DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO.SU/Engg./B.Tech./02/2019

It is hereby informed to all concerned that, the syllabi prepared by the Board of Studies & recommended by the Dean, Faulty of Science & Technology the **has accepted the following syllabi in accordance with Choice Based Credits & Grading System for all Branches of B.Tech. Final Year** in his emergency powers under section 12(7) of the Maharashtra Public Universities Act, 2016 on behalf of the Academic Council and Management Council as enclosed herewith:-

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

This is effective from the Academic Year 2019-2020 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/2019/ 820-30
Date:- 24-07-2019.

Deputy Registrar,
Syllabus Section.

Copy forwarded with compliments to :-
1] **The Principals, affiliated 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.**
   Copy to :-
1] The Director, Board of Examinations & Evaluation,
2] **The Section Officer, [Engineering Unit] Examination Branch,**
3] The Section officer, [Eligibility Unit],
4] **The Programmer [Computer Unit-1] Examinations,**
5] **The Programmer [Computer Unit-2] Examinations,**
6] The In-charge, [E-Suvidha Kendra],
7] The Public Relation Officer,
8] The Record Keeper,

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD.

Curriculum of

Final Year B.Tech

Computer Science and Engineering

Under Choice Based Credit & Grading System

UNDER THE FACULTY OF SCIENCE & TECHNOLOGY

[Effective from 2019-20 & onwards]

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD

[FACULTY OF SCIENCE AND TECHNOLOGY]

SYLLABUS
Of
Final Year B. Tech. (Computer Science and Engineering)
(w.e.f. Academic Year 2019-20)

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

FACULTY OF SCIENCE AND TECHNOLOGY

Structure w.e.f.2019-20

FinalYear B.Tech. (Computer Science and Engineering)

Course Code	SEMESTER-VII Course	L	T	P	Total	CT	TH	TW	PE	Total	Credits	Duration of Theory Exam
		Contact Hrs / Week				Examination Scheme						
CSE401	Artificial Neural Networks &Deep Learning	4	-	-	4	20	80	-	-	100	4	3 Hrs
CSE402	Cryptography and Network Security	4	-	-	4	20	80	-	-	100	4	3 Hrs
CSE403	Data Warehousing and Data Mining	4	-	-	4	20	80	-	-	100	4	3 Hrs
*	Open Elective II	4	-	-	4	20	80	-	-	100	4	3 Hrs
CSE441-443	Elective III	4	-	-	4	20	80	-	-	100	4	3 Hrs
CSE444-446	Elective IV	2	-	-	2	10	40	-	-	50	2	2 Hrs
CSE421	Lab: Artificial Neural Networks & Deep Learning	-	-	2	2	-	-	25	25	50	1	
CSE422	Lab:Cryptography and Network Security	-	-	2	2	-	-	50	-	50	1	
CSE423	Lab: Data Warehousing and Data Mining	-	-	2	2	-	-	25	25	50	1	
CSE424	Lab: Mobile Application Development	-	-	2	2	-	-	50	50	100	1	
CSE425	Project II	-	-	4	4	-	-	100	100	200	4	
	Total of semester-VII	**22**	**-**	**12**	**34**	**110**	**440**	**250**	**200**	**1000**	**30**	

Course Code	SEMESTER-VIII Course	L	T	P	Total	CT	TH	TW	PE	Total	Credits	Duration of Theory Exam
		Contact Hrs / Week				Examination Scheme						
CSE471	In Plant Training	-	-	-	-	-	-	300	300	600	24	NA
	Total of Semester-VIII	**-**	**-**	**-**	**-**	**-**	**-**	**300**	**300**	**600**	**24**	
	Grand Total of VII & VIII	**22**	**-**	**12**	**34**	**110**	**440**	**550**	**500**	**1600**	**54**	

L: Lecture hours per week   T: Tutorial hours per week   P: Practical hours per week   CT: Class Test
TH: University Theory Examination   TW: Term Work   PE: Practical/Oral Examination

Elective III

Course Code	CSE441	CSE442	CSE443
Course	Cloud Technology	Natural Language Processing	Distributed Systems

Elective IV

Course Code	CSE444	CSE445	CSE446
Course	Software Testing	Service Oriented Architecture and Web Services	Economics for Engineers

*Open Elective-II

Sr. No.	Name of course	Department	*Course code
1.	Fundamentals of Bioenergy	AED	AED431
2.	Big Data Analytics	CSED	CSE431
3.	Solid Waste Management	CED	CED431
4.	Energy Planning and Conservation	EED	EED431
5.	Data Science	ETC	ETC431
6.	Operations Research	MED	MED431
7.	Polymer Recycling and Waste Management	PPED	PPE431

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad

(Faculty of Science and Technology)

Syllabus of Final Year B. Tech. (Computer Science and Engineering) Semester-VII

Course Code.: CSE401	**Course:Artificial Neural Networks and Deep Learning**
Teaching Scheme	**Theory Examination Duration: 03 Hrs**
Theory: 04 Hours per week	**Theory Examination : 80 Marks**
Credits:04	**Class Test: 20**

Prerequisites	Basics of Artificial Intelligence, Image Processing, Engineering Mathematics	
Objectives	1. To understand basics of Artificial Neural Network(ANN)&Deep Learning. 2. To understand supervised models of ANN and Deep Learning. 3. To apply ANN models in practice for solving real world problems.	
Unit I	: **Basics of Artificial Neural Network** Characteristics of Neural Networks, Structure and working of a biological neural network, artificial neural network: terminology, models of neurons: Mc Culloch Pitts model, Perceptron model, Adaline model, topology, Basic learning laws. Functional Units for ANN for Pattern Recognition Task: Pattern Recognition Problem, Basic Functional units, PR by functional units.	**08 Hrs**
Unit II	: **Feedforward Neural Networks Supervised Learning** Perceptron – Learning and Memory, Learning Algorithms, Error Correction and Gradient Decent Rules, Perceptron Learning Algorithms, Supervised Learning Back-propagation Multilayered Network Architectures, Back-propagation Learning Algorithm, example Applications of feed forward neural networks.	**08 Hrs**
Unit III	: **Feedback Neural Networks** Introduction, Associative Learning, Hopfield network, Error Performance in Hopfield networks, simulated annealing, Boltzmann machine and Boltzmann learning, State transition diagram and false minima problem, stochastic update, simulated annealing, Boltzmann machine, Bidirectional Associative Memory, BAM Stability Analysis.	**08 Hrs**
Unit IV	: Introduction to autoencoders, Types of auto encoders, Dimensionality reduction using autoencoders, Regularization in autoencoder	**08 Hrs**
Unit V	: Convolutional Neural Networks, ImageNet, GoogLeNet, ResNet, Visualizing Convolutional Neural Networks, Classification using CNN	**08 Hrs**
Unit VI	: Sequence Learning Problem, Recurrent Neural Network, Back-propagation through Time, The problem of exploding and vanishing gradients, Long short term memory (LSTM), Gated Recurrent Units (GRU)	**08 Hrs**

Reference Books:	:	1. Artificial Neural Network by B. Yegnanarayana, PHI Publication
		2. Introduction to Artificial Neural Systems by Jacek M. Zurada, Jaico Publication
		3. Introduction to Neural Network using Matlab 6.0 by S.N.Deepa, S.N. Sivnandanan,S.Sumathi TMH publication
		4. Deep Learning, An MIT Press book, Ian Goodfellow and YoshuaBengio and Aaron Courville http://www.deeplearningbook.org
		5. NPTEL course on Neural Network and Deep learning

Section A: Units I, II and III   **Section B**: Units IV, V, and VI

Pattern of Question paper:
The 6 units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 Marks Paper:
1. Ten questions.
2. Five questions in each section
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section for 10 marks each.
4. Remaining questions will be of 15 marks each.
5. Any two questions of 15 marks from remaining questions in each section are to be solved.

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad		
(Faculty of Science and Technology)		
Syllabus of Final Year B. Tech. (Computer Science and Engineering) Semester-VII		

Course Code: CSE402	**Course: Cryptography and Network Security**
Teaching Scheme	**Theory Examination Duration: 03 Hrs**
Theory: 04 Hours per week	**Theory Examination : 80 Marks**
Credits:04	**Class Test: 20**

Prerequisites	Basic Understanding of Computer Networks	
Objectives	1. To understand the fundamentals of Cryptography 2. To acquire knowledge on algorithms used to provide confidentiality, integrity and authenticity 3. To understand the various key distribution and management schemes. 4. To use encryption techniques to secure data in transit across data networks	
Unit I	: **Introduction to the Concepts of Security:** Introduction, The Need for Security, Security Approaches, Principles of Security, Types of Attacks, Model for Network Security, Modular Arithmetic, Euclidean and Extended Euclidean algorithm.	**08 Hrs**
Unit II	: **Introduction to Cryptography Techniques:** Introduction, Plain text and Cipher text, Substitution techniques, Transposition techniques, Encryption and Decryption, Symmetric and Asymmetric Key Cryptography, Possible types of attacks.	**08 Hrs**
Unit III	: **Symmetric Key Cryptographic Algorithms:** Modes of operation, overview of Symmetric key cryptography, Data encryption Standard(DES), Strength of DES,3DES, Advanced Encryption Standard(AES), AES structure, AES Transformation fuctions, Blowfish.	**08 Hrs**
Unit IV	: **Public Key Cryptography:** Public Key Cryptosystems, Applications for public key Cryptosystems, Requirements for public key Cryptography, public key cryptanalysis, The RSA algorithms, The security of RSA, Diffie-Hellman Key Exchange algorithm, Key exchange protocol, Man-in-the Middle Attack	**08 Hrs**
Unit V	: **Cryptographic Hash Functions:** Application of cryptographic hash functions: Message Authentication,other applications, Two simple hash functions, Requirements and security, hash function based on cipher block chaining, Secure hash algorithm(SHA-512), Message Authentication Requirement, Message Authentication functions, Message Authentication Code: Requirement, Security, Cryptanalysis	**08 Hrs**

Unit VI	:	**Security in Networks**: Threats in networks, Security Controls- Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Key Management and distribution, Digital signature, Digital Certificate	**08 Hrs**
Reference Books:	:	1. Cryptography and Network Security, William Stallings , 6th Edition, Pearson Education. 2. Cryptography and Network Security , Atul Kahate, 3rd Edition, McGraw Hill Education. 3. Cryptography and Network Security , Behrouz A. Forouzan, tata Mc Graw Hill 4. Network Security Essentials: Applications and Standards , William Stallings, Prentice Hall	

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(Faculty of Science and Technology)

Syllabus of Final Year B. Tech. (Computer Science and Engineering) Semester-VII

Course Code.: CSE403	**Course: Data warehousing and Data Mining**
Teaching Scheme	**Theory Examination Duration: 03 Hrs**
Theory: 04 Hours per week	**Theory Examination : 80 Marks**
Credits:04	**Class Test: 20**

Prerequisites	Database Management Systems	
Objectives	1..To understand datawarehouse and its applications 2. To design multidimensional data models 3. To understand data mining needs and applications 4. To apply data mining for real world applications	
Unit I	: **Introduction to Data Warehousing:** Introduction to Decision Support System, Need for data warehousing, Operational & informational data,Data Warehouse definition and characteristics, Data Warehouse Architecture, The Process of Data Warehouse Design,A Three-Tier Data Warehouse Architecture.	**08 Hrs**
Unit II	: **Data Warehouse Components:** Architectural components: ETL Process, Data Preprocessing: Why Preprocess Data? Data Cleaning Techniques, Data Integration and Transformation, Data Reduction strategies overview , Discretization and Concept Hierarchy Generation for numerical data techniques binning, histogram analysis, For categorical data techniques concept hierarchies, Significant role of metadata, Datawarehouse applications and usage.	**08 Hrs**
Unit III	: **OLAP in the Data Warehouse :** A Multidimensional Data Model, Schemas for Multidimensional Databases: Stars, Snowflakes, and Fact Constellations Measures, Concept Hierarchies, OLAP Operations in the Multidimensional Data Model, Need for OLAP, OLAP tools.	**08 Hrs**
Unit IV	: **Introduction to Data Mining:** Definition of data mining, Data Mining Functionalities, Classification of Data Mining Systems , Data Mining Task Primitives**,** Mining Frequent Patterns, Associations, Market Basket Analysis , Apriori Algorithm, Association rules from frequent itemset ,Text Mining and Web Mining	**08 Hrs**
Unit V	: **Classification and Prediction:** Introduction, Classification by Decision Tree Induction, Attribute selection measures, Bayesian Classification , Bayes Theorem ,Naïve Bayesian Classification , Rule-Based Classification, If then rules for classification, Rule Extraction from decision tree, Classification by Back	**08 Hrs**

		propagation, Support Vector Machines.	
Unit VI	**:**	**Cluster Analysis and Business Intelligence** Introduction to Cluster Analysis,Categorization of Major Clustering Methods, Clustering by k-means, k-medoids, hierarchical methods partitioning, Outlier Analysis.Introduction to Business Intelligence(BI),Changing Business environment and Computerized decision support,Major tools and techniques of BI	**08 Hrs**
Reference Books:	**:**	1. Data Mining Concepts and Techniques by Han, Kamber, Morgan Kaufmann , MK publication. 2. Data Mining: Concepts and Techniques by Margaret Dunham, Morgan Kaufmann Pub. 3. Data Warehousing Fundamentalsby PaulPunnian, John Wiley Pub. 4. Data Warehousing, Data Mining and OLAPby AlexBerson, S.J. Smith,Tata McGraw Hill 5. The Data Warehouse Lifecycle Toolkit by Ralph Kimball, John Wiley 6. Business Intelligence: A Managerial Approach (2nd Ed,) Turba.n, Sharda, Delen, King.Wiley Pub	

Section A:Units I, II and III   **Section B**: Units IV, V, and VI

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Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

(Faculty of Engineering & Technology)

Syllabus of Final Year B. Tech. (ALL) Semester-VII

Course Code: AED431	**Course: Open Elective- II (Fundamentals of Bioenergy)**
	Class Test: 20 marks
Teaching Scheme	**Theory Examination: 80 Marks**
Theory: 4 hrs/week	**Theory Examination Duration: 3 Hrs**

Objectives	Objectives under this subject are: 1. Understand bioenergy technologies, processes, reactions and energy conversion rates for Anaerobic Digestion, gasification, pyrolysis (fast, intermediate and slow) and combustionTo study the wells, bore wells and well development. 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, In Photosynthesis Oxygen Comes from Water Molecule **(08 Hrs)**
Unit-II	Bioethanol- Basic concept of Cellulosic Bioethanol Process, Pretreatment and Enzyme treatment of Cellulosic Bioethanol Process,Fermentation and Distillation in Cellulosic Bioethanol Production,Basic concept of Plant Design, Pilot Plant and Scale-up **(08 Hrs)**
Unit-III	Biogas- Basic concept in anaerobic digestion and biogasification, Biochemical methane potential assay and calculations for biogasification feasibility analysis, Design and operation of biogasification systems, Biogas utilization, Biomass production System and their Categorization, Important Parameters for Selecting Biomass Crops, Factors Determining the Conversion Process - I**(08 Hrs)**
Unit-IV	Biodiesel- Biodiesel production processes, Biodiesel characterization , Biodiesel feedstocks ,Environmental permitting and safety considerations for biodiesel production **(08 Hrs)**
Unit-V	Thermo Chemical Processes: Basic concepts in gasification and pyrolysis, Gasification and pyrolysis systems, Spark Ignition Engine, Compression Ignition Engine, Gasification Types - Up Drift Gasifier(08 Hrs)
Unit-VI	Bioenergy distritribution and end use for a sustainable future - Down Draft and cross flow gasifier, operation and performance of gasifier ,fludized bed gasification, its operation and performance, Biological root of gasification (08 Hrs)

	S. No.	Title	Authors	Publication
Reference Books	1	Introduction to Bioenergy (Energy and the Environment)	Vaughn C. Nelson (Author), Kenneth L. Starcher	-
	2	Bioenergy: Biomass to Biofuels	Anju Dahiya	-
	3	Bioenergy: Principles and Applications	Yebo Li and Samir Kumar Khanal	-

Section A: Units I, II and III   **Section B**: Units IV, V, and VI

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Dr.Babasaheb Ambedkar Marathwada University, Aurangabad

(Faculty of Science and Technology)

Syllabus of Final Year B. Tech. (ALL) Semester-VII

Course Code.: CSE431	**Title: Open Elective II- Big Data Analytics**
Teaching Scheme	**Class Test: 20**
Theory: 04 Hours per week	**Theory Examination Duration: 03 Hrs**
Credits:04	**Theory Examination: 80 Marks**

Prerequisites	Knowledge of Programming Language (Java preferably), SQL
Objectives	1. To understand the Big Data Platform and its Use cases 2. To understand the basics of Apache Hadoop and HDFS 3. To apply analytics on Structured, Unstructured Data.

Unit-I	**FUNDAMENTALS OF BIG DATA** The Evolution of Data Management, Understanding the Waves of Managing Data, Defining Big Data, Four Vs , Big Data Management Architecture. Big Data Types: Defining Structured Data, Defining Unstructured Data, Big Data Applications.	**08 Hrs**
Unit-II	**BIG DATA TECHNOLOGY LANDSCAPE:** Big Data Technology Components: Exploring the Big Data Stack, Virtualization, Understanding the Basics of Virtualization, Managing Virtualization with the Hypervisor, Abstraction and Virtualization, Implementing Virtualization to Work with Big Data.	**08 Hrs**
Unit-III	**DATA ANALYTICS:** **Predictive Analytics:** Linear Regression, Logistic Regression, Decision Trees, **Descriptive Analytics:** Association Rules, Sequence Rules, Segmentation, **Social Network Analytics:** Social Network Definitions, Social Network Metrics, Social Network Learning, Relational Neighbor Classifier,Business Process Analytics, Web Analytics	**08 Hrs**
Unit-IV :	**HADOOP AND MAP REDUCE:** History of Hadoop, Analyzing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, Hadoop Storage, Common Hadoop Shell commands, Hadoop Architecture, Hadoop MapReduce Paradigm: Map and Reduce tasks , Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats	**08 Hrs**
Unit-V :	**HDFS(Hadoop Distributed File System)** The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Sqoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-	**08 Hrs**

		Based Data structures.	
Unit-VI	:	**Hadoop Eco System** **Pig :**Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. **Hive :**Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. **Hbase :**HBasics, Concepts, Clients, Example, Hbase Versus RDBMS.	**08 Hrs**
Reference Books:	:	1. Big Data Analytics by Seema Acharya, SubhasiniChellappan,Wiley 2015. 2. Hadoop: The Definitive Guide by Tom White, Third Edit on, O'reily Media, 2012. 3. Analytics in a Big Data World: The Essential Guide to Data Science and its Applications by Bart Baesens, Wiley, 2014, ISBN: 978-1-118-89270-1 4. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007. 5. Bill Franks, "Taming the Big Data Tidal Wave: Finding OpportUnit Ies in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012. 6. Glen J. Myat, "Making Sense of Data", John Wiley & Sons, 2007 7. Michael Mineli, Michele Chambers, Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013.	

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Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science and Technology)
Syllabus of Final Year B. Tech. (ALL) Semester-VII

Course Code: CED 431	Title: Open Elective - II Solid Waste Management
Teaching Scheme	Class Test: 20 Marks
Theory: 04 Hrs/week	Theory Examination Duration: 03 Hrs
Credits: 04	Theory Examination:80 Marks

Course Objective	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 of SWM, Waste Management Hierarchy, Functional elements, Environmental impact of mismanagement. Solid waste: Sources, types, Composition, Quantities, Physical, chemical and Biological properties. **[08 Hours]**
UNIT-II	**Generation of solid waste:** Factors affecting. Storage and collection: General considerations for waste storage at source, Types of collection systems. Collection System, Transfer station: Meaning, Necessity, Transportation of solid waste: Means and Methods, Routing of vehicles **[08 Hours]**
UNIT-III	**Segregation and Material Recovery:** Objectives, Stages of segregation, sorting operations, Guidelines for sorting for materials recovery, E waste management, Biomedical waste management **[08 Hours]**
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. **[08 Hours]**
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. **[08 Hours]**
UNIT-VI	**Hazardous waste management:** Types of hazardous waste (such as nuclear, biomedical and industrial waste,), problems and issues related to hazardous waste management, Need for hazardous waste management, 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 and stabilization of hazardous waste. **[08 Hours]**

Recommended Books:

1. Hilary Theisen and Samuel A, Vigil, George Tchobanoglous, Integrated Solid Waste Management, McGraw- Hill, New
2. York, 1993 2.
3. CPHEEO, Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization, Government of India, New Delhi, 2000 3.
4. Michael D. LaGrega, Philip L Buckingham, Jeffrey C. E vans and Environmental 4.
5. Resources Management, Hazardous waste Management, Mc-Graw Hill International edition, New York, 2001. 5.
6. Vesilind P.A., Worrell W and Reinhart, Solid waste Engineering, Thomson Learning Inc., Singapore, 2002. 6.
7. Charles A. Wentz, Hazardous Waste Management, Second Edition, Pub: McGraw Hill International Edition, New York, 1995.

Section A: Units I, II and III   **Section B**: Units IV, V, and VI

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Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

(Faculty of Science & Technology)

Syllabus of Final Year B. Tech. (All) Semester – VII

Course Code: EED431	**Course: Open Elective-II (Energy Planning and Conservation)**	
Teaching Scheme	**Class Test: 20 Marks**	
Theory: 04 Hrs/week	**Theory Examination Duration: 3Hrs**	
Credits: 04	**Theory Examination: 80 Marks**	

Prerequisites	:	Should have knowledge of Electrical/ Mechanical Appliances, various types of energy utilization.
Objectives	:	1. Identify the demand supply gap of energy in Indian scenario. 2. Understanding basics of energy audit. 3. Understand various opportunities in energy saving for industry
Unit-I	:	**Energy Policy:** National & State Level Energy Issues, National & State Energy Policy, Industrial Energy Policy, Energy Security, Energy Vision. Energy Pricing & Impact of Global Variations. Energy Productivity (National & Sector wise productivity). **08Hrs**
Unit-II	:	**Energy action planning:** Energy Action Planning: Key elements, Force field analysis, Energy policy purpose, perspective, Contents, Formulation, Ratification, Organizing - location of energy management, Top management support, Managerial function, Roles and responsibilities of energy manager, Accountability. Motivating-motivation of employees. **08 Hrs**
Unit - III	:	**Importance of Energy management:** Energy Management: Definition, Energy audit- need, Types of energy audit, Energy management (audit) approach-understanding energy costs, Bench marking, Energy performance. **08 Hrs**
Unit - IV	:	**Elements of Energy conservation:** General energy problem, , Scope for energy conservation and its benefits, Energy conservation Principle – Maximum energy efficiency, Maximum cost effectiveness, Mandatory provisions of Energy Conservation act 2001, Features of Energy Conservation act-Standards and labelling, designated consumers, Energy Conservation Building Codes (ECBC). **08 Hrs**

Unit -V	:	**Energy Audit and Measuring Instruments**			
		Basic measurements – Electrical measurements, Light, Pressure, Temperature and heat flux, Velocity and Flow rate, Vibrations. Instruments Used in Energy systems: Load and power factor measuring equipments, Wattmeter, flue gas analysis, Temperature and thermal loss measurements, air quality analysis etc. **8 Hrs**			
Unit -VI	:	**Lighting and Lighting System:**			
		Lightings Levels, Fixtures Lighting techniques – Natural, CFL, LED lighting sources and fittings, Day lighting, Timers, Energy Efficient Windows. **08 Hrs**			
Text Books, Reference Books, e-books, e-journals	:	**Sr. No.**	**Title**	**Author**	**Publication**
		1.	Bureau of Energy efficiency hand books No 1 & 2	BEE OF INDIA	BEE OF INDIA
		2.	Energy Management Handbook	Wayne C. Turner	Tata McGraw Hill
		3.	Energy management	Paul O Callaghan	
		4.	Bureau of Energy efficiency hand books No 3,	BEE OF INDIA	BEE OF INDIA
Additional References	:	1. https://www.beeindia.gov.in/content/energy-auditors information as & when available.			

Section A: Units I, II and III   **Section B**: Units IV, V, and VI

Pattern of Question paper:
The 6 units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

 For 80 Marks Paper:
1. Ten questions.
2. Five questions in each section
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section for 10 marks each.
4. Remaining questions will be of 15 marks each.
5. Any two questions of 15 marks from remaining questions in each section are to be solved.

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
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Syllabus of Final Year B. Tech. (ALL) Semester-VII

Course Code.:ETC431	**Course: Open Elective - II (Data Science)**
Teaching Scheme	**Class Test (Marks): 20**
Theory: 04Hrs/week	**Theory Examination Duration: 03 Hrs**
Credits:04	**Theory Examination: 80 Marks**

Prerequisites	**:**	Programming Concepts, Data Structure, Basic Linear Algebra, Basic Probability and Statistics
Objectives	**:**	● Describe what Data Science is and the skill sets needed to be a data scientist ● Explain the significance of exploratory data analysis in data science ● Apply basic machine learning algorithm. ● Identify approaches used for feature generation. ● Create effective visualization of given data.
Unit I	**:**	**Introduction:** Introduction, big data and data science hype, datafication, current landscape of perspective. **[8 Hours]**
Unit II	**:**	**Statistical Inference and Exploratory data analysis:** Populations and samples, statistical modelling, probability distributions, fitting a model, Introduction to R. Basic Tools (Plots, Graphs and summary statistics) of EDA, philosophy of EDA, the data science process, Case Study. **[8 Hours]**
Unit III	**:**	**Machine Learning Algorithm and its Usage:** Linear Regression, k-nearest Neighbors(k-NN), k-means. Spam filtering, naïve Bayes and its application for spam filtering, Data Wrangling: Tools and API for scrapping the web. .**[8 Hours]**
Unit IV	**:**	**Feature Generation and Selection:** Feature generations algorithms, feature selection algorithms: filters, wrappers, decision trees, random forest. Algorithmic ingredients of a recommendation engine, dimensionality reduction, singular value decomposition, principal component analysis. **[8 Hours]**
Unit V	**:**	**Mining Social Network:** Social Networks as graphs, clustering of graphs, direct discoveries of commUnit Ies in graphs, portioning of graphs, neighborhood properties of graphs. **[8 Hours]**
Unit VI	**:**	**Data visualization and ethical issues:** Basic principles, ideas and tools for data visualization, creation of visualization for complex data set. Case study. Privacy, security and ethics of data science. **[8 Hours]**

Reference Books:	:	**Text Books:** Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly. 2014 **Reference Books:** • . Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. • Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. ISBN 0262018020. 2013. • Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. ISBN 1449361323. 2013.

Section A: Units I, II and III   **Section B**: Units IV, V, and VI

Pattern of Question paper:
The 6 units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

 For 80 Marks Paper:
1. Ten questions.
2. Five questions in each section
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section for 10 marks each.
4. Remaining questions will be of 15 marks each.
5. Any two questions of 15 marks from remaining questions in each section are to be solved.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad	
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Syllabus of Final Year B. Tech. (All) Semester VII	
Course Code: MED431	Course: Open Elective-II (Operations Research)
Teaching Scheme:	Class Test: 20 marks
Theory: 04 Hrs/week	Theory Examination (Duration): 03 Hrs
Credits: 04	Theory Examination (Marks): 80

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. **02 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. **12 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 stepping stone method or MODI method. Degeneracy in Transportation Problem. Assignment Problem: Hungarian Method to solve Assignment Problem, Travelling Salesman as an Extension of Assignment Problem. **10 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.		
		08 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.		
		08 Hrs		
Unit VI	**:**	**Network Models:** Fulkerson 's rule, concept and types of floats, float calculations, CPM and PERT, Crashing cost and crashing Network		
		08 Hrs		

	Sr. No.	Title	Author	Publication
Reference Books, e- books, e- Journals	1	Operations Research	Taha H.A.	Ninth Edition, Prentice Hall Of India.
	2	Introduction to Operations Research	Frederick S. Hillier and Gerald J. Lieberman	Seventh Edition, Tata McGraw-Hill
	3	Operations Research	P.K. Gupta, D.S Hira	Fourth Edition S. Chand & Co.
	4	Operations Research	Man Mohan, P. K. Gupta, Kanti Swarup	12th Edition, S. Chand & Co.
	5	Operations Research Principles and Practice	Ravindran, Phillips and Solberg	Second Edition, Mc. WSE Willey
	6	Operations Research: Applications and Algorithms	Wayne L. Winston, Jeffrey B. Goldberg	Fourth edition, Thomson Brooks

	7	Operations Research: Theory, Methods and Applications	S. D. Sharma, Himanshu Sharma	Kedar Nath Ram Nath
	8	PERT and CPM: Principles and Applications	L. S. Srinath	Third Edition, ffiliated East-West Press Private Limited,
	9	Project Planning and Control with PERT & CPM	Dr. B.C. Punmia& K.K. Khandelwal	Fourth Edition, Firewall Media
Additional References :	:	1. nptel.iitm.ac.in 2. ocw.mit.edu 3. https://www.journals.elsevier.com/journal-of-operations-management 4. https://pubsonline.informs.org/journal/opre 5. https://www.theorsociety.com/		

Section A: Units I, II and III   **Section B**: Units IV, V, and VI

Pattern of Question paper:
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For 80 Marks Paper:
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2. Five questions in each section
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Course Code.: PPE431	Title: Open Elective-II: Polymer Recycling and Waste Management
Teaching Scheme: 4 hrs/week	Class Test: 20 Marks
Theory: 4 Hrs/week	Theory Examination Duration: 3 hrs
Credits: 4	Theory Examination: 80 Marks

Objectives	:	• To learn the need for polymer recycling, techniques employed and applications. • To learn the need and various methods/techniques involved in polymer waste management.
Unit I	:	**Significance of recycling:** Global plastics production and composition, global plastics waste composition, quantities and disposal, identification codes of plastics for recycling. Recycling process: collection, sorting and segregation of waste, recycling methods: Primary, secondary, tertiary and quaternary recycling, landfilling. **(08 hrs)**
Unit II	:	**Recycling equipment/machinery:** Equipment for primary and secondary recycling: shredder, granulator, pulverizer, cutter, extruder. Classification and types of reactors for tertiary recycling. **(09 hrs)**
Unit III	:	**Recycling of plastics from urban waste:** Rheology, density and mechanical behavior of recycled plastics, hydrolytic treatment of plastics waste containing paper, processing of mixed plastics waste, recycling additives. **(07 hrs)**
Unit IV	:	**Recycling techniques:** Recycling techniques of PE packaging films and woven sacks, PET bottles and films, PP battery cases, PVC products and thermosetting plastics. **(08 hrs)**
Unit V	:	**Municipal solid waste management and treatment techniques:** Collection, storage, transportation and disposal of municipal solid waste,

		sorting of MSW, types of vehicles and equipment for primary collection, secondary collection and transport. Different treatment techniques:
		a) Composting: techniques such as windrow, aerated static pile, in vessel, decentralized, bin and vermicomposting.
		b) Bio-methanation: merits, applicability, process and types of anaerobic digester systems.
		c) Refuse derived fuel: classification, composition, production process and uses.
		d) Sanitary landfilling: requirements, layout, leachate management, waste placement and inspection. **(11 hrs)**
Unit VI		**Tools for combating polymer waste:** Combating tools for waste management: extended producer responsibility, product stewardship, shared producer responsibility, usage of green products and usage of biodegradable or environmentally degradable polymers for waste reduction. **(05 hrs)**

Reference Books	:	Sr. No.	Title	Author	Publication	Edition
		1	Plastics Fabrication and Recycling	Manas Chanda and Salil K. Roy	CRC Press	4th, 2007
		2	Introduction to Plastics Recycling	Vannessa Goodship	Smithers Rapra	2nd, 2006
		3	Recycling of Polymers	Raju Francis	Wiley-VCH	1st, 2016
		4	Recycling of Plastic Materials	Francesco Paolo La Mantia	Chemtec Publishing	2nd, 1993
		5	Feedstock Recycling and pyrolysis of waste plastics	John Schiers & W. Kaminsky	John Wiley and Sons	1st, 2006
		6	Mixed Plastic Recycling Technology	B. Hegberg, G. Brenniman	Noyes Data Corporation	1st, 1992
		7	Plastics Waste: Recovery of Economic value	Jacob Leidner	Marcel Decker Inc.	2nd, 2001
		8	Management of municipal solid waste	T. V. Ramchandra	TERI Press	1st, 2009
		9	Waste Management	Martin F. Lehmann	I. A. Publishers	1st, 2008
		10	Environmental Waste Management	Ram Chandra	CRC Press	1st, 2015
		11	Plastic Waste	Jacob Leidner	Marcel Decker	1st,

					Inc.	1981

Section A: Units I, II and III   **Section B**: Units IV, V, and VI

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Syllabus of Final Year B. Tech. (Computer Science and Engineering) Semester-VII

Course Code.: CSE441	**Course:Elective III - Cloud Technology**
Teaching Scheme	**Theory Examination Duration: 03 Hrs**
Theory: 04Hours per week	**Theory Examination: 80 Marks**
Credits:04	**Class Test: 20**

Prerequisites	Basics of Computer Networks	
Objectives	1. To understand cloud computing basics. 2. To study the basic service models of cloud computing. 3. To understand the basics of virtualization. 4. To study the concept of Openstack.	
Unit I	: **Introduction** Introduction to Cloud, The Emergence of Cloud Computing,Grid Computing Vs Cloud Computing, Benefits of Using a Cloud Model, Key Characteristics of Cloud Computing, Challenges for the Cloud.	**08 Hrs**
Unit II	: **Cloud Service Models** Infrastructure as a Service (IaaS), Introduction to IaaS, Amazon EC2 - Renting, EC2 Compute Unit, Platform and Storage, Pricing, Customers, Eucalyptus. Platform as a Service (PaaS), Introduction to PaaS, Service Oriented Architecture (SOA). Cloud Platform and Management ,Google App Engine, Salesforce.com platform. Software as a Service (SaaS) ,Introduction to SaaS, Web services.	**08 Hrs**
Unit III	: **Collaborations** Collaborating on Calendars, Schedules and Task Management, online Planning and Task Management, collaborating on Event Management, collaborating on Contact Management, collaborating on Word Processing Collaborating on Databases – Storing and Sharing Files.	**08 Hrs**
Unit IV	: **Virtualization** Basics of Virtualization , virtualization Types- desktop virtualization, Network virtualization, server and Machine virtualization, storage virtualization, operating system virtualization and its advantages, Virtual machine,basics-taxonomy of Virtual machines, process virtual machines, system virtual machines, Hypervisor .	**08 Hrs**
Unit V	: **Introduction to OpenStack** OpenStack architecture, OpenStack terminologies, Object storage, block storage, Networking service and Metering service**.**	**08 Hrs**

Unit VI	:	**Openstack Components** Introduction, Horizon-Dashboard details, Keystone- different services, Nova, Cinder, Neutron, Swift, Glance, Ceilometer, Heat.	**08 Hrs**
Reference Books:	:	1. Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online by Michael Miller, Que publishing. 2. Professional Xen Virtualization by William von Hagen, WROX publication. 3. Virtual Machines: Versatile Platforms for Systems and Processes (The Morgan Kaufmann Series in Computer Architecture and Design by Jim Smith, Ravi Nair 4. Enterprise Cloud Computing: Technology, Architecture, Applications by Dr Gautam Shroff	

Section A: Units I, II and III   **Section B**: Units IV, V, and VI

Pattern of Question paper:
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(Faculty of Science and Technology)

Syllabus of Final Year B. Tech. (Computer Science and Engineering) Semester-VII

Course Code.: CSE442	Course:Elective III – Natural Language Processing
Teaching Scheme	Theory Examination Duration: 03 Hrs
Theory: 04 Hours per week	Theory Examination: 80 Marks
Credits:04	Class Test: 20

Prerequisites	Data structures, Algorithms, Basics of Theory of Computation,Artificial Intelligence	
Objectives	1. To understand natural language processing and to learn how to apply basic algorithms in this field. 2.To understand the grammars, parsing and semantics of English language for processing 3. To understand basics of knowledge representation	
Unit I	: Seven stages of NLP, Views, Applications of NLP , Evaluating language understanding system, The different levels of language analysis, Representations and understanding, Linguistic Background : Words, The elements of simple noun phrases, verb phrases and simple sentences, complex phrases ,Adjective phrases, Adverbial phrases	08 Hrs
Unit II	: **Grammars and Parsing :** Grammars and sentence structure, good grammar, Top down parser, Bottom up chart parser, Transition network grammars, finite state model and morphological processing, grammars and logic programming	10 Hrs
Unit III	: Auxiliary verbs and verb phrases, Movement phenomena in language, handling questions in context free grammars, relative clauses, hold mechanism ATNs, gap threading	06 Hrs
Unit IV	: **Ambiguity resolution :** Basic probability theory, estimating probabilities, Part of Speech tagging, lexical probabilities, probabilistic context free grammars, best first parsing, a simple context dependent best first parser	08 Hrs
Unit V	: Semantics and logical form, word sense and ambiguity, basic logical form language, encoding ambiguity in the logical form, ambiguity resolution – selectional restrictions, semantic filtering using selectional restrictions, semantic networks, statistical word sense disambiguation statistical semantic preferences	10 Hrs
Unit VI	: Knowledge representation, FOPC, Frames – representing stereotypical information, handling natural language quantification, time and aspectual classes of verbs, automating deduction in logic based representations, procedural semantics, hybrid knowledge representations , Case Study - WordNet	06 Hrs

Reference Books:	: 1. Natural Language Understanding by James Allen, Second Edition, Pearson
	
	    2. Statistical Language Learning by Charniack, Eugene, MIT Press, 1993.
	
	    3. Foundations of Statistical Natural Language Processing by Manning,	

| | | Christopher and Heinrich, Schutze, MIT Press, 1999. |
| | | 4. NPTEL Course: Natural Language Processing by Prof. Pushpak Bhattacharyya, IIT Bombay |

Section A:Units I, II and III   **Section B**: Units IV, V, and VI

Pattern of Question paper:
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Dr. Babasaheb Ambedkar Marathwada University, Aurangabad	
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Syllabus of Final Year B. Tech. (Computer Science and Engineering) Semester-VII	
Course Code.: CSE443	**Course:Elective III - Distributed Systems**
Teaching Scheme	**Theory Examination Duration: 03 Hrs**
Theory: 04	**Theory Examination: 80 Marks**
Credits:04	**Class Test: 20**

Prerequisites	Computer Networks, Computer Organization, Operating System, System Programming	
Objectives	The Distributed Systems course aims 1. To provide fundamental concepts of distributed systems along with its design. 2. To familiarize the learner about Synchronization and Message Passing, 3. To make aware of Remote Communication and Application development. 4. To prepare the learner to use various Distributed Technologies.	
Unit I	: **Distributed Systems:** Introduction, Distributed Computing Models, Software Concepts, Issues in designing Distributed System, Client – Server Model	**08 Hrs**
Unit II	: **Message Passing:** Introduction to Message Passing, Advantages and features of Message Passing, Message Format, Message Buffering, Multi Data gram Messaging, Introduction to Group Communication	**08 Hrs**
Unit III	: **Remote Procedure Call (RPC):** Basic RPC Operations, Parameter Passing, Extended RPC Models Remote Object Invocation: Distributed Objects, Binding a Client to an Object, Static Vs Dynamic RMI, Parameter Passing, Persistence and synchronicity in communication, Message Oriented Transient and Persistent Communications	**08 Hrs**
Unit IV	: **Synchronization:** Clock Synchronization, Physical and Logical Clocks, Global State, Election Algorithms, Mutual Exclusion, Distributed Transactions, Deadlocks	**08 Hrs**
Unit V	: **Distributed Technologies and Frameworks:** Case Study EJB: Overview of EJB S/W Architecture, view of EJB Conversation, Building and Deploying EJB, Roles in EJB, Types of Enterprise Beans, Lifecycle of Beans ,Applications using EJB Framework.	**08 Hrs**
Unit VI	: **CORBA :**In Introduction to CORBA, CORBA Components and architecture, Method Invocation, Static and Dynamic Invocation in CORBA, CORBA IDL, Developing Application using CORBA Introduction to .NET, .NET architecture, . NET Remoting Comparison of RMI, CORBA, EJB, .NET	**08 Hrs**
Reference Books:	: 1. Distributed Computing by Sunita Mahajan, Seema Shah, Oxford, second edition. 2. Distributed Systems : Principles and paradigms by Andrew S. Tanenbaum & Maarten van Steen Prentice Hall of India Private Limited	

	3. Middleware and Enterprise Integration Technologies by G. Sudha Sadasivam, Radha Shankarmani, , Wiley Precise Textbook
	4. Distributed Operating Systems by Pradeep K. Sinha, Prentice Hall of India Private Limited
	5. Distributed Systems by G. Coulouris, J. Dollimore and T. Kindberg

Section A:Units I, II and III   **Section B**: Units IV, V, and VI

Pattern of Question paper:
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2. Five questions in each section
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5. Any two questions of 15 marks from remaining questions in each section are to be solved.

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Course Code.: CSE444	Course: Elective IV -Software Testing
Teaching Scheme	Theory Examination Duration: 02 Hrs
Theory: 02 Hours per week	Theory Examination: 40 Marks
Credits:02	Class Test: 10

Prerequisites		Software Engineering	
Course 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?	04 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.	04 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.	04 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 .	04 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.	04 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 .	04 Hrs
Reference Books:	:	1.Software Testing by Ron Patton,SAMS Publication . 2. Software Engineering by Roger Pressman, Mc-Graw Hill publication.	

Section A:Units I, II and III   **Section B**: Units IV, V, and VI

Pattern of Question paper:
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For 40 Marks Paper:
1. Question paper should contain total eight questions.
2. Four questions in each section
3. Question no 1 from section A and Question no 5 from section B be made compulsory and should cover complete syllabus of the respective section for 06 marks each.
4. Remaining questions will be of 07 marks each.
5. Any two questions of 07 marks from remaining questions in each section are to be solved.

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Course Code.: CSE445	**Course:Elective IV -Service Oriented Architecture & Web Services**
Teaching Scheme	**Theory Examination Duration: 02 Hrs**
Theory: 02 Hours per week	**Theory Examination: 40 Marks**
Credits: 02	**Class Test: 10**

Prerequisites	Knowledge of Internet Technology, Web Design and Java Programming	
Objectives	To provide an overview of service oriented architecture and enable the students to create applications in collaborative environment.	
Unit I	: **Introduction:** Service Oriented Enterprise – Service Oriented Architecture(SOA) – SOA and Web Services – Multi-Channel Access – Business Process management – Extended Web Services Specifications – Overview of SOA – Concepts – Key Service Characteristics – Technical Benefits – Business Benefits	**04 Hrs**
Unit II	: **SOA & Web Services:** Web Services Platform – Service Contracts – Service- Level Data Model – Service Discovery – Service-Level Security – Service-Level Interaction patterns – Atomic Services and Composite Services – Proxies and Skeletons –Service Level Communication	**04 Hrs**
Unit III	: **SOA & Web Service Integration:** Overview – XML and Web Services - .NET and J2EE Interoperability – Service-Enabling Legacy Systems – Enterprise Service Bus Pattern	**04 Hrs**
Unit IV	: **SOA & Multi-Channel Access:** Business Benefits – SOA for Multi Channel Access –Tiers – Business Process Management – Concepts – BPM, SOA and Web Services –WSBPEL – Web Services Composition	**04 Hrs**
Unit V	: **Java Web Services:** JAX API's – JAXP – JAX-RPC – JAXM – JAXR – JAXB	**04 Hrs**
Unit VI	: **Web Service Transaction:** Meta-data Management – Web Services Security – Advanced Messaging –Transaction Management	**04 Hrs**

Reference Books:	: 1. Understanding SOA with Web Services by Eric Newcomer, Greg Lomow, Pearson Education, 2005.
	   2. Java Web Services Architecture byJames McGovern, Sameer Tyagi, Michael E Stevens, Sunil Mathew, Elsevier, 2003.
	   3. Service Oriented Architecture by Thomas Erl, Pearson Education, 2005.
	   4. Fast SOA byFrank Cohen, Elsevier, 2007.	

Section A:Units I, II and III   **Section B**: Units IV, V, and VI

Pattern of Question paper:
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For 40 Marks Paper:
1. Question paper should contain total eight questions.
2. Four questions in each section
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4. Remaining questions will be of 07 marks each.
5. Any two questions of 07 marks from remaining questions in each section are to be solved.

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Syllabus of Final Year B. Tech. (Computer Science and Engineering) Semester-VII

Course Code.: CSE446	Course:Elective IV: Economics for Engineers
Teaching Scheme:02 Hours per week	**Theory Examination Duration: 02 Hrs**
Theory: 02Hours per week	**Theory Examination: 40 Marks**
Credits:02	**Class Test: 10**

Prerequisites	Basics of Statistics	
Objectives	1. To make students aware of the Fundamental Economic Concepts Applicable To Engineering And To Learn The Techniques Of Incorporating Inflation Factor In Economic Decision Making. 2. To develop proficiency with methods for making rational decisions regarding problems likely to be encountered in professional practice.	
Unit I	: **Introduction to Engineering Economics:** Definition-Economics, GDP, GNP, NI, Disposable Income. Basic Principles and Methodology of Economics, Demand/Supply – elasticity – Government Policies and Application. Value Engineering- time value of money, Cash flow diagrams, Interest and Interest rate, Discrete compounding and payment	**04 Hrs**
Unit II	: **Calculation Formula:** Interest formulae for discrete compounding and discrete payments- Gradient series factors, Nominal & Effective interest. Economic equivalence, Methods of comparison of alternatives.	**04 Hrs**
Unit III	: **Cost Estimation:** Introduction to the process of Estimation; Use of relevant Indian Standard Specifications. Elements of cost Break even analysis, Economic order quantity. Cost estimation, Decision under risk and uncertainty.	**04 Hrs**
Unit IV	: **Rate analysis**: Purpose, importance and necessity of the rate analysis, factors affecting, task work, daily output from different equipment/ productivity	**04 Hrs**
Unit V	: **Maintenance and Depreciation Analysis:** Types Of Maintenance, replacements, Economic Life Of An Asset, Capital Recovery With Return, Challenger And Defender, Depreciation- Introduction, various depreciation methods- Straight Line Method, Declining Balance Method, Sum Of The	**04 Hrs**

		Years Method, Sinking Fund Method, Annuity Method Of Depreciation	
Unit VI	:	**Case Study:** Taxation effect on economic studies, Income tax analysis, Procedure to Adjust Inflation	**04 Hrs**
Reference Books:	:	1. Economics for Engineers byJames L.Riggs,DavidD. Bedworth, Sabah U. Randhawa , 4e , Tata McGraw-Hill 2. Engineering Economics Analysis byDonald Newnan, Ted Eschembach, Jerome Lavelle, OUP 3. Engineering Economy by Thuesen &Fabrycky,Pearson. 4. A Text Book of Economic Theory by Stonier and Hague ,Longman's Landon	

Section A:Units I, II and III   **Section B**: Units IV, V, and VI

Pattern of Question paper:
The 6 units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 40 Marks Paper:
1. Question paper should contain total eight questions.
2. Four questions in each section
3. Question no 1 from section A and Question no 5 from section B be made compulsory and should cover complete syllabus of the respective section for 06 marks each.
4. Remaining questions will be of 07 marks each.
5. Any two questions of 07 marks from remaining questions in each section are to be solved.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad		
(Faculty of Science and Technology)		
Syllabus of Final Year B. Tech. (Computer Science and Engineering) Semester- VII		
Course Code.: CSE 421		**Course:Lab - Artificial Neural Networks and Deep Learning**
		Term work :25 marks
Practical: 02 Hours per week		**Practical Examination: 25 Marks**
Credits:01		
Objectives	**:**	1. To implement models of ANN and Deep learning 2. To applydifferent models of ANN and Deep learning
List of Practical	**:**	1. Write a program to implement Backpropagation neural network for digit recognition 2. Write a program to implement feedforward neural network for hand written digit recognition 3. Write a program to implement all activation function of neural network for any pattern recognition application 4. Write a program to reduce dimension of given dataset 5. Write a program to implement any one of ImageNet, GoogLeNet, ResNet convolutional neural network 6. Write a program to recognize hand written character using CNN deep learning algorithm 7. Write a program to classify images using CNN deep learning algorithm 8. Write a program LSTM Neural Network for Time Series Prediction 9. Write a program to predict sequence of given data using GRU 10. Write a program to predict stock prices based on historic data using LSTM/ GRU

The assessment of term work shall be done based on the following.
- Continuous assessment
- Performing the experiments in the laboratory
- Practical/Oral examination conducted on the syllabus and term workmentioned above

The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and viva -voce based on the syllabus

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad		
(Faculty of Science and Technology)		
Syllabus of Final Year B. Tech. (Computer Science and Engineering) Semester- VII		
Course Code.: CSE422		**Course:Lab - Cryptography and Network Security**
		Term work :50 marks
Practical: 02 Hours per week		
Credits:01		
Objectives	**:**	1. To implement the fundamental algorithms of Cryptography 2. To apply DES, AES and RSA in the given scenario
List of Practical	**:**	1. Write a Program to implement Monoalphabetic Cipher 2. Write a Program to implement Caeser Cipher 3. Write a Program to implement Affine Cipher 4. Write a Program to implement Rail fence technique 5. User A want to send message "Meet me very urgently" to User B by using DES algorithms encrypt it at sender end and decrypt it at receiver end. 6. User C want to send message "Welcome to CSE" to User D by using AES algorithms encrypt it and decrypt it at receiver end. 7. User A want to communicate to user B but it should be confidential by using Blowfish algorithms send encrypted message and decrypt it. 8. User A want to communicate to user B but they want to user Asymmetric Key Cryptography by using RSA algorithms send message to each other. Encrypt message at sender side and Decrypt it at receiver side. 9. Write a Program to implement Secure hash algorithm 10. Write a Program to implement Digital Signature

The assessment of term work shall be done on the basis of the following.
- Continuous assessment
- Performing the experiments in the laboratory
- Practical/Oral examination conducted on the syllabus and term workmentioned above

The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and viva -voce based on the syllabus

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science and Technology)
Syllabus of Final Year B. Tech. (Computer Science and Engineering) Semester- VII

Course Code.: CSE423		Course:Lab - Data warehousing and Data Mining
		Term work :25 marks
Practical: 02 Hours per week		Practical Examination:25 marks
Credits:01		
Objectives	:	1. To introduce students to the basic concepts and techniques of Data Mining 2. To develop skills of using recent data mining software for solving practical problems.
List of Practical	:	List of practical Assignment .Minimum 8 practical's to be conducted (4 from each Set) **Set-I:** Implementation assignment should be performed using appropriate Programming language. 1. Demonstration of OLAP operation 2.Implementation of varying Arrays 3.Implementation of Nested arrays 4. Demonstration of any ETL tool. 5.Write Program for Naïve Bayesian classification 6.Write program for cluster Analysis using simple K means algorithm **Set-II** Following Assignments should be performed using WEKA tool 8.Create data set in arff file format. Demonstration of preprocessing on WEKA dataset 9.Demonstration of Association rule process on dataset contact lenses.arff/supermarket using apriori algorithm 10.Demonstration of Classification rule process on WEKA dataset using j48 Algorithm 11. Demonstration of Classification rule process on WEKA dataset using ID3 Algorithm 12. Demonstration of Classification rule process on WEKA dataset using Naïve Bayes Algorithm 13.Demonstration of Clustering rule process on Data set irif.arff using simple k means

The assessment of term work shall be done on the basis of the following.
- Continuous assessment
- Performing the experiments in the laboratory
- Practical/Oral examination conducted on the syllabus and term workmentioned above

The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and viva -voce based on the syllabus

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
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Syllabus of Final Year B. Tech. (Computer Science and Engineering) Semester- VII

Course Code.: CSE424	Course:Lab - Mobile Application Development
	Term work :50 marks
Practical: 02 Hours per week	Practical Examination:50 marks
Credits:01	

Objectives	:	1.Student should be able to understand the basic concepts of Android Operating System. 2. Students should be able to develop App Developing Skills for mobile,tablets
List of Practical	:	1. Create "hello world" application that will display Hello World in the middle of the screen in red colour with green background. 2. Create application with login module, on successful login or on unsuccessful login give suitable message alert 3. Create an application which will perform basic operations on a written text i.e. Bold Italic Change font colour Change font size 4. Create an application which contains basic mathematical operations in different tabs. 5. Create an application to pick up any image from the storage and display it on the screen 6. Create an application which will give weather of location of the app 7. Create an registration app in which general details of the address will be auto populated 8. Create an application which will play media from storage 9 Create an application which will perform the CRUD operations in database 10. Create an application to display contacts present in the mobile 11. Create an application to access some basic sensors in mobile. 12. Final Project
List of Reference Books	:	Anubhav Pradhan, Anil V Deshpande, " Composing Mobile Apps", Edition – I, Publication Wiley, Year 2014

The assessment of term work shall be done on the basis of the following.
- Continuous assessment
- Performing the experiments in the laboratory
- Practical/Oral examination conducted on the syllabus and term workmentioned above

The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and viva -voce based on the syllabus

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad

(Faculty of Science and Technology)

Syllabus of Final Year B. Tech. (Computer Science and Engineering) Semester-VII

Course Code.: CSE 425	**Course:Project II**
	Term work :100 marks
Practical: 04 Hours per week	**Practical Examination:100 Marks**
Credits:04	

Prerequisites	Software Engineering ,Database Management System, Programming Language
Objectives	1. The practical implementation of theoretical knowledge gained during the study to tilldate is important for engineering education. 2. The student should be able implement theirideas/real time industrial problem/ current application of their engineering branch whichthey have studied in curriculum. 3. To motivate students for creativity. 4. To create awareness regarding latest technology 5. To have common platform for interaction about emerging technology. 6. To inculcate qualities of team work. 7. To explore related information using books, research papers, journals & websites. 8. To improve presentation and communication skills.
	Guidelines For Students And Faculty: 1. Students shall complete the Project-II in continuation of the work planned in third year under the course Project-I 2. Each student/group is required to - a. Submit a report with latest status of the project work. b. Give a 10 minutes presentation through Slide projector followed by a 10 minute discussion in the second week of their academic semester. c. Submit a report on the project topic with a list of required hardware, software or other equipment for executing the project in the third week of their academic semester. d. Start working on the project and submit initial development and CPM/PERT planning drawing in the fourth week of their academic semester. e. Preparation of PCB layout/ wiring diagram/ purchase of components/ software demo/ flowchart/ algorithm/ program/code, assembling, testing, etc. should be submitted by student/s within next five/Six weeks and minimum one page report should be there for each major activity. f. Overall assembling, wiring/ code writing/ testing, commissioning along with performance analysis, should be completed within next two weeks. g. In the last week, student/group will submit final project report to the guide. 3. Every assigned faculty/s should maintain record of progress of each student or group.

The format and other guidelines for the purpose of the Project Submission in hard bound copies should be as follows,

REPORT STRUCTURE

Index/Contents/Intent
List of Figures
List of Tables
List of Symbols / Abbreviations
1. Introduction
2. Literature survey
3. System development
4. Performance analysis
5. Conclusions
References
Appendices
Acknowledgement

1. INTRODUCTION
1.1 Introduction
1.2 Necessity
1.3 Objectives
1.4 Theme
1.5 Organization

2. LITERATURE SURVEY
Literature Survey
Related information available in standard Books, Journals, Transactions, Internet Websites
etc. till date (More emphasis on last three to five years)

3. SYSTEM DEVELOPMENT
Model Development
- Mechanical / Fabricated
- Analytical
- Computational
- Experimental
- Mathematical
- Software

(out of above methods at least one method is to be used for the model development) Some mathematical treatment or related information is required to be embodied

4. PERFORMANCE ANALYSIS
- Analysis of system developed either by at least two methods depending upon depthof standard
- These methods normally used are AnalyticalComputational/Statistical/Experimental/ or Mathematical
- Results at various stages may be compared with various inputs
- Output at various stages with same waveforms or signals or related information/parameters
- Comparison of above results by at least two methods and justification for the differences or error in with theory or earlier published results

5. CONCLUSION
5.1 Conclusions

5.2 Future Scope
5.3 Applications
Contributions (if any,)
The innovative work/invention/new ideas generated from the analysis of the work which can be taken from the conclusions

REFERENCES
- Author, "Title", Name of Journal/Transactions/ Book, Edition/Volume, Publisher, Year of Publication, page to page (pp.__).

These references must be reflected in text at appropriate places in square bracket
In case of web pages complete web page address with assessing date has to be enlisted
List of references should be as per use in the text of the report

APPENDICES
Related data or specifications or referred charts, details computer code/program, *etc*.

ACKNOWLEDGEMENTS
Expression of gratitude and thankfulness for helping in completion of the said task with name& signed by the candidate

  General Guidelines
Text should be printed on front and correct side of the watermark on quality bond paper
Paper size- A4, 75 to 85 gsm paper
Left Margin-1.5"
Right Margin-3/4"
Top Margin-1"
Bottom Margin-1"
- Pagination

First page of every chapter need not be printed but counted,second page onwards page number to printed at bottom center place.
All Greek words must be italic
Report Heading -ALL CAPITAL—16 Font
Chapter heading -ALL CAPITAL—14 Font
Subchapter –Title Case-12 Font
Sub-Subchapter –First Alphabet Capital case-12 Font
Page numbers for Index/Contents/Intent should be in roman
All text should be in times new roman
Cover page should have complete symbol of institute
Suitable flap (bookmark) with name of the candidate, Department and Institute name and symbol can be used with nylon strip.
For more information and sample of hard copy please contact the respective Head of the Department.

	Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
	(Faculty of Science and Technology)
	Syllabus of Final Year B. Tech. (Computer Science and Engineering) Semester-VIII

Course Code.: CSE 471	Course:In-Plant Training
	Term work :300 marks
Practical: - Hours per week	**Practical Examination:300 marks**
Credits:24	

(a)	**Rationale:** The techniques and processes of production of goods and services do not demand only technical skills, but also a cluster or conglomerate of skills. A significant part of which is related to the total humanistic growth of the man. Such conglomerate skills technical and humanistic cannot obviously be acquired through pure academic learning of concepts in formalized and institutional courses and in isolation of the actual work situation. It, therefore, naturally follows that no technical education will be complete till it has two components, one learning of concepts vis-a vis acquiring conceptual skill and other application of the concepts in real work situation vis-a vis acquiring manipulative or practicing skills. Technical education needs to have a complement of learning of the techniques of applying the concepts within the industry and business.
(b)	**Objectives:** 1) The students of B.Tech course shall get an opportunity to work on live problems of the industry. 2) He/She shall apply learning concepts in the real work situation. 3) He/She shall get an exposure to the industrial environment and thereby enable himself/herself to appreciate the other related aspects of industry viz. human, economic, commercial and regulatory. 4) He/She shall identify career paths taking into account their individual strengths and aptitude. 5) He/She shall contribute for the achievement of economic goals and aspirations of the industry and our country as a whole.
(c)	The curriculum for B.Tech students of Final Year Course of Part-II shall consist of; 1) Inplant training for a period of one full term, and the period of the term shall be as prescribed by the university from time to time. 2) A project on live problems of the industry shall be undertaken by the student/group of students undergoing training in the same establishment. 3) The term work shall consist of the inplant training record-daily diary, work diary, progress report, a record containing the literature survey in the field of appropriate branch of Engineering, a preliminary report related to project work etc. 4) Seminars will be arranged after successful completion of period specified in the scheme of semester VIII of B.Tech. The date and times will be decided according to the convenience of guide and student.
(d)	**General Provisions, Rules and Regulation of Inplant Training** 1. **Definition**

	- In-plant training (IPT) means a course of training in any industry or establishment undergone in pursuance of memorandum of understanding between industry and institute and under the prescribed terms and conditions of Dr. Babasaheb Ambedkar Marathwada University, Aurangabad - Institute means an academic Institution of higher learning associated and admitted under the privileges of university, i.e. Maharashtra Institute of Technology, Aurangabad affiliated to Dr. Babasaheb Ambedkar Marathwada University, Aurangabad. - Industry means any industry or business in which any trade, occupation or subject field in engineering or technology may be specified as a designated trade. - Establishment includes research organizations (like IITs, NITs, National Laboratories or research organization as recognized by Central Govt. / State Govt. / University) - University means any of the universities mentioned in the schedule of Maharashtra University Act, 1994 i.e. Dr. Babasaheb Ambedkar Marathwada University, Aurangabad. - Collaboration means collaborative academic activity of the Institute with industry. - Student means a B Tech Course student.
	2. Memorandum of understanding: Maharashtra Institute of Technology, Aurangabad will enter into an agreement with the industry through 'Memorandum of Understanding' for creating facilities of inplant training in the appropriate branch of Engineering according to the Course Curriculum and keep this agreement for a period of 10 years to foster a healthy industry- institute interaction for mutual benefits of both.
	3. Admission to inplant training: No student will be deputed for inplant training unless he/she produces testimonial of having kept one term for the subject under B.Tech. of final year course satisfactorily in Maharashtra Institute of Technology, Aurangabad.
	4. Period of inplant training: The period of Inplant training will be the period of one term for the subject under B.Tech. course semester- VIII, which will be notified by Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.
	5. Contract of InplantTraining : - The student of Maharashtra Institute of Technology shall enter into a contract of inplant training with the employing industry. - The inplant training shall be deemed to have commenced on the date, on which the contract of inplant training has been entered into. - Every contract of inplant training will contain the Terms and Conditions to be agreed by both the parties. - Every contract of inplant training shall be registered with the Maharashtra Institute of Technology within 15 days from entering into the contract.
	6. Violation of contract: Where an employer, with whom a contract for inplant training has been entered into, is for any reason,unable to fulfill his obligation under the contract, the contract end with the consent of Maharashtra Instituteof Technology. It is agreed between the employer, the student and any other employer that the student shall be engaged as an "inplant trainee" under the other employer till the expiry period of the inplant training.

	The agreement on registration with Maharashtra Institute of Technology shall be deemed to be the contract of inplant training between the student and other employer, and from the date of such registration, the contract of inplant training with the first employer shall terminate and no obligation under that contract shall be enforceable at the instance of any party to contract against the other party thereto.
	7. Termination of Contract: The contract of inplant training shall terminate on the expiry of the period of inplant training. Either party to the contract of inplant training make an application to Maharashtra Institute of Technology, Aurangabad for the termination of the contract. After considering the content of the application, and objection, Maharashtra Institute of Technology by order in writing, will terminate the contract, if it is satisfied that the parties to the contract have/has failed to carry out the Terms and Conditions of the contract. Provided that where a contract is terminated- - For the failure on the part of the Employer, Maharashtra Institute of Technology will depute students to another Employer for providing facilities of inplant training to the remaining period of training. - For the failure on the part of the student, the student will not be allowed to continue his/her inplant training in that term. The student shall be deputed for inplant training in the next coming term.
	8. Expectation from the Employer / Industry / Establishment: The following expectations are derived for effective inplant training. - To provide legitimate facilities for the training and learning of all the processes. - To guide the student for understanding a project of immense importance to industry and to help him/her for his/her career advancement.
	9. Obligation of Students: - Student must maintain a minimum attendance of 90% of total working days for the period of Inplant Training. - To learn his/her subject field in Engineering or Technology consciously and diligently at his place of training. - To carry out all orders of his/her Employer and the Superior in the establishment. - To abide by the Rules and Regulations of the Industry/Establishment in all matters of conduct and discipline. - To carry out the obligation under the contract of inplant training. - The student shall maintain a report of his work during the period of his inplant training in a proforma (form no: 2) made available in Annexure. - Except in case of extreme urgency, the B.Tech. student shall submit an application for all other leaves except the medical leave to the Manager/Gen. Manager (Personnel) of the concerned industry, where he is undergoing an inplant training and obtain sanction before the leave is taken. In case of Medical Leave, he shall submit an application to Maharashtra Institute of Technology, Aurangabad. The shortage in attendance will be subjected to extending the period of inplant raining in which case, the student may not be allowed to appear for the test, project seminar and assessment of term work etc. which will be held immediately after successful completion of the inplant training.

	10. Maintenance of Record: Every student of B.Tech. course shall maintain a daily record of the work done by him/her relating to the inplant training in the proforma (Annexure).

	11. Industry Sponsored Student Projects:
	The scheme envisages working out suitable programme for B.Tech. students. They are required to complete their inplant training in a given period. During this period, they shall be familiar with the understanding of the shop process and activities. The students can be asked to solve the mini-shop problem, which will make them think and try out short experiments as an improvement in the process, tools and equipment. The students in a group alone can undertake a project of immense importance for the benefit of the industry and also useful for the students for their advancement of career. Industry staff and Maharashtra Institute of Technology faculty can plan in advance to effectively complete the practical training with the project for preliminary studies on the floor.
	The projects should aim mainly-
	    ▪ Cost reduction
	    ▪ Enhancing productivity
	    ▪ Develement/Improvement/ Effective use of Softwares/ Systems
	    ▪ Energy conservation measures
	    ▪ Process Improvement technique
	    ▪ Apllication Development
	    ▪ Plastic and Polymer working
	    ▪ Hardware/ Software
	    ▪ Agroengineering and so on.

	12. What will form a good project? Through the project, it is hoped to provide the students an exciting experience in solving line problems under practical constraints. Hence it is desired that the project should be a well-defined problem, which can be completed and implemented within the project period. It may be a problem, evolving analysis, design, fabrication and / or testing.

	13. Time Schedule for the Project:
	The following time schedule should be planned by each student or groups of students, who undertake the project.
	    ▪ Proposal to be received before specified date.
	    ▪ Project acceptance before.
	    ▪ Commencement of the project.
	    ▪ Completion of the project.

	14. Commitment on the part of the Institute:
	    ▪ Providing a faculty member to supervise the project.
	    ▪ Providing the Institute facilities to complete the project.
	    ▪ Coordinator from industry will be invited to participate in the stage wise assessment of the students performance.

	15. Assistance for completion of the Project: All the projects undertaken by the students are time bound. Although, every attempt results may not be achieved within the period available for the student. In such cases, the services of the associated faculty members can be sought for the completion of the same on mutually agreed terms.
	16. Monitoring of Inplant Training: The B.Tech. students are expected to follow all the rules and discipline of the industry.

	However, because of other academic requirements and the nature of the project, the student may have to work in other places outside the industry. The faculty and Industry supervisor will work out a suitable arrangement to review the progress of the work from time to time. Maharashtra Institute of Technology, Aurangabad will monitor the progress of inplant training in association with industry authority.
	17. **Conduct and Discipline:** In all matters of the conduct and discipline, B.Tech. student shall be governed by the rules and regulations (applicable to employees of the corresponding category) in the Establishment, where he/she is undergoing a training.
	18. **B.Tech. Students are Trainees and not Workers:** ▪ Every B.Tech. student undergoing an inplant training in the respective branch of Engineering & Technology in any Establishment shall be treated as a trainee and not a worker and- ▪ The provision of any law with respect to labour will not apply to such a trainee.
	19. **Settlement of Disputes:** Any disagreement or dispute between an industry and a B.Tech. student trainee arising out of the contract of inplant training shall be resolved both by Maharashtra Institute of Technology and the industry with mutual cooperation. The decision of both Maharashtra Institute of Technology and the industry shall be final.
	20. **Holding of Test and Grant of Certificate:** The progress in inplant training of every student shall be assessed by the industry and Maharashtra Institute of Technology faculty from time to time. Every B.Tech. student undergoing an inplant training shall be issued a certificate of Proficiency on completion of his/her training to the satisfaction of the industry.
	21. **Offer of Stipend / Other Welfare Activities and Employment:** It shall not be obligatory on the part of the Employer / Industry to offer any stipend and other welfare amenities available, if any, to the students of B.Tech. courses undergoing an inplant training. However, if the industry desirous to do so will be a privilege for the students and also for Maharashtra Institute of Technology in view of the bonding of better understanding and cooperation forever.
(e)	**PRACTICAL EXAMINATION** The Practical examination will be conducted after successful completion of the inplant training for which guide will be internal examiner and external examiner will be appointed by the university. The date of practical examination will be same for the students of a branch and will be notified by the university. The assessment of the practical examination shall consist of 1. Seminar Performance 2. An oral on the project work done. 3. Assessment of the term work / report.