UNIVERSITY OF JAMMU, JAMMU
COURSE SCHEME
B.E. 5th Semester Mechanical Engineering
For Examination to be held in the Year December 2020,2021,2022,2023

Contract Hours/Week: 25

COURSE CODE	COURSE TYPE	COURSE TITLE	LOAD ALLOCATIONS			MARKS DISTRIBUTION		TOTAL MARKS	CREDITS	% CHANGE
			L	T	P	INTERNAL	EXTERNAL			
*MOC-506	Massive Open Online Course	SWAYAM/ NPTEL	3	0	0	100	-	100	**3**	100%
PME-501	Professional Core Course	Applied Thermodynamics	3	1	0	50	100	150	**4**	100%
PME-502	Professional Core Course	Machine Design	3	1	0	50	100	150	**4**	100%
PME-503	Professional Core Course	Production Technology-II	2	1	0	50	100	150	**3**	100%
EEE-501	Professional Core Course	Basic Electrical Engg.	2	1	0	50	100	150	**3**	100%
PME-511	Professional Core Course	Fluid Machinery Lab.	0	0	3	75	-	75	**1.5**	100%
PME-512	Professional Core Course	Applied Thermodynamics Lab.	0	0	3	75	-	75	**1.5**	100%
PIT-506	Summer Industrial Internship	Industrial Training - I	0	0	0	50	-	50	**1**	100%
NCC-501	Non-Credit Course	Essence of Indian Traditional Knowledge	2	0	0	Satisfactory/ Unsatisfactory				100%
TOTAL			15	4	6	500	400	900	21	

*NOTE: *The department shall offer the SWAYAM/ NPTEL course (12 weeks) out of the list of courses offered by the SWAYAM around the time of commencement of the semester. However, the selected NPTEL course should not be similar to the regular courses offered as a part of the department curriculum.*

Examination to be held in the Year December 2020,2021,2022,2023

CLASS: B.E. 5th SEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: SWAYAM/ NPTEL
COURSE NO.: MOC-506
DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 3

			Marks
L	**T**	**P**	**Sessional**
3	**0**	**0**	**100**

The department shall offer the SWAYAM/ NPTEL course (12 weeks) out of the list of courses offered by the SWAYAM around the time of commencement of the semester. However, the selected NPTEL course should not be similar to the regular courses offered as a part of the department curriculum.

The overall monitoring of the NPTEL course will be under the supervision of the teacher incharge of the department.

The NPTEL/SWAYAM certification course comprises of Assignments (25%) and Proctor Examination (Online examination MCQ's based = 75%) conducted at the end of the semester by IIT Madras as per the schedule.

The marks obtained by the student in the NPTEL/SWAYAM certification course will be tabulated by the concerned department.

Note: In case the student does not pass the certification exam or remains absent in the proctor examination, no certificate will be given to the candidate by the NPTEL and the student will be deemed to have failed in the course. The examination of the said NPTEL course will be taken by the department concerned in the next semester under the supervision of Examination Cell of GCET Jammu. The paper will be of 75 marks and assignment marks will be carried forward from the previous semester.

Examination to be held in the Year December 2020,2021,2022,2023

CLASS: B.E. 5th SEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: APPLIED THERMODYNAMICS
COURSE NO.: PME-501
DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 4

Marks

L	T	P	Theory	Sessional
3	1	0	100	50

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO501.1:	Define various concepts of thermodynamics and design a thermal system that meets desired specifications and requirements.
CO501.2:	Apply concepts of thermodynamics for evaluating the properties of fluids used in various industrial systems such as Mechanical Power Production by using engines, air conditioning and refrigeration.
CO501.3:	Identify, formulate and solve thermal engineering problems and demonstrate and conduct experiments, interpret and analyze data and report results.

Detailed Syllabus

SECTION - A

Thermodynamics of combustion, combustion reaction of common fuels, Air-fuel ratio, enthalpy and Internal energy of combustion, Application of First law of Thermodynamics to chemical reaction (combustion), analysis of products of combustion, Orsat apparatus. **[10 Hours]**

Steam generators: Classification, Modern steam generators, boiler mounting and accessories, Boiler performance, boiler draught and chimney calculations. **[10 Hours]**

SECTION - B

Condensers: Function, Classification, Mass of circulating water required and other calculations. Steam nozzles, mass flow rate, Throat pressure for maximum discharge, Relation between area, velocity and pressure, supersaturated flow, Effect of backpressure. **[10 Hours]**

Steam turbine: Type and applications, Impulse and Reaction turbines, Velocity diagram, Blade height, Design procedure for steam turbines, Turbine performance and Governing. **[10 Hours]**

RECOMMENDED BOOKS:

1.	Thermodynamics	Rogers & Mayhew
2.	Thermal Engineering	PL Ballaney
3.	Applied Thermodynamics	Mathur& Mehta
4.	A Course in Thermodynamics	CP Kothandraman et al.
5.	Thermodynamics	Gupta & Prakash

NOTE:

1. Question paper will be of 3 Hours' duration
2. There will be 8 questions in all, four from **Section- A** (each of 20 marks) and four from **Section – B** (each of 20 marks)**.**
3. Students are required to attempt five questions in all, at least two questions from each section.
4. Use of scientific calculator will be allowed in the examination hall.
5. Use of steam table will be allowed in the examination hall.

Examination to be held in the Year December 2020,2021,2022,2023

CLASS: B.E. 5th SEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: MACHINE DESIGN
COURSE NO.: PME-502
DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 4

Marks

L	T	P	Theory	Sessional
3	1	0	100	50

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO502.1:	Understand the appropriate and traditional use of the engineering and machine design fundamentals and demonstrate knowledge on basic machine elements used in machine design.
CO502.2:	Define and calculate the factor of safety according to static failure criteria, approach a design problem successfully, and show their approach to various engineering communities.
CO502.3:	Understand the design procedure of various machine elements and selection of various materials for design and design machine element to withstand load and deformation for given application.

Detailed Syllabus

SECTION - A

Introduction to the design procedures, design requirement. theories of failure, creep, stress concentration, cyclic loading and endurance limit. Design of machine elements like screw joints, cotter and Knuckle joints, riveted, Keys and couplings.
[10 Hours]
Design of flat belts, clutches like single and multiple disc and brakes like single and pivoted block. Design and selection of sliding and roller bearings. **[10 Hours]**

SECTION - B

Design of coil i.e. helical and leaf springs, Use of compound or concentric springs, Design of chairs and ropes i.e fiber ropes. Analysis of forces and bearing reactions for gears, Design of spur, Helical, Worm and Bevel gearing. **[10 Hours]**
Design of main engine components like cylinder, Pistons, Connecting rods, Crank shafts (centre), Flywheels. Design of shafts and levers. **[10 Hours]**

RECOMMENDED BOOKS:

1. Machine Design   Black & Adam   --Tata McGraw Hill
2. Machine Design   Shigley
3. Machine Design   Sunderajamurthy &   Shanmugam   --Khanna Publishers
4. Machine Design (Data Handbook)   Abdullah and Shrief Mahadevan

NOTE:

1. Question paper will be of 3 Hours' duration
2. There will be 8 questions in all, four from **Section- A** (each of 20 marks) and four from **Section – B** (each of 20 marks)**.**
3. Students are required to attempt five questions in all, atleast two question from each section
4. Use of scientific calculator will be allowed in the examination hall.
5. Use of design data book will be allowed in the examination hall.

Examination to be held in the Year December 2020,2021,2022,2023

CLASS: B.E. 5th SEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: PRODUCTION TECHNOLOGY- II
COURSE NO.: PME-503
DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 3

Marks

L	T	P	Theory	Sessional
2	1	0	100	50

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO503.1:	Explain the features and applications of lathe, milling, drilling and broaching machine.
CO503.2:	Discuss features and applications of reciprocating machine tool like shaper, planer and slotting machine and understand concept of boring and drilling, their difference and grinding of materials.
CO503.3:	Understand construction and working of semiautomatic and fully automatic lathe machine and write a program to control and operate NC and CNC machine.

Detailed Syllabus

SECTION - A

Introduction to the machining processes **Machine tools:** classifications, elements of machine tools, structures, spindle, work and tool holding devices, speed and feeds, Machining parameters.   **[8 Hours]**

Turning operations : turning tools, Tool geometry of a single point tool, importance of tool angles, Tool designation, types of turning operation, screw, cutting, machining time and metal removal rate (MRR), chip formation,Types of chips, shear zone, tool life, tool life equation, determination of cutting forces using merchant analysis, economics. **[10 Hours]**

SECTION - B

Shaper & slotter. **Milling operation:** different type of milling operations, milling cutters, cutter geometry, Drilling, Boring and Reaming operations, types of drills, geometry of twist drill, difference between drilling , boring and reaming, boring machines, MRR and drilling time. Grinding: abrasive machining, grinding wheel structure and designation, abrasive and binding materials, effect of grinding conditions on the wheel characteristics, wheel life and grinding ratio, grinding operations-surface, cylindrical and centre less.   **[10   Hours]**

Semi-automatic lathes: capstan and turret lathe, constructional features, tool layout, indexing of turret, work and tool holding devices, machining operations. **Automatic Lathes:** Features of construction and operation of single spindle automatic screw cutting machine, Swiss type screw cutting machine.   **[8 Hours]**

RECOMMENDED BOOKS:

1. Principles of machine tools   Sen & Bhattacharya
2. Fundamentals of metal cutting & Machine tools   Juneja & Shekhon
3. Metal cutting   P N Rao
4. Mechanized Assembly   Bothroyd
5. Workshop Technology (Vol. I, II, III)   Chapman
6. Production technology   R K Jain

NOTE:

1. Question paper will be of 3 Hours' duration
2. There will be 8 questions in all, four from **Section- A** (each of 20 marks) and four from **Section – B** (each of 20 marks)**.**
3. Students are required to attempt five questions in all, at least two question from each section
4. Use of scientific calculator will be allowed in the examination hall.

Examination to be held in the Year December 2020,2021,2022,2023

CLASS: B.E. 5ᵗʰ SEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: BASIC ELECTRICAL ENGINEERING
COURSE NO.: EEE-501
DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 3

			Marks	
L	**T**	**P**	**Theory**	**Sessional**
2	**1**	**0**	**100**	**50**

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO501.1:	Understand and analyze the DC, AC and three phase circuits.
CO501.2:	Understand the working principle of transformer and electrical machines.
CO501.3:	Understand the electrical components installation for low-voltages.

Detailed Syllabus
Section-A

Module 1: DC Circuits :Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation. Mesh and Nodal analysis, Superposition, Maximum Power Transfer theorem, Thevenin and Norton Theorems. **(6 hours)**

Module 2: AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel) and resonance. **(6 hours)**

Module 3: Three-phase Circuits: Concept of three phase voltage, voltage and current relations in star and delta connections. Measurement of power in three-phase balanced circuits. (**5 hours)**

Section-B

Module 4: Transformers::Principle of operation, ideal and practical transformer (no-load & on-load phasor diagrams), equivalent circuit, losses in transformers, Transformer test (open circuit & short circuit), regulation and efficiency. **(6 hours)** **Module 5**: **Electrical Machines:** DC Machines- Principle 'of operation, emf equation, torque production. AC Machines- Three-phase induction motor, principle of operation, slip and rotor frequency. Synchronous machines- Principle of operation and emf equation. **(6 hours)**

Module 6: Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup. **(6 hours)**

Text / References:
1. D.P. Kothari and J. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.
2. D.C Kulshreshtha, "Basic Electrical Engineering', McGraw Hill.
3. L. S. Bobrow, "Fundamentals of Electrical Engineering', Oxford University Press. Zo
4. E. Hughes, "Electrical and Electronics Technology", Pearson. a
5. V.D. Toro, "Electrical Engineering Fundamentals', Prentice Hall India.

NOTE: The question paper shall comprise of total eight questions, four from each section and at least one question from each module. Students are required to attempt five questions selecting at least two questions from each section. Use of scientific calculator is allowed.

Examination to be held in the Year December 2020,2021,2022,2023

CLASS: B.E. 5th SEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: FLUID MACHINERY LAB
COURSE NO.: PME-511
DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 1.5

	L	T	P	Marks Practical
	0	0	3	75

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO511.1:	Analyze a variety of practical fluid flow devices and utilize fluid mechanics principles in design and calculate performance analysis of turbines and pumps and can be used in power plants.
CO511.2:	Understand and analyze practical problems in all power plants and chemical industries and perform modern computational techniques in fluid dynamics.
CO511.3:	Conduct experiments of pipe flows and open-channel flows and interpreting data from model studies to prototype cases, as well as documenting them in engineering reports.

LIST OF EXPERIMENTS:

Study and analysis of:

1. Pelton Wheel.
2. Francis turbine.
3. Kaplan Turbine.
4. Performance and Analysis of:-
   a) Positive Displacement pumps.
   b) Roto dynamic pumps.
5. Study of performance characteristics of a centrifugal pump at constant and different speeds.
6. Study of performance characteristics of a reciprocating pump at constant speed.

NOTE:
1. At least six practical's should be performed.
2. Additional lab/ experiment will be performed based on course content requirement.
3. Simulation/ virtual labs are used to enhance the practical ability of students.

Examination to be held in the Year December 2020,2021,2022,2023

CLASS: B.E. 5th SEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: APPLIED THERMODYNAMICS LAB.
COURSE NO.: PME-512
DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 1.5

			Marks
L	**T**	**P**	**Practical**
0	0	3	75

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO512.1:	Explain different boilers and can draw heat balance sheet of the boiler and also were in the position to explain the combustion product of the boiler and also tell about the methods to control harmful product.
CO512.2:	Explain about steam turbine and steam nozzle actual work and the type of losses occur in them with different plots.
CO512.3:	Understand practical work of power plant and communicate with each other more frequently regarding various thermodynamics equipment in industry.

LIST OF EXPERIMENTS:

1. Study and Analysis of various types of boilers.
2. Heat balance in boilers.
3. Combustion analysis by Orsat Apparatus.
4. Experiments on Steam Nozzles.
5. Study and performance of Steam turbine.
6. To study A/F ratio variation with load.
7. To determine Calorific Value of gaseous fuel.

NOTE:
1. At least six practical's should be performed.
2. Additional lab/ experiment will be performed based on course content requirement.
3. Simulation/ virtual labs are used to enhance the practical ability of students.

CLASS: B.E. 5th SEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: INDUSTRIAL TRAINING - I.
COURSE NO.: PIT-506
DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 1

	L	T	P	Marks Practical
	0	0	0	50

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO506.1:	Work in industry without any hesitation and able to use the techniques, skills, and modern engineering tools necessary for engineering practice.
CO506.2:	To identify, formulate, and solve engineering problems and apply ethical principles and commit to responsibilities and norms of engineering practice.
CO506.3:	Recognize the need for, and an ability to engage in life-long learning.

Students are required to undertake 4 to 6 weeks Practical Training during the summer vacations in the field of Mechanical Engineering in Govt./Semi-Govt./Private sector. Thereafter, each student shall be required to submit a report on the practical training to the concern HOD for evaluation.

Guidelines for evaluation of Practical Training:

The evaluation shall be done by the departmental committee by the end of 5th semester. The committee shall have a convener and at least two members.

Distribution of Marks as per the University statues:

Total Marks for Evaluation   = 150 marks

i)   Report   = 60   40%

ii)   Viva-Voce   = 45   30%

iii)   Miscellaneous Marks   = 45   30%

Due weightage will be given to those who have opted Industrial Training outside the State as well as keeping in view the profile of that Industry.

Award of the Marks:

Marks under (i), (ii) & (iii) will be awarded by the departmental committee constituted for the purpose.

Examination to be held in the Year December 2020,2021,2022,2023

CLASS: B.E. 5th SEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE
COURSE NO.: NCC-501
DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 0

Marks

L	T	P	Theory	Sessional
2	0	0	Satisfactory/Unsatisfactory	

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO501.1:	Know about the Vedic philosophy in detail and its relevance in present scenario.
CO501.2:	Strengthen their mind and body through the knowledge of yoga.

Detailed Syllabus

SECTION - A

Vedic Philosophy: Concept of Vedas, Ethics & Values, Educational system, Knowledge of science, trade/commerce & medicines as per Vedas, Environmental ethics: Preservation & Purification, Harnessing of natural resources in alienation with nature as per Vedas.

SECTION - B

Yoga Philosophy: Parts of Yoga, Importance of Yam and Niyam, Stress management through yoga, Purification of mind and body through yoga .

Note for Teacher:
The course should aim at enlightening students with the importance of ancient traditional knowledge.

Evaluation of the course:

There will be internal evaluation based on two internal sessional and viva -voce.

UNIVERSITY OF JAMMU, JAMMU

COURSE SCHEME

B.E. 6th Semester Mechanical Engineering

For Examination to be held in the Year May 2021,2022,2023,2024.

Contract Hours/Week: 27

COURSE CODE	COURSE TYPE	COURSE TITLE	LOAD ALLOCATIONS			MARKS DISTRIBUTION		TOTAL MARKS	CREDITS	% CHANGE
			L	T	P	INTERNAL	EXTERNAL			
PME-601	Professional Core Course	Quality and Reliability Engineering	3	0	0	50	100	150	3	100%
PME-602	Professional Core Course	Industrial Engineering	3	0	0	50	100	150	3	100%
PME-603	Professional Core Course	Mechatronics	3	1	0	50	100	150	4	100%
*MOC-606	Massive Open Online Course	SWAYAM/NPTEL	3	0	0	100	-	100	3	100%
HMC-601	Humanities & Social Science & Management Course	Managerial Economics	3	1	0	50	100	150	4	100%
PME-611	Professional Core Course	Industrial Engg. Lab.	0	0	2	50	-	50	1	100%
PME-612	Professional Core Course	Engg. Metrology Lab	0	0	3	75	-	75	1.5	100%
PME-613	Professional Core Course	3D Printing Lab/ MOOC on 3D Printing	0	0	3	75	-	75	1.5	100%
NCC-606	Non Credit Course	Employability Skill	2	0	0	Satisfactory/ Unsatisfactory				100%
TOTAL			17	2	8	500	400	900	21	

*NOTE: *The department shall offer the SWAYAM/ NPTEL (12 weeks) course out of the list of courses offered by the SWAYAM around the time of commencement of the semester. However, the selected NPTEL course should not be similar to the regular courses offered as a part of the department curriculum.*

Examination to be held in the Year May 2021,2022,2023,2024

CLASS: B.E. 6th SEMESTER
BRANCH: MECHANICAL ENGINEERING
CREDITS: 3
COURSE TITLE: QUALITY AND RELIABILITY ENGINEERING
COURSE NO.: PME-601
DURATION OF EXAMINATION: 3 HOURS.

Marks

L	T	P	Theory	Sessional
3	0	0	100	50

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO601.1:	Understand the concepts of reliability and maintainability and approaches and techniques to assess and improve process and/or product quality and reliability.
CO601.2:	Understand the basic concepts and techniques of modern reliability engineering tools and use control charts to analyze for improving the process quality.
CO601.3:	Attain the basic techniques of quality improvement, fundamental knowledge of statistics and probability

Detailed Syllabus

SECTION – A

Reliability and Quality, Reliability characteristics, Bathtub curve. Reliability estimation from test data, Reliability evaluation using Markov model, Statistical methods in Reliability analysis (Discrete distributions and continuous distribution). Reliability testing, Accelerated life testing, data analysis and reliability estimation.   **[20 Hours]**

SECTION - B

Recent developments in life testing practices. Managerial control, Quality control, Quality corporate strategy, cost of quality, Use of statistical methods in process control; R, P, C and D charts.   **[16 Hours]**

RECOMMENDED BOOKS:

1. Weibull Analysis Handbook   Abernethy
2. Reliability Evaluation of Engineering system   Roy Billinton and Ronald N.
3. Reliability Engineering   E, Balaguruswamy
4. Reliability and Life testing   S.K Sinha
5. Reliability and Maintainability Engineering   Charles E. Ebeling

NOTE:

1. Question paper will be of 3 Hours' duration
2. There will be 8 questions in all, four from **Section- A** (each of 20 marks) and four from **Section – B** (each of 20 marks).
3. Students are required to attempt five questions in all, at least two questions from each section
4. Use of scientific calculator will be allowed in the examination hall.

Examination to be held in the Year May 2021,2022,2023,2024

CLASS: B.E. 6th SEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: INDUSTRIAL ENGINEERING
COURSE NO.: PME-602
DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 3

Marks

L	T	P	Theory	Sessional
3	0	0	100	50

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO602.1:	Design a system, component or process to meet desired need within realistic constraints such as economics, environmental, social, political, ethical, health and safety, manufacturability and sustainability.
CO602.2:	Use the techniques, skills and modern engineering tools necessary for engineering practice.
CO602.3:	Develop understanding of professional and ethical responsibility and function on multi-disciplinary teams.

Detailed Syllabus

SECTION - A

Introduction to industrial engineering, Project Management, Network models: An Introduction modeling with networks, specialized network algorithms viz. Minimal spanning tree, shortest route, shortest route, and maximal flow. Types of layouts, charts, required for facilities planning. Materials management, Nature and scope, inventory management, classical EOQ vendor model and its various extension, other deterministic models, ABC, VED analysis, MRP and just-in-Time methods, Make-buy decisions, value engineering techniques. Technique for method study, motion economy principles.   **[18 Hours]**

SECTION - B

Managerial forecasting, nature and scope, various techniques, DELPHI method, Growth curves trend extrapolation- Cross-impact analysis, Casual method and scenario building. Acceptance sampling, simple sampling plans, OC curves, average outgoing quality levels, Total quality Management, Production Planning and Control, Gantt sequencing charts, Aggregate planning, Elementary ideas of linear Programming, Transportation and HMMS models for production planning, line balancing techniques.   **[18 Hours]**

RECOMMENDED BOOKS:

1. Modern Production Management   Buffa
2. Production/Operations Management   Chary
3. Industrial Quality Control   Leavenworth & Grautt
4. Production Planning and Control   Eilon Samuel   --UBC Ltd.
5. Industrial Engineering Handbook   Maynards

NOTE:

1. Question paper will be of 3 Hours' duration
2. There will be 8 questions in all, four from **Section- A** (each of 20 marks) and four from **Section – B** (each of 20 marks)**.**
3. Students are required to attempt five questions in all, at least two question from each section
4. Use of scientific calculator will be allowed in the examination hall.

CLASS: B.E. 6th SEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: MECHATRONICS
COURSE NO.: PME-603
DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 4

Marks

L	T	P	Theory	Sessional
3	1	0	100	50

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO603.1:	Understand the fundamentals of mechatronics and work with pneumatic and hydraulic systems..
CO603.2:	Use control charts for various engineering purposes.
CO603.3:	Differentiate between various sensors, transducers and various electrical actuation systems.

Detailed Syllabus

SECTION – A

Introduction to mechatronics: Definition and approach of mechatronics, Measurement and control system, microprocessor and controller and mechatronic approach. **[8 Hours]**

Sensors and Transducers: Performance terminology, displacement, velocity, position, proximity, force, fluid pressure, liquid small, temp, light sensors, procedure for selection. **[8 Hours]**

SECTION - B

Pneumatic and hydraulic systems: Actuation system, Directions, pressure presses control value, pneumatic & Hydraulic system. **[10 Hours]**

Electrical Actuation systems: Mechanical switches, solid state swatches, solenoid DC/AC motor, stepper motors. **[10 Hours]**

RECOMMENDED BOOKS:

1. Mechatronics : W. Bolton
2. Microprocessors : Rafiqu-zaman
3. Automatic control system : Benjamin.

NOTE:

1. Question paper will be of 3 Hours' duration
5. There will be 8 questions in all, four from **Section- A** (each of 20 marks) and four from **Section – B** (each of 20 marks)**.**
6. Students are required to attempt five questions in all, at least two question from each section
7. Use of scientific calculator will be allowed in the examination hall.

Examination to be held in the Year May 2021,2022,2023,2024

CLASS: B.E. 6ᵗʰ SEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: SWAYAM/ NPTEL
COURSE NO.: MOC-606
DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 3

L	T	P	Marks Sessional
3	0	0	100

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The overall monitoring of the NPTEL course will be under the supervision of the teacher incharge of the department.

The NPTEL/SWAYAM certification course comprises of Assignments (25%) and Proctor Examination (Online examination MCQ's based = 75%) conducted at the end of the semester by IIT Madras as per the schedule.

The marks obtained by the student in the NPTEL/SWAYAM certification course will be tabulated by the concerned department.

Note: In case the student does not pass the certification exam or remains absent in the proctor examination, no certificate will be given to the candidate by the NPTEL and the student will be deemed to have failed in the course. The examination of the said NPTEL course will be taken by the department concerned in the next semester under the supervision of Examination Cell of GCET Jammu. The paper will be of 75 marks and assignment marks will be carried forward from the previous semester.

Examination to be held in the Year May 2021,2022,2023,2024

CLASS: B.E. 6ᵗʰ SEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: MANAGERIAL ECONOMICS
COURSE NO.: HMC-601
DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 4

Marks

L	T	P	Theory	Sessional
3	1	0	100	50

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO601.1:	Understand about business environment of a country after acquiring knowledge in detail about micro economic concepts such as demand & utility analysis, consumer behaviour, demand forecasting techniques and shall be a good decision maker.
CO601.2:	Suggest producing the products at minimum cost by studying in detail about the cost curves and market structures.
CO601.3:	Have knowledge of macroeconomics concepts such as, index numbers, business cycle, banking, inflation, etc. and will be able to apply them in day to day life.

Detailed Syllabus
SECTION – A

Unit 1-Meaning and Importance of Managerial Economics*:* Introduction, Meaning, Scope of Managerial Economics, Role and responsibilities of managerial economist, Relationship of managerial economics with other disciplines: Importance of Managerial Economics in decision making, the basic process (steps) of decision making. **(5hrs)**

Unit 2-Demand Analysis: Introduction, Meaning of demand and Law of Demand, factors affecting demand, exceptions to the law of demand, Elasticity of Demand (Price, income and cross elasticity of demand) **(6hrs)**

***Unit 3-Consumer Behaviour*:** Cardinal utility analysis: Concept: law of diminishing marginal utility, law of equi-marginal utility, Ordinal utility analysis: meaning and properties of Indifference curves and utility maximization (consumer equilibrium). **(5hrs)**

Unit 4- Demand Forecasting: Introduction, Meaning and importance of demand Forecasting: Methods or Techniques of Demand Forecasting, Survey Methods, Statistical Methods, Demand Forecasting for new Products. **(4hrs)**

SECTION – B

Unit 5- Production and cost Analysis: Meaning of Production function, Isoquants (meaning and properties) law of variable proportions, law of returns to scale, Cost Analysis: Concept of Fixed, Variable, Total, Average & Marginal Costs & their relationships in short run. **(6hrs)**

Unit 6- Market structure and pricing decisions - Introduction, Perfect Competition, monopoly (Price-Output Determination under Perfect Competition and monopoly in short run and long run), kinked demand curve analysis of price stability (Sweezy's model). **(5hrs)**

Unit 7-Macro-economic environment: Index Numbers-Meaning, construction and difficulties in measurement of Index number and its uses: meaning and phases of Trade /business cycle. **(5hrs)**

Unit 8-Banking and inflation-Functions of central bank and methods of credit control: functions of Commercial bank and methods of credit creation, Inflation (Types, effects and methods to control inflation). **(6hrs)**

BOOKS RECOMMENDED :

1.	K.K.Dewett	: Modern Economic Theory
2.	H.L Ahuja	: Advanced Economic Theory
3.	M.L. Jhingan	: Macro Economics
4.	P.N Chopra	: Business Economics/Advanced Eco. Theory
5.	D,N,Dwivedi	: Managerial Economics
6.	A. Koutsoyiannis	: Modern Microeconomics

NOTE: There shall be total eight questions, four from each section. Each question carries 20 marks. Five questions will have to be attempted, selecting at least two from each section. Use of calculator is allowed.

CLASS: B.E. 6th SEMESTER
BRANCH: MECHANICAL ENGINEERING   **CREDITS: 1**
COURSE TITLE: INDUSTRIAL ENGG. LAB.
COURSE NO.: PME-611   **Marks**
DURATION OF EXAMINATION: 3 HOURS.

L	T	P	Practical
0	0	2	50

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO611.1:	Apply knowledge of mathematics, science and engineering
CO611.2:	To design a system, component or process to meet desired need within realistic constraints such as economics, environmental, social, political .ethical, health and safety, manufacturability and sustainability.
CO611.3:	Identify, formulate and solve engineering problems and have an understanding of professional and ethical responsibility.

LIST OF EXPERIMENTS:
1. Micrometer study using Gantt. Chart.
2. Study of different types of process charts,
3. Calculation of observed Normal and Standard time for an operation using stop watch by:-
   a) Continuous   b) SNAP-back timing.
4. To study the process capability of a machine.
5. Study and use of therbligs in describing an operation and for motion economy.
6. To study and analyse different types of quality control charts.

NOTE:
1. Additional lab/ experiment will be performed based on course content requirement.
2. Simulation/ virtual labs are used to enhance the practical ability of students.

Examination to be held in the Year May 2021,2022,2023,2024

CLASS: B.E. 6th SEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: ENGG. METROLOGY LAB.
COURSE NO.: PME-612
DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 1.5

			Marks
L	**T**	**P**	**Practical**
0	**0**	**3**	**75**

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO612.1:	Familiarise with the sine bars, hardness testing machines and other angular measurement techniques.
CO612.2:	Understand the concept of limits, fits and tolerances.
CO612.3:	Demonstrate the work in quality control departments of industries to ensure the quality of product.

LIST OF EXPERIMENTS:

1. To study the measuring tools and inspection tools i.e. gauges of different forms and their use, surface finish and its measurement.
2. To find out the accuracy of a machine product.
3. Limits, fits and tolerances and shaft and hole base system
4. Screw thread measurement.
5. To perform taper measurement using Sine bar and Sine Centre.
6. Calibration of measuring instruments.

NOTE:
1. Additional lab/ experiment will be performed based on course content requirement.
2. Simulation/ virtual labs are used to enhance the practical ability of students.

CLASS: B.E. 6th SEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: 3D PRINTING LAB.
COURSE NO.: PME-613
DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 1.5

	L	T	P	Marks Practical
	0	0	3	75

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO613.1:	Develop CAD models for 3D printing and import and export CAD data and generate .stl file..
CO613.2:	Select a specific material and a 3D printing process for the given application.
CO613.3:	Produce a product using 3D Printing.

LIST OF EXPERIMENTS:

1. To study the basic features of a 3D printing machine.
2. To study the different components of 3D printer.
3. To print a 3D model of nut/bolt using PLA material.
4. To print a 3D model of spanner using PLA material.
5. To print a 3D model of pyramid using PLA material.
6. To print a 3D model of gear using PLA material.
7. To print a 3D model of bearing using PLA material.
8. To print a 3D model of nut/bolt using ABS material.
9. To print a 3D model of spanner using ABS material.
10. To print a 3D model of pyramid using ABS material.
11. To print a 3D model of gear using ABS material.
12. To print a 3D model of bearing using ABS material.

NOTE:
1. At least six practical's should be performed.
2. Additional lab/ experiment will be performed based on course content requirement.
3. Simulation/ virtual labs are used to enhance the practical ability of students.

Examination to be held in the Year May 2021,2022,2023,2024

CLASS: B.E. 6th SEMESTER
BRANCH: MECHANICAL ENGINEERING   **CREDITS: 0**
COURSE TITLE: EMPLOYABILITY SKILL.
COURSE NO.: NCC-606   **Marks**
DURATION OF EXAMINATION: 3 HOURS.

	L	T	P	-
	2	0	0	

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO606.1:	Understand the basic concepts of Quantitative Ability, Verbal Reasoning and Logical Reasoning.
CO606.2:	Solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning and Verbal Ability
CO606.3:	Compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC, GPSC etc.

Detailed Syllabus
SECTION A
Quantitative Aptitude: Number System, Square Root & Cube Root, Percentages, Ratio & Proportions, HCF and LCM, Simple Interest, Compound Interest, Profit & Loss, Partnership, Average, Problem on Ages, Time & Distance, Time & Work, Boats & Streams, Problems on trains, Alligation or Mixture, Volume & Surface Area, Data Interpretation.

SECTION B
General Intelligence & Reasoning: Alphanumeric Series, Coding & Decoding, Seating Arrangement, Blood Relations, Puzzles, Syllogism, Inequalities, Input Output.

RECOMMENDED BOOKS:

1. Quantitative Aptitude for Competitive Exams   R S Aggarwal

2. Quantitative Aptitude for CAT   Arun Sharma
3. Verbal & Non-Verbal Reasoning   R S Aggarwal
4. Analytical Reasoning   M K Pandey

Evaluation of the course:
There will be internal evaluation based on two internal sessional and viva -voce.