

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY



CIRCULAR NO.SU/Engg./B.Tech./41/2022

It is hereby inform to all concerned that, the syllabi recommended by the Dean, Faculty of Science & Technology, the Hon'ble Vice-Chancellor **has accepted revised following syllabi of Bachelor of Technology Final Year (VII & VIII semester) in accordance with Choice Based Credit & Grading System as per guidelines of AICTE** in his emergency powers under section 12(7) of the Maharashtra Public Universities Act, 2016 on behalf of the Academic Council 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 2022-23 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/ 15213-22
Date:- 11.11.2022.

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Deputy Registrar,
Academic Section

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



**Revised Syllabus of Final Year Bachelor of
Technology**

**Electrical Engineering
(VII & VIII Semester)**

Under Choice Based Credit System (CBCS)

Under Faculty of Science and Technology

(Effective from 2022-23 and onwards)

FACULTY OF SCIENCE AND TECHNOLOGY
Syllabus Structure w.e.f. 2022-2023 (Choice Based Credit System)

Final Year B.Tech. (Electrical Engineering)

Semester-VII

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	Total
EED401	Switchgear and Protection	3	-	-	15	15	10	60	-	-	100	3	-	-	3
EED402	Advanced Control System	3	-	-	15	15	10	60	-	-	100	3	-	-	3
EED403	Power System Operation and Control	3	-	-	15	15	10	60	-	-	100	3	-	-	3
EED441 - EED443	Professional Elective Courses -IV	3	-	-	15	15	10	60	-	-	100	3	-	-	3
	Open Elective -III	3	-	-	15	15	10	60	-	-	100	3	-	-	3
EED421	Lab 1 :Switchgear and Protection	-	-	2	-	-	-	-	-	25	25	-	-	1	1
EED422	Lab 2: Advanced Control System	-	-	2	-	-	-	-	-	25	25	-	-	1	1
EED423	Lab 3: Power System Operation and Control	-	-	2	-	-	-	-	50	-	50	-	-	1	1
EED426	Lab: Major Project-II	3	-	8	15	15	10	60	50	50	100	-	-	4	4
		15	-	14	75	75	50	300	100	100	700	15	-	7	22

Semester-VIII

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	Total
EED471	Internship	-	-	-	-	-	-	-	300	300	600	-	-	20	20

Professional Elective Courses-IV

Group A	Group B	Group C
EED441- Utilization of Electrical Energy	EED442-Electrical Traction	EED-443 Power Quality

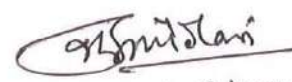

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 Dr. V. B. Malode


 Dr. B. N. Chaudhari

Open Elective-III Courses

Sr. No.	Name of course	Department	Course code
1.	Ecology and Environmental Pollution	Agricultural Engineering	AED431
2.	Town Planning	Civil Engineering	CED431
3.	Big Data Analytics	Computer Science and Engineering	CSE431
4.	Battery Management System	Electrical Engineering	EED431
5.	Data Science	Electronics and Telecommunications Engineering	ETC431
6.	Modern Management Techniques	Mechanical Engineering	MED431
7.	Packaging Technology	Plastic and Polymer Engineering	PPE431


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 Dr. B.N. Chandhane

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Syllabus of final year B.Tech (Electrical Engineering) Semester-VII

Course Code: EED401 Course Title: Switchgear and Protection Teaching Scheme: Theory: 03 Hrs / week Tutorial: 00 Hrs / week		Credits: 3-0-1 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	Different type of faults in power system , Various switchgears and their use in substation ,Principle and working of rotating machines and transformer with vector groups	
Objectives	1.Acquaint about construction and working principle of different types of HVCBs 2. Elaborate the Need of protective Relaying and operating principles of different types of relays. 3. Explain different type of faults in transformer, alternator and 3 phase Induction motor and various protective schemes related to them. 4. Impart knowledge about transmission line protection schemes and characteristics of different types of distance relays	
Unit-I	Fundamentals of protective relaying Need for protective system, nature and causes of fault, types of faults, effects of faults, evolution of protective relaying, classification of relays, zones of protection, primary and backup protection, essential qualities of protective relaying. Trip circuit of circuit breaker, zone of protection. Various basic operating principles of protection- over current, (current graded and time graded), directional over current, differential, distance, induction type relay, torque equation in induction type relay, current and time setting in induction relay, Numerical on TSM , PSM and operating time of relay (06 Hrs)	
Unit-II	Fundamentals of arc interruption Ionization of gases, deionization, Electric arc formation , Current interruption in AC circuit breaker, high and low resistance principles, arc interruption theories, arc voltage, recovery voltage, derivation and definition of restriking voltage and RRRV, current chopping, interruption of capacitive current, resistance switching, Numerical on RRRV, current chopping and resistance switching (06 Hrs)	
Unit-III	Circuit Breaker	

	Different ratings of circuit breaker (like rated voltage, rated current, rated frequency, rated breaking capacity – symmetrical and unsymmetrical breaking, making capacity, rated interrupting duties, rated operating sequence, short time rating). Classification of high voltage circuit breaker. Working and constructional features of ACB, SF6, VCB- advantages, disadvantages and applications. Auto reclosing. (06 Hrs)				
Unit-IV	Static and Digital Relaying Overview of Static relay block diagram, operating principal, merits and demerits of static relay. Numerical Relays :-Introduction and block diagram of numerical relay, Sampling theorem, Anti –Aliasing Filter, Block diagram of PMU B) 3 Phase Induction Motor Protection Abnormal conditions and causes of failures in 3 phase Induction motor, single phasing protection, Overload protection, Short circuit protection (06 Hrs)				
Unit-V	A) Transformer Protection Types of faults in transformer, Percentage differential protection in transformers, Restricted E/F protection, incipient faults, Buchholz relay, protection against over fluxing, protection against inrush current, B) Alternator Protection Various faults in Alternator, abnormal operating conditions- stator faults, longitudinal percentage differential scheme and transverse percentage differential scheme. Rotor faults abnormal operating conditions, inter turn fault, unbalance loading, over speeding, loss of excitation, protection against loss of excitation using offset Mho relay, loss of prime mover. (06 Hrs)				
Unit-VI	Transmission line protection Over current protection for feeder using directional and non-directional over current relays, Introduction to distance protection, impedance relay, reactance relay, mho relay and Quadrilateral Relays, Introduction to PLCC, block diagram, advantages, disadvantages, three stepped distance protection, Effect of arc resistance, and power swing on performance of distance relay. Realization of distance relays (impedance, reactance, and mho relay) using numerical relaying algorithm (flowchart, block diagram), Introduction to Wide Area Measurement (WAM) system. (06 Hrs)				
References	Sr. No.	Title	Author	Publication	Edition
	1.	Switchgear Protection & Power Systems	S. Rao	Khanna Publication	6th
	2.	Fundamentals of Power System Protection	Y. G. Paithankar, S. R. Bhide	Prentice Hall of India	5 th
	3.	Power System Protection & Switch	Badri Ram, D. N. Vishwakarma	Tata McGraw Hill	4 th
	4.	Protective Relaying: Principles and Applications	J. Lewis Blackburn,	CRC Press	6 th

		Thomas J. Domin		
5.	Digital Protection of power System	Prof. Dr.S. A. Soman, IIT Mumbai	A Web course	3 rd
6.	Computer relaying for Power System	A.G. Phadkeand J.S. Thorp	A Web course	2 nd

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Syllabus of final year B.Tech (Electrical Engineering) Semester-VII

Course Code: EED402

Course Title: Advance Control System

Teaching Scheme:

Theory: 03 Hrs / week

Tutorial: 00 Hrs / week

Credits: 3-0-1

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

To know knowledge of State space analysis, nonlinear systems and digital control systems.

Objectives

1. Explain the basic digital control system and the concept of sampling and reconstruction.
2. Elaborate the concept of state and to be able to represent a system in the state space format.
3. Solve the state equation and familiarize with STM and its properties.
4. Design a control system using state space techniques including state feedback control and full order observer.

Unit-I

Compensation Technique Approaches and preliminary consideration. Design of Linear Control System, Common compensating network, Transfer function of Lag, Lead and Simple lag lead network. Design using Bode diagram. Physical realization of compensators using active and passive elements. Tachometer feedback compensation. (06Hrs)

Unit-II

Introduction to state space analysis Important definitions – state, state variable, state vector, state space, state equation, output equation. State space representation for electrical network, nth order differential equation, and transfer function. Conversion of transfer functions to state model and vice versa. Concept of diagonalization, Eigen values, eigenvectors, diagonalization of system matrices with distinct and repeated Eigen values, Vander Monde matrix. Solution of homogeneous and non-homogeneous state equation in standard form, state transition matrix, its properties, Evaluation of STM using Laplace transform

	method and infinite series method. (06Hrs)				
Unit-III	Design of Control System Using State Space Technique: Concept of controllability and observability, controllability and observability Tests, condition for controllability and observability from the system matrices in canonical form, Jordan canonical form, effect of pole zero cancellation on the controllability and observability of the system, duality property. Pole placement design by state variable feedback. Necessity of an observer, design of full order observer. (06Hrs)				
Unit-IV	Nonlinear Control System Analysis Introduction, classification, common type of non-linearities observed in physical systems, peculiar behavior of nonlinear system- Spurious (sub harmonics) response, jump resonance, limit cycle, amplitude as function of frequency oscillation, nonlinear spring mass system, sub harmonic oscillation, asynchronous quenching, frequency entrainment etc. Analysis of NLCs using phase plane and describing methods for Ideal Relay. (06Hrs)				
Unit-V	Digital Control System Introduction, Configuration of the basic digital control scheme. Advantages and limitations of digital control; data conversion and quantization, Sampling & Reconstruction processes, Shannon's Sampling theorem, practical aspects of choice of sampling rate. Zero order hold (ZOH) and its transfer function, Review of z transform, difference equations and solution using z transform method. (06Hrs)				
Unit-VI	Analysis and Design of Digital Control System Pulse transfer function and z transfer function, General procedure for obtaining Pulse-transfer function, pulse transfer function of ZOH, sampled data closed loop systems, characteristic equation, causality and physical reliability of discrete data system, realization of digital controller by digital programming, direct digital programming, cascade digital programming, parallel digital programming, Digital PID controller. (06Hrs)				
References	Sr. No.	Title	Author	Publication	Edition
	1	Modern Control Engineering	Ogata K.	Prentice Hall of	5 th
	2.	2. Control System Engineering	Nagarath & Gopal	Wiley Eastern	6 th
	3.	3. Automatic Control Engineering	Benjamin C. Kuo	Prentice Hall of India	7 th
	4.	Digital Control System	Benjamin C. Kuo	Prentice Hall of India	4 th

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Syllabus of final year B.Tech (Electrical Engineering) Semester-VII

Course Code: EED403 Course Title: Power System Operation and Control Teaching Scheme: Theory: 03 Hrs / week Tutorial: 00 Hrs / week		Credits: 3-0-1 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	Must have knowledge of Power system Transmission and Distribution, Power System Analysis, Control System, AC Machines and Power Electronics	
Objectives	1. To develop skills for performing power system stability studies. 2. To provide knowledge of various power system operations and controls.	
Unit-I	Power System Stability: Introduction to stability, dynamics of synchronous machine, swing equation, power angle equation and curve, types of power system stability (concepts of steady state, transient, dynamic stability), equal area criterion, applications of equal area criterion (sudden change in mechanical input, effect of clearing time on stability, critical clearing angle, short circuit at one end of line, short circuit away from line ends and reclosure), methods to improve steady state and transient stability. (06Hrs)	
Unit-II	Reactive Power and Voltage Control: Necessity of reactive power control, Sources of reactive power, reactive power Generation by a synchronous machine, effect of excitation, loading capability curve of a generator, power factor correction, voltage regulation, compensation in power system, Problems with Series Compensation, synchronous condenser and synchronous phase modifier, TAP changing transformer. (06Hrs)	
Unit-III	FACTS Technology: Problems of AC transmission system, evolution of FACTS technology, basic Description and definition of basic types of FACTS controller, principle of operation, circuit diagram and applications of SVC, TCSC, STATCOM and UPFC. (06Hrs)	
Unit-IV	Automatic Generation and Control (AGC): Concept of AGC, complete block diagram representation of load-frequency control of an isolated power system, steady state and dynamic response, control area concept, two area load frequency control. Schematic and block diagram of alternator voltage Regulator scheme. (06Hrs)	

Unit-V	Economic Load Dispatch and Unit Commitment: Economic load dispatch: Introduction, revision of cost curve of thermal and hydropower plant, plant scheduling method, equal incremental cost method, method of Lagrange multiplier (neglecting transmission losses), Bmn coefficient, economic scheduling of thermal plant considering effect of transmission losses, penalty factor, numerical. Unit commitment: Concept of unit commitment, constraints on unit commitment – spinning reserve, thermal and hydro constraints, methods of unit commitment – priority list and dynamic programming. (06Hrs)			
Unit-VI	Computer control of power system: Energy Control: Interchange of power between interconnected utilities, economy interchange evaluation, interchange evaluation with unit commitment, types of interchange, capacity and diversity interchange, energy banking, emergency power Interchange, inadvertent power exchange, power pools. Energy control center and its functions, SCADA and EMS, reliability of power system, Hierarchical levels for reliability study, Reliability evaluation of generation system, loss of load probability (LOLP), loss of load expectation (LOLE), Expected Energy Not Supplied(EENS), reliability indices (ASAI, CAIDI, SAIDI, SAIFI), hierarchy of power system operation and control in India. (06Hrs)			
References	Sr. No.	Title	Author	Publication
	1.	Power Generation, Operation	Allen. J. Wood and Bruce F. Wallenberg	John Wiley & Sons, Inc.
	2.	Power System Analysis: Operation and Control	P S R Murthy	Prentice Hall of India
	3.	Power system operation and control	Dr. B. R. Gupta and Vandana Singhal	S. Chand & Company Ltd
	4.	Modern Power System Analysis	D.P. Kothari and I.J.Nagarath	Tata McGraw
	5.	Elements of Power System Analysis	Stevenson W.D	TMH

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Syllabus of final year B.Tech (Electrical Engineering) Semester-VII

Course Code: EED441 Course: Utilization of Electrical Energy Teaching Scheme: Theory: 03 Hrs./week Tutorial: 0 Hr./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	Basics of Electrical Engineering, Power systems, Electrical Machines
Objectives	1. Understand laws of illumination and different lighting schemes 2. Understand different heating methods employed in various industries such as steel, wood and plastic, different types welding methods used in industries, at construction sites and domestic purposes as well 3. Define Electrolytic processes 4. Understand existing traction systems in India 5. Understand different services such as urban, sub-urban and mainline rail traffic
Unit-I	Illumination: Introduction, Definition, Laws of illumination, Polar curves, Photometry, Artificial sources of light, Incandescent lamps, Arc lamps, Discharge lamps, Lighting scheme, Street lighting, Factory lighting, Flood lighting. (06 Hrs)
Unit-II	Electrical Heating & Welding: Electrical Heating: Introduction, Advantages, Modes of transfer of heat, Methods of electrical heating, Resistance heating, Induction heating, Dielectric heating, High frequency heating, Causes of failure of heating elements. Electric Welding: Introduction, Advantages, Disadvantages of welding, Resistance welding, Electric arc welding, Choice of welding time, Submerge arc welding, Electron beam welding, Laser beam welding, Types of welding electrodes, Comparison between resistance & arc welding, Electrical welding equipment, between AC & DC welding. (08Hrs)

Unit-III	Electrolytic Process: Introduction, Principle of electrolysis, Laws of electrolysis, Various terms related to electrolytic process, Application of electrolytic process, Power supply for electrolysis process. (04Hrs)				
Unit-IV	Electrical Traction I : Introduction, Heavy of existing electrical traction system in India, System of traction, System of track electrification, Comparison between DC & AC traction, Special features of traction motors, Different type of traction motor, Braking, Overhead & auxiliary equipment. (06Hrs)				
Unit-V	Electrical Traction II : Introduction, Types of services, Speed time & speed distance curves for different services, Definition crest speed, Average speed, Schedule time, Dead weight, Accelerating weight, Adhesive weight, Coefficient of adhesion. Factors affecting schedule speed of train, Traction efforts, and specific Energy conservation. (06Hrs)				
Unit-VI	Hybrid and electric vehicle (HEV): History of hybrid and electric vehicle, purpose of hybrid and electric vehicle, Basic designs of hybrids and electric vehicle, power electronics converters used in HEV(Boost, Buck-boost and Dual active bridge Converter), electric machines used in HEV (PM & BLDC), Energy storage (LI-ion and fuel cell) used in HEV, Regenerative braking, advantage and disadvantage of HEV. (06Hrs)				
References	Sr. No.	Title	Author	Publication	Edition
	1	Utilization of Electrical Power	Er. R. Rajput	Laxmi Publications	
	2	Applied Illumination Engineering	Jack L. Lindsey	The Fairmont Publisher	II
	3	Utilization of Electric Power Electric Traction	S.V.Suryanarayana	New Age International	
	4	Utilization of Electric Power and Electric Traction	J.B. Gupta	Kataria & Sons publishers	
	5	Electric and Hybrid Vehicles: Design Fundamentals	Iqbal Hussein	CRC Press	

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Syllabus of final year B.Tech (Electrical Engineering) Semester-VII

Course Code: EED442 Course Title: Electrical Traction Teaching Scheme: Theory: 03 Hrs / week Tutorial: 00 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
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Prerequisite	Should have Knowledge of Electrical Drives, Electrical Machines
Objectives	1. Understanding the fundamentals of electric traction system by acquiring knowledge on track electrification, train movement, tractive effort, and characteristics of traction motor and their starting, control and protection. 2. Understand special features of traction motors and methods of electric
Unit-I	Traction Systems and Latest Trends Present scenario of Indian Railways – High speed traction, Metro, Latest trends in traction-Metro, monorail, Magnetic levitation Vehicle, Steam, diesel, diesel-electric, Battery and electric traction systems, General arrangement of D.C., A.C. single phase, 3 phase, Composite systems, Choice of traction system - Diesel- Electric or Electric (06 Hrs)
Unit-II	Mechanics of Train Movement Analysis of speed time curves for main line, suburban and urban services, Simplified speed time curves. Relationship between principal quantities in speed time curves, Requirement of tractive effort, Specific energy consumption and Factors affecting it. (06 Hrs)
Unit-III	Traction Motors and Their Control Features of traction motors., Significance of D.C. series motor as traction motor, A. C. Traction motors-single phase, Three phase, Linear Induction Motor, Comparison between different traction motors, Series-parallel control, Open circuit, Shunt and bridge transition, Pulse Width Modulation control of induction motors, Types of electric braking system. (06 Hrs)
Unit-IV	Electric Locomotives and Auxiliary Equipment Important features of electric locomotives, Different types of locomotives, Current collecting equipment, Coach wiring and lighting devices, Power conversion and transmission systems, Control and auxiliary equipment. (06 Hrs)
Unit-V	Feeding and Distribution System.

	Distribution systems pertaining to traction (distributions and feeders), Traction sub-station requirements and selection, Method of feeding the traction sub- station. (06 Hrs)				
Unit-VI	Application of computers in management of electric traction Introduction. Computer capability relevant to electric traction. Advantages of use of computers for management of electric traction. (6 Hrs)				
References	Sr. No.	Title	Author	Publication	Edition
	1	Utilization of Electric Power & Electric Traction	G.C Garg	Khanna Publishers Delhi	
	2	Modern Electric Traction	H. Partab	Dhanpat Rai and Sons, New Delhi	
	3	Electric Traction	A.T. Dover	Mac millan, Dhanpat Rai and Sons, New Delhi	
	4	Electric Traction	J. Upadhyay S. N. Mahendra	Allied Publishers Ltd., Dhanpat Rai and Sons, New	
	5	Electric Traction Hand Book	R. B. Brooks	Sir Isaac Pitman and sons ltd. London	

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Syllabus of final year B.Tech (Electrical Engineering) Semester-VII

Course Code: EED443 Course Title: Power Quality Teaching Scheme: Theory: 03 Hrs / week Tutorial: 00 Hrs / week	Credits: 3-0-1 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	To study the various issues affecting power quality, production, monitoring and Suppression and analysis of harmonics.
Objectives	1. To study the production of voltages sags, over voltages and harmonics and Methods of control. 2. To study various methods of power quality monitoring
Unit-I	Basics of power quality and standards: Introduction and importance of Power Quality, symptoms of poor power Quality. Various power quality issues such as transients, short duration voltage variations, long duration voltage variations, voltage imbalance, voltage Fluctuations, voltage flicker and waveform distortion. Relevant power quality Standards such as IEEE 1159- 2009 and IEEE 519- 2014. Grounding and power quality issues.
Unit-II	Voltage sag: Origin of voltage sags and interruptions, voltage sag characteristics- magnitude, duration, phase angle jump, point on wave initiation and recovery, missing Voltage. Area of vulnerability, equipment behaviour under voltage sag, ITIC curve, voltage sag monitoring and mitigation techniques
Unit-III	Transient Over Voltages and Flickers: Classification of transients, sources of transient over voltages, computer tools For transient analysis, techniques for over voltage protection. Voltage flickers – sources of flickers, quantifying flickers and mitigation techniques.
Unit-IV	Fundamentals of Harmonics: Harmonic distortion – voltage and current distortion, power system quantities under non sinusoidal condition – active, reactive and apparent power, power factor – displacement and true power factor, harmonic phase sequences and Triple harmonics, harmonic indices, sources of harmonics, effect of harmonic distortion.
Unit-V	Measuring and control of harmonics: Concept of point of common coupling and harmonic evaluation, principles of controlling harmonics, Harmonic study procedures and computer tools for Harmonic analysis, Devices for controlling harmonic distortion design of filters for harmonic reduction.
Unit-VI	Measuring and solving power quality problems: Introduction, power quality measurement devices – harmonic analyser, transient disturbance analyser, oscilloscopes, data loggers and chart recorders, True rms meters, power quality measurements, number of test location, test duration, instrument setup and guidelines.

References	Sr. No.	Title	Author	Publication	Edition
	1	Power System Quality Assessment	J. Arrillaga, M. R. Watson, S. Chan	John Wiley and Sons.	
	2	Understanding Power Quality Problems, Voltage Sag and Interruptions	M. H. J. Bollen	New York: IEEE Press, 2000, Series on Power Engineering	
	3	Electrical Power System Quality	R. C. Dugan, Mark F. McGranahan, Surya Santoso, H. Wayne Beatty	2nd Edition, McGraw Hill Publication.	
	4	Power System Harmonics: Computer Modelling & Analysis	Enrique's Acha, Manuel Madrigal	John Wiley and Sons Ltd	
	5	Power Quality in Power Systems and Electrical Machines	Ewald F. Fuchs, Mohammad A. S. Masoum	Elsevier Publication	
	6	Electric Power Quality	G. J. Heydt	Stars in Circle Publications	

	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).
	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 student here is not expected to acquire the skills in operating machines values. He should appreciate the application of theory learnt. 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 • Reducing cycle time • Enhancing productivity • Energy conservation measures • Process Improvement technique • Inventory control • Quality control Technique • Improvement in Material handling system • Bottlenecks in material flow system and so on. • Live problems in the industry. • Application development using electrical related knowledge. • EMI/EMC related issues
	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.
	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.

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

Course Code: AED431 Course: Open Elective-III Ecology and Environmental Pollution 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	Concept of ecology and types of pollution
Objectives	1. To impart knowledge of ecological applications 2. To impart knowledge of environment and different types of pollution 3. To impart knowledge of pollution analysis and instrumentation
Unit-I	Principles of Ecology: Definition Principles and Scope of Ecology – Energy Flows, Ecological Pyramids, Types and Diversity, Food Chains and Food Webs. Homeostasis – Theories of Limiting Factors Ecological Succession – Population and Communities- Reproductive Strategies- r and k Factors. Community Ecology- Structure, Species Diversity and Species Interaction. (4 Hrs)
Unit-II	Ecosystem Ecology: Ecosystem- Structure- Components (Abiotic and biotic) and Functions of an Ecosystem. Ecosystem Types and Diversity- Terrestrial and Aquatic (Fresh water and Marine) Ecosystems. Ecotones - Concept of Edge Effect, Ecological Niche- Classification Biomes - General Relationships Landscapes and Biomes – Climatic factors - Bio-geographical Regions of the World and Modern Biogeography. (6 Hrs)
Unit-III	Ecological Applications: Sustainable Development- Ecological Sustainability- Organic Farming, Bio fertilizers and Bio pesticides - Integrated Pest Management (IPM) - Biological Monitoring of the Environment- Indicator species - Ecosystem Development- Theory of Human Ecology, Ecology of Space Travel- Types of Life Supporting Systems- Exobiology. (6 Hrs)
Unit-IV	Atmosphere Structure of Atmosphere: Temperature Profile – Influence of Meteorological factors on Air Pollution – Air Pollutants: Oxides of Sulphur – Oxides of Nitrogen – Carbon monoxide – Particulate matter, Dispersion and impacts – Photochemical smog – Green house effect – Ozone depletion – Acid Rains – Sources of noise pollution, measurement of noise and standards – impacts of Air Pollution on human health and structures. (6 Hrs)

Unit-V	Hydrosphere and Lithosphere Classification of water and Water bodies – Abnormal properties of water – Water cycle Water Quality Parameters – Water Pollution – Sources – Classification, nature and Toxicology of water pollutants: Trace metals – Lead – Mercury – Zinc – Cadmium – Organic substances - Pesticides – Oil surfactants – Nutrients – Phosphates – Nitrates – Eutrophication – Ground water pollution – Ocean Pollution by toxic wastes – Ecological and Economic impacts of water pollution. Soil: Texture – Composition and distribution – Land use Classification and Patterns – Impacts of land use on soil ecology – Ecological and Economic impacts of soil erosion and soil pollution. (8 Hrs)				
Unit-VI	Pollution Analysis and Instrumentation: Principles of Sampling of Air, Water and Soil: Samplers and Sampling Techniques – Analysis of Pollutants: Titrimetry – Gravimetry – Spectrophotometry – Chromatography and Flame techniques. Instrumentation: Instruments for specific parameters – Principles and Applications of UV – VIS Spectrophotometer – Flame Photometer – Atomic Absorption Spectrophotometer – Gas Chromatography – GLC – HPLC – Instrumentation for Weather monitoring (6 Hrs)				
Reference Books:	Sr. No.	Title	Author	Publication	Edition
	1	Environmental Sciences	Turk J and Turk A.	Saunders College Pub	1984 3rd Edn.
	2	Fundamentals of Ecology	Odum E. P.	W. B. Saunders Company London	1971 3rd Edn.
	3	Environmental Pollution	Laurent Hodges	Holt McDougal	1977 2nd Revised Edn.
	4	Environmental Pollution Control Engineering	C.S. Rao	John Wiley & Sons	1992

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

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

Course Code: CED431		Credits: 3-0-0
Course: Open Elective –III Town Planning		Mid Semester Examination-I: 15 Marks
Teaching Scheme:		Mid Semester Examination-II: 15 Marks
Theory: 3 Hrs/week		Teacher Assessment: 10 Marks
		End Semester Examination: 60 Marks
		End Semester Examination (Duration): 3 Hrs
Prerequisite	Basic of Urban Planning and Development	
Objectives	1. The course is intended to provide the students an overview and understanding of Town Planning. 2. To study history & ancient planning in India. 3. To study origin and growth of towns.	
Unit-I	Introduction: Necessity and scope of Town planning, Brief History Greek and Roman Town, Planning in Ancient India, Indus valley Civilization Vedic and Harappan period. Principals of Town Planning, Development of Towns, Elements of towns. (06 Hrs)	
Unit-II	Levels of planning process: Town planning survey, Data collection and analysis, Growth Pattern, Development plan, Master Plan, Regional Plan, Zoning. (06 Hrs)	
Unit-III	Housing: Importance of housing, Demand for houses, Requirements, Rural Housing, Village Planning, Low-cost Housing, Agencies for Housing, Functions of CIDCO, HUDCO, MHADA, HDFC, Housing problems in India. (06 Hrs)	
Unit-IV	Town Planning Scheme: Concept, Preparation of town planning scheme, Relation with Development plan, Original Plot, Final plot, Semi Final Plot, Local Area Plan-Concept, objective, methods of Preparation, Case studies in India, Re-planning of Existing Towns. (06 Hrs)	
Unit-V	History of Architecture: Principle, Types of Architecture (Greek Egyptian Roman styles), Building Byelaws: Objective, Principles, Aspect, Prospect, Importance. (06 Hrs)	
Unit-VI	Acts: Land Acquisition Act, Necessity, and procedure of Acquisition, MRTP Act, RTI and RTS Act, URDPFI. Urban Road Development: Objectives Requirements, Classification, Types.	

(06 Hrs)					
Reference Books:	Sr. No.	Title	Author	Publication	Edition
	1	Town Planning	S. C. Rangwala	Charotar	21 st Edn.
	2	Fundamentals of Town Planning	G. K. Hirasakar	Dhanpat Rai Publication	2 nd Edn.
	3	Textbook of Town Planning	G.K. Bandopadhyaya	Charotar	2 nd Edn.

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

Course Code: CSE431 Course: Open Elective -III- Big Data Analytics 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): 3 Hrs
Prerequisite	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. (6 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. (6 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. (6 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. (6 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-Based Data structures. (6 Hrs)				
Unit-VI	HADOOP ECOSYSTEM 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 :HBase Basics, Concepts, Clients, Example, Hbase Versus RDBMS. (6 Hrs)				
Reference Books:	Sr. No.	Title	Author	Publication	Edition
	1.	Big Data Analytics	Seema Acharya, Subhasini Chellappan	Wiley	2 nd Edn.
	2.	Hadoop: The Definitive Guide	Tom White	O'reilly Media	3 rd Edn.
	3.	Analytics in a Big Data World: The Essential Guide to Data Science and its Applications	Bart Baesens	Wiley	2014

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Syllabus of final year B. Tech (All) Semester-VII

Course Code: EED431		Credits: 3-0-0
Course: Open Elective III – Battery Management System		Mid Semester Examination-I: 15 Marks
Teaching Scheme:		Mid Semester Examination-II: 15 Marks
Theory: 03 Hrs/week		Teacher Assessment: 10 Marks
		End Semester Examination: 60 Marks
		End Semester Examination (Duration): 03 Hrs
Prerequisite		
Objectives	The objective of this course is to introduce learner to batteries, its parameters, modelling and charging requirements. The course will help learner to develop battery management algorithms for batteries.	
Unit-I	Introduction: Introduction to Battery Management System, Cells & Batteries, Nominal voltage and capacity, C rate, Energy and power, Cells connected in series, Cells connected in parallel. (5 Hrs)	
Unit-II	Battery cell: Electrochemical and lithium-ion cells, Rechargeable cell, Charging and Discharging Process, Overcharge and Undercharge, Modes of Charging. (6 Hrs)	
Unit-III	Battery Management System Requirement: Introduction and BMS functionality, Battery pack topology, BMS Functionality, Voltage Sensing, Temperature Sensing, Current Sensing, BMS Functionality, High-voltage contactor control, Isolation sensing, Thermal control, Protection, Communication Interface, Range estimation, State of charge estimation, Cell total energy and cell total power. (7 Hrs)	
Unit-IV	Battery State Parameters: State of Charge (SoC), estimation of SOC, voltage-based methods to estimate SOC, Model-based state estimation, Battery Health Estimation, State of Health Definition (SoH), State of function definition (SoF), Charge acceptance (CA). Classification of Soc, SoH Estimation Methods. (6 Hrs)	

Unit-V	Cell Balancing and aging: Battery Cell Balancing. Causes of Imbalance in Battery Cells. Classification Systems for Balancing Methods- Static Methods, Dynamic methods. Lithium-ion aging: Negative electrode, Lithium-ion aging: Positive electrode, Cell Balancing, Causes of imbalance, Circuits for balancing (7 Hrs)				
Unit-VI	Design of battery BMS: Design principles of battery BMS, Effect of distance, load, and force on battery life and BMS, energy balancing with multi-battery system. (5 Hrs)				
Reference Books:	Sr. No.	Title	Author	Publication	Edition
	7.	Battery management systems	Plett, Gregory L	Volume I: Battery modeling. Artech House	2015
	8.	Battery management systems	Plett, Gregory L	Volume II: Battery modeling. Artech House	2015
	9.	Battery Management Systems -Design by Modelling	Bergveld, H.J., Kruijt, W.S., Notten, P.H.L	Philips Research Book Series	2002
	10.	Battery Management Systems for Large Lithium-ion Battery Packs	Davide Andrea	Artech House	2010
	11.	Battery management systems: Accurate state-of-charge indication for battery-powered applications	Pop, Valer, et al.	Vol. 9. Springer Science & Business Media,	2008

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of B. Tech Final Year (All) Semester-VII	
Course Code: ETC431 Course: Open Elective-III Data Science 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	Programming Concepts, Data Structure, Basic Linear Algebra, Basic Probability and Statistics.
Objectives	1. Give an introduction to data science and its applications. 2. Understand use of statistics in data science 3. Use data science to analyze large and unstructured data with different tools.
Unit-I	Introduction: Introduction, Terminologies in data science, Applications of Data science, Data science and Development , datafication, current landscape of perspective. Role of Data science in AI and ML. (6 Hrs)
Unit-II	Statistical Inference and Exploratory data analysis: Statistical modelling, probability distributions, fitting a model, Populations and samples, Basic Tools (Plots, Graphs and summary statistics) of EDA, philosophy of EDA, the data science process, Case Study. Introduction to R. (6 Hrs)
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. (6 Hrs)
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. (6 Hrs)

Unit-V	Mining Social Network: Social Networks as graphs, clustering of graphs, direct discoveries of communities in graphs, portioning of graphs, neighbourhood properties of graphs. Illustration with an example. (6 Hrs)				
Unit-VI	Data visualization and ethical issues: Basic principles, ideas and tools for data visualization, creation of visualization for complex data set. Aesthetics in data visualization, software's used for data visualization, Case study. Privacy, security and ethics of data science. (6 Hrs)				
Reference Books:	Sr. No.	Title	Author	Publication	Edition
	1.	Doing Data Science: Straight Talk from The Frontline	Cathy O'Neil and Rachel Schutt	O'Reilly Media, Inc	3 rd Edn.
	2.	Mining of Massive Datasets. v2.1	Jure Leskovek, Anand Rajaraman and Jeffrey Ullman	Cambridge University Press	1 st Edn.
	3.	Learning: A Probabilistic Perspective	Kevin P. Murphy	MIT Press	2 nd Edn.
	4.	Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking.	Foster Provost and Tom Fawcett	O'Reilly Media, Inc	1 st Edn.

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

Course Code: MED431 Course: Open Elective-III Modern Management Techniques 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
Prerequisites	:	1.Knowledge of basic concepts of manufacturing processes
Objectives	:	1) To understand the concepts of modern management to enhance creativity 2)To understand the significance of TPM & SCM
Unit-I	:	Value Engineering: Value-types, Value analysis, Value Engineering, Value Control, FAST analysis DARSARI method (06 Hrs)
Unit-II	:	Supply Chain Management: Introduction, Decision Phases in Supply Chain, Process view of a supply chain importance of supply Chain Flows. New Customer – Supplier relationship –Supplier selection, purchasing, JIT in Supply Chain, E-Business and the Supplier Chain. (06 Hrs)
Unit-III	:	Methods Engineering: Continuous method improvement, waste, type of waste elimination. KAIZEN Improvement versus Innovation, Finding & Implementing improvements-PDCA cycle, Five -Why Process. Process Reengineering. Ensuring Correct method of working POKAYOKE. Workplace layout & work station design, single minute exchange of dies, material handling system. (06 Hrs)
Unit-IV	:	Lean Manufacturing: Introduction Definition, distinctive features, mall-Lot Production, setup- time Reduction, Maintaining and Improving Equipment .Pull production system .Focused factories and group technology, work cells and Cellular Manufacturing Standard Operation. (06 Hrs)
Unit-V	:	Total Productive Maintenance: Introduction, Definition, Distinctive features, Four developments striving for overall equipment effectiveness, the five TPM development activities the twelve steps of TPM, stages of TPM development. (06 Hrs)
Unit-VI	:	Management Information System Data, Information, Needs of computer based introduction system Definition & concept of MIS and Data processing, need of database, Role of MIS in organization Impact of MIS on function of organization. (06 Hrs)

Reference Books:	Sr. No.	Title	Author	Publication	Edition
	1	Industrial Engineering & Production Management	Maratand Telsang	S. Chand	3 rd Edn.
	2	Techniques of Value Analysis & Engineering	I.D. Miles	McGraw-Hill	3 rd Edn.
	3	Kaizen	Masaaki Imai	McGraw-Hill Education	1986
	4	Pokayoke	Hiroyuki Hirmaao	Productivity Press, Cambridge	1994
	5	Management Information System	W.S. Jawadekar	TMH	4 th Edn.
	6	Supply Chain Management	Sunil Chopra, Peter Meindl	Pearson Education	6 th Edn.
	7	Competitive Manufacturing Management	John M. Nicholas	TMH	1997
		Management Information System, Conceptual foundation, Structure & Development	Gordon Davis , Margrethe Olson	McGraw Hill Education	2017
	8	Industrial Engineering & Production & Operations Management	Sanjay S.Patil Nanadkumar Hukkeri	Electrotech Publications	3 rd Edn.
Additional References:	:	1. https://onlinecourses.nptel.ac.in/noc21_ge20/preview 2. https://onlinecourses.nptel.ac.in/noc22_cs97/preview 3. https://onlinecourses.nptel.ac.in/noc22_cs89/preview 4. https://onlinecourses.nptel.ac.in/noc22_cs73/preview			

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

Course Code: PPE431		Credits: 3-0-0
Course: Open Elective-III: Packaging Technology		Mid Semester Examination-I: 15 Marks
Teaching Scheme:		Mid Semester Examination-II: 15 Marks
Theory: 3 Hrs/week		Teacher Assessment: 10 Marks
		End Semester Examination: 60 Marks
		End Semester Examination (Duration): 3 Hrs
Prerequisite	Basic knowledge of Polymeric Materials, Processing and Testing.	
Objectives	1. To impart knowledge and skills related to packaging system for various products. 2. To understand the concepts of materials, machinery used and testing of packaging material.	
Unit-I	Introduction: Packaging history, need and evolution, elements, approach, functions of packaging, advantages of plastic packaging, applications. Elements of package design, importance of a good design, packaging hazards and their control. (6 Hrs)	
Unit-II	Plastic packaging materials: Selection criteria, origin, types, properties, applications and limitations of plastic packaging materials, bio-degradable material. Packaging wastes and its management. (6 Hrs)	
Unit-III	Packaging forms: Bottle, strip, skin, blister, shrink box, vacuum, gas, CAP, MAP, tubes, woven sack etc. (6 Hrs)	
Unit-IV	Specialty packages: Aseptic, tetra, types of pouches/sack, stand up pouch, retort pouch, gusseted pouch, 2-seal, 3 side sealed pouch. Flexible packaging, forms of flexible packaging. Wrapping, form-fill-seal (FFS), sealing methods, metalising. (6 Hrs)	
Unit-V	Food and agro-based packaging: Requirements and their selection for raw and processed foods, meat, fish, poultry, eggs, milk and dairy products, fruits and vegetables, cereal grains and baked food products, beverages, snacks, ready to eat food, packaging of horticultural crops. Packaging of drugs and cosmetics. (6 Hrs)	

Unit-VI	Printing: Surface treatment, printing processes, printing inks.				
	Packaging quality control: Criteria, physical, chemical, mechanical test procedure for packaging materials & packaged products. (6 Hrs)				
Reference Books:	Sr. No.	Title	Author	Publication	Edition
	1.	Understanding Plastic Packaging Technology	Susan E. M. Seleke	Hanser publications - Munich	1 st Edn.
	2.	Plastics in Packaging	A.S. Althalye	Tata Mc Graw Hill publishing Co. Ltd., New Delhi.	1 st Edn.
	3.	Food Packaging Technology Handbook	NIIR	Asia-Pacific publication.	1 st Edn.
	4.	Package Engineering	Honlon J. F.	Mc Graw Hill	1 st Edn.
	5.	Plastics Packaging	Turtle Ivor	Pira International	1 st Edn.
	6.	Handbook of Packaging-Plastics	A. S. Althalye	Multi-tech Plastics publishing Co. Mumbai.	1 st Edn.
	7.	The Wiley Encyclopedia of Packaging Technology	Kit L. Yam	John Wiley & Sons Inc. Publication	2009
	8.	The Packaging User's Handbook	F. A. Paine	Blackie Academic & Professional.	1 st Edn.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Final Year B. Tech. (Electrical Engineering)-Semester-VII	
Course Code: EED421 Course Title: Switchgear & Protection Teaching Scheme: Practical: 2 Hrs/week	Credits: 1 Practical: 25 Marks
Objectives :	To aware and develop among students about switchgear and protection by experiment
List of Practical (Minimum -08)	: 1. Study of switchgear testing kit. 2. Study of Fuse, MCB & their testing. 3. Study & testing of contactors. 4. Study & testing of MCCB. 5. Study & testing of ACB. 6. Study & testing of 3 Phase induction motor simulation study kit 7. Study and application of directional over current relay 8. Microprocessor under voltage/Overvoltage relay kit 9. Percentage differential protection of transformer. 10. Protection of alternator. 11. Protection of Transmission line using Impedance relay 12 Study & testing of Negative Sequence Relay 13. Study of various LT switchgears like RCCB, timers.

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory

Oral examination conducted on the syllabus and term work mentioned above

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Final Year B. Tech. (Electrical Engineering) Semester – VII (2022-23 Choice Based Credit System)	
Course Code:EED422 Course Title: Advanced Control System Teaching Scheme: Practical: 2 Hrs/week	Credits: 1 Practical: 25 Marks
Objectives	:
List of Practical	: 1. Design a lead/lag compensator for highly under damped second order plant in Experiment1 using MATLAB. 2. Check for observability and Controllability in MATLAB. 3. Verify State feedback control using pole placement. 4. Convert a continuous time system into digital control system and check Response using software. 5. Design State observer and validate it by software. 6. Software programming for determination of state space representation for given transfer function and vice-versa 7. Software programming for determination of STM. 8. Study of non-linearity using OPAMPs and verification of those by software. 9. Implementation of digital PID controller for physical system. 10. Effect of sampling and verification of sampling theorem.

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Final Year B. Tech. (Electrical Engineering) Semester – VII (2022-23 Choice Based Credit System)		
Course Code: EED423 Course Title: Power System Operation and Control Teaching Scheme: Practical: 2 Hrs/week		Credits: 1 Term Work: 50 Marks
Objectives	:	1. To understand and develop among students about power system operation and control by experiment
List of Practical	:	1. To determine Steady state Stability of synchronous motor (performance). 2. To determine Steady state stability of medium transmission line (performance). 3. To plot swing curve by Point by Point method for transient stability analysis. 4. To apply equal area criteria for analysis stability under sudden rise in mechanical Power input. 6. To apply equal area criteria for stability analysis under fault condition. 6. To study reactive power compensation using any device.
		7. To study Lagrange multiplier technique for economic load dispatch. 8. To develop dynamic programming method for unit commitment. 8. To study load frequency control using approximate and exact model. 10. To study load frequency control with integral control. 11. To study the two area load frequency control.

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

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Syllabus of Final Year B. Tech. (Electrical Engineering) Semester – VII
(2022-23 Choice Based Credit System)

Course Code: EED426 Course: Major Project-II Teaching Scheme: Practical: 8Hrs/week	Credits: 0-0-4 Term Work: 50 Marks Practical Examination: 50 Marks
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Objectives	• The practical implementation of theoretical knowledge gained during the study to till date is important for engineering education. The student should be able implement their ideas/real time industrial problem/ current application of their engineering branch which they have studied in curriculum. • To motivate students for creativity. • To create awareness regarding latest technology. • To have common platform for interaction about emerging technology. • To inculcate qualities of team work. • To explore related information using books, research papers, journals & websites. • To improve presentation and communication skills.
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	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 OHP, PC, and 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
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	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 4. PERFORMANCE ANALYSIS • Analysis of system developed either by at least two methods depending upon depth of standard. • These methods normally used are Analytical/ Computational/ 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. CONCLUSIONS 5.1. Conclusions 5.2. Future Scope

	5.3. Applications 5.4. Contributions (if any) The innovative work/invention/new ideas generated from the analysis of the work which can be taken from the conclusions. 6. 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. 7. APPENDICES Related data or specifications or referred charts, details computer code/program, etc. 8. 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

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Final Year B. Tech. (Electrical Engineering) Semester – VIII (2022-23 Choice Based Credit System) Code No. : EED471 Teaching Scheme: Practical: Credits: 20 Title: Internship Term Work(Marks): 300 Practical Examination (Marks): 300		
Rationale	(a)	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.
Course Objectives	(b)	1) The students of B.Tech course shall get an opportunity to work on live problem 2) He/She shall apply his leaving 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 vis, 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)	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.
		Admission to inplant training: No student will be deputed for inplant training unless he produces testimonial of having kept one term for the subject under B Tech Semester –VIII of final year course satisfactorily in Maharashtra Institute of Technology after passing the TY B Tech Examination (in the appropriate branch).
		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.
		Contract of Inplant Training : • 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.
		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 Institute of 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.
		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 next coming term.
		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.
		Obligation of Students: - To learn his/her subject field in Engineering or Technology conscientiously and diligently at his place of training. - To carry out all orders of his 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 training 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.

	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).
	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 student here is not expected to acquire the skills in operating machines values. He should appreciate the application of theory learnt. 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 • Reducing cycle time • Enhancing productivity • Energy conservation measures • Process Improvement technique • Inventory control • Quality control Technique • Improvement in Material handling system • Bottlenecks in material flow system and so on. • Live problems in the industry. • Application development using electrical related knowledge. • EMI/EMC related issues
	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.
	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.

	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.
	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.
	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.
	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.
	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.
	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.
	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 training to the satisfaction of the industry.
	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, it 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.
		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. Assessment of the term work / report.