design : Waterfall model of software development, Phases of Software design, Goals of software design, Design of structured program, Testing and debugging of program (6 Hrs)				
Unit-V	Product Testing: Environmental Testing, Temperature testing Humidity testing, Various test on enclosures, EMI and EMC related testing, Importance of standards, Classification of standards, IEC standards (6 Hrs)				
Unit-VI	Product Documentation: Need of documentation, Types of documentation, Manual, Types of manual, Study of one typical manual, Bill of Material-examples, (6 Hrs)				
Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Electronic Product Design	R.G. Kaduskar	Wiley-India	2 nd
	2.	Integrated Circuits	K. R. Botkar	Khanna Publisher	10 th

	3.	Embedded System: A contemporary design Tool	James Peckol	Wiley	2 nd
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Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester V	
Course Code: MED331 Course: Open Elective-I (Operations Research) Teaching Scheme: Theory: 03 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs
Prerequisite	1. Fundamental knowledge and understanding of Engineering mathematics 2. Understanding of concepts of costing and management concepts
Objectives	1. To familiarize the students with formal quantitative approach to problem solving 2. To formulate real life engineering problems 3. To solve engineering problems using various Operations Research Techniques
Unit-I	Introduction to Operations Research: Basics definition, scope, objectives, phases, models, applications, and limitations of Operations Research. (2 Hrs)
Unit-II	Linear Programming Problem: Formulation of LPP, Graphical solution of LPP, Simplex Method, Artificial variables, Big-M method, two-phase method, degeneracy and unbound solutions. (8 Hrs)
Unit-III	Transportation Model: Transportation Problem: Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method, and Vogel's approximation method. Optimality test – the steppingstone method or MODI method. Degeneracy in Transportation Problem. Assignment Problem: Hungarian Method to solve Assignment Problem, Travelling Salesman as an Extension of Assignment Problem. (8 Hrs)
Unit-IV	Inventory Control, Replacement Analysis and Theory of Games: Inventory Models: Economic Order Quantity Models, Quantity Discount Models, Stochastic Inventory Models, Multi Product Models, Inventory Control Models in Practice. Replacement Analysis: Replacement of Items that Deteriorate, Replacement of Items that Fail Suddenly. Theory of Games: Introduction, Minimax and Maximin Principle, Solution of Game with Saddle Point, Solution by Dominance. (8 Hrs)
Unit-V	Queuing model and Sequencing model: Queuing Systems and Structures, Notation Parameters, Single Server and Multi Server Models, Poisson Input, Exponential Service, Constant Rate Service, Infinite Population Sequencing Model: Introduction, n jobs through two machines, n jobs through three machines, two jobs through m machines and n jobs through m machines.

	(6 Hrs)				
Unit-VI	Network Models: Fulkerson 's rule, concept and types of floats, float calculations, CPM and PERT, Crashing cost and crashing Network.				
	(6 Hrs)				
TextBooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Operations Research	Taha H.A.	Prentice Hall Of India.	9 th
	2.	Introduction to Operations Research	Frederick S. Hillier and Gerald J. Lieberman	Tata McGraw-Hill	7 th
	3.	Operations Research	P.K. Gupta, D.S Hira	S. Chand & Co.	4 th
	4.	Operations Research	Man Mohan, P. K. Gupta, Kanti Swarup	S. Chand & Co.	12 th
	5.	Operations Research Principles and Practice	Ravindran, Phillips and Solberg	Mc. WSE Willey	2 nd
	6.	Operations Research: Applications and Algorithms	Wayne L. Winston, Jeffrey B. Goldberg	Thomson Brooks	4 th
	7.	Operations Research: Theory, Methods & Applications	S. D. Sharma, Himanshu Sharma	Kedar Nath Ram Nath	4 th
	8.	PERT and CPM: Principles & Applications	L. S. Srinath	East-West Press Private Limited,	3 rd
	9.	Project Planning & Control with PERT & CPM	Dr. B.C. Punmia & K.K. Khandelwal	Firewall Media	4 th

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester V	
Course Code: PPE331 Course: Open Elective-I (Introduction to Nanotechnology) Teaching Scheme: Theory: 03 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs
Objectives	1. To study the introduction to nanomaterials and the factors affecting it. 2. To study the types and synthesis methods of nanomaterials. 3. To study the characterizations and properties of nanomaterials. 4. To study the different applications of nanomaterials.
Unit-I	Introduction Introduction to nanotechnology, conventional micro vs. nano-material properties, role of size in properties of nano-materials, length scale and surface to volume concept, and uniqueness of nanostructured materials; health hazards and handling of nanomaterials. (4 Hrs)
Unit-II	A) Synthesis Bottom-up and top-down approach for nano materials synthesis, methods: ball milling, chemical vapor deposition, pressure vapor deposition, ultrasound assisted, minimulsion, microemulsion, nanoemulsion, hydrothermal, sol-gel, miscellaneous techniques. (4 Hrs) B) Types of Nano-Materials Natural and synthetic clays – Montmorillonite and layered double hydroxide (LDH); carbon nanofibers (CNFs), carbon nanotubes, graphene nanosheets, nanosilica, nanoaluminium oxide, nanotitanium oxide, nano-hybrids. (4 Hrs)
Unit-III	Properties of Nanomaterials in terms of Structure Property Relationship Thermal properties, mechanical properties, gas barrier properties, flame retardant properties, electrical and electrochemical properties, electronic properties, optical properties, magnetic properties, biodegradable properties, antimicrobial properties, catalytic properties. (6 Hrs)
Unit-IV	Preparation of Polymer Nanocomposites Solution intercalation, melt intercalation, roll milling, emulsion polymerization, in-situ polymerization. (6 Hrs)
Unit-V	Characterization of Nanomaterials and Nanocomposites X-ray diffraction (XRD), dynamic light scattering (DLS), scanning electron microscopy (SEM), Transmission electron microscopy (TEM), energy dispersive X-ray spectroscopy (EDS), atomic force microscopy (AFM), small angle X-ray scattering (SAXS), differential scanning calorimetry (DSC), thermo gravimetric

	analysis (TGA).				
Unit-VI	Application of Nanomaterials and Nanocomposites Biomedical-drug delivery, bone replacement; sensors – gas sensor, metal adsorption and recovery, bio-molecule detectors; energy storage and conversion - super capacitors, solar cells, energy generators; electronics; self cleaning and self healing paints, nano-engineering of cement-based materials, agricultural nanotechnologies. (6 Hrs)				
TextBooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Polymer Nanocomposites Processing, Characterization, and Applications	Joseph H. Koo	McGraw-Hill Nanoscience and Technology Series	1 st 2006
	2.	Encyclopedia of Nanoscience and Nanotechnology	Hari singh Nalwa	American Scientific publishers	-
	3.	Chapter: Advanced Hybrid Nanostructures: Preparation, Properties and Applications, Book: Encyclopedia of Nanoscience and Nanotechnology	Aniruddha Chatterjee et al	American Scientific publishers	2018
	4.	Nanoparticle Technology Handbook	M Hosokawa, K Nogi, M Naito, T Yokoyama	Elsevier	-
	5.	The Science of Nanotechnology: An introductory text	Luanne Tilstra et al	Nova Science Publishers, Inc.	-
	6.	Polymer-Layered Silicate and Silica Nanocomposites	Y.C. Ke, P. Stroeve	Elsevier	2005
	7.	Nanotechnology in concrete – A review	Florence Sanchez, Konstantin Sobolev	Construction and Building Materials, Elsevier	24 (2010) 2060–2071
	8.	Agricultural Nanotechnologies: What are the current possibilities?	Claudia Parisi et al	Nano Today, Elsevier	2014

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Computer Science and Engineering) Semester V	
Course Code: CSE321 Course: Software Engineering Lab Teaching Scheme: Practical: 2 Hrs/week	Credits: 0-0-1 Practical: 25 Marks
Objectives	: - To understand the importance of software testing - To understand software bug detection and resolution techniques.
List of Practical	: 1. Write down the problem statement for a suggested system of relevance. 2. Do requirement analysis and develop Software Requirement Specification Sheet (SRS) for suggested system. 3. To perform the function-oriented diagram: Data Flow Diagram (DFD) and Structured chart. 4. To perform the user's view analysis for the suggested system: Use case diagram. 5. To draw the structural view diagram for the system: Class diagram, object diagram. 6. To draw the behavioral view diagram: State-chart diagram, Activity diagram 7. To perform the behavioral view diagram for the suggested system: Sequence diagram, Collaboration diagram 8. To perform the implementation view diagram: Component diagram for the system. 9. To perform the environmental view diagram: Deployment diagram for the system. 10. Perform Estimation of effort using FP Estimation for chosen system.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Computer Science and Engineering) Semester V		
Course Code: CSE322 Course: Design and Analysis of Algorithms Lab Teaching Scheme: Practical: 02 Hrs/week		Credits: 0-0-1 Practical: 25 Marks
Objectives	:	• To understand the concepts of Algorithm Design techniques. • To Implement computer algorithms in programming language. • Familiarizing students with specific algorithms for a number of important computational problems like sorting, searching, and graphs, etc.
List of Practical	:	1. Study of various code tuning techniques. 2. Program for Insertion Sort. 3. Program for finding maximum and minimum number using Divide and conquer. 4. Program for Knapsack problem. 5. Program for Job sequencing with deadlines 6. Program for single source shortest path. 7. Program for Multistage Graph. 8. Program for all pairs shortest path. 9. Program for N-Queen Problem. 10. Program for sum of subsets.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Computer Science and Engineering) Semester V		
Course Code: CSE323 Course: Software Testing Lab Teaching Scheme: Practical: 2 Hrs/week		Credits: 0-0-1 Term Work: 25 Marks
Objectives	:	- To understand the importance of software testing - To understand software bug detection and resolution techniques.
List of Practical	:	1. Write a program in C for Matrix Multiplication. Write test cases and check when the cases fail 2. Take any system (e.g., ATM). Study its specifications and find the possible cases of bugs in the system 3. Write test cases for any known application (e.g. Banking) 4. Create Test Plan document for any application (e.g. Library management system) 5. Study of any testing tool (e.g. Winrunner) 6. Study of any web testing tool (e.g. selenium) 7. Study of any bug tracking tool (e.g. Bugzilla) 8. Study of any testing management tool(e.g. Test Director) 9. Study of any open source testing tool (e.g. Test Link) 10. Study of Katalon studio open source automation tool with example.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Computer Science and Engineering) Semester V		
Course Code: CSE324 Course: Digital Image Processing Lab Teaching Scheme: Practical: 2 Hrs/week		Credits: 0-0-1 Term Work : 25 Marks
Objectives	:	• To study the Digital Image Processing concepts. • To study the different Image processing algorithms to achieve desired result. • To study applications in image processing.
List of Practical	:	1. Write a program to read and display an image. 2. Write a program for arithmetic and logical operations on images. 3. Write a program for image transformations using log transformation, negative transformation, power law transformation and thresholding. 4. Write a program to perform low pass, high pass and median filtering on image. 5. Write a program for 1D DCT and 2D DCT. 6. Write a program for histogram and histogram equalization. 7. Write a program for bit plane slicing. 8. Write a program for edge detection. 9. Write a program for color image processing. 10. Write a program for morphological operations on image.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Computer Science and Engineering) Semester V		
Course Code: CSE325 Course: Distributed System Lab Teaching Scheme: Theory: 02 Hrs / week		Credits: 0-0-1 Term Work: 25 Marks
Objectives	:	- To introduce students to the basic concepts and techniques of Data Mining - To develop skills of using recent data mining software for solving practical problems.
List of Practical	:	1. Configure HIVE with MySQL and perform queries for Create, Alter & Drop Table (for both managed and external tables) 2. Perform advanced HIVE queries (index, view, order by, group by, joins, subqueries, cluster by) 3. Configure PIG and implement various PIG commands, implement same programs using PIG script 4. Perform import and export database/tables from/to hadoop/RDBMS using Sqoop (Use various options like custom number of mappers, delimiters, change default directory, etc.) 5. Prepare a case study/survey presentation on Big Data security and visualization 6. Implement Java RMI mechanism for accessing methods of remote systems 7. Implement CORBA mechanism by using C++ program at one end and Java program on the other 8. Program to implement locking algorithm 9. Program to implement Remote Procedure Call. 10. Program to implement Chat Server.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Computer Science and Engineering) Semester V	
Course Code : CSE326 Teaching Scheme: Practical: 02 Hrs/week	Title: Minor Project Term Work: 25 Credits: 01
Objectives :	• To plan for various activities of the project and distribute the work amongst team members. • To develop the ability to define and design the problem and lead to its accomplishment with proper planning. • To understand the importance of document design by compiling Technical Report on the Minor Project work carried out. • To develop student's abilities to transmit technical information clearly and test the same by delivery of Seminar based on the Minor Project.
Guidelines :	1. Students should select a problem which addresses some basic home, office or other real-life applications. 2. Projects which will address the social issues will be given due weightage. 3. It is desirable that the systems developed by the students have some novel features. 4. The group size shall not exceed TWO students per batch. 5. The students have to select a suitable problem, design, prepare the drawings, produce the components, assemble and commission the project. 6. Institute may arrange demonstration with poster presentation of all minor projects developed by the students at the end of semester. 7. At the end of the semester, the students have to prepare and present 20-25 pages project report. 8. Final evaluation shall be based on continuous internal assessment followed by Viva-Voce.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Computer Science and Engineering) Semester V	
Course Code: CSE327 Course: Introduction to MEAN Stack Teaching Scheme: Practical: -02 Hrs/week	Credits: 0-0-1 Practical:25Marks
Prerequisite	: Java, concepts of Databases and Web Programming
List of Practical	: 1. Study and understand the Architecture of MEAN stack 2. Experiment to Create MongoDB Environment 3. Experiment to Configure Access Control 4. Experiment to add MongoDB Driver to Node.js 5. Experiment to Manipulate MongoDB Documents from Node.js 6. Developing Web Page with AngularJS 7. Adding validations to the web page 8. Generating web application using Express 9. Adding AngularJS to Node.js Environment 10. Create a small application using MEAN

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Computer Science & Engineering) Semester-V	
Course Code: CSE328 Course: Experiential / Problem Based Learning Teaching Scheme: Practical: 02 Hrs/week	Credits: 0-0-1 Term Work: 25 Marks
Course Objectives: On completion of the course, learner will be able to – • To develop positive attitude, new skills or new ways of thinking. • To introduce independent and group learning by solving real world problem with the help of available resources. • To be able to develop systematic approach in technical documentation. • To select and utilize appropriate Software tools/Equipment/Problem solving tools to solve real life problems.	
Guidelines: The students plan, manage and complete a activity which addresses the stated problem. 1. The students must work in group to solve real life problem. 2. Open ended problems from course teachers can be considered from any course related to engineering field. (It can be domain specific/multidisciplinary but the emphasis on Computer Science and Engineering) 3. A mentor to be assigned to 3-4 groups / one batch. 4. The steps to be followed for problem-based learning are as mentioned below:	
Step 1: Explore the issue. Gather necessary information; learn new concepts, principles, and skills about the proposed topic.	
Step 2: State what is known. Individual students and groups list what they already know about the scenario and list what areas they are lacking information.	
Step 3: Define the issues. Frame the problem in a context of what is already known and information the students expect to learn.	
Step 4: Research the knowledge. Find resources and information that will help create a compelling argument.	
Step 5: Investigate solutions. List possible actions and solutions to the problem, formulate and test potential hypotheses.	
Step 6: Present and support the chosen solution. Clearly state and support your conclusion with relevant information and evidence.	
Step 7: Review your performance. Often forgotten, this is a crucial step in improving the problem-solving skills. Students must evaluate their performance and plan improvements for the next problem.	
Recommended parameters for assessment, evaluation, and weightage: 1. Identification of the Problem (20%) 2. Documentation (Gathering requirements, design & modeling, implementation/execution, use of technology and final report, other documents). (30%) 3. Demonstration (Poster Presentation/Model Exhibition etc). (20%). 4. Awareness /Consideration of - Environment/ Social /Ethics/ Safety measures/Legal aspects. (10%) 5. Outcome (Participation in technical events / publication in national international conference	

journal/copyright/patent/prototype). (20%)

Reference Books/ Research Articles:	Sr. No.	Title	Author
	01	A new model of problem-based learning	Terry Barrett
	02	Research Methodology: Methods and Techniques	C. R. Kothari
Web Resources:		1. Problem-Based Learning: https://www.coursera.org/lecture/university-teaching/problem-based-learning-i-pbl-in-practice-SMXol 2. Problem-Based Learning: https://onlinecourses.swayam2.ac.in/ntr20_ed29/preview	

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Computer Science and Engineering) Semester VI	
Course Code: CSE351 Course: Operating System Teaching Scheme: Theory: 03 Hrs / week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 03 Hrs
Prerequisites	Fundamentals of Computer organization
Objectives	1. To understand the fundamentals of distributed environment in complex application. 2. To get comprehensive knowledge of the architecture of distributed systems. 3. To make students aware about security issues and protection mechanism for distributed environment.
Unit-I	Introduction: Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems. (6 Hrs)
Unit-II	Concurrent Processes: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation. (6 Hrs)
Unit-III	CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock. (6 Hrs)
Unit-IV	Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference. (6 Hrs)
Unit-V	I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. (6 Hrs)
Unit-VI	File System: File concept, File organization and access mechanism, File directories, and File sharing, Filesystem implementation issues, File system

	protection and security.				
	(6 Hrs)				
Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1	Operating Systems Concepts	Silberschatz, Galvin and Gagne	Wiley	9 th
	2	Operating Systems	Sibsankar Halder and Alex A Aravind	Pearson Education	2 nd
	3	An Introduction to Operating System	Harvey M Dietel	Pearson Education	3 rd
	4	Operating Systems: A Concept based Approach	D M Dhamdhare	McGraw Hill.	1 st
	5	Operating Systems: A Design-Oriented Approach	Charles Crowley	Tata McGraw Hill Education	1 st
	6	Operating Systems	Stuart E. Madnick & John J. Donovan	McGraw Hill	1 st

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Computer Science and Engineering) Semester VI	
Course Code: CSE352 Course: Artificial Neural Network & Fuzzy Logic Teaching Scheme: Theory: 03 Hrs / week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 03 Hrs
Prerequisite	Artificial Intelligence, Fundamental Concepts of Programming, Data Structure
Objectives	1. To introduce the concepts and understanding of artificial neural networks. 2. To introduce various types of Learning methods. 3. To design and use different types of neural networks. 4. To introduce Fuzzy logic and its various methods 5. To understand methods to implement fuzzy set theory and logic 6. To learn neural networks and fuzzy logic-based methods to solve real world complex problems.
Unit-I	Introduction: Introduction to Artificial Intelligence and AI Logics, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models Characteristics of ANN, McCulloch-Pitts Model, Applications of ANN. (6 Hrs)
Unit-II	Neural Network Architecture: Types of activation functions, Neural networks architectures, Linearly separable and linearly non-separable systems and their examples, Features and advantages of neural networks over statistical techniques, Knowledge representation, learning process, error-correction learning, concepts of supervised learning, and unsupervised learning (6 Hrs)
Unit-III	Neural Network Learning: Single layer perception and multilayer perceptron neural networks, their architectures Error back propagation algorithm, generalized delta rule, learning factors, step learning Momentum learning ,Concept of training, testing and cross-validation data sets for design and validation of the networks (6 Hrs)
Unit-IV	Types of Learning: Unsupervised Learning Neural Networks: Competitive learning networks, kohonen self-organizing networks K-means and LMS algorithms, RBF neural network, its structure and training algorithm for RBF neural networks, Vector Quantization neural network architecture and its training algorithm Applications of Neural Networks: Pattern classification, Handwritten character recognition Face recognition ,Image compression and decompression (6 Hrs)
Unit-V	Fuzzy logic: Basic Fuzzy logic theory, sets and their properties, Operations on fuzzy sets Fuzzy relation and operations on fuzzy relations and extension principle, Fuzzy membership functions and linguistic variables ,Fuzzy rules and fuzzy reasoning Fuzzification and defuzzification and their methods, Fuzzy inference systems, Mamdani and Sagano Fuzzy models, and Fuzzy knowledge based controllers (6 Hrs)

Unit-VI	Applications of Fuzzy Logic and Fuzzy Systems: Fuzzy pattern recognition Fuzzy image processing Simple applications of Fuzzy knowledge-based controllers like washing machines, traffic regulations, and lift control (6 Hrs)				
Textbooks/ Reference Books	Sr. No.	Title	Author	Publicati on	Edition
	1	Neural Networks, Fuzzy Logic, and Genetic Algorithms	S. Rajsekaran and G. A. Vijayalakshmi Pai	PHI.	1 st
	2	Neural Network- A Comprehensive Foundation	Simon Haykin,	Pearson Education	1 st
	3	Fuzzy Logic with Engineering Applications",	Thimothy J. Ross	Wiley India Publications	1 st
	4	Fundamentals of Neural Networks	Laurence Fausett	Pearson Education	-
	5	Introduction to Neural Network Using MATLAB	S. N. Sivanandam, S. Sumathi, and S. N. Deepa	Tata McGraw-Hill	-
	6	Neural networks and Fuzzy Systems	Bart Kosko	Pearson Education	-

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Computer Science and Engineering) Semester VI	
Course Code: CSE353 Course: Formal Languages & Automata Theory Teaching Scheme: Theory: 03 Hrs / week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 03 Hrs
Prerequisite	Discrete Mathematics
Objectives	1. To Study abstract computing models. 2. To learn Grammar and Turing Machine. 3. To learn about the theory of computability and complexity. 4. To create background for designing compiler.
Unit-I	Formal Language Theory and Finite Automata Introduction to Formal language, Alphabets and strings, Finite representation of language, Finite Automata (FA): An Informal Picture of FA, Finite State Machine (FSM), Language accepted by FA, Definition of Regular Language, Deterministic and Nondeterministic FA DFA and NFA), epsilon- NFA, FA with output: Moore and Mealy machines -Definition, models, inter-conversion. Applications of finite automata. Case Study: FSM for vending machine, spell checker (6 Hrs)
Unit-II	Regular Expressions Regular expressions - The Operators of Regular Expressions, Building Regular Expressions, Finite Automata and Regular Expressions, From DFA's to Regular Expressions, Converting DFA's to Regular Expressions by Eliminating States, Converting Regular Expressions to Automata, Applications of Regular Expressions, Regular Expressions in UNIX, Lexical Analysis, Finding Patterns in Text, Algebraic Laws for Regular Expressions, Associativity and Commutativity, Arden's theorem, Closures, Pumping Lemma for regular language. (6 Hrs)
Unit-III	Context Free Grammar Chomsky Hierarchy, Context Free Grammars – Definition, Derivations Using a Grammar, The Language of a Grammar, Parse Tree, Constructing Parse Trees, Simplification of CFG: Eliminating unit productions, useless production, useless symbols, and epsilon productions, Normal forms :Chomsky normal form, Greibach normal form, Closure properties of CFL, Applications of Context-Free Grammars, Parsers, The YACC Parser-Generator, Ambiguity in Grammars and Languages, Ambiguous Grammars, Removing Ambiguity From Grammars (6 Hrs)
Unit-IV	Pushdown automata and parsing Push Down Automata - Definition of the Pushdown Automaton, DPDA, NPDA, Graphical Notation for PDA's, Instantaneous Descriptions of a PDA, The Languages of a PDA, Acceptance by PDA, Acceptance by Final State, Acceptance by Empty Stack, Equivalence of PDA's and CFG's, Closure properties of CFL's, top

	down parsing, bottom up parsing (6 Hrs)				
Unit-V	Turing Machine and Linear bounded automata Turing Machines - Introduction to Turing Machines, Turing Machine, Instantaneous Descriptions for the Turing Machines, Transition Diagrams for Turing Machines, The Language acceptability of a Turing Machine, Design of Turing machine. Turing Storage in the State, Multiple Tracks, Shifting Over, Subroutines, Multiple Turing Machines, Variants of Turing machine, Computable Functions. The model of Linear bounded automata, Linear bounded automata and languages. (6 Hrs)				
Unit-VI	Decidability and recursively enumerable languages Definition of algorithm, Decidability, Decidable language, Undecidable language, Halting problem of Turing machine, Recursive and recursively enumerable languages, Non recursively Enumerable Languages, The diagonalization Language, Universal Language, Post correspondence problem, Undecidable problems for context free grammars, Markov algorithm. (6 Hrs)				
Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1	Theory of Computer Science : Automata Languages and Computation	K.L.P Mishra, N.Chandrasekaran	PHI.	3 rd
	2	Introduction to Automata Theory Languages and Computation	John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman	Addison-Wesley	3 rd
	3	Theory of Computation	Vivek Kulkarni	Oxford University Press	3 rd
	4	Elements of the Theory of Computation	H.L. Lewis, Christos H. Papadimitriou	Prentice Hall	3 rd
	5	Introduction to Theory of Computation	Michael Sipser	Course Technology	3 rd

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Computer Science and Engineering) Semester VI	
Course Code: CSE391 Course: Professional Elective Courses-III Modeling and Simulation Teaching Scheme: Theory: 03 Hrs / week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 03 Hrs
Objectives	1. Define the basics of simulation modeling and replicating the practical situations in organizations 2. Generate random numbers and random variates using different techniques. 3. Develop simulation model using heuristic methods. 4. Analysis of Simulation models using input analyzer, and output analyzer 5. Explain Verification and Validation of simulation model.
Unit-I	Introduction: When simulation is the appropriate tool and when it is not appropriate, Advantages and disadvantages of Simulation; Areas of application, Systems and system environment; Components of a system; Discrete and continuous systems, Model of a system; Types of Models, Discrete-Event System Simulation, Simulation examples: Simulation of queuing systems. General Principles, Simulation Software: Concepts in Discrete-Event Simulation. The Event-Scheduling / Time-Advance Algorithm, Manual simulation Using Event Scheduling (6 Hrs)
Unit-II	Statistical Models in Simulation: Review of terminology and concepts, Useful statistical models, Discrete distributions. Continuous distributions, Poisson process, Empirical distributions. Queuing Models: Characteristics of queuing systems, Queuing notation, Long-run measures of performance of queuing systems, Long-run measures of performance of queuing systems cont..., Steady-state behavior of M/G/1 queue, Networks of queues (6 Hrs)
Unit-III	Random-Number Generation: Properties of random numbers; Generation of pseudo-random numbers, Techniques for generating random numbers, Tests for Random Numbers, Random-Variate Generation: Inverse transform technique Acceptance-Rejection technique. (6 Hrs)
Unit-IV	Input Modeling: Data Collection; Identifying the distribution with data, Parameter estimation, Goodness of Fit Tests, fitting a non-stationary Poisson process, Selecting input models without data, Multivariate and Time-Series input models. Estimation of Absolute Performance: Types of simulations with respect to output analysis, Stochastic nature of output data, Measures of performance and their estimation, (6 Hrs)
Unit-V	Measures of performance and their estimation, Output analysis for terminating simulations Output analysis for steady-state simulations. Verification, Calibration And Validation: Optimization: Model building, verification and validation, Verification of simulation models, Verification of simulation models, Calibration and validation of models, Optimization via Simulation. (6 Hrs)

Unit-VI	Output Analysis – Types of Simulations with Respect to Output Analysis, Stochastic Nature of output data, Measures of Performance and their estimation, Output analysis of terminating simulation, Output analysis of steady state simulations, Simulation Softwares: Selection of Simulation Software, Simulation packages, Trend in Simulation Software.				
	(6 Hrs)				
Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Discrete Event system Simulation	Jerry Banks, John S Carson, II, Berry L Nelson, David M Nicol	Pearson Education	4 th
	2.	System Simulation	Geoffrey Gordon,	Prentice Hall publication	2 nd
	3.	Simulation Modelling & Analysis	Averill M Law, W David Kelton	McGraw Hill International	4 th
	4.	Systems Simulation with Digital Computer	Narsingh Deo,	PHI Publication (EEE),	3 rd

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (FACULTY OF SCIENCE AND TECHNOLOGY) Syllabus of Third Year B. Tech. (Computer Science and Engineering) Semester VI					
Course Code: CSE392 Course: Professional Elective Courses-III Pattern Recognition Teaching Scheme: Theory: 03 Hrs / week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs		
Prerequisite	Linear Algebra ,Probability				
Objectives	1. To study basics of pattern classification, structural pattern recognition 2. To learn various parameter and non parametric methods 3. To study various pattern recognition techniques 4. To learn dimensionality reduction methods				
Unit-I	Basics of Probability, Random Processes and Linear Algebra: Probability: independence of events, conditional and joint probability, Bayes' theorem; Random Processes: Stationary and nonstationary processes, Expectation, Autocorrelation, Cross-Correlation, spectra; Linear Algebra (6 Hrs)				
Unit-II	Design of Pattern recognition system, Pattern recognition Life Cycle ,Introduction to Statistical Pattern Recognition, Bayes Decision Theory: Minimum-error-rate classification, Classifiers, Discriminant functions, Decision surfaces, Normal density and discriminant functions, discrete features (6 Hrs)				
Unit-III	Parameter estimation methods: Maximum-Likelihood estimation, Expectation-maximization method, Bayesian parameter estimation (6 Hrs)				
Unit-IV	Concept of feature extraction and dimensionality, Curse of dimensionality, Dimension reduction methods - Fisher discriminant analysis; Principal component analysis; Factor Analysis (6 Hrs)				
Unit-V	Non-Parameter methods: Non-parametric techniques for density estimation - Parzen-window method, K-Nearest Neighbour method (6 Hrs)				
Unit-VI	Linear discriminant functions: Gradient descent procedures; Perceptron; Support vector machines and kernel based method (6 Hrs)				
Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1	Pattern Classification,	R.O.Duda, P.E.Hart and D.G.Stork,	John Wiley	2001
	2	Pattern Recognition and Machine Learning	C.M.Bishop	Springer	2006

3	Pattern Recognition	S.Theodoridis and K.Koutroumbas	Academic Press	4 th
4	Combining Pattern Classifiers: Methods and Algorithms	Lumila I. Kuncheva	Wiley	2004

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (FACULTY OF SCIENCE AND TECHNOLOGY) Syllabus of Third Year B. Tech. (Computer Science and Engineering) Semester VI	
Course Code: CSE393 Course: Professional Elective Courses-III Wireless networks Teaching Scheme: 03 Theory: 03 Hrs / week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs
Prerequisite	Computer networks
Objectives	1. The student should be made: 2. To understand the concept about Wireless networks, protocol stack and standards 3. To understand and analyse the network layer solutions for Wireless networks 4. To study about fundamentals of 3G Services, its protocols and applications 5. To have in depth knowledge on internetworking of WLAN and WWAN 6. To learn about evolution of 4G Networks, its architecture and applications
Unit-I	WIRELESS LAN : Introduction-WLAN technologies: - IEEE802.11: System architecture, protocol architecture, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, WPAN – IEEE 802.15.4, Wireless USB, Zigbee, 6LoWPAN, WirelessHART (6 Hrs)
Unit-II	MOBILE NETWORK LAYER : Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet- Mobile IP session initiation protocol - mobile ad-hoc network: Routing: Destination Sequence distance vector, IoT: CoAP (6 Hrs)
Unit-III	3G OVERVIEW : Overview of UMTS Terrestrial Radio access network-UMTS Core network Architecture: 3GPP Architecture, User equipment, CDMA2000 overview- Radio and Network components, Network structure, Radio Network, TD-CDMA, TD – SCDMA. 6Hrs
Unit-IV	INTERNETWORKING BETWEEN WLANS AND WWANS : Internetworking objectives and requirements, Schemes to connect WLANS and 3G Networks, Session Mobility, Internetworking Architecture for WLAN and GPRS, System Description, Local Multipoint Distribution Service, Multichannel Multipoint Distribution System. (6 Hrs)
Unit-V	4G & Beyond : Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, IMS Architecture, LTE, Advanced Broadband Wireless Access and Services, MVNO. (6 Hrs)
Unit-VI	INTERNETWORKING BETWEEN WLANS AND WWANS : Internetworking objectives and requirements, Schemes to connect WLANS and 3G Networks, Session Mobility, Internetworking Architecture for WLAN and GPRS, System Description, Local Multipoint Distribution Service, Multichannel Multipoint Distribution System. (6 Hrs)

Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Mobile Communications	Jochen Schiller	Pearson Education	2 nd
	2.	Wireless Communications and networking	Vijay Garg	Elsevier	1 st
	3.	Evolution HSPA and LTE for Mobile Broadband 3G	Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming	Academic Press	2 nd
	4.	Wireless Networking	Anurag Kumar, D.Manjunath, Joy kuri	Elsevier	1 st
	5.	Modern Wireless Communications	Simon Haykin , Michael Moher, David Koilpillai	Pearson Education	1 st

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester VI					
Course Code: AED381 Course: Open Elective-II Fundamentals of Bioenergy Teaching Scheme: Theory: 3 Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60Marks End Semester Examination (Duration):3 Hrs		
Prerequisite	Biomass sources and waste to energy recovery				
Objectives	1.Understand bioenergy technologies, processes, reactions and energy conversion rates for anaerobic Digestion, gasification, pyrolysis and combustion 2.Know what constitutes a suitable feedstock for bioenergy applications				
Unit-I	Introduction to bioenergy- Introduction ,Unit of Energy and Introduction of Bioenergy, How Biomass Formed on the Earth, Road Map of Bioenergy, Basic Biomass Technology (Resources and Production) Exploration of Photosynthesis Process (6 Hrs)				
Unit-II	Biogas- Basic concept in anaerobic digestion and biogasification, mechanism of anaerobic digestion, Biochemical methane potential assay and calculations for biogasification feasibility analysis, Biogas utilization, Biomass production System and their Categorization, Components of biogas plants (6 Hrs)				
Unit-III	Bioethanol- Basic concept of Cellulosic Bioethanol Process, Pretreatment and Enzyme treatment of Cellulosic Bioethanol Process, Fermentation and Distillation in Cellulosic Bioethanol Production, characteristics of bioethanol (6 Hrs)				
Unit-IV	Biodiesel- Biodiesel production processes, Biodiesel characterization , Biodiesel feedstocks, biodiesel characteristics, Environmental permitting and safety considerations for biodiesel production (6 Hrs)				
Unit-V	Thermo Chemical Processes: Basic concepts in gasification and pyrolysis, Gasification and pyrolysis systems, Gasification Types - Up Drift Gasifier, Down Draft and cross flow gasifier, operation and performance of gasifier (6 Hrs)				
Unit-VI	Bioenergy distribution and end use for a sustainable future: Biological root of gasification, non-conventional energy sources, waste-to-energy recovery (6 Hrs)				
Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Introduction to Bioenergy (Energy and the Environment)	Vaughn C. Nelson (Author), Kenneth L. Starcher	CRC press	-
	2.	Bioenergy: Biomass to Biofuels	Anju Dahiya	AP Publications	-
	3.	Bioenergy: Principles and Applications	Yebo Li and Samir Kumar Khanal	Wiley Publications	1 st

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester-VI					
Course Code: CED381 Course: Open Elective-II Solid Waste Management Teaching Scheme: Theory: 3 Hrs/week			Credits: 3 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3Hrs		
Prerequisite		1. Environmental Engineering			
Objectives		1. To get introduced to the generation, collection and management of the various types of solid waste and different waste management techniques.			
Unit-I		Introduction to Solid Waste Management (SWM): Need and Objectives, Waste Management Hierarchy, Functional elements, Environmental impact of mismanagement. Solid waste: Sources, types, Composition, Quantities, Physical, chemical and Biological properties. (6 Hrs)			
Unit-II		Generation of solid waste: Factors affecting. Storage and collection: General considerations for waste storage at source, Types of collection Systems, Transfer station: Meaning, Necessity, Transportation of solid waste: Means and Methods, Routing of vehicles. (6 Hrs)			
Unit-III		Segregation and Material Recovery: Objectives, Stages of segregation, sorting operations, Guidelines for sorting for materials recovery, E waste management, Biomedical waste management. (6 Hrs)			
Unit-IV		Waste processing: processing technologies: Composting, thermal conversion technologies incineration, treatment of biomedical wastes. Energy recovery from solid waste: Parameters affecting energy recovery, Bio-methanation, Fundamentals of thermal processing, Pyrolysis, Incineration, Advantages and disadvantages of various technological options. (6 Hrs)			
Unit-V		Disposal: Landfills and its introduction, Definition, Essential components, Site selection, Land filling methods, Leachate analysis and landfill gas management, treatment & disposal, Determination of capacity of landfill disposal site. (6 Hrs)			
Unit-VI		Hazardous waste management (HWM): Types of hazardous waste (such as nuclear, biomedical and industrial waste), problems and issues related to HWM, Need for HWM, Legislations on management and handling of HW, Hazardous Characteristics, reduction of wastes at source, Recycling and reuse, labeling and handling of hazardous wastes, incineration, solidification & stabilization of hazardous waste. (6 Hrs)			
Textbooks/		Sr. No.	Title	Author	Publication Edition

Reference Books	1.	Integrated Solid Waste Management	Hilary Theisen and Samuel A, Vigil, George Tchobanoglous	McGraw- Hill, New York	1993
	2.	Manual on Municipal Solid waste management	CPHEEO, Central Public Health and Environmental Engineering Organization	Government of India, New Delhi	2000
	3.	Environmental Resources Management and Hazardous waste Management,	Michael D. LaGrega, Philip L Buckingham, Jeffrey C. E vans	Mc-Graw Hill International edition, New York	2001
	4.	Solid waste Engineering	Vesilind P.A., Worrell W and Reinhart	Thomson Learning Inc., Singapore	2002
	5.	Hazardous Waste Management	Charles A. Wentz	McGraw Hill International Edition, New York	1995 2 nd Edition

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

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Syllabus of Third Year B. Tech. (All) Semester VI

Course Code: CSE381 Course: Open Elective-II (Information & Cyber Security) Teaching Scheme: Theory: 3 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs
Prerequisite	Knowledge of Computer Networking is necessary to understand the concepts.
Objectives	1. To understand the foundations of Information Security. 2. To learn various types of algorithms and its applications of Cyber Security 3. To identify insights on how to apply Cyber Security
Unit-I	Introduction The History of Information Security, Balancing Information Security and Access, Introduction and Security Trends, General Security Concepts, and introduction to what is an "infosphere", Operational Security and People's Role in Information Security. (6 Hrs)
Unit-II	Security Needs The Need for Security, Business Needs, needs to protect against Threats and Attacks, Security in Emails, Secure Software Development. Essential Terminologies: CIA, Risks, Breaches, Threats, Attacks, Exploits. (6 Hrs)
Unit-III	Cryptography Concepts Concepts of Data encryption, Introduction, Plaintext & Cipher text, Substitution Techniques, Transposition Techniques, Encryption & Decryption, Symmetric & Asymmetric key Cryptography. Public Key Infrastructure (PKI), Different attacks on Cryptosystems. (6 Hrs)
Unit-IV	Internet Standards and Authentication Basic concepts of Internet Standards and Physical Security, Network Security and Infrastructure, Authentication Basics, Password, Authentication Token, Certificate based Authentication, Basics of authentication in Wireless Networks, Need of authentication in Wireless Communication. (6 Hrs)
Unit-V	Security in Evolving Technology Biometrics, Mobile Computing and Hardening on android and ios, IOT Security, Web server configuration and Security. Introduction, Basic security for HTTP Applications and Services, Basic Security for Web Services like SOAP, REST etc., Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges. Open Source/ Free/ Trial Tools: adb for android, xcode for ios, (6 Hrs)
Unit-VI	Cyber Security Vulnerabilities & Safeguards Vulnerabilities-Overview, vulnerabilities in software, System administration, Open Access to Organizational Data, Weak Authentication, Authorization, Unprotected

	Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, IT Audit, Authentication. Open Web Application Security Project (OWASP), Web Site Audit and Vulnerabilities assessment .Open Source/ Free/ Trial Tools: WinAudit, Zap proxy (OWASP), burp suite, DVWA kit. (6 Hrs)				
Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Cryptography and Network Security	William Stallings	Pearson Education/PHI	2006
	2.	Cryptography and Network Security	V.K. Jain	Khanna Publishing House.	2017
	3.	Principles of Information Security	Michael E Whitman and Herbert J Mattord	Vikas Publishing House, New Delhi.	5 th
	4.	Handbook of Information Security Management	Micki Krause, Harold F. Tipton	CRC Press LLC	6 th
	5.	Information security and Cyber Laws	Gupta Sarika	Khanna Publishing House, Delhi.	-
	6.	Cryptography and Network Security	Atul Kahate	McGraw Hill.	4 th

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester VI	
Course Code: EED381 Course: Open Elective-II (Electrical materials) Teaching Scheme: Theory: 03 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs
Prerequisite	Basics of Electrical and Electronics Engineering, Physics, Chemistry
Course Objectives	1.To understand Basic electrical and electronics engineering. 2.To understand Electromagnetism and its laws. 3.To study the conducting and superconducting materials 4. To study the dielectric and nano materials
Unit-I	Crystallography Crystal directions and planes, Diatomic Crystal (CsCl, NaCl, Diamond, BaTiO ₃) Crystal imperfection, Point defects, Line defects, Surface and Volume defects, Structure properties relationship, structure determination by X-ray diffraction. (8 Hrs)
Unit-II	Magnetic Materials Origin of magnetization using atomic theory, classification of magnetic materials and properties, Laws of magnetism, comparison of electrical and magnetic circuits theory of Dia, Para and ferromagnetism, Soft and Hard magnetic materials and their uses, Domain theory of ferromagnetism, Hysteresis loss, Antiferromagnetic and Ferrimagnetic materials, Ferrites and Garnets. (5 Hrs)
Unit-III	Conducting and Superconducting Materials Band theory of solids, Classical free electron theory of metals, Quantum free electron theory, Density of energy states and carrier concentration, Fermi energy, Temperature and Fermi energy distribution, Superconductivity, Factor affecting Superconductivity, Meissner effect, Type-I and Type-II superconductors, BCS theory, Josephson effect, High temperature superconductors, Application of superconductors. (5 Hrs)
Unit-IV	Semiconducting Materials Band structure of semiconductor, Charge carrier concentration, Fermi level and temperature, Electrical conductivity, Hall effect in semiconductors, P-N junction diode, Preparation of single crystals, LED, Photovoltaic cell. (6 Hrs)
Unit-V	Dielectric Materials Dielectric constant and polarizability, types of polarization, temperature and frequency dependences of Dielectric parameter, internal fields in solids, Clausius-Mosotti equation, dielectric loss, dielectric breakdown, ferroelectric, pyroelectric and piezoelectric materials, applications of dielectric materials. (6 Hrs)
Unit-VI	Nano Materials

	Nanomaterials: Introduction and properties, synthesis of nanomaterials, Carbon Nano Tubes, Characterization techniques of nanomaterials- SEM, TEM, EDAX, FMR, XRD. Applications of nanomaterials. (6 Hrs)				
Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Electrical engineering materials	A.J. Dekkar	McGraw Hill Publication	2 nd
	2.	Science of Engineering Materials and Carbon Nanotubes	C.M. Srivastava and C. Srinivasan	New Academic Science	3 rd
	3.	Material Science and Engineering	V.Raghavan	PHI Learning	5 th
	4.	Solid State Physics	A.J. Dekkar	Laxmi publication	3 rd

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

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Syllabus of Third Year B. Tech. (All) Semester VI

Course Code: ETC381 Course: Open Elective-II (Internet of Things) Teaching Scheme: Theory: 3 Hrs/week		Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration):3 Hrs			
Prerequisite	Python Fundamentals, basics of electronics, Networking fundamentals, WWW Terminology				
Objectives	1. To understand IoT value chain structure (device, data cloud), application areas and technologies involved 2. To understand IoT sensors and technological challenges faces by IoT devices. 3. Explore and learn about Internet of things with the help of projects				
Unit-I	Introduction to IoT: Industry 4.0., Definition of IoT- Evolution of IoT and related terms, hardware, software, network stack for IoT, SAAS Model (6 Hrs)				
Unit-II	Elements of IoT: Introduction to elements of IoT, Basic Architecture of an IoT application sensors, and Actuators, WPAN and LPWAN, 6LoPAN, Sigfox (6 Hrs)				
Unit-III	IoT Sensors: Node MCU ESP 8266- hardware specification, GPIO programming, WIFI connectivity programming, Access Point Programming, Introduction to basis looping and conditional statements, basics of HTML. (6 Hrs)				
Unit-IV	Communication and Connectivity Technologies: Introduction to: TCP/IP, UDP, NTP, MQTT, Network and Sockets, Cloud Computing in IoT, IoT Communication Model (6 Hrs)				
Unit-V	Data Analytics and IoT Platforms: Basics of statistics, Descriptive statistics and probability distributions. Big Data Analytics, Hadoop, Data Visualization, IoT Platforms Things speak, Microsoft Azure and Amazon Web Services, IBM Watson, Google Home and Amazon's Alexa (6 Hrs)				
Unit-VI	Preparing IoT Projects Creating the sensor project with Node MCU ESP 8266, Sensor libraries, Internal representation of sensor values, External representation of sensor values, Exporting sensor data, Creating the actuator project (6 Hrs)				
Text Book/ Reference	Sr. No.	Title	Author	Publication	Edition

Books/ Web	1.	The Internet of Things: Applications and Protocols,	Oliver Hersent, David Boswarthick, Omar Elloumi	Wiley publications	1 st
	2.	Architecting the Internet of Things,	Dieter Uckelmann, Mark Harrison, Florian Michahelles	Springer publications.	1 st
	3.	Internet of Things with Arduino	Marco Schwatz	Cookbook, Packt Publications	1 st
	4.	Internet of Things	Arshdeep Bagha, Vijay Madiseti	Universities Press (India) Pvt. Ltd.	1 st
	5.	<u>Introduction to internet of things - Course (nptel.ac.in)</u>			

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester VI					
Course Code: MED381 Course: Open Elective II (Industry 4.0) Teaching Scheme: Theory: 03 Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs		
Prerequisite	1.Computer fundamentals and understanding of basics of information technology. 2.Understanding of basic concepts of production and manufacturing technology				
Objectives	- To make students aware of the structure and role of Industry 4.0, in current evolving industrial environment. - To give learners overview of Industry 4.0 technologies and their integration.				
Unit-I	Introduction- Four industrial revolutions, Digital transformation of Industry and the fourth industrial revolution, Scope of Industry 4.0, Automation pyramid and Industry 4.0, Principles of Industry 4.0. (6 Hrs)				
Unit-II	Internet of Things (IoT) – Concept of IoT, IoT Architecture – Sensing layer, Network layer, Data processing layer, Application layer, Applications of IoT – for automobiles, homes, etc. Internet of Service (IoS), Internet of Energy (IoE). (6 Hrs)				
Unit-III	Technologies in Industry 4.0 (1)- Augmented reality and Virtual Reality, 3D Printing, Collaborative robots, Smart material handling, Smart sensors, Concept of smart products. (6 Hrs)				
Unit-IV	Technologies in Industry 4.0 (2)- Machine learning, Introduction to Cyber Physical Systems (CPS), Components of Cyber Physical Systems, Digital twins, Machine vision, Smart factory, Artificial intelligence. (6 Hrs)				
Unit-V	Data in Industry 4.0- Big Data, Data Mining, Data Analytics, Cloud computing, Data – anew resource of organization, Data analysis for optimal decision making, Digitalization of the entire value chain. (6 Hrs)				
Unit-VI	Applications of Industry 4.0- Industry 4.0 in Manufacturing – Predictive maintenance, Real-time supply-chain optimization, Digital performance management, Smart energy consumption, Challenges in implementing Industry 4.0. (6 Hrs)				
Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1	Industry 4.0_ the Industrial Internet of Things	Industry 4.0_ the Industrial Internet of Things	Industry 4.0_ the Industrial Internet of Things	-
	2	Industry 4.0_ Managing The	Alp Ustundag, Emre Cevikcan	Springer	1 st

		Digital Transformation			
	3	Automated Manufacturing System	Hugh Jack	-	7 th
	4	Industry 4.0 _ Opportunities Behind The Challenge	Dr. Mirjana Stankovic, Ravi Gupta and Dr. Juan E. Figueroa	UNIDO General Conference 2017	-
	5	Handbook of Industrial Automation	Richard L. Shell Ernest L. Hall	CRC Press	1 st

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester VI	
Course Code: PPE381 Course: Open Elective-II (Polymer Recycling and Waste Management) Teaching Scheme: Theory: 03 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs
Prerequisite	• Basic knowledge of polymeric materials, additives and their properties. • Basic knowledge of polymer rheology and processing.
Objectives	1. To learn the basic concepts used in the recycling of polymers along with learning about solid waste management.
Unit-I	Significance of Recycling Introduction and classification of waste. Global polymer production and consumption, Global polymer waste composition, quantities and disposal, Identification of polymer for recycling. Recycling Process: collection, sorting and segregation of waste, Use of advanced technologies such as artificial intelligence in sorting, Recycling methods: primary, secondary, tertiary and quaternary recycling, landfilling. (6 Hrs)
Unit-II	Recycling Equipment/Machinery Equipment for primary and secondary recycling: shredder, granulator, pulverizer, shredder, cutter, Classification and types of reactors for tertiary recycling, Case study on waste to energy conversion plant. (5 Hrs)
Unit-III	Recycling of Plastics from Urban Waste Physiochemical, mechanical and rheological characteristics of recycled plastics, hydrolytic treatment of plastics waste containing paper, mixed plastic waste and its processing, recycling extrusion and additives used in polymer recycling, wood plastic composites, use of x-ray photoelectron spectroscopy (XPS) in recycling, international standards in recycling. (7 Hrs)
Unit-IV	Recycling Techniques PE/PP packaging films and woven sacks, PET bottles and films, PVC products, fiber reinforced plastics (FRP), and rubber products. (6 Hrs)
Unit-V	Municipal Solid Waste Management and Treatment Techniques Collection, storage, transportation and disposal of municipal solid waste, sorting of MSW, vehicles and equipment for primary collection, secondary collection and transport. a) Sanitary landfilling: Requirements, layout, leachate management, waste placement and inspection. b) Composting: windrow, aerated static pile, in vessel, decentralized, bin, box and vermicomposting.

	c) Biomethanation and refuse derived fuel. (7 Hrs)				
Unit-VI	Tools for Combating Polymer Waste Combating tools for waste management: Case studies on extended producer responsibility, product stewardship, usage of green products and usage of biodegradable or environmentally degradable polymers, plastic roads. (5 Hrs)				
TextBooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Plastics Fabrication and Recycling	Manas Chanda and Salil K. Roy	CRC Press	4 th (2007)
	2.	Introduction to Plastics Recycling	Vannessa Goodship	Smithers Rapra	2 nd (2006)
	3.	Recycling of Polymers	Raju Francis	Wiley-VCH	1 st (2016)
	4.	Recycling of Plastic Materials	Francesco Paolo La Mantia	Chemtec Publishing	2 nd (1993)
	5.	Feedstock Recycling and pyrolysis of waste plastics	John Schiers & W. Kaminsky	John Wiley and Sons	1 st (2006)
	6.	Mixed Plastic Recycling Technology	B. Hegberg, G. Brenniman	Noyes Data Corporation	1 st (1992)
	7.	Plastics Waste: Recovery of Economic value	Jacob Leidner	Marcel Decker Inc.	2 nd (2001)
	8.	Management of municipal solid waste	T. V. Ramchandra	TERI Press	1 st (2009)
	9.	Waste Management	Martin F. Lehmann	I. A. Publishers	1 st (2008)
	10.	Environmental Waste Management	Ram Chandra	CRC Press	1 st (2015)
	11.	Plastic Waste	Jacob Leidner	Marcel Decker Inc.	1 st (1981)

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Computer Science and Engineering) Semester VI	
Course Code: CSE371 Course: Operating System Lab Teaching Scheme: Practical: -02 Hrs/week	Credits: 0-0-1 Practical Marks: 25
Objectives :	• To study various File operations. • To study Process scheduling algorithms. • To study Page replacement algorithms.
List of Practical	: 1. To perform various primitive operations of Files: Open a file, Read text from a file, Append to a file, Write Text into a file, Copy contents of one file to other. 2. To study and implement various basic Linux System Calls 3. Fork(), Exec(), Delay(), Kill(), Alarm() 4. To study and implement First Come First Serve(FCFS) process scheduling algorithm 5. To study and implement shortest job first(SJF) process scheduling algorithm. 6. To study and implement Round Robin(RR) process scheduling algorithm. Use Quantum very low and Very high and compare results 7. To study and implement Priority Scheduling Algorithm. 8. To study and implement Deadlock Detection Algorithm 9. To study and implement Banker's Algorithm. 10. To study and implement various page replacement policies: First In First Out(FIFO), Least Recently Used (LRU), Least Recently Used Approximation(LRUA)

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Computer Science and Engineering) Semester VI		
Course Code: CSE372 Course: Artificial Neural Network & Fuzzy Logic Lab Teaching Scheme: Practical: -02 Hrs/week		Credits: 0-0-1 Practical Marks: 25
Objectives	:	- To recall the basic concepts and logics of Artificial Neural Network - To implement pattern recognition - To study classification using Matlab - To study Fuzzy logic relations and functions using Matlab
List of Practical	:	- Learning rules and activation functions in NN - Development of logic using MP and Hebb neuron model - Development of supervised learning using NN Toolbox - Development and testing of perceptron NN algorithm - Development of ADALINE algorithm with bipolar inputs and outputs. - Development of auto associative network using outer product rule - Development of fuzzy membership functions and fuzzy set properties. - Development of logic for fuzzy relations - Verification of logic using fuzzy relations - Design of a fuzzy controller systems using fuzzy tool of Matlab

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Computer Science and Engineering) Semester VI		
Course Code: CSE373 Course: Open Source Technologies Teaching Scheme: Practical: -02 Hrs/week		Credits: 0-0-1 Practical:25Marks
Objectives	:	• To study Linux Operating System • To study containerization • To study container management and orchestration
List of Practical	:	1. Linux Distributions & Installation Methods. 2. User Management. 3. Linux file sharing. 4. Understanding Linux Software Management and Installation. 5. Managing Linux Networking. 6. Virtualization in Linux. 7. Cloud computing. 8. Working with Docker and Containers. 9. Linux Automation. 10. Kubernetes

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Computer Science and Engineering) Semester VI		
Course Code: CSE375 Course: Cloud Computing Lab Teaching Scheme: Practical: -02 Hrs/week		Credits: 0-0-1 Term Work: 25
Objectives	:	• To study basics of cloud computing. • To learn various cloud components. • To study the Virtualization Techniques
List of Practical	:	1. To study Emergence of cloud computing 2. To study the different cloud services 3. Demonstration of Google cloud Print 4. Collaborating on Google Calenders 5. Collaborating on Google docs, sheets and Presentations 6. Collaborating on Google forms, drawings 7. Creating a warehouse application in salesforce.com 8. Demonstration of Virtualization techniques using different tools 9. Demonstration of AWS service using Amazon 10. Demonstration/Installation of Red Hat Openstack

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Computer Science and Engineering) Semester VI	
Course Code.: CSE374 Title: Major Project I Teaching Scheme: Practical: 04 Hrs/week	Credits:0-0-2 Practical Examination(Marks): 50
Objectives	: The Projects in the undergraduate study of engineering aims at developing in the student, knowledge, and skills to match the current and projected needs of industry, society or user systems and to create social awareness and professional attitudes. Apart from monitoring the engineering processes and maintenance of engineering work, machines and equipment, an engineer has to do investigate survey, collect data, refer handbooks/datasheets, prepare estimates and design the systems.
Contents	• The completion of project is to be carried out in two semesters i.e. in Third Year Sem. VI and Final Year B. Tech Sem. VII. • The students shall form project group of maximum 3 students for within department projects and maximum of 6 students in case of interdisciplinary projects of their choice. • The student groups shall collect the information on the topic/area of interest and submit brief synopsis to Project Coordinator. • The Project Coordinator shall allot the Project Guide depending upon the area or specialization of eligible faculty members from the department. • The individual student from the project group shall maintain the project diary and update weekly by taking remark of respective guide. • The industry sponsored projects and inter departmental projects shall be encouraged and in case of inter departmental projects, students of maximum 3 different departments/disciplines shall work together by forming the group. The guide allotment and internal/external assessment of such groups shall be done by the respective departments. • The projects addressing issues related to environmental, rural development and societal issues shall be preferred. • The selected project shall help to promote participation in government approved schemes like Unnat Maharashtra Abhiyaan (UMA) and Unnat Bharat Abhiyaan (UBA). • The students shall aim to promote their project work in project exhibitions/competitions, paper presentation/publication in reputed journals and conferences. • The relevance of project and implementation including details of attainment of POs and PSOs addressed through the projects with justification must be clearly stated. Phases of Major Project - I: Phase I: Problem Identification, Literature survey, data collection, deciding scope of topic and objectives and Methodology of the project. Phase II: Confirmation of block diagram or layout of the proposed project. Phase III: Submission of report of project work.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science and Technology) Syllabus of Third Year B. Tech. (All) Semester VI				
Code No.: BSH807 Course: Mandatory non-credit course (German Language) Teaching Scheme: Theory: 2 Hrs/week		Credits: 0-0-0 Marks: 50 (Continuous Assessment)		
Objectives		1. Students will be able to apply communicative German Grammar in communication. 2. Students will be able to enhance the level of German vocabulary. 3. Students will be able to pronounce and articulate words as well as sentences accurately. 4. Students will be able to understand and apply German language eventually. 5. Students will be able to develop German language skills. 6. Students will be able to manage situational communication in German.		
Unit I	:	Introduction - Self-Introduction - Nos. up to 10,000 - Weekdays, Months - Date and Time - Greetings (6 Hrs)		
Unit II	:	Vocabulary - My house - My family - Daily routine - Hobbies - Food (6 Hrs)		
Unit III	:	Grammar - Verb forms (Present Tense) - Articles - Possessive pronouns - Auxiliary verbs - Wh-Questions / Yes-No Questions - Past-Tense of haben and sein (12 Hrs)		
List of Reference	Sr. No.	Title	Author	Publication
Books	1	German Made Simple: Learn to speak and understand German quickly and easily	Arnold Leitner PhD	Namrata's Amazon.in
	2	The Everything Learning German Book: Speak, write, and understand basic German	Edward Swick	Adams Media

		in no time		
	3	Langenscheidt German in 30 Days	Von Angelika G. Beck	Langenscheidt
	4	Complete German Beginner to Intermediate Book and Audio Course: Learn to read, write, speak and understand a new language with Teach Yourself	Heiner Schenke	The McGraw Hill
	5	German: How to Speak and Write It (Beginners' Guides)	Joseph Rosenberg	Repro Books
	6	Collins Easy Learning – Collins Easy Learning German Grammar and Practice	Collins	Collins

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science and Technology) Syllabus of Third Year B. Tech. (All) Semester VI				
Course Code.: BSH808 Course: Mandatory non-credit course (Japanese language) Teaching Scheme: Theory: 2 Hrs/week			Credits: 0-0-0 Marks: 50 (Continuous Assessment)	
Objectives	1. Students will be able to apply communicative Japanese Grammar in communication. 2. Students will be able to enhance the level of Japanese vocabulary. 3. Students will be able to pronounce and articulate words as well as sentences accurately. 4. Students will be able to understand and apply Japanese language eventually. 5. Students will be able to develop Japanese language skills. 6. Students will be able to manage situational communication in Japanese.			
Unit I	:	Introduction - Introduction - Numbers - Days, Months, Dates (8 Hrs)		
Unit II	:	Grammar - Verb and verb forms - Present and Past Tense (8 Hrs)		
Unit III	:	Communication - Introduction of Japanese script - Dialogues (Shopping, in the restaurant) - Themes: Family, my city, my country, my friend (8 Hrs)		
List of Reference	Sr. No.	Title	Author	Publication
Books	1	Japanese Kanji for Beginners	Timothy G. Stout and Kaori Hakone	Tuttle Publishing
	2	Essential Japanese Grammar: A Comprehensive Guide to Contemporary Usage	Masahiro Tanimori and Eriko Sato Ph.D.	Tuttle Publishing
	3	15-Minute Japanese: Learn in Just 12 Weeks	D.K. Goel and Rajesh Goel	Amazon.in
	4	Oxford Japanese Grammar and Verbs (Dictionary)	Bunt Jonathan	Oxford Publication
	5	Read and write Japanese scripts:	Helen Gilhooly	Teach Yourself

		Teach yourself		
	6	Complete Japanese Beginner to Intermediate Book and Audio Course: Learn to read, write, speak and understand a new language with Teach Yourself	Helen Gilhooly	Teach Yourself

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester-VI	
Course Code: CED801 Course: Mandatory Non-Credit course (Professional Ethics and Constitution of India) Teaching Scheme: Theory: 02 Hrs/week	Credits: 0-0-0 Continuous Assessment: 50 Marks
Prerequisite	Knowledge of the basic structure of constitution of India.
Objectives	1. To create awareness of Engineering Ethics and human values, instill moral social values, loyalty and ethical issues. It will allow the students to assimilate with basic information about Indian Constitution, know its salient features and thus functioning of Democracy in India.
Unit-I	Professional Ethics: Definition of Ethics, Professional Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, Personal Ethics; Profession, Professionalism, Professional Responsibility, Professional Ethics; Conflict of Interest, Gift v/s Bribery, Environmental breaches, Negligence, Deficiencies in state of-the-art; Vigil Mechanism, Whistle blowing, protected disclosures. (4 Hrs)
Unit-II	Engineering and Professionalism: Positive and Negative Faces of Engineering Ethics, Code of Ethics as defined in the website of Institution of Engineers (India): Profession, Professionalism, and Professional Responsibility. Clash of Ethics, Conflicts of Interest. (4 Hrs)
Unit-III	Responsibility and reliability in Engineering: Responsibilities in Engineering and Engineering Standards, the impediments to Responsibility. Trust and Reliability in Engineering, IPRs (Intellectual Property Rights), Risks, Safety and liability in Engineering. (4 Hrs)
Unit-IV	Introduction to Indian Constitution: The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian constitution, The Making of the Constitution, The Role of the Constituent Assembly - Preamble and Salient features of the Constitution of India. Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and significance in Nation building. (4 Hrs)
Unit-V	Union Executive and State Executive: Parliamentary System, Federal System, Centre-State Relations. Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism. State Executives – Governor, Chief Minister, State Cabinet, State Legislature, High Court and Subordinate Courts, Special Provisions (Articles 370,371,371J) for some States. (4 Hrs)

Unit-VI	Elections, Amendments and Emergency Provisions: Elections, Electoral Process, and Election Commission of India, Election Laws. Amendments - Methods in Constitutional Amendments (How and Why) and Important Constitutional Amendments. Amendments – 7,9,10,12,42,44, 61, 73,74, ,75, 86, and 91,94,95,100,101,118 and some important Case Studies. Emergency Provisions, types of Emergencies and its consequences. (4 Hrs)				
Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Engineering Ethics (Including Human Values)	Govindrajan.M, Natrajan S, Senthilkumar V.S	PHI publication	2013
	2.	Ethics, Integrity and Aptitude	Reddy.N H, Ajmera, Santosh,	Tata McGraw Hill	2014
	3.	Introduction to the Constitution on India	Durga Das Basu	Prentice – Hall EEE, 19th / 20th Ed.	2008
	4.	“Constitution of India and Professional Ethics	Shubham Singles, Charles E. Haries, and Et al	Cengage Learning India Private Limited	Edition – 2018
	5.	An Introduction to Constitution of India	M.V.Pylee	Vikas Publishing	2002

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester VI	
Course Code: CSE801 Course: Mandatory Non-Credit Course (Green Computing) Teaching Scheme: Theory: 2 Hrs /week	Credits: 0-0-0 Marks: 50 (Continuous Assessment)
Prerequisite	Nil
Objectives	1. To learn the fundamentals of Green Computing. 2. To understand the concepts related to Green IT, Green devices and hardware along with software methods, green enterprise activities. 3. To study the various laws, standards, protocols for regulating green IT 4. To study various case studies related to the application of Green IT strategies.
Unit-I	Green IT: An Overview Introduction, Environmental Concerns and Sustainable Development, Environmental Impacts of IT, Green IT, Holistic Approach to Greening IT, Applying IT for enhancing Environmental sustainability, Green IT Standards and Eco-Labeling of IT. (4 Hrs)
Unit-II	Green Devices and Hardware with Green Software (04 hrs) Green Devices and Hardware: Introduction, Life Cycle of a device or hardware, Reuse, Recycle and Dispose. Green Software: Introduction, Energy-saving software techniques. (4 Hrs)
Unit-III	Green Enterprises and the Role of IT (04 hrs) Introduction, Organization and Enterprise Greening, Information systems in Greening Enterprises, Greening Enterprise: IT Usage and Hardware, Inter-Organizational Enterprise activities and Green Issues. (4 Hrs)
Unit-IV	Managing Green IT: Introduction, Strategizing Green Initiatives, Implementation of Green IT, Information Assurance, Communication and social media. (4 Hrs)
Unit-V	Regulating the Green IT: Laws, Standards and Protocols Introduction, The regulatory environment and IT manufacturers, Non regulatory government initiatives, Industry associations and standards bodies, Green building standards, Green data centers, Social movements and Greenpeace. (4 Hrs)
Unit-VI	Case Studies The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital. (4 Hrs)

	Sr. No.	Title	Author	Publication	Edition
Textbooks/ Reference Books	1	Harnessing Green IT Principles and Practices	San Murugesan, G.R. Gangadharan	Wiley Publication	-
	2	Green IT Strategies and Applications-Using Environmental Intelligence	Bhuvan Unhelkar	CRC Press	June 2014
	3	The Greening of IT	John Lamb	Pearson Education	2009
	4	Green Home computing for dummies	Woody Leonhard, Katherine Murray		2012

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad						
(Faculty of Science & Technology)						
Syllabus of Third Year B. Tech.(All) Semester VI						
Course Code: ETC801 Course: Mandatory Non-credit Course (Smart Cities) Teaching Scheme: Theory: 02 Hrs/week				Credits: 0-0-0 Marks: 50 (Continuous Assessment)		
Prerequisite		Nil				
Objectives		1. To identify urban problems. 2. To study Effective and feasible ways to coordinate urban technologies. 3. To study models and methods for effective implementation of Smart Cities.				
Unit-I		Smart cities: Ideal Smart City loop, Socio-economic and environmental issues, Implications of Urbanization, Urbanization models and global trends, Urbanization in India (4 Hrs)				
Unit-II		Criteria for smart cities: Smartness - Citizens, Living, Environment, Mobility, Economy, Governance Pillars of Smart cities, Buildings, Utilities, Transportation and road Infrastructure, Health Care, Sustainability issues (04 Hrs)				
Unit-III		Fundamental Technologies: Ubiquitous computing, Big Data, Networking, Internet of Things, Cloud computing, Cyber security architectures (04 Hrs)				
Unit-IV		ICT for Smart Cities: Complex Urban systems ICT Infrastructure modelling, Typical Edge Environment, Smart Cities as Systems of Systems, IoT Centric approach, IoT technologies: WiFi, 6LowPAN, Cellular, NFC, LoRa, Bluetooth, RFID, Zigbee (04 Hrs)				
Unit-V		Smart City: Smart Street lighting, Smart Parking, Environmental pollution monitoring, Vehicular tracking, Smart Traffic Control, Waste Management, Smart Grid, Amenity availability, Heritage Information portal, Mobile application design, development and Visualization (4 Hrs)				
Unit-VI		Case Studies of Smart Cities: National and International smart cities, their model, Clusters and Urbanization, Environmental Issues: The Role of Local and Global Climate Change (4 Hrs)				
TextBooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition	
	1.	The City of Tomorrow: Sensors, Networks, Hackers, and the	Carlo Ratti and Matthew	Yale University	-	

		Future of Urban Life (The Future Series)	Claudel	Press	
	2.	The Responsive City: Engaging Communities Through Data-Smart Governance	Stephen Goldsmith, Susan Crawford	Jossey Bass – Wiley	1, 1st Edition.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester VI	
Course Code: MED801 Course: Mandatory Non-Credit Course (Research Methodology) Teaching Scheme: Theory: 02 Hrs/week	Credits: 0-0-0 Marks: 50 (Continuous Assessment)
Prerequisite	No prerequisite as such
Objectives	1. To introduce students to quantitative and qualitative methods for conducting meaningful inquiry and research. 2. Prepare a preliminary research design for projects in their subject matter areas 3. Accurately collect, analyze, and report data 4. Present complex data or situations clearly
Unit-I	Research Problems and Research Design: -Meaning of research, objectives of research, motivation in research, types of research, steps involved in research process, criteria of good research, significance of research, research methods versus methodology, selection of research problem, steps involved in defining research problem, research process, need for research design, types of research designs, basic principles of experimental design, formal and informal experimental design. (4 Hrs)
Unit-II	Sampling Design: -Need for sampling, steps in sampling design, different types of sampling designs, sampling distributions, concept of central limit and standard error, sources of errors, population mean and proportion, sample size calculations, tests of measurements for validity, reliability, and practicality. (4 Hrs)
Unit-III	Data collection, Processing and Analysis: -Methods for collection of data, selection of data collection method, data processing operations, statistics in research, confidence level, measures of central tendency, dispersion, asymmetry and relationship. Spearman's and Pearson's coefficient of correlation, simple & multiple regression analysis, analysis of variance (ANOVA), factor analysis methods. (4 Hrs)
Unit-IV	Hypothesis Test: -Concept of research hypothesis, concept of testing of hypothesis, Procedure for hypothesis testing, Flow diagram for hypothesis testing, Measuring the power of a hypothesis test, Parametric tests (z, t, F and chi-square tests), Hypothesis testing of means and correlation coefficient, Limitations of the tests of hypotheses. (4 Hrs)
Unit-V	Report Writing Interpretation: Meaning of Interpretation, Why Interpretation? Technique of Interpretation, Precaution in Interpretation. Report Writing: Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation,

	Mechanics of Writing a Research Report, Precautions for Writing Research Reports, Conclusions. (4 Hrs)				
Unit-VI	Ethics: - Ethical Issues, Ethical Committees, Commercialization, copy right, royalty, Intellectual Property rights and patent law, Reproduction of published material, Plagiarism, Citation and Acknowledgement, Reproducibility, and accountability. (4 Hrs)				
TextBooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Research Methodology: Methods & Techniques	C. R. Kothari and G. Garg	New Age International	4 th Edition, 2019.
	2.	Research Methodology	R. Pannervselvam	PHI Learning,	2 nd Edition, 2014
	3.	Research Methods and Statistics	Bernard C. Beins & Maureen A. McCarthy	Pearson Education Inc.	2012
	4.	Research Methods Handbook	Stuart MacDonald & Nicola Headlam	CLES	-
	5.	Intellectual Property Rights--Unleashing the Knowledge Economy,	Ganguli Prabuddha.	Tata McGraw-Hill,	2001
	6.	Intellectual Property Rights	Neeraj Pandey and Khushdeep Dharni.	PHI Learning	1st Edition, 2014
	7.	Fundamentals of Intellectual Property Rights,	Ramakrishna B.	Notion Press	1st Edition, 2017
	8.	The Indian Patents Act 1970 (as amended in 2005)		-	-

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester VI					
Course Code: PPE801 Course: Mandatory Non-Credit Course (Industrial Safety and Management) Teaching Scheme: Theory: 02 Hrs/week			Credits: 0-0-0 Marks: 50 (Continuous Assessment)		
Objectives	1. To understand the fundamental concepts, and methods in Industrial Safety. 2. To understand the impact of safe industrial operations, its benefits and safety management.				
Unit-I	Introduction to Industrial Safety Introduction, key concepts, terminologies, Need for safety, Safety information system. (4 Hrs)				
Unit-II	Safety Management Safety inspection, procedure, checklist, safety sampling, safety audit, safety survey, accident prevention, training for safety. (4 Hrs)				
Unit-III	Safety in Process Safety in material handling and equipments used, design for safety in process. (4 Hrs)				
Unit-IV	Fire Safety Classification of fires. Common causes of industrial fires. Fire protection systems. (4 Hrs)				
Unit-V	Hazards Occupational health hazards, physical and chemical hazards. (4 Hrs)				
Unit-VI	Hazard Analysis Fault tree and event tree analysis, hazard identification techniques (e.g., HAZOP, HAZAN, OSHAS 18001). (4 Hrs)				
TextBooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Industrial Safety, Health and Environment Management Systems	R.K.Jain and Sunil S.Rao	Khanna Publishers, New Delhi	2006
	2.	Industrial Safety Management	Deshmukh L M	Tata McGraw-Hill	-
	3.	Handbook of Occupational Safety and Health	Slote.L	John Willey and Sons, New York	-

	4.	Safety at Work	Ridley J and Channing J	Butterworth-Heinemann UK	-
	5.	Loss of prevention in Process Industries , Vol. 1 and 2	Frank P. Lees	Butterworth-Heinemann Ltd., London	1991
	6.	Safety Management	Grimaldi and Simonds	AITBS Publishers, New Delhi	2001
Website	https://nptel.ac.in/courses/110/105/110105094/				

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