B. Tech. Semester -III (Mechanical Engineering-Major)

SN	Course Category	Course Code	Name of Course	BOS	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
									Theory				Practical		
					(Th)	TU	P		Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	PCC-II	BME3T09	Fluid Mechanics and Hydraulic Machines	Mechanical	3	-	-	3	3	70	30	45	-	-	-
2	PCC-II	BME3P09	Fluid Mechanics and Hydraulic Machines Lab	Mechanical	-	-	2	1	-	-	-	-	25	25	25
3	PCC-III	BME3T10	Kinematics of Machines	Mechanical	3	-	-	3	3	70	30	45	-	-	-
4	MDM-I	BMEMD3T01	Multidisciplinary Minor-I Refer MDM Basket	Mechanical	2	-	-	2	3	70	30	45	-	-	-
5	OE-I	BMEOE3T01	Open Elective – I Refer OE Basket	Mechanical	3	-	-	3	3	70	30	45	-	-	-
6	OE-I	BMEOE3P01	Open Elective – I Lab Refer OE Basket	Mechanical	-	-	2	1	-	-	-	-	25	25	25
7	HSSM-I	BMEH3T01	Introduction to Innovation and Entrepreneurship	Mechanical	2	-	-	2	3	70	30	45	-	-	-
8	VEC-I	BMEVE3T01	Constitution of India	ASH	2	-	-	2	3	70	30	45	-	-	-
9	CEP	BMECE3P01	Community Engagement Project/Mini Project	Mechanical	-	-	4	2	-	-	-	-	50	50	50
			Total (800)		**15**	**-**	**08**	**19**		**420**	**180**		**100**	**100**	

B. Tech. Sem-IV (Mechanical Engineering-Major)

SN	Course Category	Course Code	Name of Course	BOS	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
									Theory				Practical		
					(Th)	TU	P		Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	PCC-IV	BME4T11	Engineering Thermodynamics	Mechanical	3	-	-	3	3	70	30	45	-	-	-
3	PCC-V	BME4T12	Manufacturing and Machining Processes	Mechanical	3	-	-	3	3	70	30	45	-	-	-
4	PCC-V	BME4P12	Manufacturing and Machining Processes Lab	Mechanical	-	-	2	1	-	-	-	-	25	25	25
5	PCC-VI	BME4P13	Machine Drawing and Solid Modelling	Mechanical	-	-	4	2	-	-	-	-	50	50	50
6	MDM-II	BMEMD4T02	Multidisciplinary Minor-II Refer MDM Basket	Mechanical	2	-	-	2	3	70	30	45	-	-	-
7	OE-II	BMEOE4T02	Open Elective – II Refer OE Basket	Mechanical	2	-	-	2	3	70	30	45	-	-	-
8	AEC-II	BMEAE4T02	Aptitude and Reasoning	Mechanical	2	-	-	2	3	70	30	45	-	-	-
9	HSSM-II	BMEHM4T02	Industrial Engineering and Management	Mechanical	2	-	-	2	3	70	30	45	-	-	-
10	VEC-II	BMEVE4T02	Environmental Science	ASH	2	-	-	2	3	70	30	45	-	-	-
11	VSEC-III	BMEVSE4P02	Introduction to MS-Office	Mechanical	-	-	4	2	-	-	-	-	-	50	25
			Total(900)		**16**	**-**	**10**	**21**		**490**	**210**		**75**	**125**	

Exit option: Award of UG Diploma in Major and Minor with 8 Credits and an additional 8 credits in skill-based courses, internship, mini projects etc.

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR FACULTY OF SCIENCE & TECHNOLOGY B.TECH. MECHANICAL ENGINEERING

Sem: IIIrd	**Total Hours Distribution per week**		
Total Credit:3	**Lecture(L):3 Hrs**	**Tutorial/Activity(T/A): 0 Hr**	
Subject Code	**BME3T09**	**Fluid Mechanics and Hydraulic Machines**	
Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks	**70 Marks**	**45 Marks**	**3 Hours**

Sr. No.	**Course Objective** **The objective of this course is–**
1	To classify fluid & their properties under static and dynamic condition and apply the equations to various hydraulic components and working principles of various measuring devices.
2	To establish the relationship between various properties & apply mathematical treatment to various problems related to fluid system & their Design.
3	To explain the working Principles of Fluid mechanics and their Practical applications in designing the fluid systems
4	To introduce various principles & design of Hydraulic Machines i.e. Turbines.
5	To appreciate the design of Hydraulic Machines, ie Centrifugal and Positive Displacement Pump

Course Outcomes	
After successful completion of this course the student will be able to:	
CO1	Classify and explain fluid their properties, fluid in rest condition, types of flow & flow measuring devices and mathematical application of equations on hydraulic components.
CO2	Explain behavior of fluid in motion condition and application of Bernoulli's equation to fluid flow measuring devices.
CO3	Analyze the different types of losses of fluid flow through pipes.
CO4	Classify different layout of hydro-electric power plant and analyze design characteristics of hydraulic machines i.e. turbines (impulse and reaction), Pelton turbine , Francis turbine, propeller turbine and Kaplan turbine
CO5	Explain the working principle & design of Centrifugal and reciprocating pump & its practical applications.

SYLLABUS	
Contents	No of hours
UNIT-I Fluid Properties: Types of fluids, Mass Density, Specific Weight, Specific Gravity, Newton's Law of Viscosity, Dynamic Viscosity, Stroke's Theorem, Surface Tension, Capillarity, Types of Flow- steady, unsteady, uniform, non-uniform, laminar, turbulent. Fluid Statics :- Pressure, Measurement of pressure using manometers, Hydrostatic law, Pascal's law, Pressure at a point, Total pressure, Centre of pressure, Pressure on a plane (Horizontal, vertical, Inclined) Archimedes' principle, Buoyancy and stability of floating and submerged bodies, Metacentric height ,	09

UNIT-II Fluid Dynamics Introduction to Navier-Stroke's Equation, Euler equation of motion along a stream line, Bernoulli's equation, application of Bernoulli's equation to pitot tube, Venturimeter, orifices, orifice meter.	08
UNIT-III Flow Through Pipes Flow Through Pipes: TEL, HGL, Energy losses through pipe, Darcy-Weisbach equation, Minor losses in pipes, TEL, HGL, Moody diagram, pipes in series and parallel, Siphons, Transmission of power.	08
UNIT-IV Theory of turbo machines Turbo Machine classification, Elements of hydro-electric power plant, Impulse Turbine:- principles of operation , constructional features, Velocity Diagram and Analysis, Design parameters, Performance characteristics, Governing. Reaction or pressure Turbine:- principles of operation, Classification , Degree of reaction, comparison over Pelton Turbine, Draft tube, Cavitation in Turbine, Francis Turbine: Constructional features, Installations, Velocity Diagram and analysis, Design parameters, Performance characteristics, Governing. Propeller Turbine, Kaplan Turbine: -Constructional features, Velocity Diagram and analysis,	09
UNIT- V Hydrodynamic pumps: Centrifugal pumps:- Principle of operation, Classification, Component of Centrifugal Pump, Various heads, Velocity triangles and their analysis, N.P.S.H., Cavitation's in pumps, Installation and operation, Performance characteristics, Introduction to self-priming pumps. Reciprocating pump : Basic principle, Classification, Main Components, Slip, Work Done, Indicator Diagram, Cavitation's, Air vessels	09

References:

Text Books Recommended:

1. Fluid Mechanics, Dr. R.K. Bansal, Laxmi Publication (P) Ltd. New Delhi
2. Fluid Mechanics & Hydraulic Machines, R.K. Rajput, S. Chand & Company Ltd
3. Fluid Mechanics & Fluid Power Engineering – D. S. Kumar, S.K. Kataria & Sons
4. Introduction to Fluid Mechanics, James E.A., John and Haberm W.A., Prentice Hall of India

Reference Books Recommended:

1. Introduction to Fluid Mechanics, James E.A., John and Haberm W.A., Prentice Hall of India
2. Fluid Mechanics, Cengel & Cimbla, Tata McGraw Hill
3. Fluid Mechanics, Jain A.K., Khanna Publication

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FACULTY OF SCIENCE & TECHNOLOGY
B.TECH. MECHANICAL ENGINEERING

Sem: IIIrd	**Total Hours Distribution per week**		
Total Credit:1	**Practical: 2 Hrs / Week**	**Tutorial/Activity(T/A): 0 Hr**	
Subject Code :	**BME3P09**	**Fluid Mechanics and Hydraulic Machines (Practical)**	
Examination Scheme:			
Practical Internal Marks:	**Practical University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
25 Marks	**25 Marks**	**25 Marks**	**NA**

Course Outcomes	
After successful completion of this course the student will be able to:	
CO1	Verify the law of conservation of energy for fluid flow.
CO2	Apply Frictional losses and Hydraulic co-efficient in the pipe flow.
CO3	Estimate the Performance characteristics of Pelton Turbine.
CO4	Estimate the Performance characteristics of Francis Turbine & Kaplan Turbine.
CO5	Estimate the Performance characteristics of Centrifugal Pump & Reciprocating Pump.

SYLLABUS	
Minimum Eight out of the following practical's shall be performed:	
Sr No	List of Practical's
01	To verify Bernoulli's theorem.
02	To estimate the various friction losses in pipe.
03	To determine the type of flow by calculating the Reynold's Number
04	To find the value of co-efficient of discharge of a given venturimeter fitted in a pipe.
05	To find the value of co-efficient of discharge for a given orifice meter.
06	To Estimate the Performance characteristics of Pelton wheel.
07	To Estimate the Performance characteristic of Francis Turbine.
08	To Estimate the Performance characteristic of Kaplan Turbine.
09	To Estimate the Performance characteristic of Variable Centrifugal speed pump
10	To Estimate the Performance characteristic of Reciprocating pump.

References:

Text Books Recommended:

1. Fluid Mechanics, Dr. R.K. Bansal, Laxmi Publication (P) Ltd. New Delhi
2. Fluid Mechanics & Hydraulic Machines, R.K. Rajput, S. Chand & Company Ltd
3. Fluid Mechanics & Fluid Power Engineering – D. S. Kumar, S.K. Kataria & Sons
4. Introduction to Fluid Mechanics, James E.A., John and Haberm W.A., Prentice Hall of India

Reference Books Recommended:

1. Introduction to Fluid Mechanics, James E.A., John and Haberm W.A., Prentice Hall of India
2. Fluid Mechanics, Cengel & Cimbla, Tata McGraw Hill
3. Fluid Mechanics, Jain A.K., Khanna Publication

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Sem: IIIrd	**Total Hours Distribution per week**		
Total Credit:3	**Lecture(L):3 Hrs**	**Tutorial/Activity(T/A): 0Hr.**	
Subject Code :	**BME3T10**	**Kinematics of Machines**	
Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks	**70 Marks**	**45 Marks**	**3 Hours**

Course Objectives	
1	**To make the student conversant with the process of motion transformation.**
2	**To develop ability to critically analyze the machines, mechanisms and controlling devices**
3	**To synthesis the mechanism for different applications**

Course Outcomes	
After completion of syllabus, students would be able to	
1	Understand the basics of machines and mechanism.
2	Perform kinematic analysis (Displacement, Velocity, acceleration, Inertia forces) of a given mechanism using analytical and graphical method.
3	Synthesize new mechanisms for specific requirements.
4	Construct cam profiles for various the follower motions.
5	Understand the geometry of gears, its types, analysis of forces and motions of gear teeth and analyse the gear trains .

SYLLABUS	
Contents	
Unit I – INTRODUCTION • Basic concept of machine, kinematic links, kinematics pairs, kinematics chain, mechanism, Difference between machine and mechanism, Inversions, simple & compound chain. • Degrees of freedom, Estimation of degree of freedom of mechanism by Grubber's criterion and other methods. Harding's notations, Classification of four bar chain , Class-I & Class-II, Kutzbach's criteria. • Various types of mechanism such as Geneva wheel, Pawl and ratchet mechanism, Exact straight line mechanism, Approx. straight line mechanism, Pantograph mechanism.	08
Unit II- KINEMATIC ANALYSIS Kinematic analysis of simple mechanisms using vector algebra (Graphical method). Concept of Corioli's component of acceleration. Velocity analysis using Instantaneous center of Rotation method, Kennedy's theorem.	08
Unit III- KINEMATIC SYNTHESIS • Synthesis of mechanisms, Graphical • Synthesis of mechanisms analytical technique. Restricted to design of crank rocker and slider crank mechanism only.	08

Unit IV- CAMS and FOLLOWERS: • Types of cams and followers, types of follower motion, velocity and acceleration diagrams, Construction of cam profile. • Introduction to cams with specified contours (No analytical treatment).	08
Unit V- GEARS and GEAR TRAINS • Classification of gears, Types of gears, Spur gears - terminology, conjugate gear tooth action and law of gearing, involute and cycloidal profile, contact ratio, Interference and under cutting, methods of avoiding interference, minimum number of teeth. • Helical gears: Nomenclatures, center distance, force analysis. • Spiral Gears, Worm and worm Gears, Bevel Gears; their terminologies, center distance, force analysis and efficiency. • Gear Trains.	08

Books:

References:

Text Books Recommended:

1. Theory of Machine, S. S. Rattan, Tata McGraw Hill.
2. Mechanism and Machine Theory, J.S. Rao & Dukki Patti, New Age International (P) Ltd, Publishers
3. Theory of Machines, P L Ballaney, Khanna Publications.

Reference Books Recommended:

1. Theory of Machines and Mechanisms, J. E. Shigley and J. J. Uicker, Oxford University Press
2. Theory of Machines, Sadhu Singh, Pearson publications.
3. Advanced Mechanism Design–Analysis and Synthesis, A.G.Erdman and G.N.Sandor, Vol. I and II, Prentice – Hall
4. "Mechanisms and Mechanical Devices Source Book", Neil Sclater, Nicholas P Chrironis, McGraw-Hill
5. Kinematics and Linkage Design, A. S. Hall, Jr., Prentice – Hall
6. Mechanism Synthesis and Analysis, A. H. Soni, McGraw Hill

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR FACULTY OF SCIENCE & TECHNOLOGY B.TECH. MECHANICAL ENGINEERING

Sem: III	**Total Hours Distribution per week**		
Total Credit : 2	**Lecture (L): 2 Hrs**	**Tutorial/Activity (T/A): 0 Hr.**	
Subject Code	**BMEMD3T01**	**Introduction to IOT**	
Examination Scheme			
Internal Marks	**University Marks**	**Minimum Passing Marks**	**Examination Duration**
30	**70**	**45**	**3 Hours**

Course Objectives	
1	To study fundamental concepts of IoT
2	To understand roles of sensors in IoT
3	To Learn different protocols used for IoT design
4	To be familiar with data handling and analytics tools in IoT

Course Outcomes	
After completion of syllabus, students would be able to	
1	Explain the **basics of networking and emergence of Internet of Things.**
2	Classify various sensing devices and actuator types.
3	Explain IoT Processing Topologies and its types.
4	Demonstrate Cloud Computing concept and IOT case studies.

SYLLABUS	
Contents	No of hours
Unit I **Basics of Networking:** Introduction, Network Types- connection types, physical topology, network reachability; Layered network models-OSI model, Internet protocol suite; **Emergence of IoT:** Introduction, Evolution of IoT, Enabling IoT and the Complex Interdependence of Technologies, IoT Networking Components.	7
Unit II **IoT Sensing and Actuation:** Introduction, Sensors, Sensor Characteristics, Sensorial Deviations, Sensing Types, Sensing Considerations, Actuators, Actuator Types, Actuator Characteristics.	7

Unit III **IoT Processing Topologies and Types**: Data Format- Structured data, unstructured data; Importance of Processing in IoT; Processing Topologies- onsite processing, off-site processing; IoT Device Design and Selection Considerations, Processing Offloading- Offload location, offload decision making, Offloading considerations	7
Unit IV **Cloud Computing**: Introduction, Virtualization- Advantages and types ; Cloud Models- Service model and deployment model; Service-Level Agreement in Cloud Computing, Cloud Implementation- Cloud simulation, OpenStack, Amazon web services;Sensor-Cloud:Sensors-as-a-Service. **IOT Case Studies:** Agricultural IoT – Introduction and Case Studies; Vehicular IoT – Introduction; Healthcare IoT – Introduction and Case Studies; IoT Analytics – Introduction, Machine Learning- Advantages , challenges and types.	7

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B.TECH. MECHANICAL ENGINEERING

Sem: III	**Total Hours Distribution per week**		
Total Credit : 3	**Lecture (L): 3 Hrs**	**Tutorial/Activity (T/A): 0 Hr.**	
Subject Code	**BMEOE3T01A**	**Introductions to Metrology**	
Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30	**70**	**45**	**3 Hours**

Course Objectives	
1	This course is designed to learn and understand need of measurements
2	To impart the knowledge about the functioning of Metrology
3	It aims to perform the assessment of Production design and calculation.
4	It provides a basic knowledge of metrological measurement.
5	To the use of the metrology measurement comparator.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Students will be able to analyze the concept of metrology.
2	Students will be able asses the functioning of instrument.
3	Students will be able to understand the production design and analysis
4	Students will be able to differentiate Linear and angular measurement
5	Students will be able to identify the different type of comparators

SYLLABUS	
Contents	No of hours
Unit I Standard of measurement, line end and wave length standards allowance & tolerance inter changeability selective assembly and applications	08
Unit II Limits and fits, types of fits, shaft and hole basic system, Applications of hole and shaft basis system	08
Unit III Design of limit gages(analytical treatment is expected),Introduction to process planning sheet.	08

Unit IV Measurement of straightness and flatness, instruements for Linear and Angular Measurement (Vernier, Angle gage, Sine Bar, Level Indicator, Clinometer and Taper gage	09
Unit V Comparators :Mechanical ,Optical ,Electrical ,Electronic, Pneumatic, Use of optical profile projector and Tool Makers Microscope ,Autocollimator	08

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Sem: III	**Total Hours Distribution per week**		
Total Credit : 1	**Lecture (L): 2 Hrs**	**Tutorial/Activity (T/A): 0 Hr.**	
Subject Code	**BMEOE3P01A**	**Introduction to Metrology Lab**	
Examination Scheme			
Internal Marks	**University Marks**	**Minimum Passing Marks**	**Examination Duration**
25	**25**	**25**	**---**

Course Objectives	
1	Demonstrate the ability to select various precision measuring instruement
2	Identify the concept of linear and angular dimensions
3	It aims to perform assessment of production design
4	To understand the concept of measurement system and standard o f measurement
5	To classify the comparators and design limit gages

List of Practical's

Sr. No.	**List of Practical's** **Minimum Eight out of the following practical's shall be performed**
01	Measurement of Linear Using Vernier, angular dimensions (, Sine Bar)
02	Measurement angular dimensions using Sine Bar
03	Measurement of Flatness and Straightness
04	Study of Measurement of parameters using Tool Maker Microscope
05	Study of measurement of parameters using Optical Profile Projector
06	Use of Optical flat
07	Design of Limit Gage
08	Industrial use of comparator

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B.TECH. MECHANICAL ENGINEERING

Sem: III	**Total Hours Distribution per week**	
Total Credit : 3	**Lecture (L): 3 Hrs**	**Tutorial/Activity (T/A): 0 Hr.**
Subject Code	**BMEOE3T01B**	**Automobile Engineering**

Examination Scheme			
Internal Marks:	**University Mark**	**Minimum Passing Marks**	**Examination Duration:**
30	**70**	**45**	**3 Hours**

Course Objectives	
1	To make the students conversant with fundamentals of automobile systems
2	To develop competencies in the performance analysis of vehicle.
3	To understand the working of transmission system, suspension system, brakes, steering system, wheels and tyres used in automobiles
4	To make the students conversant with Alternative fuels and pollution control devices in Automobiles.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Demonstrate the vehicle construction, chassis, lubrication system and cooling system in automobile.
2	Describe the principle and working of Transmission system and clutch, gear box, rear axle drives, fluid flywheel, torque converter.
3	Identify the steering, suspension system and types of brakes.
4	Describe construction of different automotive chassis components.
5	.Ability to select proper alternative energy source according to application considering economy, Environmental effect, Physical effect on human etc

SYLLABUS	
Contents	No of hours
Unit I: **Introduction:** Classification of automobiles, Major components and their functions. Chassis, different vehicle layouts. **Power Plant:** Constructional features of different types of engines used in automobiles. Fuel supply systems, cooling systems, lubrication systems.	08

Unit II **Transmission system:** **Clutch:** Necessity, requirements of a clutch system. Types of Clutches, centrifugal clutch, single and multi-plate clutch. **Gear Box:** Necessity of transmission, principle, types of transmission, sliding mesh, constant mesh, synchromesh, transfer gear box, gear selector mechanism, lubrication and control. Torque converter, semiautomatic and automatic transmission.	09
Unit III **Steering systems:** Principle of steering, steering geometry and wheel alignment, Power Steering. Under steer, Over-steer. **Suspension systems:** Need, Function of spring and shock absorber, conventional suspension, Independent, suspension System, Active suspensions. **Brakes:** Function, Classification, Basic Components. Drum Brakes, Disc Brakes, Hydraullic brakes, Air Brakes, ABS.	09
Unit IV **Drive to Wheels**: Propeller shaft and universal joints, , differential, rear axle, , steering geometry, camber, king pin inclination, included angle, castor, toe in & toe out, steering gears, power steering, general arrangements of links and stub axle, types of chassis frames. .	08
Unit V **Alternative Fuels**: CNG, LPG, biodiesel, bio-ethanol, gasohol and hydrogen fuels in automobiles. **Automotive Emission Control Systems**: Sources of emission from engines,Automotive emission controls, Controlling crankcase emissions, Controlling evaporative emissions, Exhaust gas recirculation, Catalytic converter, Emission standards- Euro I, II, III and IV norms, Bharat Stage II, III norms .	09

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Sem: III	Total Hours Distribution per week		
Total Credit : 1	Lecture (L): 2 Hrs	Tutorial/Activity (T/A): 0 Hr.	
Subject Code	BMEOE3P01B	Automobile Engineering Lab	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
25	25	25	----

Course Outcomes	
After completion of syllabus, students would be able to	
1	Make students understand the basic concepts, requirement and working of various components of automobile.
2	Make students understand the assembling and disassembling procedure of Engine .clutch ,brakes and the process of wheel alignment, balancing and battey testing.
3	Enable students to understand and identify components of transmission system, brakes, steering and suspension systems.
4	Aware students about automotive electronics and recent technologiesused in automobiles.
5	Aware students about the importance of safety considerations in automobiles, automobile maintenance and overhauling.

List of Practical's

Minimum 8 out of the following Practical's shall be performed

Sr. No.	List of Practical's Minimum Eight out of the following practical's shall be performed
01	To prepare a report on visit to automobile engineering industry/ service center / any industry related to automobile components or systems.
02	Demonstration and study of Chassis layout and frame used in any one automobile.
03	To assemble and disassemble of single or multi cylinder engine and identify its components
04	To assemble and disassemble multi plate clutch
05	To assemble and disassemble mechanical brakes and identify its components.
06	To identify battery condition using battery tester and its restoration.
07	To prepare a report on process of wheel alignment and balancing
08	Demonstration and study of air suspension system. Identify its components and study about the functions of each components.
09	Demonstration and study of different types of steering systems
10	Study of heating, ventilation and air conditioning system in a given car
11	To prepare a report on pre-delivery inspection (PDI),free service schedule of a Carwith checklist of work to be carried in PDI. 1st,2nd and 3rdfree service.

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Sem: III	**Total Hours Distribution per week**		
Total Credit : 2	**Lecture (L): 2 Hrs**	**Tutorial/Activity (T/A): 0 Hr.**	
Subject Code	**BMEH3T01**	**Introduction to Innovation and Entrepreneurship**	
Examination Scheme			
Internal Marks	**University Marks**	**Minimum Passing Marks**	**Examination Duration**
30	**70**	**45**	**3 Hours**

Course Objectives	
1	To develop an understanding of innovation as a structured and strategic business process by exploring its sources, drivers, and impact on business growth and competitive advantage.
2	To explore strategies for building an innovative organization, leveraging open innovation, collaboration, and networking to develop new products, services, and ventures.
3	To equip students with the skills to recognize entrepreneurial opportunities, develop effective entry strategies, and sustain competitive advantage through innovation and intellectual property protection.
4	To develop an understanding of financial planning in entrepreneurship, including financial projections, valuation, and various stages and sources of business financing.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Analyze and differentiate knowledge push and need pull innovations, evaluating whether innovation is a structured process or an unpredictable, uncertain activity.
2	Evaluate the effectiveness of collaborative innovation networks versus independent approaches in fostering innovation and entrepreneurial success.
3	Analyze opportunity recognition methods, evaluate entry strategies, and apply intellectual property rights (IPR) to safeguard innovations in a competitive market.
4	Analyze financial projections, assess business valuation, and evaluate different financing options, including debt, venture capital, and alternative funding sources.

SYLLABUS	
Contents	No of hours
Unit I Innovation: What and Why? Innovation as a core business process, Sources of innovation, Knowledge push vs. need pull innovations. Class Discussion- Is innovation manageable or just a random gambling activity?	7

Unit II Building an Innovative Organization Creating new products and services, Exploiting open innovation and collaboration, Use of innovation for starting a new venture Class Discussion- Innovation: Co-operating across networks vs. 'go-it-alone' approach.	7
Unit III Entrepreneurship: Opportunity recognition and entry strategies, Entrepreneurship as a Style of Management, Maintaining Competitive Advantage- Use of IPR to protect Innovation. ,	7
Unit IV Entrepreneurship- Financial Planning: Financial Projections and Valuation, Stages of financing, Debt, Venture Capital and other forms of Financing. ,	7

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Sem: III	**Total Hours Distribution per week**		
Total Credit : 2	**Lecture (L): 2Hrs**	**Tutorial/Activity (T/A): 0 Hr.**	
Subject Code	**BMEVE3T01**	**Constitution of India**	
Examination Scheme			
Internal Marks	**University Marks**	**Minimum Passing Marks**	**Examination Duration:**
30	**70**	**45**	**3 Hours**

Course Objectives	
1	Analyze the basic structure of Indian Constitution.
2	Remember the Fundamental rights and duties.
3	Know DPSP's and Nation's political structure.
4	Understand function of Parliament and Judiciary.

SYLLABUS	
Contents	No of hours
Unit I Introduction to the Indian Constitution, Preamble of the Indian Constitution and key concepts, Salient features of the Indian Constitution, Role and objective of Constituent Assembly	07
Unit II Fundamental rights meaning, significance, restrictions and limitations Fundamental duties and its scope, difference between Fundamental rights and Fundamental duties	07
Unit III Directive Principles of State Policy (DPSP's) and its present relevance in India, Union Executive- President, Prime Minister and Union cabinet ,	07
Unit IV Parliament - role and function, Lok Sabha and Rajya Sabha, Judiciary system in India, Supreme Court of India and other courts.	07

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B.TECH. MECHANICAL ENGINEERING

Sem: III	**Total Hours Distribution per week**		
Total Credit : 2	**Lecture (L): 4 Hrs**	**Tutorial/Activity (T/A): 0 Hr.**	
Subject Code	**BMECE3P01**	**Community Engagement Project/Mini Project**	
Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
50	**50**	**50**	**---**

Course Objectives	
1	Provide students with real-world experience, fostering a sense of social responsibility and preparing them to address societal challenges with empathy and innovation

Course Outcomes	
After completion of syllabus, students would be able to	
1	gain hands-on experience by applying their technical skills to address real-world problems within their communities.
2	develop essential skills beyond technical expertise, including communication, teamwork, problem-solving and life-long learning skills.
3	exhibit a sense of social responsibility and ethical awareness and prepare themselves to become socially conscious engineers.
4	work with diverse groups of people and address community-specific needs to develop a broader perspective and understanding of different contexts.
5	contribute to their communities by developing solutions to local problems, improving quality of life, and addressing social needs.

Instructions:

- The project is to be carried out in a group of 4-6 students.
- The project work will be guided and supervised by a faculty member and workload for the same shall be 2 hr / week.
- Students can collaborate with community members to identify needs and develop solutions.
- Students can offer technical expertise to local businesses, organizations, or community groups.

The assessment will be based on:

1. Demonstration of model (crafted / fabricated)/ survey report/ research report.
2. Presentation based on project work carried out.
3. Viva-voce.

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Sem: IV	**Total Hours Distribution per week**		
Total Credit : 3	**Lecture (L): 3 Hrs**	**Tutorial/Activity (T/A): 0 Hr.**	
Subject Code	**BME4T11**	**Engineering Thermodynamics**	
Examination Scheme			
Internal Marks	**University Marks**	**Minimum Passing Marks**	**Examination Duration**
30	**70**	**45**	**3 Hours**

Course Objectives	
1	This course deals with the fundamentals of Thermodynamics, including thermodynamic systems and properties, relationships among the thermos-physical properties, the laws of thermodynamics and applications of these fundamental laws in thermodynamic systems
2	To present a comprehensive and rigorous treatment of classical thermodynamics while retaining an engineering perspective.
3	Explain the working principle of various power cycles used in thermal systems.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Explain the concepts of thermodynamics, relate laws of gases, identify various types o thermodynamic processes and apply the laws to determine the energy transfer i terms of heat and work.
2	Explain first law of thermodynamics and apply the law to evaluate open, closed systems, thermal components and devices.
3	Interpret second law of thermodynamics, entropy and apply the law to evaluate the performance of heat engine, heat pump, and refrigerator.
4	Relate various steam properties, and analyze the various types of processes using steam as working fluid to determine the energy transfer in terms of heat and work.
5	Explain various types of gas power cycles and evaluate the efficiencies of cycles used in steam power plant.

SYLLABUS	
Contents	No of hours
Unit I: Basic concepts of Thermodynamics, Systems and their types, Property, State, Process. Path and point functions. Thermodynamic Equilibrium. Zeroth law of thermodynamics and its significance for temperature measurement Introduction to First law of thermodynamics, Energy transfer, Heat and work transfer. Ideal Gas laws: Boyle‟s law, Charle‟s law, Gay-Lussac‟s law. Equation of state, General gas equation, Specific Heat, Universal gas constant. Various Thermodynamic Processes: Constant pressure, Constant volume, Isothermal, Isentropic and polytropic process, Calculation of Heat transfer, Work done, Change in Internal Energy and Enthalpy for these processes. ,	09

Unit II: The first law of Thermodynamics for Closed System undergoing a process and cycle (Control Mass System) and Open System (Control Volume System) . Steady Flow process applies to Compressor, Turbine, Boiler, Steam Nozzle, Throttling Device, Heat Exchanger. (Analytical treatment on First law applied to thermodynamic processes and cycles and Steady low energy equation applied to various flow devices is expected). ,	09
Unit III: Second Law of Thermodynamics:- Heat Reservoir, source and sink. Heat Engine, Refrigerator, Heat Pump, Kelvin-Plank and Clausius Statements, Perpetual Motion Machine I and II, Carnot Cycle. Entropy:- Clausius Inequality, Entropy, Principle of Increase of Entropy, Change in Entropy for different thermodynamics processes. ,	08
Unit IV: Properties of Steam:- Formation of steam and its thermodynamic properties like Sensible Heat, Latent Heat, Critical State, Triple Point, Wet Steam, Dry Steam, Superheated Steam, Dryness Fraction, Enthalpy, Internal Energy of Steam, External Work Done during Evaporation, T-S Diagram, Mollier Chart, Work and Heat Transfer during various Thermodynamic Processes with steam as working fluid (Analytical Treatment using steam table and Mollier chart is expected) ,	09
Unit V: Power Cycles: - Otto Cycle, Diesel Cycle, Brayton Cycle, Representation on P-v and T-s diagrams. The equation for work done, heat transfer, air standard efficiency, and mean effective pressure. Comparison of Otto, Diesel and Dual cycles. Introduction to simple vapour power cycle, i.e., Rankine cycle (Analytical treatment in terms of calculation Work done & efficiency analysis is expected on Otto Cycle, Diesel Cycle) ,	08

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Sem: IV	**Total Hours Distribution per week**		
Total Credit : 3	**Lecture (L): 3 Hrs**	**Tutorial/Activity (T/A): 0 Hr.**	
Subject Code	**BME4T12**	**Manufacturing and Machining Processes**	
Examination Scheme			
Internal Marks	**University Marks**	**Minimum Passing Marks**	**Examination Duration**
30	**70**	**45**	**3 Hours**

Course Objectives	
1	To understand pattern making, gating system, moulding process and the casting process.
2	To study metal forming techniques, rolling, drawing.
3	To learn about plastics along with properties, types, applications and shaping m
4	To expose the students to the principles of the metal & plastic joining methods.
5	To understand basic mechanism of metal removal processes and working mechanisms of various machine tools and machining principles.
6	Understand the importance of machining processes and be able to apply the suitable manufacturing and machining processes for an engineering product.
7	To know and apply surface finishing and allied processes.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Understand the importance and application of various manufacturing processes viz. casting, rollinforging, extrusion, drawing and plastics shaping methods.
2	Understand the basic concept of joining process and the application of various metal and plastic joining processes.
3	Get acquainted with the fundamentals of metal cutting and cutting tools.
4	Understand basic construction and operations of lathe, shaper, planer and milling machines, milling cutters.
5	Understand the basics of drilling, reaming, grinding and super finishing processes and their applications.

SYLLABUS	
Contents	**No. of hours**
Unit I **Casting Process:** Introduction, Pattern: Types, materials used, Pattern making allowances. Core types. Moulding: Types of sand moulds, moulding sand composition and properties. Gating design: Elements of gating systems, types of gates. Melting furnaces -Types, Electric furnace, Induction furnace, Cupola- construction & operation. Casting defects. **Forming Process for metals:** Introduction to Rolling, types of rolling machine, Forging, Extrusion and Drawing. **Introduction to Plastics:** Properties & types, applications, Forming & Shaping of plastics - Extrusion, Injection moulding, Blow moulding, Compression moulding, Transfer moulding, Embossing, Calendaring.	**9**
Unit II **Joining Processes:** **Introduction to metal Joining** - Types of Welding. Arc Welding & Gas Welding Processes, Defects & Inspection of Welding Joints, Electrodes, Resistance Welding, TIG Welding, MIG Welding, Spot Welding. **Introduction to Joining of Plastics -** Mechanical Fastening, Spin Welding, Solvent Bonding, Ultrasonic welding, Induction welding, Dielectric welding, Hot Plate welding, Vibration welding, Hot gas welding.	**9**
Unit III **Introduction to Machining Parameters**: Introduction to machining, Tool materials, tool materials properties, nomenclature and tool geometry of single point cutting tool. Theory of Metal Cutting: Introduction, Orthogonal and Oblique cutting, Mechanics of Metal Cutting, Chip formation, cutting fluids, Machining Parameters: cutting speed, feed and depth of cut, tool life.	**9**
Unit IV **Lathe:** Introduction, types, construction of simple lathe, mechanism and attachments for various operations, machine specifications, basis for selection of cutting speed, feed and depth of cut, turning operations such as facing, step turning, taper turning, threading, knurling. Introduction to Capstan & Turret Lathe. **Shaper & Planer:** Introduction, description of machines. Mechanisms of shaper: Quick return mechanism, Crank & slotted link mechanism. **Milling:** Introduction, Column & knee type milling machines, Types of milling operations, Types of milling cutters, Tool geometry & their specifications. Indexing – simple and compound.	**9**
Unit V **Drilling:** Introduction, classification of drills, nomenclature of twist drills, sensitive drilling machine and radial drilling machine. Introduction to Reaming Process. **Grinding**: Grinding wheel, specifications & selection, cylindrical & centreless grinding operations. **Super Finishing processes:** Honing, Lapping, super finishing, polishing, buffing, Metal spraying, Galvanizing and Electroplating.	**9**

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Sem: IV	Total Hours Distribution per week		
Total Credit : 1	Lecture (L): 2 Hrs	Tutorial/Activity (T/A): 0 Hr.	
Subject Code	BME4P12	Manufacturing and Machining Processes Lab	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
25	25	25	----

Course Outcomes	
After completion of syllabus, students would be able to	
1	Understand casting, forming processes and plastic production methods.
2	Understand the various metal and plastic joining processes.
3	Understand basic cutting mechanics and cutting tools.
4	Know the working of lathe and perform turning and other lathe, shaping, planing milling operations.
5	Perform drilling operation and suggest super finishing processes applicable to a particular product.

List of Practical's

Minimum Eight out of the following practical's shall be performed:

Sr. No.	List of Practical's
01	Study of Casting Process, Pattern making
02	Study of Forming Processes
03	Study of Metal and Plastic Joining Processes
04	Study of Single Point Cutting Tool
05	Study of multiple point cutting tools (Milling, Drills, Broaches).
06	Study of Lathe Machine.
07	Study of Shaper Machine and mechanisms.
08	Study of milling machine.
09	Study of Super Finishing processes
10	One Job – Casting
11	One Job – on Arc Welding/TIG/ MIG/ Resistance welding
12	One Job on Lathe machine with turning, facing, Thread Cutting, Taper Turning operations.
13	One Job on Milling machine.

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Sem: IV	**Total Hours Distribution per week**		
Total Credit : 2	**Lecture (L): 4 Hrs**	**Tutorial/Activity (T/A): 0 Hr.**	
Subject Code	**BME4P13**	**Machine Drawing and Solid Modelling**	
Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
50	**50**	**50**	**------**

Course Objectives	
1	Create 2-D orthographic manual drawings as well as digital drawing using CAD software package of standard machine components
2	Apply standard practices for creation of 2-D orthographic manual drawings as well as digital drawing using CAD software package of assembly with dimension detailing, part list and ballooning. Also perform 2-D detailing of assembly components.
3	Create 3-D solid model and 2-D detailing of simple parts using CAD software package and perform 2-D detaining.
4	Create production drawing and process sheet for standard machine components.
5	Get hands on experience of reverse engineering process and concepts.

List of Practical's

Minimum Six out of the following practical's shall be performed:

Sr. No.	**List of Practical's**
01	2-D Orthographic pencil drawings of standard components with dimensions and detailing : Minimum One sheet
02	2-D Orthographic pencil drawings showing sectional views of part with dimensions and detailing: Minimum One sheet
03	2-D Orthographic pencil drawings of Assembly showing at least two views with assembly dimensioning, part list and ballooning: Minimum One sheet
04	2-D Orthographic pencil drawings of Assembly detailing (disassembly) showing dimensional details of assembly components : Minimum One sheet
05	Creating 3-D solid model of simple part with basic features like extrude, revolve, holes, round, chamfer from Given 2-D detailing using any CAD software package. Perform 2-D drafting and detailing of solid model: Print out showing 2-D detailing and pictorial view (isometric view) of part to be submitted.
06	Creating 2-D Orthographic drawings of Assembly with one sectional view with assembly dimensioning, part list and ballooning using any CAD software package: Print out to be submitted.
07	**Production drawing and process sheet:** Prepare production drawing and process sheet of any standard machine component using CAD software package: Submit print out.
08	**Compulsory Reverse engineering group activity (maximum 4 members in a group):** Each group to be given unique assembly comprising of minimum four components (preferably standard assembly e.g. bearing housing, tool post, clutch housing, automobile parts, parts in workshop facilities etc.).Students to disassemble all parts, study each part, identify standard components, perform complete reverse engineering process: create rough sketch of each part, measure its various dimensions using basic measuring instruments (ruler scale, vernier etc.), prepare final drawing using any CAD software package, apply GD & T: Print out showing complete detailing of each assembly component to be submitted.

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Sem: IV	**Total Hours Distribution per week**		
Total Credit : 2	**Lecture (L): 2 Hrs**	**Tutorial/Activity (T/A): 0 Hr.**	
Subject Code	**BMEMD4T02**	**Introduction to Artificial Intelligence**	
Examination Scheme			
Internal Marks	**University Marks**	**Minimum Passing Marks**	**Examination Duration**
30	**70**	**45**	**3 Hours**

Course Objectives	
1	Understand the basics of artificial intelligence and its subfields.
2	Explore real-world applications of AI across different industries.
3	Gain insights into the ethical, social, and economic implications of AI
4	Develop an appreciation for the potential of AI to drive innovation and transformation

Course Outcomes	
After completion of syllabus, students would be able to	
1	Define and explain the fundamental concepts and subfields of AI.
2	Identify real-world applications of AI across various industries
3	Analyze the ethical, social, and economic implications of AI
4	Recognize the potential of AI to drive innovation and transformation in different domains.

SYLLABUS	
Contents	No of hours
Unit I : Definition and scope of AI, Historical overview and key milestones, Differentiating AI from human intelligence, AI Subfields and Technologies: Machine learning: Supervised, unsupervised, and reinforcement learning, Deep learning and neural networks, Natural language processing (NLP) and computer vision	**7**
Unit II: Ethical and Social Implications of AI Bias and fairness in AI systems, Privacy and data protection concerns, Impact of AI on employment and the workforce, AI and social inequality, Ethical guidelines and responsible AI practices, AI and Innovation, Emerging trends and future directions in AI, AI and creativity: Generative models and artistic applications	**7**
Unit III: Applications of AI AI in healthcare: Diagnosis, treatment, and medical imaging, AI in finance: Fraud detection, algorithmic trading, and risk assessment, AI in transportation: Autonomous vehicles and traffic optimization, AI in customer service and chatbots, AI in education: Personalized learning and intelligent tutoring system	**7**
Unit IV: Building AI Projects Workflow of a machine learning project, Workflow of a data science project, how to use data, how to choose an AI project, working with an AI team, how to process and visualize data, technical tools for AI teams, use of python in AI related projects.	**7**

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Sem: IV	**Total Hours Distribution per week**		
Total Credit :2	**Lecture (L): 2 Hrs**	**Tutorial/Activity (T/A): 0 Hr.**	
Subject Code	**BMEOE4T02A**	**Operation Research Techniques**	
Examination Scheme			
Internal Marks	**University Marks**	**Minimum Passing Marks**	**Examination Duration**
30	**70**	**45**	**3 Hours**

Course Objectives	
1	To study the various OR tools
2	Study to apply appropriate model to the given situation
3	Formulate the problem
4	Solve and analyze the problem

Course Outcomes	
After completion of syllabus, students would be able to	
1	formulate linear programming problems and solve it using simplex and graphical methods.
2	suggest a solution of transportation and assignment model problem
3	draw the network diagram, obtain critical path and arrive at an optimum solution using crashing.
4	to provide optimum sequence for job processing and calculate economic order quantity for inventory management

SYLLABUS	
Contents	No of hours
Unit I **Basics of Operations Research: Introduction to OR & Basic OR Models, Definition Characteristics and limitations of OR.** **Linear programming: Introduction, Linear programming formulation, solutions of LPP by graphical methods and simplex method. Formulation of Dual of LPP.**	**7**
Unit II **Transportation Model: Formulation of transportation model, Basic feasible solution using different methods (North-West corner, Least Cost, Vogel's Approximation Method) Optimality Methods, Unbalanced transportation problem, Variants in Transportation Problems.** **Assignment Model: Formulation of the Assignment problem, unbalanced assignment problem, typical assignment problems.**	**7**
Unit III **Network Analysis in Project Planning: Drawing of Network, CPM & PERT, probability of completion of project, Cost Analysis of Project, and Concept of Crashing.**	**7**

Unit IV **Queuing models – Poisson arrivals and Exponential service times – Single channel models (MM1) (No derivation expected)** **Sequencing Model – Introduction, Sequencing Model: n job two machines problem, n job 3 machines problem.** **Inventory Control Models- Introduction and inventory management concepts, Economic Order Quantity model (EOQ), Economic Production Quantity model (EPQ).**	**7**

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Sem: IV	**Total Hours Distribution per week**		
Total Credit : 2	**Lecture (L): 2 Hrs**	**Tutorial/Activity (T/A): 0 Hr.**	
Subject Code	**BMEOE4T02B**	**Waste Management**	
Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30	**70**	**45**	**3 Hours**

Course Objectives	
1	To protect health, well being and environment through effective **waste management** techniques.
2	To minimize the production of **waste** and to prevent pollution .
3	to reduce and reuse of **waste**
4	safe **disposal** of **waste**

Course Outcomes	
After completion of syllabus, students would be able to	
1	Understand different aspects of solid waste, its sources and effects on man and material etc.
2	Understand problems arriving in handling large amount of solid waste generated ,its collection and transportation, processing and will able able to design safe collection and disposal methods
3	Design methods and equipments for solid waste management to reduce its impact on environment.
4	Evaluate and Analyze hazardous waste.

SYLLABUS	
Contents	No of hours
Unit I **Solid Waste: Definition of solid wastes; Types of solid wastes – Sources based and Type based; Characteristics of Solid waste- Physical and chemical; Effect of solid waste on Health and on Environment; Concepts of waste reduction, recycling and reuse; Functional Elements of SWM system.**	7
Unit II **Handling, Collection, Segregation and Transport Of Municipal Solid Wastes:** **Handling and segregation of wastes at source. Collection and storage of municipal solid wastes; analysis of Collection systems. Transfer stations.**	7

Unit III **Municipal Solid Waste Management :** **Solid waste processing technologies. Mechanical and thermal volume reduction- Compaction, shredding, incineration; Biological and chemical techniques for energy and other resource recovery: composting, vermicomposting, termigradation, fermentation.**	7
Unit IV **Hazardous waste: Definition, Characteristics, Classification, Bioaccumulation, Labeling and handling of hazardous wastes. Hazardous waste treatment technologies - Physical, chemical and thermal treatment of hazardous waste.** **Radioactive waste: Definition, Sources, Low level and high level radioactive wastes and their management.**	7

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Sem: IV	**Total Hours Distribution per week**		
Total Credit : 2	**Lecture (L): 2 Hrs**	**Tutorial/Activity (T/A): 0 Hr.**	
Subject Code	**BMEOE4T02C**	**Financial and Cost Management**	
Examination Scheme			
Internal Marks	**University Marks**	**Minimum Passing Marks**	**Examination Duration**
30	**70**	**45**	**3 Hours**

Course Objectives	
1	To understands the concept of finance and cost management, various sources of generating the finance and to understand the books of account and also about recent trends in management
2	To do break even analysis, decide equipment replacement policy, and to take make or buy decision
3	Ability to appreciate the importance of cost and management accounting, understand the applicability of cash flow statement in business

Course Outcomes	
After completion of syllabus, students would be able to	
1	Apply the knowledge of basics of financial management concepts and time value of money
2	Select, classify, analyze and the plan the sources of Finance, types of capital, various elements of cost, cost control and evaluate equipment replacement policy, make buy decisions
3	Develop and interpret books of accounts, trail balance, balance sheet, Capital P&L account, cash flow statement in business
4	Evaluate and examine various costs of Capital, opportunity cost of capital, cost of different sources of Finance
5	Evaluate, Select, and determine various techniques of capital budgeting, profitability index

SYLLABUS	
Contents	No of hours
Unit 1: **Introduction to Financial Management-** Concept of Business Finance, Goals and Objectives of Financial Management, Time Value of Money ,	07
Unit 2: **Financial Management-** Various Sources of Finance, Financing Organizations, Types of Capital, Break even Analysis, Equipment Replacement Policy, Make or Buy Analysis. ,	07
Unit 3: **Recording of Transactions**- Accounting Process, Journals, Cash Book, Ledger, Balance Sheet, Profit and Loss Statement ,	07

Unit 4: **Cost of Capital-** Concept and Meaning of Cost of Capital, Cost of Different Sources of Finance, Factors affecting Cost of Capital ,	07
Unit 5: **Investment Decision-** Capital Budgeting, Significance of Capital Budgeting, Pay Back Method, Accounting Rate of Return, Internal Rate of Return, Net Present Value and Profitability Index. ,	07

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Sem: IV	**Total Hours Distribution per week**		
Total Credit : 2	**Lecture (L): 2 Hrs**	**Tutorial/Activity (T/A): 0 Hr.**	
Subject Code	**BMEAE4T02**	**Aptitude & Reasoning**	
Examination Scheme			
Internal Marks	**University Marks**	**Minimum Passing Marks**	**Examination Duration**
30	**70**	**45**	**3 Hours**

Course Objectives	
1	To prepare student for campus placement activity
2	To enhance employability skills to increase chance of employment.
3	To increase confidence in competitive exams like GATE, CAT etc

Course Outcomes	
After completion of syllabus, students would be able to	
1	Understand the power of words and its importance in organization
2	Get acquainted with data interpretations used in industry
3	Develop logical thinking process.
4	Develop visual imagination skill to solve the problems

SYLLABUS	
Contents	
Unit I - Verbal Aptitude Basic English grammar: tenses, articles, adjectives, prepositions, conjunctions, verb-noun agreement, and other parts of speech Basic vocabulary: words, idioms, and phrases in context Reading and comprehension Narrative sequencing	07
Unit II- Quantitative Aptitude Data interpretation: data graphs (bar graphs, pie charts, and other graphs representing data), 2- and 3-dimensional plots, maps, and tables Numerical computation and estimation: ratios, percentages, powers, exponents and logarithms, permutations and combinations, and series Mensuration and geometry Elementary statistics and probability ,	07
Unit III- Analytical Aptitude Logic: deduction and induction, Analogy, Numerical relations and reasoning	07
Unit IV- Spatial Aptitude Transformation of shapes: translation, rotation, scaling, mirroring, assembling, and grouping Paper folding, cutting, and patterns in 2 and 3 dimensions	07

Books:

1. A Modern Approach to Verbal & Non-Verbal Reasoning by R.S. Agrawal
2. Verbal Ability & Reading Comprehension for CAT by Arun Sharma
3. Competitive English for professional course by J. K. Gangal
4. General English for Competitions by A. N. Kapoor

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Sem: IV	Total Hours Distribution per week	
Total Credit : 2	Lecture (L): 2 Hrs	Tutorial/Activity (T/A): 0 Hr.
Subject Code	BMEHM4T02	Industrial Engineering and Management

Examination Scheme			
Internal Marks	University Marks	Minimum Passing Marks	Examination Duration
30	70	45	3 Hours

Course Objectives	
1	Understand concept and significance of Industrial Engineering & Management
2	Understand Plant location & Plant layout
3	Understand applications of Time & Motion study
4	Understand concept and application of Value Engineering.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Apply the concepts of Industrial Management in industries.
2	Understand and illustrate the plant location & layouts concepts of the manufacturing plant
3	Explain and evaluate the Time and motion study concepts in the design the workplace layout design.
4	Apply the concepts of Value engineering and Value analysis.

SYLLABUS	
Contents	No of hours
Unit I **INTRODUCTION:** Concept, nature and significance of Industrial Management, Economic, Social, Political forces affecting business operations & growth. Social responsibility of business. ,	7
Unit II **PRODUCTION MANAGEMENT:** Plant location, Weber's Theory of location of industries, Layout and assembly line balancing- process and product layout, Government policies on industrial location, Production control charts, Route & process charts, Operation charts, Machine load charts, Process charts. ,	7

Unit III **TIME AND MOTION STUDY:** Time and motion study, Job design, job standards, work measurement time study, work sampling, job evaluation, merit rating, method studies, predetermined motion time standards (PMTS).	7
Unit IV **VALUE ENGINEERING**: Introduction, applications and types of values, concepts of value engineering, phases of value engineering studies, value analysis.	7

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Sem: IV	**Total Hours Distribution per week**		
Total Credit : 2	**Lecture (L): 2 Hrs**	**Tutorial/Activity (T/A): 0 Hr.**	
Subject Code	**BMEVE4T02**	**Environmental Science**	
Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30	**70**	**45**	**3 Hours**

Course Objectives	
1	to develop awareness about environmental issues, sustainability, and the role of engineers in solving them.
2	to impart fundamental knowledge of environmental chemistry relevant to mechanical engineering.
3	to link mechanical processes (thermal, fluid, manufacturing) with environmental impact and sustainable design.
4	To promoting multidisciplinary learning, ethics, and sustainable development.

Course Outcomes	
After completion of syllabus, students would be able to	
1	explain ecosystem structure, biodiversity, and sustainability in the context of engineering.
2	understand environmental chemistry and pollution related to mechanical processes.
3	apply sustainable and green practices in mechanical engineering.
4	comprehend energy and resource conservation through renewable technologies and regulations.

SYLLABUS	
Contents	No of hours
Unit I: Multidisciplinary Nature of Environmental Studies Definition, scope, and importance, Need for environmental awareness in engineering. Ecosystem, Energy flow: .Major ecosystems: forest, desert, aquatic (pond, river, ocean). Biodiversity and Conservation , Importance and threats to biodiversity, Role of mechanical engineers in ecosystem preservation and responsible design ,	**7**

Unit II : Environmental Chemistry: **Water Chemistry:** COD, DO, alkalinity, hardness, pH **Air Chemistry:** Composition, greenhouse gases, photochemical smog, acid rain **Soil Chemistry**: Salinity, acidity, contamination, nutrient cycles (C, N, P, S)Pollution and Its Effects **Air Pollution**: Sources (vehicular, industrial, thermal systems), effects, control methods **Water Pollution**: Types, causes, impacts, treatment techniques (aeration, filtration, ETPs)	**7**
Unit III: Engineering and Environmental Interface **Mechanical Systems and Environmental Impact -** Combustion systems: emissions, thermal pollution. **Manufacturing processes**: Waste generation, noise, and emissions. **Green Manufacturing & Eco-Design**- Cleaner production, lean and sustainable manufacturing. Recycling, remanufacturing, eco-friendly material selection	**7**
Unit IV : Sustainable Development, Renewable Energy Sustainable Development Goals (SDGs) and Engineering - Global goals and relevance to engineering practices, Industrial ecology and sustainable product development. Renewable and Clean Energy Technologies (Solar PV and thermal, wind, hydro, biomass).	**7**

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Sem: IV	**Total Hours Distribution per week**		
Total Credit : 2	**Lecture (L): 4 Hrs**	**Tutorial/Activity (T/A): 0 Hr.**	
Subject Code	**BMEVS4P02**	**Introduction to MS-Office**	
Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
50	**---**	**25**	**---**

Course Objectives	
1	Create and manage professional documents using word.
2	Analyze, manage and present data using excel.
3	Create and manage presentation using power point.
4	Insert a table, picture, or drawing into the document.
5	Prepare the document to be sent as a circular letter.

List of Practical's

Minimum Eight out of the following practical's shall be performed:

Sr. No.	**List of Practical's**
01	To create a new document, open, save and print a document, edit and format text using MS-Word.
02	To change the page layout, background and borders, insert headers and footers using MS-Word.
03	To insert and edit tables, insert clip art and pictures to documents using MS-Word.
04	To Create a project abstract containing Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes in MS-Word.
05	To Work with excel workbook and sheets, Formatting excel work book like New, Open, Close, Save, Save As.
06	To format text in MS-Excel such as Font Size, Font Style, Font Color, Use the Bold, Italic, and Underline, Wrap text, Merge and Centre text.
07	Modifying Columns, Rows & Cells, Perform Calculations with Functions, Creating Simple Formulas Setting up your own formula in MS-Excel.
08	Sort and Filter Data with Excel, Sort and filtering data Using number filter, Text filter, Custom filtering, Removing filters from columns, Conditional formatting.
09	To Create Effective Charts to Present Data Visually Inserting Column, Pie chart etc. Create an effective chart with Chart Tool, Design, Format, and Layout options, Adding chart title, Changing layouts, Chart styles, Editing chart data range Editing data series,
10	Making presentation which demonstrates use of Hyperlinks in MS-Power Point.
11	Inserting -Images, Clip Art, Audio, Video, Objects, Tables and Charts in MS-Power Point.
12	Inserting - Background, textures, Design Templates, Hidden slides. Auto content wizard, Slide Transition, Custom Animation, Auto Rehearsing in MS-Power Point.

Suggested References:

1. Microsoft Office 97: Will Train, Gini Courter, Annette Marquis BPB Publication.
2. MS Office 2000 for Everyone : Saxena Sanjay, s schnd
3. Writer's Guide to Microsoft Word : Kari Holloway
4. Access 2016 Bible : Michael Alexander, Richard Kusleika
5. Excel 2019: Greg Harvey 6. Microsoft Powerpoint Made Easy: Chris Smith

Suggested Digital Platforms, Web links

1. http://www.digimat.in/nptel/courses/video/121106007/L12.html
2. https://www.webucator.com/how-to/how-use-mail-merge-microsoftword.cfm
3. https://support.microsoft.com/en-us/office/create-pivottable-orpivotchart-views-in-an-access-desktop-database-83e524df-dfbd-456d9dd0-0a48c1aa6752
4. https://support.microsoft.com/en-us/office/create-a-pivottable-toanalyze-worksheet-data-a9a84538-bfe9-40a9-a8e9-f99134456576