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 Enginccring],
[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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1] **The Principal of all concerned Colleges,**
Dr. Babasaheb Ambedkar Marathwada University,

2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

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Dr. Babasaheb Ambedkar Marathwada University, Aurangabad-431004

Revised Syllabus of Final Year Bachelor of Technology

Mechanical 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. (Mechanical 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
MED401	Tool Design	3	-	-	15	15	10	60	-	-	100	3	-	-	3
MED402	Control System Engineering	3	-	-	15	15	10	60	-	-	100	3	-	-	3
MED403	Refrigeration and Air-conditioning	3	-	-	15	15	10	60	-	-	100	3	-	-	3
MED441-MED443	Professional Elective Course-IV	3	-	-	15	15	10	60	-	-	100	3	-	-	3
	Open Elective-III	3	-	-	15	15	10	60	-	-	100	3	-	-	3
MED421	Lab 1: Tool Design	-	-	2	-	-	-	-	-	25	25	-	-	1	1
MED422	Lab 2: Control System Engineering	-	-	2	-	-	-	-	-	25	25	-	-	1	1
MED423	Lab 3: Refrigeration and Air-conditioning	-	-	2	-	-	-	-	50	-	50	-	-	1	1
MED426	Major Project-II	-	-	8	-	-	-	-	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
ME471	Internship	-	-	-	-	-	-	-	300	300	600	-	-	20	20

MSE- Mid Semester Exam, ESE- End Semester Examination, TH-Theory, OR- Oral, TA-Teacher Assessment, TW- Term Work, PR- Practical, Tut- Tutorial

Dr. Santosh Bhosle

3/11/22

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Faculty of Science & Technology
Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Dr. R. P. Deshmukh.

Course Code	Professional Elective-IV
MED441	Design for Innovation
MED442	Stress Analysis
MED443	Electric Vehicles
Course Code	**Open Elective-III**
AED431	Ecology and Environmental Pollution
CED431	Town Planning
CSE431	Big Data Analytics
ETC431	Data Science
EED431	Battery Management System
MED431	Modern Management Techniques
PPE431	Packaging Technology

Dr. Santosh Ghosle

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University, Aurangabad

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

Course Code: MED401 **Teaching Scheme:** **Theory: 03 Hrs/week** **Credits: 03**	**Course: Tool Design** **MSE-I: 15 Marks** **MSE-II: 15 Marks** **TA: 10 Marks** **Theory Examination Duration: 04 Hrs** **Theory Examination Marks: 60**

Prerequisite	:	1. Fundamental knowledge of manufacturing sciences and manufacturingprocesses along with engineering and machine drawing. Basic knowledge of machine design and familiar with design data book.
Objectives	:	1. To study and understand elements of Tooling. 2. Analyses and applications of Tooling. 3. Design of Jigs, Fixtures and Dies for a given component.
Unit-I	:	**Introduction**: Tooling-Definition, classification, AISI tool materials and their properties **02 Hrs**
Unit-II	:	**Elements of Machining Process:** Basic requirements of machining process, single point cutting tool-Geometry and tool signature, mechanics of chip formation, types of chips, effect of tool geometry and cutting condition on machining process, tool wear-types and mechanism, tool life, forces on cutting tool, merchants force circle, power requirements, design and construction details of single point cutting tool for turning, boring and shaping operations, economics based on cutting tool, cutting fluids-types, properties, Numerical **Progresses in Cutting Tools:** Review of recent progresses in rake angles, tool life, carbide inserts cutting tools to improve machining performance. **06 Hrs**

Unit-III	:	**Multipoint Cutting Tools:** Drills-classification and nomenclature, drill point geometry, selection of drills for various operations. Reamers-classification and nomenclature. Milling cutters-classification and nomenclature of end mill, plain milling cutter. Taps-classification and nomenclature. Broaches- classification and nomenclature. Hobs- classification and nomenclature. Machining volume, time and forces for drilling and milling operations. **04 Hrs.**
		Limits, fits and Gauges Tolerances, functional and nonfunctional dimensions, way of expressing tolerances, specifying tolerances and tolerances accumulation, compounding interchangeability, selective assembly, Indian standards BIS-919-1963, nominal and basic size , limits and fits, plain gauge, snap gauge, contour and profile gauges, gauge design, Taylor's principle, numerical. **04 Hrs.**
Unit-IV	:	**Jigs and Fixtures:** Principle of location, degree of freedom, 3-2-1 method of location, 4-2-1 method of location, locating devices, Drill jig-types of jig bushes, types of drill jigs, design and development procedure of jig for different components. Fixtures- setting block, tenon, clamping of fixtures, types of fixtures, design and development of milling / turning fixture for different components. Tolerances, method of dimensions and manufacturing of jigs and fixtures. **08 Hrs.**
Unit-V	:	**Design of Dies:** Power presses types and construction details, die cutting operation, cutting action in die and punch, center of pressure, clearances and significance, cutting forces, methods of reducing cutting forces, methods of punch support, strippers, stock stops, guide pilots, knockouts, design of blanking and piercing dies. **06 Hrs.**
Unit-VI	:	**Drawing Dies:** Metal flow and factors affecting drawing, blank size calculations, drawing force, single and double acting dies, design and development of drawing dies for different components. **06 Hrs.**

	No.	Title	Author	Publication
Reference Books, e- books, e-Journals	1.	Fundamentals of Tool Design	ASTME	ASTME
	2.	Tool design	Cyril Donaldson	TMH Publication, New Delhi.
	3.	Jig & Fixtures	P. H. Joshi,	TMH Publication, Second Edition
	4.	Introduction to Jig and ToolDesign	M H A Kempster	Cengage Learning
	5.	Jigs and fixture design manual	Erik K Henriksen	Industrial Press Inc.,

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Syllabus of B. Tech. (Mechanical)

Course Code: MED402 **Teaching Scheme:** **Theory: 03 Hrs/week** **Credits: 03**	**Course: Control System Engineering** **Mid Semester Examination - I: 15 marks** **Mid Semester Examination - II: 15 marks** **Teacher's Assessment: 10** **Theory Examination (Duration): 03 Hrs** **Theory Examination (Marks): 60**

Objectives	:	1. To study the fundamental concepts of control systems and mathematical modeling of the system. 2.To study the concept of time response and frequency response of the system. 3.To study the basics of stability analysis of the system. 4.To study the various control actions & controllers of a control system.
Unit-I	:	**Representation of Control System Components Introduction,** Review of various types of measuring instruments and transducers, Basic concepts of control systems, Classification of control systems, Open loop and Closed loop control system, Transfer Function &Its significance. Introduction, Study of Mechanical, Electrical & Electronics components employed in construction of control systems and Mathematical equations for the same, Study of Mechanical, Electrical, Thermal &Fluid systems and mathematical equations for the same, Analogies (Direct and Indirect) for Mechanical ,Electrical, Thermal & Fluid systems **08Hrs**
Unit-II	:	**Block Diagram Algebra:** Introduction, Basic rules for solving block diagrams, Representing & reducing block diagram for actual control systems like Liquid level systems, Speed control systems, Temperature control systems, Position control systems **06Hrs**
Unit-III	:	**Hydraulic Systems & Pneumatic Systems:** Study of Hydraulic components used in Hydraulic Systems Viz. Pumps (Gear, Reciprocating, Vane Pump etc); Hydraulic Actuators (Hydraulic Cylinder, Hydraulic servo motors etc); Valves (2 way, 3 way, 4way, Directional, Pressure Control Valves). Study of components used in Pneumatic systems viz. pneumatic cylinders, Bellows, Various types of Pressure Control Relays, Flapper nozzle system **04Hrs.**

Unit-IV	:	**Electrical Systems & Modes of Control:** Study of electrical motors viz. A.C., D.C., Stepper, Servomotors; Speed control of these electrical motors by armature control, field control etc and their circuit diagrams; Study of electrical servomechanism for position control, speed control of stepper motor. Study of a) On Off Control, b) Proportional (P) Control, c) Integral (I) Control, d) Derivative (D) Control, e) P + I, f) P + D, g) P + I + D (including mathematical representation of the same); Study of these control actions with examples of Mechanical, Hydraulic ,Pneumatic systems. **06 Hrs.**
Unit-V	:	**Response Characteristics:** Introduction of various types of standard input signals ,Transient & Steady state response, Transient & Steady state response characteristics of First order and Second order systems when subjected to standard input signals. **06 Hrs**
Unit-VI	:	**Analysis of Frequency Response:** Introduction, Characteristics of Frequency Response of different functions (up to Second order systems only) Graphical Method of analyzing frequency response, Bode Plot, Nyquist Plot (Polar Plot),Concept of Stability, Routh's stability criteria **06Hrs**

Reference Books:

Sl.No	Title	Author	Publication
1	Automatic Control Systems	Francis Raven	TMH, 5th edition.
2	Modern Control Engineering	K. Ogata,	PHI, 3 edition.
3	Automatic Control Systems	Hasan Saeed	Katson Publication, 6th edition
4	Automatic Control Systems,	Nagrath Gopal,	New Age International, 4th edition
5	Control Systems Engineering	S. K. Bhattacharya	Pearson Education, 3rd edition.
6	Automatic Control Systems,	Benjamin C. Kuo	PHI, 7th edition.

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

Course Code: MED403 **Teaching Scheme:** **Theory: 03 Hrs/week** **Credits: 03**	**Course: Refrigeration and Air-conditioning** **MSE-I: 15 Marks** **MSE-II: 15 Marks** **TA: 10 Marks** **Theory Examination Duration: 04 Hrs** **Theory Examination Marks: 60**

Prerequisite	:	1. Basic knowledge and understanding of thermodynamics, heat transfer and fluid mechanics
Objectives	:	1. To understand fundamentals of refrigeration and cryogenic systems 2. To apply knowledge for various applications of refrigeration and cryogenics 3. To design refrigeration and cryogenic systems. 4. To analyse various refrigeration systems for thermal performance.
Unit-I	:	**Introduction:** Introduction, Recapitulation of Thermodynamics, Thermodynamics process pertaining to refrigeration and air conditioning. First and Second law applied to refrigerating machines, Carnot principles, Unit of refrigeration, COP EER **Air refrigeration:** Air refrigeration cycle. Reverse Carnot cycle, Bell-Coleman cycle Numerical on above. Air Refrigeration Systems: Thermodynamic processes, priority criteria and suitability of air refrigeration system. Types of Air refrigeration system, Simple, Boot Strap, Regeneration, Reduced Ambient. Evaporative System. Comparison of these cycles based on DART rating. (Theoretical and Numerical treatment) **06 Hrs**
Unit-II	:	**Simple Vapor Compression Cycle**: Necessity of modification of Carnot Cycle, Thermodynamic processes in VCC. Simple vapor compression system: Various conditions of vapor refrigerant in the system, Improvement in simple system. Flash Chamber, Flash Intercooler. Numerical on above syllabus. Refrigerants: Desirable properties of refrigerant, R-12, R-22, R-717, R-134, Butane, Recent substitute for refrigerants (Theoretical and Numerical treatment) **06 Hrs**

Unit-III	:	**Compound Vapor Compression Cycle:** Compound vapor Compression System: Need of compound compression Two stage compression, and various arrangements for improvement in C O P with mathematical analysis, Multiple Evaporator System, Requirement for multiple Evaporator, Cascade Refrigeration: Thermodynamic analysis of Cascade systems Various arrangements. (Theoretical and Numerical treatment) **06 Hrs**
Unit-IV		**Introduction to Cryogenics and Non-Conventional Heat Operated Systems:** Methods of Producing and maintaining low temperature such as simple Linde, Claude, Kapitea, Heylandt cycle, Philips, Stirling machine, Thermodynamic analysis of above cycle to find yield and exegetic efficiency. Vapor absorption system: System components, Representation of system on various charts, Steam ejector system, Representation on T-s and P-V plane, Applications and Limitations. (Theoretical Treatment) **06 Hrs.**
Unit-V	:	**Psychrometry:** Introduction to Psychrometry: Need of Air Conditioning, principle of psychrometry, psychometric properties such as DBT, WBT relative humidity, specific humidity, dew point temperature, Enthalpy, Thermodynamic wet bulb temperature, Applied Psychrometry: Representation of various psychometric processes on psychometric chart and their analysis, Adiabatic mixing of streams, By pass factor, sensible heat factor, RSHF, ESHF, GSHF, ADP, Ventilation and infiltration Use of psychometric charts (Theoretical and Numerical treatment) **06 Hrs.**
Unit-VI	:	**Human Comfort and Air Conditioning:** Requirements of temperature, Humidity and concept of effective temperature, comfort charts. Air Conditioners: Air conditioning systems and their types, selection of system, Components and controls of air distribution, Window air conditioners, split air conditioners, Central air conditioners, Human comfort parameters, Load Estimation, Infiltration, Internal heat gains. (Theoretical and Numerical treatment) **06 Hrs.**
Reference Books		1. Arora C P, Refrigeration and Air Conditioning, Tata McGraw Hill, 3rd edition. 2. Domkundwar and Domkundwar, Refrigeration and Air Conditioning, DhanpatRai Publications, 1st . 3. Manohar Prasad, Refrigeration and Air Conditioning, New Age International Publishers, 2nd edition. 4. Ballany P L, Refrigeration and Air Conditioning, Khanna Publications, 2nd edition. 5. Dossat R J, Principles of Refrigeration, Prentice Hall, 5th edition. 6. William C Whitman, William Johnson, Refrigeration and Air Conditioning Technology, Thomson Delmar Learning, 5th edition

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

Course Code: MED 441 **Course Title: Design For Innovation** **Teaching Scheme:** **Theory:** 3 Hrs./week	**Credits: 3-0-0 (3)** **Mid Semester Examination-I:** 15 Marks **Mid Semester Examination-II:** 15 Marks **Teacher Assessment:** 10 Marks **End Semester Examination:** 60 Marks **End Semester Examination (Duration):** 03 Hrs

Objectives	:	1.To explain the concept of design thinking for product and service development 2.To explain the fundamental concept of innovation and design thinking 3.To discuss the methods of implementing design thinking in the real world
Unit-I	:	**Introduction to Design Thinking** Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, principles of design thinking, New materials in Industry. **04 Hrs**
Unit-II	:	**Design Thinking Process** Design thinking process (empathize, analyze, idea & prototype), Evaluation of ideas, implementing the process in driving inventions, Prototype Phase, Lean Startup Method for Prototype Development, Visualization and presentation techniques, design thinking in social innovations. Tools of design thinking **08 Hrs**
Unit-III	:	**Introduction to Innovation** Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity. **06 Hrs**
Unit-IV		**Product Design** Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. **06 Hrs**
Unit-V	:	**Ergonomics in Design** Importance and overview of Human Factors/ Ergonomics in Product Design, Physical ergonomics Principles, Cognitive and Emotional Aspects of Human Factors with respect to Product Design. **06 Hrs.**

Unit-VI	:	**Case Studies** Narration of five case studies based on innovation towards product design **05 Hrs.**

Reference Books

Sr. No.	Title	Author	Publication
1	Design Thinking in the Classroom	David Lee	Ulysses press
2	Universal principles of design	William lidwell, kritinaholden, Jill butter	
3	Product design: fundamentals and methods (Vol. 2)	Roozenburg, N. F., & Eekels, J.	John Wiley & Sons Inc
4	Human factors in engineering and design	Sanders, M. S., & McCormick, E. J.	McGRAW-HILL
5	Product design and development	Eppinger, S., & Ulrich, K	McGRAW-HILL

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

Course Code: MED 442 **Course Title: Stress Analysis** **Teaching Scheme:** **Theory:** 3 Hrs./week	**Credits: 3-0-0 (3)** **Mid Semester Examination-I:** 15 Marks **Mid Semester Examination-II:** 15 Marks **Teacher Assessment:** 10 Marks **End Semester Examination:** 60 Marks **End Semester Examination (Duration):** 03 Hrs

Prerequisite	:	Fundamental knowledge of Physics and Strength of materials
Objectives	:	1.To expose students to basic theories while emphasizing on their applications under stated conditions.
Unit-I	:	**Fundamentals of Stress & Strain** Concept of Stress & Strain, Types of loading, types of stresses and strains, equilibrium equations, compatibility equation, concept of complementary shear stress, concept of equilibrium for eccentric loading, importance of stress strain curve in stress analysis. **05Hrs.**
Unit-II	:	**Material Failure Analysis** Modes of material failures, importance of factor of safety, expression for strain energy & distortion energy, importance of theories of elastic failures, Weighted method for selection of materials, Analysis of ductile & brittle material failures. **07Hrs.**
Unit-III	:	**Stress Analysis of Bending and Torsional Stresses** Importance of flexural formula, analysis of bending stress distribution for various cross sections, analysis of parameters effecting bending stress, Importance of torsional formula, analysis of shear stress distribution for various cross sections, analysis of parameters effecting torsional shear stress. **06Hrs.**
Unit-IV		**Stress Analysis on Inclined Plane** Expression for stress on inclined plane, Principal stresses and strains, Transformation of inclined plane stresses to normal stresses, Importance of principal stress, Analysis of 2D Mohr Circle and 3D Mohr's circle, Eigen value method for principal stress, stress invariants, octahedral stresses. **06Hrs.**
Unit-V	:	**Stress Analysis of Machine Elements** Effect of stress concentration, importance of notch sensitivity, analysis of bearing characteristics curve, buckling of columns & Struts, force analysis of threads, force analysis

		of gears, stress analysis of thin cylinders. **07Hrs.**
Unit-VI	:	**Experimental Stress Analysis** Photo elasticity Introduction, polarized light, wave plates, plane and circular polariscope, Isochromatic & isoclinic fringes, compensation techniques, separation techniques, analysis of Fringe patterns. Introduction to 3-D photo elasticity, Strain Gauge techniques, strain gauge circuit, strain rosette, Brittle coating technique. **05Hrs.**

Reference Books

Sr. No.	Title	Author	Publication
1	Design of Machine Elements	J. E. Shigley	TMH Publication
2	Design of Machine Elements	M. F. Spotts	Prentice Hall
3	Machine Design	V. B. Bhandari	TMH Publication
4	Machine Design	Khurmi & Gupta	Eurasia Publishing House
5	Theory of Elasticity	Timoshnko, Goodiar,	McGraw Hill Book Co
6	Experimental Stress Analysis	Dove, Adams	Prentice Hall of India
7	Advanced Mechanics of Solids	L S Srinath	McGraw Hill Book Co

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Final Year B. Tech. (Mechanical Engineering) Semester-VII	
Course Code: MED-443 **Course: Electric Vehicles** **(Professional Elective Course - IV)** **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): 3 Hrs**

Prerequisite	Fundamentals of Mechanical Engineering, Basic Electrical Technology.
Objectives	1. To understand the concept of electric vehicles. 2. To familiarize with the motors, drives and architecture for electric vehicles. 3. To understand different energy storage systems and the concepts of battery management system. 4. To understand the modelling of various vehicle performance parameters. 5. To acquaint with the global scenario and future of electric vehicles.
Unit-I	**Introduction to Electric Vehicle (EV):** Review of Conventional Vehicles, **Electric Vehicle Technology** – History, Need, Classification of EV, General Layout and Configuration of EV, Components and Controls, Electric Vehicle and the Environment. **05Hrs**
Unit-II	**Electric Vehicle Architecture and Vehicle Modelling:** **Electric Vehicle Architecture:** Battery Electric Vehicles, The IC Engine/Electric Hybrid Vehicle, Fuelled EVs, EVs using Supply Lines, EVs which use Flywheels or Supercapacitors, Solar-Powered Vehicles, Vehicles using Linear Motors, EVs for the Future. Fundamentals of Regenerative Braking. **Electric Vehicle Modelling:** Introduction, Tractive Effort, Modelling Vehicle Acceleration, Modelling of Vehicle Range. **07Hrs**
Unit-III	**Electric Propulsion System:** **Motors (DC, Induction, BLDC)**: Types, Principle, Construction, Configuration and Control. **Electric Drive Trains (EDT)**: Series HEDT (Electrical Coupling) – Power

	Rating Design, Peak Power Source (PPS); Parallel HEDT (Mechanical Coupling) – Torque Coupling and Speed Coupling. Switched Reluctance Motors (SRM) Drives – Basic structure, Drive Convertor, Design. **06Hrs**
Unit-IV	**Energy Storages:** Batteries: Battery Parameters, Electrochemical Batteries - Lead-Acid Batteries, Nickel-based Batteries, Lithium-Based Batteries, Sodium-Air Batteries, Metal-Air Batteries. Supercapacitors and Flywheels, Hybridization of Energy Storages, Electric Supply System, EV Charging. **06Hrs**
Unit-V	**Battery Pack and Battery Management System:** Selection of battery for EVs & HEVs, Traction Battery Pack design, Requirement of Battery Monitoring, Battery State of Charge Estimation methods, Battery Cell equalization problem, thermal control, protection interface, SoC Estimation, Energy & Power estimation, Battery thermal management system, Battery Management System: Definition, Parts: Power Module, Battery, DC/DC Converter, load, communication channel, Battery Pack Safety, Battery Standards & Tests. **07Hrs**
Unit-VI	**Electric Vehicle Market Scenario** Introduction to Fuel Cell technology for EVs, Indian and Global Scenario for EVs: Technology Scenario, Market Scenario, Payback and Commercial Model, Policies in India, Recent EVs in the global market, Future perspectives of EVs. **05Hrs**

Text Book/ Reference Books

Sr. No.	Title	Author	Publication	Edition
1	Electric and Hybrid Vehicles – Design Fundamentals	Iqbal Husain	CRC Press (2021)	Third
2	Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design	Mehrdad Ehsani, Yimin Gao, Stefano Longo, and Kambiz M. Ebrahimi	CRC Press (2018)	Third
3	Electric Vehicle Technology Explained	Larminie, James, and John Lowry	John Wiley and Sons (2012)	Second
4	Build Your Own Electric Vehicle	Seth Leitman and Bob Brant	McGraw-Hill Education (2013)	Third

	5	Fundamentals of Electrical Drives	G. K. Dubey	CRC Press, (2002)	Second

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Syllabus Final Year B. Tech. (Mechanical Engineering) Semester-VII

Course Code: MED421		**Course: Laboratory - Tool Design**
Teaching Scheme:		**Term Work: 25 marks**
Practical: 02 Hrs / Week		**Practical Examination: 25 marks**
Credits: 01		
Prerequisite	:	1. Fundamental knowledge of manufacturing sciences and manufacturing processes along with engineering and machine drawing. 2. Basic knowledge of machine design and familiar with design data book.
Objectives	:	1. To design a cutting tool suitable for the given operation 2. To select tool material 3. To analyze tool wear and tool life 4. To design a jig or fixture for given operation 5. To design blanking and piercing die
List of Practical's	:	**Tool design Experiment** 1. Study of demonstration of formation of various types of chips at different cutting conditions. 2. Prepare a single point cutting point cutting tool in workshop from any soft material. 3. One sheet (A1 size) on multipoint cutting tools. 4. One sheet (A1 size) on locating devices. 5. One sheet (A1 size) on clamping devices. 6. One sheet (A1 size) on Jig design by referring design data book. 7. One sheet (A1 size) on Fixture design by referring design data book. 8. One sheet on die design. 9. Numerical based on measurements of cutting time, forces, cutting power.

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

Course Code: MED422 Course: Laboratory of Control System Engineering

Teaching Scheme: **Term Work: 25 marks**

Practical: 02 Hrs/week **Practical/ Oral: 25 marks** **Credits: 01**

Prerequisites	1. Basic knowledge of engineering mathematics, physics. 2. Basic understanding of electrical, mechanical systems.
Objectives	1. After successful completion of course, students shall be able to understand working of Hydraulic systems, Pneumatic systems and many Control Actions.
(Minimum 10 of the following should be completed)	1. Study of various types of measuring instruments & transducers (at least one ofEach type) 2. Study of control system components (At least TEN components) 3. Study of any ONE of Hydraulic system using hydraulic servomechanism 4. Experiment on speed control of DC Motor 5. Experiment on speed control of AC Motor 6. Experiment on speed control of Stepper Motor 7. Circuit Preparation by using Hydraulic Trainer Kit 8. Circuit Preparation by using Pneumatic Trainer Kit 9. Study of Circuits for M/C Tools. 10. Experiment on Level Control System 11. Experiment on Temperature Control System 12. Experiment on Position Control system 13. Study of Design of Automatic Control System with i) Plant layout. ii) Block diagram. iii) Steady state Analysis iv) Design of controller. For various control systems like Temp. flow etc.

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Syllabus Final Year B. Tech. (Mechanical Engineering) Semester-VII

Course Code: MED423	**Course: Laboratory - RAC**
Teaching Scheme:	**Term Work: 25 marks**
Practical: 02 Hrs / Week	**Practical Examination: 25 marks**
Credits: 01	

Prerequisite	:	1.Basic knowledge and understanding of thermodynamics, heat transfer and fluid mechanics.
Objectives	:	1. To study understand the fundamental working of various component of 'Refrigeration systems' 2. To study and understand the working of various compressors, controllers and tools used in 'Refrigeration systems' 3. To apply basic concept and analyze the performance of 'Refrigeration systems'
List of Practical's (Minimum 8)	:	**A] To study and demonstrate the of followings (minimum six)** 1. To study varies tools used in refrigeration and Air-conditioning 2. To study working of domestic refrigerator its wiring diagram and maintenance. 3. To study various compressors used in refrigeration 4. To study various controllers in refrigeration (at least ten) 5. To study leak detection and charging of refrigeration systems. 6. To study steam jet refrigeration system 7. To study magnetic refrigeration system 8. To study construction, working of water cooler. 9. To study vapor absorption refrigeration system **B] To conduct trail on following system (minimum three)** 1. Trial on refrigeration system 2. Trail on ice plant 3. Trial on cascade refrigeration system 4. Trial on Heat pump 5. Trial on window air conditioner /air conditioning system/ water cooler. **C] Technical visit to at least one refrigeration establishment and report on the basic of observations.** **D] Technical report on current trend (at least one) of refrigeration such as greenhouse effect, global warming, alternative refrigerants etc.**

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

(Faculty of Science & Technology)

Syllabus Final Year B. Tech. (Mechanical Engineering) Semester-VII

Course Code: MED426	**Course: Laboratory – Major Project-II**
Teaching Scheme:	**Term Work: 50 marks**
Practical: 08 Hrs / Week	**Practical Examination: 50 marks**
Credits: 04	

Objectives	:	1. 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. 2. To motivate students for creativity. 3. To create awareness regarding latest technology 4. To have common platform for interaction about emerging technology. 5. To inculcate qualities of team work. 6. To explore related information using books, research papers, journals & websites. 7. To improve presentation and communication skills.
Guidelines	:	**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 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 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

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 Margin3/4" 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 & Technology)
Syllabus of Final Year B. Tech. (Agricultural Engineering) Semester VII

Course Code: AED 431 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 cycleWater 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:	1. Turk J and Turk A. 1984 Environmental Sciences 3rd Edn. Saunders College Publications. Seed Processing by Gregg, NSC 2. Odum E. P. 1971 Fundamentals of Ecology 3rd Edn. W. B. Saunders Company London 3. Laurent Hodges – Environmental Pollution 4. C.S. Rao – Environmental Science and Engineering

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of B. Tech. final year (Civil Engineering) Semester - VII	
Course Code: **CED431** Course: **Open Elective –III Town Planning** **Teaching Scheme:** Theory: 3 Hours/week Credits: 3-0-0	Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs

Prerequisite	Basic 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)

REFERENCES:

Sr. No.	Title	Author	Publication	Edition
1	Town Planning	Rangwala	Charotar	21st Edition
2	Fundamentals of Town Planning	G.K.Hirasakar	Dhanpat Rai Publication	2nd Edition
3	Textbook of Town Planning	G.K. Bandopadhyaya	Charotar	2nd Edition

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

(FACULTY OF SCIENCEAND TECHNOLOGY)

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

Course Code: CSE 431 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 ECHO SYATEM** **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. **(6 Hrs)**				
References	**Sr. No.**	**Title**	**Author**	**Publication**	**Edition**
	1.	Big Data Analytics	Seema Acharya, Subhasini Chellappan	Wiley	Second
	2.	Hadoop: The Definitive Guide	Tom White	O'reily Media	Third
	3.	Analytics in a Big Data World: The Essential Guide to Data Science and its Applications	Bart Baesens	Wiley	

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of final year B.Tech (All) Semester-VII	
Course Code: EED 431 Course: Open Elective III – Battery Management System **Teaching Scheme:** Theory: 03Hrs/week Tutorial: 00 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):03 Hrs

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. (6Hrs)
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. (7Hrs)
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.** (6Hrs)
Unit-V	**Cell Balancing and aging:** Battery Cell Balancing. Causes of Imbalance in Battery Cells. Classification Systems for Balancing Methods- Static Methods, Dynamic methods.

<table>
<tr><td></td><td colspan="5">Lithium-ion aging: Negative electrode, Lithium ion aging: Positive electrode, Cell Balancing, Causes of imbalance, Circuits for balancing
(7Hrs)</td></tr>
<tr><td>Unit-VI</td><td colspan="5">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
(5Hrs)</td></tr>
<tr><td rowspan="6">References</td><td>Sr. No.</td><td>Title</td><td>Author</td><td>Publication</td><td>Edition</td></tr>
<tr><td>1.</td><td>Battery management systems</td><td>Plett, Gregory L</td><td>Volume I: Battery modeling. Artech House, 2015</td><td></td></tr>
<tr><td>2.</td><td>Battery management systems</td><td>Plett, Gregory L</td><td>Volume II: Battery modeling. Artech House, 2015</td><td></td></tr>
<tr><td>3.</td><td>Battery Management Systems -Design by Modelling</td><td>. Bergveld, H.J., Kruijt, W.S., Notten, P.H.L</td><td>Philips Research Book Series 2002</td><td></td></tr>
<tr><td>4.</td><td>Battery Management Systems for Large Lithium-ion Battery Packs</td><td>Davide Andrea</td><td>Artech House, 2010</td><td></td></tr>
<tr><td>5.</td><td>Battery management systems: Accurate state-of-charge indication for battery-powered applications</td><td>Pop, Valer, et al.</td><td>Vol. 9. Springer Science & Business Media, 2008.</td><td></td></tr>
</table>

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

(Faculty of Science & Technology)

Syllabus of final year B.Tech (Electronics and Telecommunication Engineering) 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, neighborhood 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)

	Sr. No.	Title	Author	Publication	Edition
References	1.	Doing Data Science: Straight Talk From The Frontline	Cathy O'Neil and Rachel Schutt	O'Reilly Media, Inc	**III**
	2.	Mining of Massive Datasets. v2.1	Jure Leskovek, Anand Rajaraman and Jeffrey Ullman	Cambridge University Press	**I**
	3.	Learning: A Probabilistic Perspective	Kevin P. Murphy	MIT Press	**II**
	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	I

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

(Faculty of Science & Technology)

Syllabus of B. Tech. (Mechanical)

Course Code: MED431	**Course: Modern Management Technique**
	(Open Elective-III)
Teaching Scheme:	**MSE I:-15 Marks**
Theory: 03 Hrs/week	**MSE II:- 15 Marks**
Credits: 3	**TA:- 10 Marks**
	Theory Examination (Duration): 03 Hrs
	Theory Examination (Marks): 60

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 **(06Hrs)**
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. **(06Hrs)**
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**

e- books, e- Journals	1	Industrial Engineering& Production Management	Maratand Telsang	S.Chand
	2	Techniques of Value Analysis & Engineering	I.D. Miles	
	3	Kaizen	Masaaki Imai	
	4	Pokayoke	Hiroyuki Hirmaao	Productivity Press,Cembridge
	5	Management Information System	W.S. Jawadekar	TMH
	6	Supply Chain Management	Sunil Chopra,Peter Meindl	Pearson Education
	7	Competitive Manufacturing management	John M.Nicholas	TMH
	8	Management Information System, Conceptual foundation, Structure & Development	Garden Bdevis & Margrath H.Olson.MGH	
	9	Industrial Engineering &Production& Operations Management	Sanjay S.Patil Nanadkumar Hukeri	Electrotech Publications
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		

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of final year B.Tech (All) Semester-VII	
Course Code: PPE431 Course: Open Elective-III: Packaging Technology **Teaching Scheme:** Theory: 3 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs

Prerequisite	Basic knowledge of 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)

	Sr. No.	Title	Author	Publication	Edition
	1.	Understanding Plastic Packaging Technology	Susan E. M. Seleke	Hanser publications - Munich	1st 1997
	2.	Plastics in Packaging	A.S. Althalye	Tata Mc Graw Hill publishing Co. Ltd., New Delhi.	1st 1992
References	3.	Food Packaging Technology Handbook	NIIR	Asia-Pacific publication.	1st 2012
	4.	Package Engineering	Honlon J. F.	Mc Graw Hill	1st 1984
	5.	Plastics Packaging	Turtle Ivor	Pira International	1st 1990
	6.	Handbook of Packaging-Plastics	A. S. Althalye	Multi-tech Plastics publishing Co. Mumbai.	1st 2013
	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.	1st 1999

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology)		
Syllabus Final Year B. Tech. (Mechanical Engineering) Semester-VIII		
Course Code: MED471 **Teaching Scheme** **Credits: 24**		**Course: In-Plant Training** **Term Work: 300 Marks** **Practical Examination: 300 Marks**
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)**	The students of B.Tech course shall get an opportunity to work on live problem He / She shall apply his leaving concepts in the real work situation. He / She shall get an exposure to the industrial environment and thereby enable himself / herself to appreciate the other related aspects of industry via, human, economic, commercial and regulatory. He / She shall identify career paths considering their individual strengths and aptitude. He / She shall contribute for the achievement of economic goals and aspirations of the industry and our country.
	(c)	The curriculum for B.Tech students of Final Year Course of Part-II shall consist of; In-plant 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 A project on live problems of the industry shall be undertaken by the student/group of students undergoing training in the same establishment. The term work shall consist of the In-plant 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. 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 In-plant 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 In-plant training: No student will be deputed for In-plant 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 In-plant training: The period of In-plant 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 In-plant Training : The student of Maharashtra Institute of Technology shall enter into a contract of In-plant training with the employing industry. The In-plant training shall be deemed to have commenced on the date, on which the contract of In-plant training has been entered. Every contract of In-plant training will contain the Terms and Conditions to be agreed by both the parties. Every contract of In-plant training shall be registered with the Maharashtra Institute of Technology within15 days from entering into the contract.
		Violation of contract: Where an employer, with whom a contract for In-plant training has been entered into, is for any reason, unable to fulfil 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 "In-plant trainee" under the other employer till the expiry period of the In-plant training. The agreement on registration with Maharashtra Institute of Technology shall be deemed to be the contract of In-plant training between the student and other employer, and from the date of such registration, the contract of In-plant 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 In-plant training shall terminate on the expiry of the period of In-plant training. Either party to the contract of In-plant 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 In-plant 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 In-plant training in that term. The student shall be deputed for In-plant training in next coming term.
		Expectation from the Employer / Industry / Establishment: The following expectations are derived for effective In-plant 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 In-plant training. The student shall maintain a report of his work during the period of his In-plant training in a pro-forma (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 In-plant 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 In-plant 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 In-plant 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 In-plant training in the pro-forma (Annexure).
		Industry Sponsored Student Projects: The scheme envisages working out suitable programme for B.Tech students. They are required to complete their In-plant 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 In-plant 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 In-plant 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 In-plant 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 labor 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 In-plant 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 In-plant 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 In-plant 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 In-plant training. However, if the industry desirous to do so, at 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 In-plant 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 Seminar Performance An oral on the project work done. 3. Assessment of the term work / report.