IPS Academy, Institute of Engineering & Science
(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Mechanical Engineering Department

B. Tech, VIII Sem

Scheme A

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.	ME02	PEC	Professional Elective Course-II	60	25	15	-	-	100	3	-		3
2.	ME02	IOC	Interdisciplinary Open Course-II	60	25	15	-	-	100	3	-		3
3.	ME06	SBC	Software Lab –II				60	40	100			4	2
4.	ME03(A)	PRO	Project Phase -II				100	100	200			16	8
Total Academic Engagements and Credits										**6**		**20**	**16**
Total				**120**	**50**	**30**	**160**	**140**	**500**				**16**

*MST: Minimum of two mid semester tests to be conducted.

L: LectureT: Tutorial P: Practical

12/01/25

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IPS Academy, Institute of Engineering & Science
(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Mechanical Engineering Department

B. Tech, VIII Sem

Scheme B

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.	ME02	PEC	Professional Elective Course-II	60	25	15	-	-	100	3	-		3
2.	ME02	IOC	Interdisciplinary Open Course-II	60	25	15	-	-	100	3	-		3
3.	ME06	SBC	Software Lab –II				60	40	100			4	2
4.	ME03(B)	PRO	Internship & Project (Industry/ Corporate/ Academia)				100	100	200			16	8
Total Academic Engagements and Credits										6		20	16
Total				120	50	30	160	140	500				16

*MST: Minimum of two mid semester tests to be conducted.

L: Lecture T: Tutorial P: Practical

12/07/25

MECHANICAL ENGG. DEPTT. HOD IPSA IES, INDORE

IPS Academy, Institute of Engineering & Science

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

Mechanical Engineering Department

B. Tech, VIII Sem

Note:

In Eighth Semester, students may opt for 'SCHEME A' or 'SCHEME B'.

Professional Elective Course -II, PEC-ME02 (Any One Course)

A. Renewable Energy Technology

B. Statistical Quality Control

C. Product Management

D. Financial & Marketing Management

Interdisciplinary Open Course-II, IOC – ME02 (Any One Course)

A. Data Science

B. Electric & Hybrid Vehicle

C. Disaster Preparedness & Planning

D. Occupation Health and First Aid

E. Any MOOC Course, Minimum 12 Weeks, (AICTE/SWAYAM/ Other Relevant Online Learning Platform)

Skill Based Courses (SBC), Software Lab -II, ME04 (P)

CAD, CAM, CIM

12/07/25

MECHANICAL ENGG. DEPTT. HOD

IPS Academy, Institute of Engineering & Science

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

Mechanical Engineering Department

B. Tech, VIII Sem

PEC - ME02(A)	Renewable Energy Technology	3L : 0T : 0P (03 hrs.)	Credits: 03

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. P.M. Solar Rooftop Scheme.

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.

12/01/25

MECHANICAL ENGG. DEPTT. HOD IPSA IES, INDORE

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.

12/07/25

MECHANICAL ENGG. DEPTT. HOD IPSA IES, INDORE

IPS Academy, Institute of Engineering & Science
(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Mechanical Engineering Department

B. Tech, VIII Sem

PEC - ME02(B)	Statistical Quality Control & Total Quality Management	3L : 0T : 0P (03 hrs.)	Credits: 03

Pre requisite(s): Nil

Course Objectives:

- To get the concept of Statistical Quality Control.
- To get the concept of Process Diagnostics in SQC
- 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 Diagnostics: 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.

Module 2 **(08 hrs)**

Process Improvement: Performance and technical specifications, attribute-process and variable-process capability studies; unstable and stable process capability studies and examples; attribute and variable improvement studies; Inspection: acceptance sampling(AS)-lot formation, single, double and multiple/sequential sampling plans, operating characteristic (OC) curve, producer and consumer risk, theoretical invalidation of AS, kp rule for stable and chaotic processes

Module 3 **(08 hrs)**

Statistical Quality Control: 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 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.

12/07/25

MECHANICAL ENGG. DEPTT. HOD

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. Examine the role of Process Diagnostics.
2. Gain knowledge of Process Improvement.
3. Apply the concept of Statistical Quality Control in real life problems.
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.

12/07/25

MECHANICAL ENGG. DEPTT. HOD IPSA IES, INDORE

IPS Academy, Institute of Engineering & Science

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

Mechanical Engineering Department

B. Tech, VIII Sem

PEC - ME02(C)	Product Management	3L : 0T : 0P (03 hrs.)	Credits: 03

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. Packaging design.

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.

12/01/25

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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.

12/07/25

MECHANICAL ENGG. DEPTT. HOD IPS A IES, INDORE

IPS Academy, Institute of Engineering & Science

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

Mechanical Engineering Department

B. Tech, VIII Sem

PEC - ME02(D)	Financial & Marketing Management	3L : 0T : 0P (03 hrs.)	Credits: 03

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. Concept of Unit Economics.

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. Type of Funding, Venture Capital Funding.

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. Social media marketing, Digital marketing

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.

12/6/25

MECHANICAL ENGG. DEPTT. HOD INDORE

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

12/07/25

MECHANICAL ENGG. DEPTT. HOD IPSA IES, INDORE

IPS Academy, Institute of Engineering & Science

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

Mechanical Engineering Department

B. Tech, VIII Sem

SBC-ME06	Software Lab	0L:0T: 2P (04 hrs)	Credits: 01

The Computer Integrated Manufacturing Laboratory (CIM) laboratory is established to equip students with knowledge and hands-on experience in Computer Integrated Manufacturing, acknowledging emerging research and development in the manufacturing segment. Objective is to prepare students for the industry and to acquire employability skills in CNC programming and cutting tool path generation through CNC simulation software, utilizing G-Codes and M-Codes.

The CIM laboratory, in addition to its core offerings, also houses a cutting-edge 3D printing facility. This technology plays a pivotal role in enhancing student's understanding of rapid prototyping and additive manufacturing processes, preparing them for the forefront of modern manufacturing practices.

12/07/25

MECHANICAL ENGG. DEPTT. HOD IPSA IES, INDORE

IPS Academy, Institute of Engineering & Science

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

Mechanical Engineering Department

B. Tech, VIII Sem

PROJ-ME03	Project Phase -II / Internship	0L:0T: 16P (16hrs)	Credits: 08

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.

12/07/25

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