IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Mechanical Engineering Department

B. Tech, VIII Sem

S. No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory			Practical						
				End Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem	Term work / Lab Work & Sessional		L	T	P	
1.	PCC - ME801	PCC	Automobile Engineering	70	20	10	60	40	200	2	1	2	4
2.	PEC - ME801	PEC	Professional Elective – III	70	20	10	-	-	100	4	0	0	4
3.	PEC - ME802	PEC	Professional Elective – IV	70	20	10	-	-	100	4	0	0	4
4.	OEC - ME801	OEC	Open Elective - IV	70	20	10	-	-	100	3	0	0	3
5.	PROJ - ME801	PROJ	Seminar – II	-	-	-	-	100	100	0	0	2	1
6.	PROJ - ME802	PROJ	Project-II	-	-	-	100	100	200	0	0	12	6
Total Academic Engagements and Credits										**13**	**1**	**16**	**22**
Total				**280**	**80**	**40**	**160**	**240**	**800**	**30**			**22**

*MST: Minimum of two mid semester tests to be conducted. L: Lecture T: Tutorial P: Practical

S. No.	Professional Elective-III	Professional Elective-IV	Open Elective-IV
1	PEC - ME801 (A) Renewable Energy Technology	PEC-ME-802 (A) Energy Conservation & Management	OEC-ME801 (A) Data Science
2	PEC - ME801 (B) Tool Engineering	PEC-ME-802 (B) Statistical Quality Control & Total Quality Management	OEC-ME801 (B) Electric & Hybrid Vehicle
3	PEC - ME801 (C) Financial & Marketing Management	PEC-ME-802 (C) Product Management	OEC-ME801 (C) Disaster Preparedness & Planning

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PCC - ME801	Automobile Engineering	2L : 1T : 2P (05hrs.)	Credits: 04

Pre-requisite: Theory of Machines & Mechanism, Strength of Materials

Course Objective:

- To study basics of principles of actual automobile systems.
- To study significance and role of different systems like axle, differential, brakes, Steering, suspension, and Transmission.
- To know some recent trends in Automobile Engineering.
- To study working of various Automobile Systems.
- To gather some knowledge on Emission Norms.

Course Content:

Module 1 **(08 hrs)**

Chassis:, Types of chassis lay out, types of frames, testing of frames for bending & torsion on unutilized body frame, vehicle body and their construction, drivers visibility and methods for improvement, Technical details of commercial vehicles**,** safety aspects of vehicles, vehicle aerodynamics, optimization of body shape, drivers cab design, body materials, location of engine, front wheel and rear wheel drive, four wheel drive.

Module 2 **(10 hrs)**

Steering and Front Axle: Front axle beam, stub axle, front wheel assembly, principles of types of wheel alignment, front wheel geometry viz. camber, Kingpin inclination, castor, toe-in and toe out, condition for true rolling motion, centre point steering, directional stability of vehicles, steering gear, power steering, slip angle, cornering power, over steer & under steer, gyroscopic effect on steering gears.

Module 3 **(09 hrs)**

Transmission System: Function and types of clutches, single plate, multi-plate clutch, roller & spring clutch, clutch lining and bonding, double declutching, types of gear Boxes, synchronizer, gear materials, determination of gear ratio for vehicles, gear box performance at different vehicle speed, automatic transmission, torque converters, fluid coupling, principle of hydrostatic drive, propeller shaft, constant velocity universal joints, differential gear box, rear axle construction.

Module 4 **(10 hrs)**

Suspension system and Brakes: Basic suspension movements, Independent front & rear suspension, shock absorber, type of springs: leaf spring, coil spring, air spring, ECAS System, torsion bar, location of shackles, power calculations, resistance to vehicle motion during acceleration and breaking , power & torque curve, torque & mechanical efficiency at different vehicle speeds, weight transfer, braking systems, disc theory, mechanical, hydraulic & pneumatic power brake systems, ABS & EBS , performance, self-energisation, air bleeding of

hydraulic brakes, types of wheels and tyres, tyre specifications, construction and material properties of tyres & tubes.

Module 5 **(10 hrs)**

Electrical and Control Systems: Storage battery, construction and operation of lead acid battery, testing of battery, principle of operation of Vehicle starting mechanism , starter relay switch, electric fuel gauge, fuel pump, horn, wiper, Lighting system, head light dazzling, signaling devices, Introduction to Electrical and Hybrid Vehicle.

Emission Standards and Pollution Control: Indian standards for automotive vehicles, Bharat & Euro norms, fuel quality standards, environmental management systems for automotive vehicles, catalytic converters, fuel additives, and modern trends in automotive engine efficiency and emission control.

Course Outcomes:

After completion of the course student will be able:

1. Define the vehicle body aesthetics and appropriate location of engine.
2. Apply & identify the geometry of steering system and the parameters on which its performance depends.
3. Define & Compare the different types of gearboxes and their applications.
4. Judge the importance of suspension system and brakes.,
5. Apply knowledge about electrical system of automobiles and proper handling of battery, emission standards and pollution control.

List of Text Books:

1. Kripal Singh, Automotive Engineering Khanna Pub.
2. R.B Gupta, Automative Engineering Satya Prakashan

List of Reference Books:

1. David Crolla, Encyclopedia of Automotive Engineering Wiley
2. Crouse, Automotive Mechanics TMH.
3. Joseph Heitner, Automotive Mechanics, Principles and Practices, CBS Pub.
4. Newton & Steeds , Automotive Engineering
5. Emission standards from BIS and Euro Norms

List of Experiments:

1. Study and demonstration of layout of an automobile
2. Study and demonstration Differential systems
3. Study and demonstration Suspension System
4. Study and demonstration Electrical systems of Automotive Vehicles,
5. Study and demonstration of Brakes
6. Study and demonstration of Internal Combustion Engines
7. Study and demonstration Steering System of an Automobile
8. Study and demonstration different types of Gear Boxes

9. Study and demonstration different types of Clutches

PEC - ME801(A)	Renewable Energy Technology	4L : 0T : 0P (04 hrs.)	Credits: 04

Prerequisite: Elementary knowledge of energy resources

Course Objectives:

- Understand the various forms of conventional energy resources.
- Enable the students to estimate the potential of different resources at different numerical exercises
- Understand economics of renewable energy system
- Expose them to conceptualize and design renewable energy appliances and equipment
- Enable them to independently analyze, implement and asses the existing real life systems

Course Content:

Module 1 **(10 Hrs)**

Solar Radiation: Extra-terrestrial and terrestrial, radiation measuring instrument, radiation measurement and predictions.

Solar Thermal Conversion: Basics, Flat plate collectors-liquid and air type. Theory of flat plate collectors, selective coating, advanced collectors, Concentrators: optical design of concentrators, solar water heater, solar dryers, solar stills, solar cooling and refrigeration.

Solar photovoltaic: Principle of photovoltaic conversion of solar energy; Technology for fabrication of photovoltaic devices; Applications of solar cells in PV generation systems; Organic PV cells.

Module 2 **(08 Hrs)**

Wind energy characteristics and measurement: Metrology of wind speed distribution, wind speed statistics, Weibull, Rayleigh and Normal distribution, Measurement of wind data, Energy estimation of wind regimes;

Wind Energy Conversion: Wind energy conversion principles; General introduction; Types and classification of WECS; Power, torque and speed characteristics; power curve of wind turbine, capacity factor, matching wind turbine with wind regimes; Application of wind energy.

Module 3 **(08 Hrs)**

Production of Biomass, photosynthesis-C3 & C4 plants on biomass production; Biomass resources assessment; CO_2 fixation potential of biomass; Classification of biomass; Physicochemical characteristics of biomass as fuel.

Biomass conversion Routes: biochemical, chemical and thermo chemical Biochemical conversion of biomass to energy: anaerobic digestion, biogas production mechanism, technology, types of digesters, design of biogas plants, installation, operation and maintenance of biogas plants, biogas plant manure-utilization and manure values.

Biomass Gasification: Different types, power generation from gasification, cost benefit analysis of power generation by gasification.

Module 4 **(08 Hrs)**

Ocean Energy: Ocean energy resources, ocean energy routs; Principle of ocean thermal energy conversion system, ocean thermal power plants. Principles of ocean wave energy and Tidal energy conversion.

Module 5 **(08 Hrs)**

Geothermal Energy: Origin of geothermal resources, type of geothermal energy deposits, site selection geothermal power plants.
Hydrogen Energy: Hydrogen as a source of energy, Hydrogen production and storage.
Fuel Cells: Types of fuel cell, fuel cell system and sub-system, Principle of working, basic thermodynamics.

Course Outcome's:

After completion of the course student will be able:

1. Gain knowledge about working principle of various solar energy systems
2. Identify Winds energy as alternate form of energy and to know how it can be tapped
3. Explain bio gas generation and its impact on environment
4. Illustrate ocean energy and explain the operational methods of the utilization of small hydropower systems.
5. Applying different renewable energy sources like hydrogen energy, geothermal energy & fuel cell as a source of energy.

Text/References Books:

1. Kothari, Singal & Rajan; Renewable Energy Sources and Emerging Technologies, PHI Learn
2. Khan, B H, Non Conventional Energy, TMH.
3. Sukhatme and Nayak, Solar Energy, Principles of Thermal Collection and Storage, TMH.
4. Tiwari and Ghosal, Renewable Energy Resources: basic principle & application, Narosa Publ
5. Koteswara Rao, Energy Resources, Conventional & Non-Conventional, BSP Publication.
6. Chetan Singh Solanki, Solar Photovoltaics: Fundamental, technologies and Application,PHI L
7. Abbasi Tanseem and Abbasi SA; Renewable Energy Sources; PHI Learning
8. Ravindranath NH and Hall DO, Biomass, Energy and Environment, Oxford University Press.
9. Duffie and Beckman, Solar Engineering of Thermal Process, Wiley
10. Nikolai, Khartchenko; Green Power; Tech Book International
11. Tester, Sustainable Energy-Choosing Among Options, PHI Learning.
12. Godfrey Boyle, Renewable Energy: Power for a sustainable future, Oxford OUP.

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PEC - ME801(B)	Tool Engineering	4L : 0T : 0P (04 hrs.)	Credits: 04

Pre requisite(s): Nil

Course Objectives:

- How to select proper tool for given manufacturing operation
- Interpret designation system of cutting tool and tool holder.
- Select and design jig and fixture for given simple component.
- Classify and explain various press tools and press tools operations.
- Select a die for a given simple component.

Course Content:

Module 1 **(10Hrs)**

Introduction: Concept, meaning and definitions of tool, tool design and tool engineering. Tools-types, classification, features & applications. Tool engineering-functions and importance to enhance productivity and quality. Importance of process planning in tool engineering. Economy-concept, meaning, importance and principles in tool engineering. Universal acts & their elements of a manufacturing operation with suitable simple example.

Module 2 **(08 Hrs)**

Cutting Tools and Tool Holders: Cutting tool materials-types, composition, properties and applications. Carbide inserts-types, ISO-designation and applications. Re-sharpening methods of cutting tools: Introduction to Tool Holders, Tool holders for turning and milling carbide inserts-types, ISO-designation and applications. Tool holding and tool mounting systems for conventional milling and drilling machine tools..

Module 3 **(08 Hrs)**

Jigs and Fixtures: Concept, meaning, differences and benefits of jigs and fixtures. Types, sketches with nomenclature, working and applications of jigs. Types, sketches with nomenclature, working and applications of fixtures. Steps to design jigs and fixture. For given simple component: i. Select type (Jig or fixture). ii. Develop locating method. iii. Develop clamping method. iv. Design jig and fixture (as applicable). v. Prepare details and assembly sketches.

Module 4 **(08 Hrs)**

Press Tools: Press working processes-types, sketches and applications. Press tools: types, working, components and their functions. Concept, meaning, definitions and calculations of press tonnage and shut height of press tool. Shear action in die cutting operation. Centre of pressure: Concept, meaning, definition, methods of finding and importance. Die clearance: Concept, meaning, definition, reasons, effects and methods of application. Cutting force: Methods to calculate and methods of reducing. Shear angle- concept, need and method to give shear angle on punch and die. Scrap strip layout: - Concept, importance, method to prepare, and determining percentage stock utilization. Types, working, and applications of stock stop, pilots, strippers and knockouts, Cutting dies-types and applications.

Module 5 **(08 Hrs)**

Dies and Moulds: Bending: Types, Parts and functions of bending die, Definition, calculations and factors affecting bend radii, bend allowance and spring back. iv. Method to compute bending pressure. v. Types, sketch, working and applications of bending dies. Drawing dies-types and method to determine blank size for drawing operation. Types, sketch, working and applications of drawing dies (embossing, curling, bulging, coining, swaging and hole flanging). Forging dies- terminology, types, sketch, working and applications. Case Study on Design of Blanking Die

Course Outcomes:

After completion of the course student will be able to:

1. Apply the selection of proper tool for given manufacturing operation
2. Utilize the Cutting Tools and Tool Holders for operations
3. Apply the selection of proper jig and fixture.
4. Select the press tools for press tools operations.
5. Make use of die for operation on component .

Text books:

1. ASTME, Fundamentals of tool design, Publication PHI.
2. Donaldson & Lecain, Tool design, Publication TME
3. M. H. A. Kempster, Principles of tool & jig design, Blackie & Son Ltd.
4. HMT, Production Technology Publication.
5. PSG Design data book, Coimbatore PSG.

Reference Books:

1. P. H. Joshi , Jigs and fixture, TMGH
2. C. Elanchezhian, T. Sunder Selwyn, B. Vijaya Ramnath, Design of Jigs Fixtures And Press Tools, Eswar Press, 2007, 2nd Edition
3. BIS, Cutting tools standards.

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B. Tech, VIII Sem

PEC - ME801(D)	Financial & Marketing Management	4L : 0T : 0P (04hrs.)	Credits: 04

Pre requisite(s): NIL

Course Objectives:

- To introduces the role of production management.
- To introduces the concept of Plant layout and Material Handling.
- To introduces the Strategies of Aggregate Planning
- To know about maintenance procedure.
- The course further introduces the scope of material management.

Course Content:

Module 1 **(08 Hrs)**

Nature and Scope of Financial Management: Role of financial management in business decision, goal of financial management. , The Firm and Its Environment: Forms of business ownership.

Module 2 **(10 Hrs)**

Tools of Financial Analysis: Balance sheet and profit and loss statements, Funds flow analysis - sources and uses of funds. break even analysis, ratio analysis, of operating and financial leverages. Working Capital Management

Module 3 **(10 Hrs)**

Investment Management: Capital Budgeting Techniques. PBP, ARR, Discounted PBP, PI, Time Value of Money, NPV v/s IRR. Risk Analysis, Case Studies.

Module 4 **(08 Hrs)**

Marketing Management: Tasks and Philosophies of Marketing Management. The marketing system and environment. Systems approach to marketing.

Marketing Organization : Organization of Marketing department. Responsibilities and functions of Marketing managers, Interaction of Marketing with other functions. Sales Function : Recruitment, Selection, Training, Motivation and compensation of sales force, Controlling and evaluating.

Module 5 **(08 Hrs)**

Marketing Research: Scope and objective, Planning and formulating Marketing Research Projects, Methods of collecting data. Analysis and evaluation of data, Consumer behavior analysis, Vendor analysis.

Course Outcomes:

After completion of the course student will be able to:

1. Apply the knowledge of financial management in growth of the firm.
2. Illustrate the Balance sheet and profit and loss statements.
3. Gain the knowledge on application of different techniques of capital budgeting under riskless and risky conditions for the investment decisions.

4. Apply concept of marketing management in an organization.
5. Examine the role of Planning and formulating Marketing Research.

Text Books:

1. Khan and Jain, Financial management. ata McGraw-Hill Educatio, 8th edition,2018
2. Kuchchal, Financial management. Chitanya Publishing House,1988
3. Philip Kotler, Marketing Management : Analysis ,Planning Implementation and Control. PHI. 1988
4. Stanton " Marketing Management " Mc Graw Hill, 1993
5. Philip Kotler " Principles of Marketing " PHI,2002

Reference Books :

1. Pandey I M, Financial Management , Vikas Publishing House Pvt Limited, 2015
2. Rosalind Masterson, Nichola Phillips, David Pickton "Marketing An Introduction" TMH ,2017

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B. Tech, VIII Sem

PEC - ME802(A)	Energy Conservation & Management	4L: 0T: 0P (04hrs.)	Credits: 04

Prerequisite: Elementary knowledge of Energy Resources

Course Objectives:

- To inculcate the importance of energy conservation and its management.
- To introduce the intricate phenomenon of Demand Side Management in Electrical
- systems.
- To induce the knowledge of important phenomenon like Energy auditing and economic analysis.

Course Content:

Module 1 **(08 Hrs)**

Energy Management: Concept of energy management, energy demand and supply, economic analysis; Duties and responsibilities of energy managers.

Energy Conservation: Basic concept, energy conservation in Household, Transportation, Agricultural, service and Industrial sectors, Lighting, HVAC.

Module 2 **(10 Hrs)**

Energy Audit: Definition, need and types of energy audit; Energy management (Audit) approach: Understanding energy cost, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirement; Fuel & energy substitution; Energy audit instruments; Energy conservation Act; Duties and responsibilities of energy manager and auditors.

Module 3 **(08 Hrs)**

Material Energy Balance: Facility as an energy system; Method for preparing process flow; material and energy balance diagrams. Energy Action Planning: Key elements, force field analysis; Energy policy purpose, perspective, content, formulation, rectification

Module 4 **(07 Hrs)**

Monitoring and Targeting: Definition monitoring & targeting; Data and information analysis. Electrical Energy Management: energy conservation in motors, pumps and fan systems; energy efficient motors.

Module 5 **(07 Hrs)**

Thermal Energy Management: Energy conservation in boilers, steam turbine and industrial heating system; Application of FBC; Cogeneration and waste heat recovery; Thermal insulation; Heat exchangers and heat pump; Building Energy Management.

Course Outcomes:

After completion of the course student will be able to:

1. Analyse the viability of energy conservation projects
2. Conceptualize about technology, economics and regulation related issues associated with energy conservation and energy auditing.

3. Analyse the flow process of he material in and out.
4. Examine efficient heat & electricity utilization, saving and recovery in different thermal and electrical system.
5. To Evaluate the energy saving & conservation in different mechanical utilities.

Text/References Books:

1. Murphy & Mckay, Energy Management, BSP Books Pvt. Ltd.
2. Smith CB; Energy Management Principle, Pergamon Press, New York.
3. Energy conservation-related booklets Published by National productivity Council (NPC) &Petroleum Conservation Research Assn.(PCRA).
4. S Rao and B B Parulekar ," Energy Technology' Khanna Publishers, 1999
5. Rajan GG, Optimising Energy Efficiency in Industry, TMH.
6. Callaghan P O, Energy Management, McGraw-Hill Book Company.
7. Amit Kumar Tyagi, Handbook on Energy Audit and Management, Tata Energy Research Institute.
8. Bureau of Energy Efficiency, Study material for energy Managers and Auditors: Paper I to V.
9. Hamies; Energy Auditing and Conservation: Method, Measurement, Hemisphere, Washington.
10. Witty, Larry C, Industrial Enegy Management Utilisation, Hemisphere Publishers, Washington 9.Kreith & Goswami, Energy Management and Conservation Handbook, CRC Press.

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PEC - ME802(B)	Statistical Quality Control & Total Quality Management	4L:0T:0P (04 hrs.)	Credits: 04

Pre requisite(s): Nil

Course Objectives:
- To get the concept of Statistical Quality Control.
- To get the concept of Control charts and application.
- To get the concept of Process Improvement in SQC
- Get knowledge about history and evolution of TQM.
- To get knowledge about TQM Process.

Course Content:

Module 1 (08 hrs)

Process- definition, variation and feedback, funnel-marble experiment- rules of adjustment and its effects, quality- definition, goalpost and kaizen view, quality of design, conformance and performance; Taguchi loss function, cost of quality, chain action of improving quality to productivity to motivation and low cost; Deming's theory of mgt, fourteen points and variance reduction; attributes enumerative and variables analytic studies.

Module 2 (08 hrs)

SQC-Control charts: basic discrete and continuous distributions, measures of central tendency, variability and shapes, sampling, size and central value theorem, control chart structure, process plotting and stability, study of out-of-control evidences, defect detection and prevention, use of control charts in evaluating past, present and future trends; attribute control charts, count and classification charts, construction and interpretation of p , np , c and u charts, PDSA cycle(plan, do, study, act), and R charts, and s charts, individual and moving range chart, trial control limits and out of control points.

Module 3 (08 hrs)

Process diagnostics & **Process Improvement** : Between and Within Group variations, periodic and persistent disturbances, control chart patterns-natural, level-shift, cycle, wild, multi-universe, relationship and other out of control patterns; diagnosing a process, brainstorming; cause-effect, Ishikava, interrelationship, systematic and matrix diagrams; change concepts and waste elimination Performance and technical specifications, attribute-process and variable-process capability studies; unstable and stable process capability studies and examples; attribute and variable improvement studies.

Module 4 **(08 hrs)**

Total Quality Management: Historical perspective, teamwork, TQM and ISO 9000; information technology and Business Process Re-engineering (BPR); TPM and quality awards; aids and barriers to quality mgt, creating vision and initiating transformation, establishing

programs for education and self coordination, policy setting and review, flowchart of policy mgt and relation with daily mgt. improvements, measurement of key indicators; quality mgt leader; cross functional teams and coordination, policy setting and review, flowchart of policy mgt and relation with daily mgt.

Module 5 **(08 hrs)**

TQM Process: Definition, variation and feedback, funnel-marble experiment- rules of adjustment and its effects, quality- definition, goalpost and kaizen view, quality of design, conformance and performance; Taguchi loss function, cost of quality, chain action of improving quality to productivity to motivation and low cost; Deming's theory of mgt, fourteen points and variance reduction; attributes enumerative and variables analytic studies. Introduction to six sigma, A case study

Course Outcomes:

After completion of the course student will be able to:

1. Gain knowledge of quality.
2. Apply the concept of Statistical Quality Control in real life problems
3. Examine the role of Process Diagnostics.
4. Learn fundamentals of TQM.
5. Apply the concept of TQM Process.

Text Books:

1. Gitlow HS, Oppenheim et al; Quality Management; TMH
2. Gryna FM; Juran's Quality Planning and Analysis; TMH
3. Kulkarni VA and Bewoor AK; Quality Control; Wiley
4. Subburaj R; Total Qality Management; TMH
5. Barsterfield, "Total Quality Management", Pearson Publication

Reference Books:

1. Crosby Philips; Quality is still free; New Amer Library.
2. Jankiraman B and Gopal RK; Total Quality Management- Text and Cases; PHI Learning.
3. Sugandhi L and Samual A; Total Quality Management; PHI Learning.

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PEC - ME802(C)	Product Management	4L:0T:0P (04 hrs.)	Credits: 04

Pre requisite(s): Engineering Drawing & design

Course Objectives:

- To introduces the Basic concepts of engineering products.
- To understand the concept of products' specifications and product architecture.
- To introduces the concept of patent and patent laws.
- To know about how to market a product.
- The course further introduces the break even analysis.

Course Content:

Module 1 **(10 Hrs)**

Introduction: Product Design : Product specifications, concept development, configuration design involving synthesis, analysis and optimization, Detailed design, Presentation of design Oral and Visual presentations, various types of models used in product design, Design through creative routes, Adaptive and variant design, Concurrent Engineering.

Module 2 **(08 Hrs)**

Product Design: Design for manufacturing and Design for assembly, Role of Aesthetics and Ergonomics in design. Design for Environment. Robust Design using Taguchi methods, Reliability based design. Modular versus integral design.

Module 3 **(08 Hrs)**

New Product Development: Research and new product development - Patents - Patent search - Patent laws - International code for patents - Intellectual property rights (IPR).

Module 4 **(08 Hrs)**

Marketing Management: Philosophies of Marketing, Market and Product strategies, BCG matrix, Portfolio management, New Product development strategy.

Module 5 **(10 Hrs)**

Value analysis and BEP: Introduction to value analysis, cost analysis, market impact and feedback data from market to designer. The product life cycle,

Break Even Analysis: Introduction and applications; BEA concepts, make or buy decisions.

Course Outcome's:

After completion of the course student will be able to:

1. Learn software and develop product drawing.
2. Analyzing the requirement of customer.
3. Detecting how to file patent and its importance.
4. Contrasting the concept of marketing management in new product development.
5. Identify the use of break even analysis and its application.

Text Books:

1. K.T. Ulrich and S. D. Eppinger," Product design and development". TMH ,2003
2. Chitale A. K. and Gupta R. C., Product Design and Manufacturing, PHI, New Delhi, India. 6th Ed.2013.
3. Dieter, Engineering Design, Marketing Management, McGraw-Hill Education 2008.

Reference Books:

1. Otto, Product design , Pearson Education , 2001
2. Stanton, Principles of Marketing, Prentice Hall, 2018
3. James Garrat, Design & Technology, Cambridge University Press, 1996.

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PROJ-ME801	**Seminar - II**	**0L:0T: 2P (04 hrs)**	**Credits: 01**

Before the end of semester, each student will have to deliver a seminar on a subject mutually decided by candidate and his/her guide. The student should select the topic for his/her seminar other than project work. The seminar topic should be latest and ahead of the scope of curriculum. The student, as a part of the term work, should submit the write-up of the seminar topic in duplicate, typed on A4 size sheet in a prescribed format and bound at the end of semester. The performance of the student will be evaluated on the basis of the contents, the presentation and discussion during the delivery of sem.

Course Outcome's:

After completion of the course student will be able to:

1. Establish motivation for any topic of interest and develop a thought process for technical presentation.
2. Organize a detailed literature survey and build a document with respect to technical publications.
3. Effective presentation and improve soft skills.

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PROJ-ME802	**Major Project II**	**0L:0T: 12P (12 hrs)**	**Credits: 06**

Course Objectives:

- To provide students with a comprehensive experience for applying the knowledge gained so far by studying various courses.
- To develop an inquiring aptitude and build confidence among students by working on solutions of small industrial problems.
- To give students an opportunity to do something creative and to assimilate real life work situation in institution.
- To adapt students for latest development and to handle independently new situations.
- To develop good expressions power and presentation abilities in students**.** The focus of the Major Project I is on preparing a working system or some design or understanding of a complex system using system analysis tools and submit it the same in the form of a write up i.e. detail project report.

The student should select some real life problems for their project and maintain proper documentation of different stages of project such as need analysis market analysis, concept evaluation, requirement specification, objectives, work plan, analysis, design, implementation and test plan. Each student is required to prepare a project report and present the same at the final examination with a demonstration of the working system (if any).

Working schedule:

The faculty and students should work according to following schedule:

Each student undertakes substantial and individual project in an approved area of the subject and supervised by a faculty of the department. In special case, if project is huge, then maximum 03 students may be permitted to work together as a team to do the same. The student must submit outline and action plan for the project execution (time schedule) and the same be approved by the concerned faculty and Head of department.

Project guide should motivate students to develop some Innovative working models in the area of Advanced Automotives, Aero modelling, Renewable Energy based systems, Mechatronics, Robotic systems, Advanced Manufacturing Technology based systems etc. which can contribute to the society.

Course Outcome's:

1. Identify a topic in areas of Mechanical Engineering.
2. Review literature to identify gaps and define objectives & scope of the work.
3. Generate and implement innovative ideas for social benefit.
4. Develop a prototypes/models, experimental set-up and software systems necessary to meet the objectives.
5. Prepare a report as per recommended format and defend the work.