Tripura University
(A Central University)

Curriculum

For

B. Tech in Mechanical Engineering

(8th Semester)

2021

8th SEMESTER

Sl. No.	Course Category	Subject Code	Subject Title	L	T	P	Contact Hours/ week	Credit	Total Marks
1.	Program Elective-4	PE ME 801/1	1.Welding and Allied Processes	3	0	0	3	3	100
		PE ME 801/2	2.Non-Traditional Machining						
		PE ME 801/3	3.Production Engineering						
2.	Program Elective-5	PE ME 802/1	1.Automobile Engineering	2	0	0	2	2	100
		PE ME 802/2	2.Operation Research						
		PE ME 802/3	Gas Dynamics & Jet Propulsion						
3.	Open Elective-1	OE ME 803	Refer Annexure-III	3	0	0	3	3	100
4.	Open Elective-2	OE ME 804	Refer Annexure-IV	2	0	0	2	2	100
5.	Project - 3	PR ME 805	Project Work Final	0	0	12	12	6	200
6.	Seminar - 2	SE ME 806	Seminar on Contemporary Engineering Topics - II	0	0	2	2	1	100
7.	Online Course	SW ME 807	SWAYAM Courses	0	0	0	0	1	100
			Total :	10	0	14	24	**18**	**800**

Welding and Allied Processes

Course Code	PE ME 801/1
Course Title	Welding and Allied Processes
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Primary manufacturing processes
Course Category	Program Elective (PE)
Number of classes	36 hours

Course Outcome:

After successful completion of this course, the students will be able to

CO Number	CO Description	K-level
CO-1	differentiate thevarious welding processes with related advantages in the applied field	K2
CO-2	select the type of welding process required for a specific application	K3
CO-3	demonstrate the welding defects and their related issues	K4
CO-4	analyze the heat effect in welding with associated welding metallurgy (K4)	K4

Course Content:

Module 1: Introduction:(9 hours)

Welding- Introduction and classification, Selection of welding processes, Electrodes and filler metal - classification and uses, Weld joint- joint preparation, classification and symbols, Gas tungsten arc (TIG) welding – working principle and application, Gas metal arc (MIG) welding – working principle and application, Submerged arc welding-working principle and application, Electro slag welding - working principle and application, Resistance welding -working principle and application,

Module 2: Welding Processes & Application:(9 hours)

Solid state welding processes - fundamentals and classification. Working principle and application of Friction welding, Forge welding, Diffusion bonding, Ultrasonic welding and Explosion welding. Underwater welding - working principle and application, Laser beam welding - working principle and application, Electron beam welding-working principle and application, Plasma arc welding- working principle and application, Welding of dissimilar metals-Fundamentals and application.

Module 3: Testing ofWeldment: (9 hours)

Weldment Testing – Defects in welding, causes and remedies, Destructive testing of weldments- Strength, hardness, ductility, fatigue, creep properties etc. Non-destructive testing of weldments- Liquid penetrant testing, Magnetic particle testing, Radiographic testing, Ultrasonic testing. Pressure and leak testing in boilers, pressure vessels, pipe line etc. Welding residual stresses- Fundamentals, classification, causes and remedies.

Module 4:Welding Metallurgy: (9 hours)

Weldability – Definition, factors affecting weldability, Weldability tests- Murex test, Varestraint test, Lehigh restraint test, Longitudinal bead-weld test, Heat flow in welding – fundamental analysis and problems, Weld thermal cycle – effect of welding heat input, critical cooling time calculation and importance, Welding metallurgy of fusion welds, Allied processes - joining processes, metal depositing processes, thermal cutting processes.

Suggested Learning Resources- Text/ References

1. R.S. Parmar, Welding Engineering and Technology, Khanna Publishers.
2. Radhakrishnan,V.M., Welding Technology and Design, New Age International Pvt. Ltd.

3. Little R.L., Welding Technology, Tata McGraw- Hill.
4. Rao.P.N., Manufacturing Technology, Tata McGraw- Hill.
5. Abbot.J., Smith.K.M, Welding Technology, Texas State Technical College Publishing.

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Non-Traditional Machining

Course Code	PE ME 801/2
Course Title	Non-Traditional Machining
Number of Credits	3(L: 3, T: 0, P: 0)
Prerequisites	---
Course Category	Program Elective (PE)
Number of classes	36 hours

Course Outcome:-

After completion of the course, students will be able to:

CO No	CO Description	K-level
CO-1	Understand the compare traditional and non-traditional machining process and recognize the need for non-traditional machining and the constructional features, performance parameters, process characteristic, applications, advantages and limitations of USM, AJM and WJM.	K3
CO-2	Understand the constructional features of the equipments, performance parameters, process characteristic, applications, advantages and limitations of EDM and PAM.	K3
CO-3	Identify the need of Chemical and Electro-chemical Machining process along with the constructional features of the equipments, performance parameters, process characteristic, applications, advantages and limitations.	K4
CO-4	Understand the LBM equipments, LBM parameters and characteristic. EBM equipment and mechanism of metal removal, applications, advantages and limitations of LBM and EBM.	K3

Course Content:-

Module 1: Introduction and Mechanical Process (12 hours)

Need of Non-Traditional Machining Processes – Classification Based on Energy, mechanism, source of energy, transfer media and process. Process selection - based on physical parameters, shapes to be machined, process capability and economics.

Ultrasonic Machining: Principle- Transducer types – Concentrators - Abrasive Slurry – Process Parameters – Tool Feed Mechanism – Material Removal Rate - Advantages and Limitations – Applications.

Abrasive Jet Machining: Process- Principle – Process Variables – Material Removal Rate - Advantages and Limitations – Applications.

Water Jet Machining: Principle – Process Variables – Advantages and Limitations – Practical Applications – Abrasive water jet machining process.

Module 2: Electrical Discharge Machining (8 Hours)

Electrical Discharge Machining: Mechanism of metal removal – Dielectric Fluid – Flushing methods - Electrode Materials - Spark Erosion Generators – Electrode Feed System – Material Removal Rate – Process Parameters – Advantages and Limitations – Practical Applications.
Plasma Arc Machining: Principle –Gas mixture– Types of Torches – Process Parameters - Advantages and Limitations – Applications.

Module 3: Chemical and Electro Chemical Machining (8 hours)
Chemical Machining: fundamentals, Principle –classification and selection of Etchant –chemical milling, Engraving, Blanking - Advantages and limitations – Applications.
Electro Chemical Machining: Electro-chemistry of the process-Electrolytes - Electrolyte and their Properties – Material Removal Rate – Tool Material – Tool Feed System – Advantages and Limitations – Applications.
Electro Chemical Grinding: Honing, cutting off, deburring and turning.

Module 4: High Energy Machining Process (8 hours)
Electron Beam Machining: Principle – Generation and control of electron beam-Advantages and Limitations – Applications.
Laser Beam Machining: Principle –Solid and Gas Laser Application – thermal features of LBM - Advantages and Limitations – Applications.
Ion Beam Machining: Equipment – process characteristics - Principle – MRR – Advantages and Limitations – Applications.

Text Books / References:
1. P.C Pandey And H.S. Shan, "Modern Machining Process", Tata Mc Graw – Hill Publishing Company Limited, New Delhi.
2. V.K. Jain, "Advanced Machining Process", Allied Publishers Pvt Limited.
3. Amithaba Bhattacharyya, "New Technology", The Institution of Engineers (India).
4. "Production Technology", HMT Bangalore, Tata Mc Graw–Hill Publishing Company Limited, New Delhi.
5.Modern Machining Process by P.C Pandey and H S Shah McGraw Hill Education India Pvt. Ltd.2000.

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Production Technology

Course Code	PE ME 801/3
Course Title	Production Technology
Number of Credits	3 (L: 3, T:0, P: 0)
Prerequisites	Nil
Course Category	Program Elective
Number of classes	36 hours

Course Outcome:
After completing this course, the students will be able to

CO Number	CO Description	K-level
CO-1	ComprehendManufacturing science and Recent advances in manufacturing technology.	K2
CO-2	Distinguish Mechanization& automation and Automated Machine Tools.	K2
CO-3	Analyze Product Development & Design.	K4

CO-4	Evaluate the Assembly line balancing.	K5

Course Content:

Module 1: Manufacturing science and advances in manufacturing technology: (10 hours)

Manufacturing science & its application to mass production. Machining allowances, machining accuracy, surface finish. Different mass production techniques-both chip forming & non chip forming- their advantages & disadvantages. Recent advances in manufacturing technology-Non-conventional machining processes.

Module 2: Mechanisation& automation, Automated Machine Tools:(8 hours)

Mechanisation& automation of manufacturing & assembly lines. Machining & tooling for mass production-Jigs & Fixtures design. Locating, clamping, guiding, indexing devices. Hydropneumatic devices. Tooling economics.

Automated Machine Tools, Numerically controlled machines, CNC machines, their construction, components & operation, part programming for CNC machines. Advantages & disadvantages of CNC machines.

Module 3: Product Development & Design: (8 hours)

Manufacture of typical machine parts, e.g. screw threads, gears, housing. machine beds, engine components. Product Development & Design, Production Design-productibility consideration of product & components, value engineering process planning, group technology. Manufacturing Costs, Break-Even Analysis, Economic Batch Quality, Economics of Metal Removal, Economics of material utilization.

Module 4: Production Planning & Control: (10 hours)

Production Planning & Control, sequencing & scheduling, processing of "n" jobs through two machines, processing of "n" jobs through three machines, processing of two jobs through "n" machines, Assignment Models.

Assembly line balancing Theory, Ranked positional weight technique of Assembly line Balancing. Computerized method of sequencing operations for Assembly lines(COMSOAL).

References / Suggested Learning Resources:

1. Jain R.K., Production Technology, Khanna Publishers, 2001
2. Hajra Choudhry, Elements of Workshop Technology, Vol – II Dhanpat Rai & Sons, 1992.
3. HMT Production Technology, Tata Mc Graw-Hills Publishing Co. Limited, 1994.
4. Chapman, W.A.J., Workshop Technology, Vol - II, Oxford & IBH Publishing Co. Ltd., 1986.

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Automobile Engineering

Course Code	PE ME 802/1
Course Title	Automobile Engineering
Number of Credits	**2 (L: 2, T: 0, P: 0)**
Prerequisites	**Nil**
Course Category	Program Elective (PE)
Number of classes	**24 hours**

Course Outcome:

	At the end of the course, the student will be able to:	
CO1	Identify the components of an automobile with their working	K2
CO2	Diagnose the problems related to the transmission and Fuel supply.	K3
CO3	Diagnose the problems related to the steering and Suspension system.	K3
CO4	Choose proper tires and fuel for the vehicle.	K4

Course Content:

Module 1:Engine: BasicFunction and Management: (05 hours)

Concept of Engine and its classification, working of 2-Stroke and 4-Stroke SI and CI engine. Vehicle Structure and Engines-Types of automobiles, vehicle construction and layouts, chassis, frame and body, vehicleaerodynamics, IC engines-components, function and materials, variable valve timing (VVT). Review of Cooling and Lubrication systems in Engine, Turbo Chargers, Engine Emission Control by 3–Way Catalytic Controller, Electronic Engine Management System.

Module 2:Fuel Supply and Electrical System: (05 hours)

Fuel Supply in SI and CI engine: Carburetor–working principle, Electronic fuel injection system – Mono-point and Multi - Point Injection Systems, **Electrical systems** – Battery generator – Starting Motor and Drives – Lighting and Ignition (Battery, Magneto Coil and Electronic Type) - Regulators-cut outs.

Module 3:Transmission and Braking System: (08 hours)

Transmission System: Clutch – Types and Construction, Gear Boxes-Manual and Automatic, Simple Floor Mounted Shift Mechanism, Over Drives, Transfer Box, Fluid flywheel-Torque convertors, Propeller shaft – Slip Joint – Universal Joints, Differential and Rear Axle, Hotchkiss Drive and Torque Tube Drive.**Braking System :** Types and functions, pneumatic and hydraulic braking systems, antilock braking system (ABS),electronic brake force distribution (EBD) and traction control.

Module 4:Steeringand Suspension: (06 hours)

Steering and Suspension: Wheels and Tires Construction, Steering geometry and types of steering gear box, power steering, types of front axle, types ofsuspension systems,

Alternative Energy Sources-Use of Natural Gas, LPG and Biodiesel in Automobiles, hydrogen fuels in automobiles, Electric and Hybrid Vehicles, application of Fuel Cells.

References / Suggested Learning Resources:

1. Crolla, D., Automotive Engineering: Powertrain, Chassis System, Butterworth-Heinemann.
2. Heisler, H., Advanced Vehicle Technology, Butterworth-Heinemann.
3. Happian-Smith, J., An Introduction to Modern Vehicle Design, Butterworth- Heinemann.
4. Newton, Steeds and Garet, Motor vehicles, Butterworth Publishers.
5. Crouse, W. H., & Anglin, D. L., Automotive Mechanics: Study Guide, McGraw-Hill
6. Automotive Mechanics,2nd ed., Joseph Heitner, East West Press 1999
7. Automotive Mechanics, S. Srinivasan, 2nd Edition, Tata McGraw Hill
8. Kirpal Singh, Automobile Engineering, 7th ed., Standard Publishers, New Delhi, 1997.

Operations Research

Course Code	PE ME 802/2
Course Title	Operations Research
Number of Credits	2 (L: 2, T: 0, P: 0)

Prerequisites	Mathematics
Course Category	Program Elective(PC)
Number of classes	24 hours

Course Outcome:-

After completion of the course, students will be able to:

CO No	CO Description	K-level
CO-1	Formulate and solve Linear programming Problems.	K5
CO-2	SolveTransportation and Assignmentproblem.	K3
CO-3	Calculate Economic order quantity and queue length.	K3
CO-4	Evaluate the value of games and critical path.	K6

Course Content:-

Module 1*:* Linear Models: (6 lectures)

Introduction to Operation Research, characteristics and the phases of an operation research scope and applications of Operation Research, techniques used, Linear programming: Formulations of linear programs, graphical method, simplex method.

Module 2:Transportation and Assignment Models:(6 lectures)

Transportation Models, formulation of mathematical model, solution of Transportation problem by different method. Assignment Models, formulation of mathematical model, solution of different types of Assignment problems, Traveling Salesman problem.

Module 3:Inventory and QueueingModels: (6 lectures)

Inventory models, Economic order quantity models, Quantity discount models. Multi product model, Inventory control models in practice. Queueing models, Queueing systems and structures, Notation parameter, Single server and multi-server models, Poisson input, Exponential service,

Module 4:Decision Models: (6 lectures)

Game theory, Two-person zero sum games, Graphical solution- Algebraic solution, Linear Programming solution.Networks models, Project network, CPM and PERT networks, Critical path.

References/ Suggested Learning Resources: -

1. Taha, H.A., “Operations Research”, Prentice Hall of India, Sixth Edition, 2003.
2. Sharma, J. K., Operation Research: Theory and Applications, Macmillan Publishers.
3. Swarup, K., Gupta, P. K.,“Operations Research”, Sultanchand Publisher.
4. Ravindran, Phillips and Solberg, Operations Research: Principles and practices, John Wiley.
5. Tulsian and Pasdey V., “Quantitative Techniques”, Pearson – Asia.
6. Bronson and Naadimuthu, Operations Research – Schaum’s Outline Series, McGraw-Hill.

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Gas Dynamics & Jet Propulsion

Course Code	PE ME 802/3
Course Title	Gas Dynamics & Jet Propulsion

Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	Thermodynamics, Fluid Mechanics.
Course Category	Program Elective (PE)
Number of classes	26 hours

Course Outcome:

After completing this course, the students will be able to

CO Number	CO Description	K-level
CO-1	Explain the basic principle of compressible flow.	K2
CO-2	Analyze the Rayleigh flow and Fanno flow.	K4
CO-3	Apply the knowledge ofjet propulsion to solve practical problems.	K3
CO-4	Summarize rocket propulsion system.	K5

Course Content:

Module 1: Compressible flow: (08 hours)

Compressible flow, definition, Mach waves and Mach cone, stagnation states, Mass, momentum and energy equations of one-dimensional flow, Isentropic flow through variable area ducts, nozzles and diffusers, subsonic and supersonic flow through variable area ducts, choked flow, Area-Mach number relations for isentropic flow.

Module 2: Non-isentropic flow: (06 hours)

Non-isentropic flow in constant area ducts, Rayleigh and Fanno flows, Normal shock relations, oblique shock relations, isentropic and shock tables

Module 3: Jet propulsion: (06 hours)

Theory of jet propulsion, thrust equation, thrust power and propulsive efficiency, Operating principle and cycle analysis of ramjet, turbojet, turbofan and turboprop engines.

Module 4: Rocket engines: (06 hours)

Types of rocket engines, propellants & feeding systems, ignition and combustion, theory of rocket propulsion, performance study, staging, terminal and characteristic velocity, space flights

References / Suggested Learning Resources:

1. Ahmed F. El-Sayed, Aircraft Prpoulsion and Gas Turbine Engines, CRC Press, 2008.
2. H.S. Mukunda, “Understanding Aerospace Chemical Propulsion”, Interline Publishing, 2004.
3. Hill P. and Peterson C., Mechanics & Thermodynamics of Propulsion, Addison Wesley, 1992.
4. Zucrow N. J., Aircraft and Missile Propulsion, Vol.I& II, John Wiley, 1975.
5. Sutton G.P., Rocket Propulsion Elements, John Wiley, New York, 1986.

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Basics of Robotics

Course Code	OE ME 803
Course Title	Basics of Robotics
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Engineering Mathematics
Course Category	Program Elective (PE)
Number of classes	36 hours

Course Outcome:

After successful completion of this course, the students will be able to

CO Number	CO Description	K-level
CO-1	Understand the fundamentals of robotics and robot	K2
CO-2	Demonstrate the classification & specifications of industrial robots	K4
CO-3	Explain robot anatomy & functions of different parts of industrial robot.	K4
CO-4	Evaluate the positions in space of manipulator by kinematic and dynamics of robot arm.	K5
CO -5	Explain the fundamentals of robot control system and programming languages	K4

Course Content:

Module 1: Fundamental of Robotics: (9 hours)

Robotics- Fundamental and definition, Laws of robotics, Robot- definition and functions. Differences between a robot and an automated machine. Advantages and disadvantages of robots. Classification of industrial robots, Understanding the working principles of robot joints and basic motions,Introduction to robot with artificial intelligence.

Module 2: Robot Anatomy: (9 hours)

Robot anatomy- Architecture of industrial robots, Robot actuators- Definition, classification, working principle and problems, Robot sensors - Definition, classification and working principle, Robot specifications –Definition, applicationand problems.

Module 3: Robot Vision System: (9 hours)

Robot arm kinematics – fundamentals and problem analysis, Robot arm dynamics- fundamentals and problem analysis.

Module 4:Robot Control System &Languages: (9 hours)

Robotcontrol system – Fundamentals, classification,mathematical model, block diagram and application, Robot languages – Fundamentals, classification andfeatures of some common robot languages.

Suggested Learning Resources- Text/ References

1. M.P. Groover, Industrial Robotics, Mc Graw Hill.
2. Robotic Engineering – An Integrated Approach, Richard D Klafter

3. Control System Engineering, I.J. Nagrath and Gopal
4. Saha, Introduction to Robotics, Mc Graw Hill
5. Tsuneo Yoshiklawa, Foundation of Robotics, MIT Press
6. Spong M.W. and Vidyasagar M., Robot dynamics and Control, John Wiley and Sons

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Principles of Management

Course Code	OE ME 804
Course Title	Principles of Management
Number of Credits	2 (L: 2, T:0, P: 0)
Prerequisites	Basic Engineering Knowledge
Course Category	Open Elective (OE)
Number of classes	26 hours

CO And K-Level

CO Number	CO Description	K Level
CO 1	Understanding the principles of management and their application to the functioning of an organization.	**K2**
CO 2	Different aspects of work system design and facilities design pertinent to manufacturing industries	**K3**
CO 3	Understanding the role of productivity in streamlining a production system	**K4**
CO 4	Applying the inventory management tools in managing inventory	**K3**

Course Contents:

Module 1:Introduction: (5 Hours)
Definition of management, science or art, manager vs entrepreneur; Types of managers- managerial rolesand skills; Evolution of management- scientific, human relations, system and contingency approaches; Types of Business Organizations, sole proprietorship, partnership, company, public and privateenterprises; Organization culture and environment; Current trends and issues in management.Nature and purpose of Planning, types of Planning, objectives, setting objectives, policies, StrategicManagement, Planning Tools and Techniques, Decision making steps & processes.

Module 2:Nature and purpose of Organizing: (7 Hours)
Nature and purpose of Organizing, formal and informal organization, organization structure, types, lineand staff authority, departmentalization, delegation of authority, centralization and decentralization, job design, human resource management, HR planning, Recruitment selection, Training & Development, Performance Management, Career planning and Management.

Directing, individual and group behavior, motivation, motivation theories, motivational techniques, job satisfaction, job enrichment, leadership, types & theories of leadership, effective communication.

Module 3: Material Handling: (8 Hours)

Nature, Significance and Scope ofFacility layout and design; Steps in facility layout planning, Assembly Line Balancing.Material Handling: Definition, Objective and Principles of MaterialHandling, Classification of Material Handling Devices.Controlling, system and process of controlling, budgetary and non-budgetary control techniques, use of computers and IT in management control, productivity problems and management, control and performance, direct and preventive control, reporting

Module 4:Inventory& Value Analysis:(6 Hours)
Importance and areas ofmaterials management, Introduction to Inventory: Definitions, Need for inventory, Types of inventory, Inventory costs; Structure of inventory models, Deterministic models; safety stock, inventory control systems; Selective inventory management. MRP and JIT-based production systems, Concept of zero inventory, Fundamental concepts of purchasing, storing, distribution, and value analysis & engineering.

TextBooks:

1. Robins S.P. and Couiter M., Management, Prentice HallIndia,10th ed., 2009.
2. Stoner JAF, FreemanREand GilbertDR, Management, 6th ed., PearsonEducation, 2004. 3. TripathyPC & ReddyPN, Principles ofManagement, Tata McGraw Hill, 1999.
3.C. Sharma, Industrial Engineering and Management, Khanna Book Publication, 2016.
4. O.P. Khanna, Industrial Engineering and Management, Dhanpat Rai Publication, 1980.
5. S. Ray, Introduction to Materials Handling, New Age International, 2016

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Project Work Final

Course Code	PR ME 805
Course Title	Project Work Final
Number of Credits	6 (L: 0, T: 0, P: 12)
Prerequisites	Nil
Course Category	Project (PR)
Number of classes	130 hours

Course Outcome:- After completion of the course, students will be able to:

CO Number	CO Description	K-level
CO-1	Demonstrate a sound technical knowledge of their selected project topic	K-2
CO-2	Develop the skill of working in a Team	K-3
CO-3	Design engineering solutions to complex problems utilizing a systematic approach	K-6
CO-4	Design the solution of an engineering project involving latest tools and techniques	K-6
CO-5	Develop the skill of effective communication with engineers and the community at large in written an oral forms	K-3
CO-6	Demonstrate the knowledge, skills and attitudes of a professional engineer	K-2

Course Content:-

The project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The course should have the following-

1) Develop sound knowledge about the domain of the project work.
2) Perform detailed study about various components of a project.
3) Learn to be an important member of a team for successful execution of a project work.
4) Study about methodologies and professional way of documentation and communication related to project work.
5) Develop idea about problem formulation, finding the solution of a complex engineering problem.
6) Develop project report as per the suggested format to communicate the findings of the project work.
7) Acquire the skill of effective oral communication to the fellow engineers and people in the society at large.
8) Develop knowledge of how to organize, scope, plan, do and act within a project thesis.
9) Familiarity with specific tools (i.e. hardware equipment and software) relevant to the project selected.
10) Demonstrate the implementation of a project work.

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Seminar on Contemporary Engineering Topics – II

Course Code	SE ME 806
Course Title	Seminar on Contemporary Engineering Topics – II
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	Nil
Course Category	Seminar (SE)
Number of classes	24 hours

Course Outcome:- After completion of the course, students will be able to:

CO Number	CO Description	K-level
CO-1	Identify contemporary topics in respective branch of engineering	K-3
CO-2	Survey literature to understand insight of the selected topic	K-4
CO-3	Develop report writing and presentation making skill	K-3
CO-4	Present the topic so prepared among audience using suitable aid	K-3

Course Content:-

Each student shall

1) Identify a topic of current relevance in his/her branch of engineering,
2) Get approval of the faculty concerned/HOD,
3) Collect sufficient literature on the selected topic, study it thoroughly (literature survey),
4) Prepare their own report and presentation slides and

5) Present in the class among fellow students and faculty members.

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SWAYAM Courses

Course Code	SW ME 807
Course Title	SWAYAM Courses
Number of Credits	1 (L: 0, T: 0, P: 0)
Prerequisites	Nil
Course Category	Online Course (SW)
Number of classes	-

Courses Outcome:- After completion of the courses, students will be able to:

CO Number	CO Description	K-level
CO-1	Make use of digital learning platform to enhance knowledge and skill beyond the prescribed curriculum structure	K-3
CO-2	Take part in proctored examination system to prepare oneself for similar future challenges	K-4
CO-3	Utilize the opportunity to learn from best faculty in the country for professional development	K-3
CO-4	Develop the skill of lifelong self-learning and become future ready	K-3

Courses Content:-

SWAYAM (Study Webs of Active-learning for Young Aspiring Minds); India Chapter of Massive Open Online Courses. SWAYAM is an indigenous developed IT platform, initiated by Government of India, which is instrumental for self-actualization providing opportunities for a life-long learning. Learner can choose from hundreds of courses, virtually every course that is taught at the university/college/school level and these shall be offered by best of the teachers in India and elsewhere. Student having registered a course, having submitting the Assignments as per requirements of the course, shall at the end of each course, be assessed through a proctored examination. A student having successfully completed the course shall get a Certificate.

Each student has to undergo and qualify at least two relevant SWAYAM or equivalent courses (to be certified by concerned HOD) with certification during the entire course of B. Tech. program. The Head of the departments will approve the relevancy of a SWAYAM or equivalent course for respective branch of engineering.

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PROGRAM OUTCOMES (POS) AS PER NATIONAL BOARD OF ACCREDITATION (NBA)

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.