UNIVERSITY OF JAMMU

NOTIFICATION
(24/Aug./Adp/58)

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the Competent Bodies, has been pleased to authorize the adoption of the revised Syllabi and Courses of Studies in **Bachelor of Technology (B. Tech) in Mechanical Engineering** for Semester V to VIII under the **Credit Based System** as per the new **AICTE Model Curriculum** adopted from batch 2022 and onwards **(as given in the Annexure)** for the candidates of **Govt. /Pvt. Engineering Colleges affiliated with the University of Jammu** for the Examinations to be held in the years indicated against each Semester as under:-

Branch	Semester	For the Examination to be held in the years
Mechanical	Semester-V	Dec. 2024, 2025, 2026, and 2027
	Semester-VI	May 2025, 2026, 2027 and 2028
	Semester-VII	Dec. 2025, 2026, 2027 and 2028
	Semester-VIII	May 2026, 2027, 2028 and 2029

The Syllabi of the course is available on the University Website: www.jammuuniversity.in.

-Sd/
DEAN ACADEMIC AFFAIRS

No. F.Acd/III/24/ 8628-38
Dated:8/08/2024

Copy for information & necessary action to:-
1. Dean Faculty of Engineering
2. Principal, GCET/MBSCET /UIET/BCET/YCET
3. C.A to the Controller of Examinations
4. Joint /Assistant Registrar (Exams Prof. /Eval Prof /Confidential)
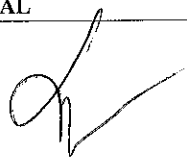5. Incharge University Website for uploading the same in the University Website.
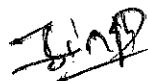
Deputy Registrar (Academic)

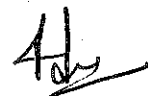# B.Tech. Mechanical Engineering 5th Semester
Examination to be held in the Year December 2024, 2025, 2026, 2027

B. Tech. Mechanical Engineering 5th Semester   **Contact Hours: 24**

COURSE CODE	COURSE TYPE	COURSE TITLE	LOAD ALLOCATIONS			MARKS DISTRIBUTION		TOTAL MARKS	CREDITS	% CHANGE
			L	T	P	INTERNAL	EXTERNAL			
MOC-5501	Massive Open Online Course	SWAYAM/NPTEL	2	1	0	-----	100	100	3	100%
MET-5501	Professional Core Course	Fluid Machinery	2	1	0	25	75	100	3	100%
EET-2505	Professional Core Course	Basic Electrical Engineering	2	1	0	25	75	100	3	100%
MET-5502	Professional Core Course	Machine Design	2	1	0	25	75	100	3	100%
MET-5503	Professional Core Course	Material Science & Metallurgy	2	1	0	25	75	100	3	100%
CSO-3505		Python Programming	2	1	0					
ECO-1505		Introduction to Internet of Things	2	1	0					
EEO-2505	Open Elective Course	Non-Conventional Energy sources and Instrumentation	2	1	0	25	75	100	3	100%
CEO-6505		Essentials of Civil Engineering	2	1	0					
ITO-4505		Linux Programming	2	1	0					
MEP-5511	Professional Core Course	Fluid Machinery Lab.	0	0	2	25	-	25	1	100%
MEP-5512	Professional Core Course	Material Science and Metallurgy Lab.	0	0	2	25	-	25	1	100%
CSO-3515		Python Programming Lab								
ECO-1515		Introduction to Internet of Things Lab								
EEO-2515	Open Elective Course	Non-Conventional Energy sources and Instrumentation Lab	0	0	2	25	-	25	1	100%
CEO-6515		Essentials of Civil Engineering Lab								
ITO-4515		Linux Programming Lab								
SIT-5511	Summer Internship Training	Summer Training-I	0	0	0	25	-	25	1	100%
TOTAL			12	06	06	225	475	700	22	

REMARKS:

1. New course entitled **Fluid Machinery** having course code (**MET-5501**) has been introduced.
2. The Course Code of the course titled **SWAYAM/NPTEL** changed from **MOC-506 to MOC-5501.**
3. The Course Code of the course titled **Machine Design** changed from **PME-502 to MET-5502.**
4. Interdisciplinary course titled **Basic Electrical Engineering** having code changed from **EEE-501 to EET-2505.**
5. New course entitled **Material Science and Metallurgy** and its lab having course code (**MET-5503**) **and** (**MEP-5512**) has been introduced.
6. Interdisciplinary open elective course titled Python Programming (**CSO-3505**), Introduction to Internet of Things (**ECO-1505**), Non-Conventional Energy sources and Instrumentation (**EEO-2505**), Essentials of Civil Engineering (**CEO-6505**) and Linux Programming (**ITO-4505**) has been introduced to incorporate multidisciplinary courses as per NEP.
7. Interdisciplinary open elective lab titled Python Programming Lab (**CSO-3515**), Introduction to Internet of Things Lab (**ECO-1515**), Non-Conventional Energy sources and Instrumentation Lab (**EEO-2515**), Basic Civil Testing Lab (**CEO-6515**) and Linux Programming Lab (**ITO-4515**) has been introduced.
8. Marks distribution for theory subjects has been changed. There will be 25 marks for internal assessment and 75 marks for external assessment.
9. There is change in allotment of credits to theory courses. **Fluid Machinery (MET-5501), Basic Electrical Engineering (EET-2505) & Machine Design (MET5502)** has been reduced from 4 credits to 3 credits.
10. The Course code of **Fluid Machinery Lab** has been changed from PME-511 to **MEP-551.**
11. Industrial training-I having code PIT-506 has been replaced by the course titled **Summer Training-I** with code **SIT-5511.**

②

Item No-02

Resolved the syllabus of B.Tech.6th Semester starting from session 2024 of Mechanical Engineering branch:-

B.Tech. 6th Semester Mechanical Engineering Examination to be held in the Year May 2025, 2026, 2027, 2028

COURSE CODE	COURSE TYPE	COURSE TITLE	LOAD ALLOCATIONS			MARKS DISTRIBUTION		TOTAL MARKS	CREDITS	% CHANGE
			L	T	P	INTERNAL	EXTERNAL			
MET-5601	Professional Core Course	Quality and Reliability Engineering	2	1	0	25	75	100	3	100%
MET-5602	Professional Core Course	Industrial Engineering	2	1	0	25	75	100	3	100%
MET-5603	Professional Core Course	Mechatronics	2	1	0	25	75	100	3	100%
MET-5604/ MOOC 5601	Professional Elective Course / Massive Open Online Course	Maintenance Engineering	2	1	0	25	75	100	3	100%
		SWAYAM/NPTEL				0*	100*			
MET-5605	Professional Core Course	Automobile Engineering	2	1	0	25	75	100	3	100%
HMT-7601	Humanities & Social Science & management course	Fundamentals of Economics	2	1	0	25	75	100	3	100%
MOC-5611	Massive Open online course	MOOC	0	0	2	25	--	25	1	100%
MEP-5611	Professional Core Course	Mechatronics Lab	0	0	2	25	-	25	1	100%
MEP-5612	Professional Core Course	Automotive Lab	0	0	2	25	-	25	1	100%
TOTAL			12	6	6	225/200*	450/475*	675	21	

*In case of SAYAM/NPTEL

REMARKS:

1. The Course Code of the course titled **Quality and Reliability** changed from **PME-601 to MET-5601.**
2. The Course Code of the course titled **Industrial Engineering** changed from **PME-602 to MET-5602.**
3. The Course Code of the course titled **Mechatronics** is changed from **PME-603 to MET-5603.**
4. A new Lab of course titled Mechatronics Lab has been introduced having code **MEP-5611**
5. New course entitled **Automobile Engineering** and its lab entitled **Automotive lab** having course code **MET-5605 and MEP-5612** has been introduced.
6. Interdisciplinary course titled **Managerial Economics** having code **HMC-601** has been renamed as **Fundaments of Economics** having code **HMT-7601.**
7. A new course titled **Maintenance Engineering** having code **MET-5604** has been introduced with an either option of **SWAYAM/NPTEL** having code **MOOC-5601.**
8. A massive open online course **(MOOC)** having code **MOC-5611** has been introduced.
9. **Internal Marks for all theory and labs (including MOOC)** has been reduced to 25 marks from 50 marks and external marks will be 75 for theory examination **(except 100 marks for SWAYAM/NPTEL).**
10. There is change in allotment of credits to theory and lab courses. The theory courses entitled **Quality and Reliability (MET-5601), Industrial Engineering (MET-5602) & Mechatronics (MET-5603)** has been reduced from 4 credits to 3 credits. In addition to it, **MOOC (MOC-5611), Mechatronics lab (MEP-5611) and Automotive lab (MEP-5612)** have been allotted 1 credit.

Rita Sharma
19/07/2024

(4)

Resolved the syllabus of B.Tech.7th Semester starting from session 2025 of Mechanical Engineering branch:-

B.Tech. Mechanical Engineering 7th Semester Examination to be held in the Year
December 2025, 2026, 2027, 2028

COURSE CODE	COURSE TYPE	COURSE TITLE	LOAD ALLOCATIONS			MARKS DISTRIBUTION		TOTAL MARKS	CREDITS	% CHANGE
			L	T	P	INTERNAL	EXTERNAL			
MET-5701	Professional Course	CAD/CAM	2	1	0	25	75	100	3	100%
MET-5702	Professional Elective Course	Plant Layout and Material Handling	2	1	0	25	75	100	3	100%
MET-5703		Advance Manufacturing								
MET-5704		Production Planning and Control								
MET-5705	Professional Course	Refrigeration and Air conditioning	2	1	0	25	75	100	3	100%
MET-5706	Professional Elective Course/ Massive Open Online Course	Product Design &Development	2	1	0	25	75	100	3	100%
MET-5707		Engineering Metrology				0*	100*			
MOC-5701		SWAYAM/NPTEL								
HMT-7703	Humanities Elective Course	Entrepreneurship and Industrial Management	2	1	0	25	75			
HMT-7704		Organizational Behavior								
MEP-5711	Professional Core Course	CAD/CAM Lab	0	0	3	50	-	50	1.5	100%
MEP-5712	Professional Core Course	Refrigeration and Air conditioning Lab	0	0	2	25	-	25	1	100%
SEM-5711	Seminar	Seminar	0	0	4	50	-	50	2	100%
SIT-5711	Summer Internship Training	Summer Training-II	0	0	0	50	-	50	2	100%
NCC-5701	Non Credit course	Employability Skill	2	0	0	Satisfactory/Unsatisfactory			Non Credit	100%
TOTAL			12	5	09	300/275*	375/400*	675	21.5	

*In case of SWAYAM/NPTEL

MARKS:

1. The course entitled as **Computer Aided Design and Manufacturing has been renamed as CAD/CAM and its code is** changed from **PME-701(A) to MET-5701.**
2. The Course Code of the course titled **Plant Layout and Material Handling** has been **changed** from **PME-702(B) to MET-5702.**
3. The Course Code of the course titled **Production Planning and Control has** been changed from **PME-702(C) to MET-5704.**
4. The Course Code of the course titled **Refrigeration and Air Conditioning and its lab** changed from **PME-703(C) to MET-5705 and PME-714 to MET-5712**
5. The lab titled **Computer Aided Design and Manufacturing lab** has been renamed as **CAD/CAM lab and its code is** changed from **PME-715 to MET-5711.**
6. A new course entitled **Advanced Manufacturing** with course code **MET-5703** has been introduced.
7. A new course entitled **Product Design and Development** with course code **MET-5706** has been introduced.
8. New course entitled **Engineering Metrology** with course code **MET-5707** has been introduced.
9. The Course Code of **Seminar** has been changed from **SEM-705 to SEM-5711**
10. Interdisciplinary course titled **Industrial Management** has been renamed as Entrepreneurship and Industrial Management and its code has been changed from **HMC-702 to HMT-7703.** Also the course code of the course titled **Organizational Behavior** has been changed from **HMC-702 to HMT-7704.**
11. Industry Training-II is renamed as **Summer Training- II** and is assigned code as **SIT-5711.**
12. A non-credit course entitled **Employability Skills** with course code **NCC-5701** has been introduced.
13. There is change in allotment of credits to theory courses. The theory courses entitled **CAD/CAM (MET-5701), Plant Layout and Material Handling (MET-5702), Additive Manufacturing (MET-5703), Production Planning and Control (MET-5704), Engineering Metrology (MET-5707), Industrial Management (MET-7703), Organizational Behavior (MOC-7704) and SWAYAM/NPTEL (MOC-5701)** has been allotted 3 credits.
14. In addition to it, **Summer Training -II (SIT-5711), Seminar (SEM-5711) and RAC lab (MEP-5712)** have been allotted 1 credit.
15. Also, there is enhancement in credits for **CAD/CAM lab** from **1 to 1.5 Credits.**

Ritu Sharma
19/07/2024

6

B.Tech. Mechanical Engineering 8ᵗʰ Semester Examination to be held in the Year May 2026, 2027, 2028, 2029

SCHEME-I

Course Code	Course Type	Course Title	Load Allocations			Marks Distribution		Total Marks	Credits	% Change
			L	T	P	Internal	External			
MET-5801	Professional Elective Course/ Massive Open Online Course	Optimization Techniques	2	1	0	25	75	100	3	100%
MET-5802		Tribology								
MOC-5801		SWAYAM/NPTEL				0*	100*			
MET-5803	Professional Core Course	Additive Manufacturing	2	1	0	25	75	100	3	100%
PRJ-5811	PROJECT	Project	0	0	16	150	50	200	8	100%
MOC-5811	Massive Open Online Course	MOOC	0	0	2	25	0	25	1	100%
MEP-5811	Professional Core Course	3D Printing Lab	0	0	2	25	0	25	1	100%
NCC-5801	Non Credit Course	Disaster Management	2	0	0	Satisfactory/Unsatisfactory			Non-Credit	100%
TOTAL			06	02	20	250/225*	200/225*	450	16	

*In case of SWAYAM/NPTEL.

OR

SCHEME-II

Course Code	Course Type	Course Title	Load Allocations			Marks Distribution		Total Marks	Credits	% Change
			L	T	P	Internal	External			
PII-5811	Professional Industry Internship	Industry Internship	0	0	24	325	100	425	15	100%
MOC-5811	Massive Open Online Course	MOOC	0	0	2	25	0	25	1	100%
TOTAL			0	0	26	350	100	450	16	

⑦

P MARKS:

SCHEME-I

1. The Course Code of the course titled **Optimization Techniques** has been **changed** from **PME-801(A)** to **MET-5801.**
2. The Course Code of the course titled **Tribology has** been changed from **PME-801(C)** to **MET-5802.**
3. New course entitled **Additive Manufacturing** with course code **MET-5803** has been introduced.
4. Massive Open Online Course is divided into **SWAYAM/NPTEL** having code **MOC-5801** and **MOOC** with code **MOC-5811** with 3 **credits and 1 credit** respectively.
5. The Course Code of the Project work has been changed from **PRJ-805** to **PRJ-5811 with 8 credits.** The mentioned course has 150 marks for internal and 50 marks for external evaluation.
6. New course entitled **Additive Manufacturing** with course code **MET-5803** has been introduced.
7. New lab entitled **3D Printing Lab** with course code **MEP-5811** has been introduced.
8. There will be 3 credits for courses viz. **Optimization Techniques (MET-5801), Tribology (MET-5802), Additive Manufacturing (MET-5803).**
9. The Course Code of the non-credit course entitled **Disaster Management has** been changed from **NCC-806** to **NCC-5801.**

SCHEME-II

1. The Course Code of the course titled Professional Industry Internship has been **changed** from **PII-805** to **PII-5811.**
2. The Course Code of Massive Open Online Course titled **MOOC** has been changed from **MOC-805** to **MOC-5811.**
3. The course entitled **Professional Industry Internship (PII-5811) and MOOC** with code **(MOC-5811)** have been allotted **15 credits and 1 credit** respectively

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B.Tech. Mechanical Engineering 5th Semester
Examination to be held in the Year December 2024, 2025, 2026, 2027

B. Tech. Mechanical Engineering 5th Semester   **Contact Hours: 24**

COURSE CODE	COURSE TYPE	COURSE TITLE	LOAD ALLOCATIONS			MARKS DISTRIBUTION		TOTAL MARKS	CREDITS	% CHANGE
			L	T	P	INTERNAL	EXTERNAL			
MOC-5501	Massive Open Online Course	SWAYAM/NPTEL	2	1	0	-----	100	100	3	100%
MET-5501	Professional Core Course	Fluid Machinery	2	1	0	25	75	100	3	100%
EET-2505	Professional Core Course	Basic Electrical Engineering	2	1	0	25	75	100	3	100%
MET-5502	Professional Core Course	Machine Design	2	1	0	25	75	100	3	100%
MET-5503	Professional Core Course	Material Science & Metallurgy	2	1	0	25	75	100	3	100%
CSO-3505		Python Programming	2	1	0					
ECO-1505		Introduction to Internet of Things	2	1	0					
EEO-2505	Open Elective Course	Non-Conventional Energy sources and Instrumentation.	2	1	0	25	75	100	3	100%
CEO-6505		Essentials of Civil Engineering	2	1	0					
ITO-4505		Linux Programming	2	1	0					
MEP-5511	Professional Core Course	Fluid Machinery Lab.	0	0	2	25	-	25	1	100%
MEP-5512	Professional Core Course	Material Science and Metallurgy Lab.	0	0	2	25	-	25	1	100%
CSO-3515		Python Programming Lab								
ECO-1515		Introduction to Internet of Things Lab								
EEO-2515	Open Elective Course	Non-Conventional Energy sources and Instrumentation Lab	0	0	2	25	-	25	1	100%
CEO-6515		Essentials of Civil Engineering Lab								
ITO-4515		Linux Programming Lab								
SIT-5511	Summer Internship Training	Summer Training-I	0	0	0	25	-	25	1	100%
	TOTAL		12	06	06	225	475	700	22	

BRANCH: MECHANICAL ENGINEERING
CLASS: 5th Semester
COURSE TITLE: SWAYAM/ NPTEL
COURSE CODE: MOC-5501
DURATION OF EXAMINATION: 3 HOURS

CREDITS: 3

L	T	P	Marks	
			External	Internal
2	1	0	100	0

The department shall offer the 12 weeks NPTEL course, out of the list of courses listed by NPTEL around the time of commencement of the semester.

The courses offered shall be related to the core stream but 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 faculty Incharge of the department.

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

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

Note :- The Course is declared pass in the semester only after the production of the NPTEL Certificate, by the student.

The marks obtained by the student in the NPTEL certification course will be tabulated by the concerned department.
The students must select their College name from the drop down box while registering for a particular course. Only those certificates will be accepted and validated by the department whose information will be shared by NPTEL to college authorities.

No certificate will be accepted without this and student will be marked absent in the college record.

In case the student does not pass the certification exam or remains absent in the proctored examination, no certificate will be awarded by NPTEL and hence the student will be deemed to have failed in the said Course.

The student has to appear again in the NPTEL examination conducted either in the same course or any other course as per the next semester schedule of NPTEL and earn the certificate by passing the exam.

BRANCH: MECHANICAL ENGINEERING
CLASS: 5TH SEMESTER
COURSE TITLE: FLUID MACHINERY
COURSE CODE: MET-5501
DURATION OF EXAMINATION: 3 HOURS

CREDITS: 3

L	T	P	Marks	
			External	Internal
2	1	0	75	25

COURSE OUTCOMES

On completion of the course the students will be able to:

CO1	Calculate forces and work done by a jet on fixed or moving plate and curved plates.
CO2	Know the working of turbines and select the type of turbine for an application
CO3	Discuss the characteristics of centrifugal pump and reciprocating pumps.
CO4	Do the analysis of air compressors and select the suitable one for a specific application.

Detailed Syllabus

SECTION-A

Force due to a jet on a curved plate, Velocity diagram for axial and radial flow turbine blades, Work output and efficiency, Pelton turbine, main components nozzle and jet diameters, mean diameter of Pelton runner, jet ratio, minimum number of buckets, work done, power developed and turbine efficiencies, Governing of impulse turbines.

[10 Hours]

Reaction turbine, Francis turbine, main components, design of spiral casing guide vanes, runner and number of runner blades, types of Francis runners, Kaplan turbine, velocity diagram power and efficiency calculations, draft tube, cavitation factor, Governing of reaction turbines. Principles of similarity: unit and specific quantities, performance characteristics, selection, of water turbines, hydro-electric power plants.

[12 Hours]

SECTION-B

Rotodynamic pumps, classification, centrifugal pumps, specific speed, velocity diagrams, heads, power and efficiency, special features of propeller and mixed flow pumps, Positive displacement pumps, reciprocating pump, Indicator diagram, effect of friction and acceleration, Theory of air vessel, Hydraulic systems and power transmission, pumps and other devices used in hydraulic systems, Gear pump, vane pump, screw pump, pressure intensifier, Hydraulic coupling, torque converter and dynamometer, Hydraulic power transmission.

[12 Hours]

Air compressors, working principle and types, compression ratios and efficiency, capacity control, energy efficiency in compressed air systems, applications, safety considerations, Industry standards and regulations.

[10 Hours]

RECOMMENDED BOOKS:

1. Massey, B.S., "Mechanics of Fluid", 6th Edition, Van Nostrand Reinhold co., 1968.
2. Jagdish, L., "Hydraulic Machines including Fluidics", Mertopolitan Books co. Pvt. Ltd., 1997
3. Guthrie, Brown, "Hydroelectric Engineering Practice, CBS Publishers, New Delhi, 1993.
4. Douglas, Gasiorek, Swaffield, "Fluid Mechanics", Pearson Education, , 2007.
5. Kumar, D.S., "Fluid Mechanics & Fluid Power Engineering", S.K. Kataria & Sons., New Delhi, 2008.

NOTE:

1. There will be 8 questions in all, four from Section-A (each of 15 marks) and four from Section-B (each of 15 marks).
2. Students are required to attempt five questions in all, at least two questions from each section.
3. Use of scientific calculator will be allowed in the examination hall.

B.Tech. Mechanical Engineering 5th Semester Examination to be held in the Year
December 2024, 2025, 2026, 2027

BRANCH: MECHANICAL ENGINEERING
CLASS: 5TH SEMESTER
COURSE TITLE: BASIC ELECTRICAL ENGINEERING
COURSE CODE: EET-2505
DURATION OF EXAMINATION: 3 HOURS

CREDITS: 3

L	T	P	Marks	
			External	Internal
2	1	0	75	25

COURSE OUTCOMES:-	
At the end of the semester the Student will be able to	
CO1	Understand and analyze the DC, AC circuits.
CO2	Understand the concept of three phase circuit.
CO3	Understand the working principle of transformer and electrical machines
CO4	Understand the electrical components installation for low-voltages.

Detailed Syllabus

SECTION-A

Module1: 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, The venin and Norton Theorems. **(6hours)**

Module2: AC Circuits: Representation of sinusoidal wave forms, 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, R L, R C, R L C combinations (series and parallel) and resonance. **(6hours)**

Module3: 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

Module4: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. **(6hours)**

Module5: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)**

Module6:Electrical Installations: Components of LT Switch gear: 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.Kothariand J.J.Nagrath,"Basic Electrical Engineering",Tata McGraw Hill.
2. D. C Kulshreshtha,"Basic Electrical Engineering', Mc Graw 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: There will be Eight questions of 15 marks each, four from each section. Students are required to attempt five questions selecting atleast two questions from each section. Use of calculator is allowed.

B.Tech. Mechanical Engineering 5th Semester Examination to be held in the Year December 2024, 2025, 2026, 2027

BRANCH: MECHANICAL ENGINEERING
CLASS: 5th SEMESTER
COURSE TITLE: MACHINE DESIGN
COURSE CODE: MET-5502
DURATION OF EXAMINATION: 3 HOURS

CREDITS: 3

L	T	P	Marks	
			External	Internal
2	1	0	75	25

COURSE OUTCOMES	
On completion of the course the students will be able to:	
CO1	Understand the appropriate and traditional use of the engineering and machine design fundamentals and demonstrate knowledge on basic machine elements used in machine design.
CO2	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.
CO3	Understand the design procedure of various machine elements.
CO4	Selection of various materials for design and design machine element to withstand load and deformation for given application.

Detailed Syllabus

SECTION–A

Introduction to Design procedures and design requirements, selection of materials and manufacturing considerations in design, theories of failure, stress concentration, cyclic loading and endurance limit.

[10 Hours]

Design of machine elements: Riveted joints, welded joints, Cotter and knuckle joints, Key and coupling, Shafts and Levers, Design of Flat Belt Drives, Clutches like single and multiple disc, brakes like single and pivoted block, Design and selection of sliding and roller bearings.

[12 Hours]

SECTION-B

Gear Drives: Classification &selection of type of gears, law of gearing, standard systems of gear tooth, interference and undercutting, backlash.
Spur Gears, Helical Gears, Bevel Gears, Worm Gears: Geometry and nomenclature, force analysis, beam strength, effective load on gear tooth, wear strength, thermal considerations and design procedure.

[12 Hours]

I.C. Engine Components: Design of cylinder, design of studs for cylinder head, design of piston, design of crank shaft, design of connecting rod.
Flywheel: Flywheel materials, torque analysis, coefficient of fluctuation of energy, design of solid disc and rimmed flywheel.
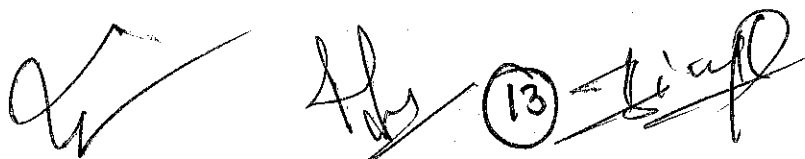
[8 Hours]

RECOMMENDED BOOKS:

1. Machine Design : Black & Adam –Tata McGraw Hill
2. Machine Design : Shigley
3. Machine Design : Sunderajamurthy & Shanmugam – Khanna Publisher
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 15 marks) and four from Section – B (each of 15 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.

B.Tech. Mechanical Engineering 5th Semester Examination to be held in the Year

December 2024, 2025, 2026, 2027

BRANCH: MECHANICAL ENGINEERING

CLASS: 5th SEMESTER

COURSE TITLE: MATERIAL SCIENCE AND
METALLURGY

COURSE CODE: MET-5503

DURATION OF EXAMINATION: 3 HOURS

CREDITS: 3

L	T	P	Marks	
			External	Internal
2	1	0	75	25

COURSE OUTCOMES	
On completion of the course the students will be able to:	
CO1	Understand the crystalline structure of different metals and study the stability of phases in different alloy systems.
CO2	Study the behaviour of ferrous and non-ferrous metals and alloys and their applications in different domains
CO3	To understand the effect of heat treatment, addition of alloying elements on properties of ferrous metals
CO4	To study and analyse different metal failure and deformation mechanisms
CO5	To acquire basic knowledge of properties of materials and their testing procedures.

Detailed Syllabus
SECTION–A

Structure of Crystalline Solids: Crystal structure and crystal systems, closed packing, some prominent crystal structures, Miller indices, determination of crystal structure, reciprocal lattice.

Imperfections in Solid: Points imperfections and their equilibrium concentration, edge and screw dislocations, Burgers vector and the dislocation loop, stress field and energy of dislocation, Dislocation multiplication.

[10 hrs]

Phase : Equilibrium between phases, Gibb's phase rule, Solid solutions: Interstitial, Substitutional, Ordered and disordered types, Hume-Rothery rules, Iron carbon diagram with peritectic and eutectoid reactions, Steels: types and applications, microstructures properties as a function of microstructures. Cooling curves and equilibrium diagrams for brass and aluminium alloys.

[12 hrs]

SECTION-B

T-T-T-Diagram and its uses: Heat Treatment of Carbon steel, Annealing, Normalising, Hardening, Tampering, Austempering, Martempering, etc. Case hardening, Surface treatment of steel, Hot dipping, Electroplating, Impregnation, Metal spraying, Metal facing and cladding.

Failure of metals: Creep, Mechanism of creep, Creep curves, Creep resistance materials, Fracture, Brittle fracture, Griffith's theory, Ductile fracture, Ductile- brittle transition, Protection against fracture, Fatigue, Mechanism of fatigue, S.N. curves.

[11 hrs]

Deformation of metals: Elastic, Inelastic and visco elastic behaviour, Plastic deformation, Mechanism of slip: Slip planes and slip directions,strengthening mechanisms: Work hardening, Grain boundary hardening, Precipitation hardening Recovery, Recrystallization and grain growth.

Material properties and testing: Basic concepts of materials properties like hardness, ductility, toughness and resilience etc .Mechanical Testing: Tension test, Hardness tests, Torsion test, Impact Test, Creep & Fatigue Testing.
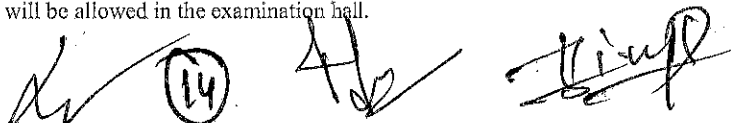
[11 hrs]

RECOMMENDED BOOKS:

1. Material Science and Metallurgy   Dr. V.D.kodgire – Everest Publishing House
2. Materials Science and engineering   Callister & Balasubramanian- Wiley Publications
3. Material Science for Engineering students   Fischer – Elsevier Publishers
4. Material science and Engineering   V. Raghavan-PHI Publishers
5. Material Science and Metallurgy   A V K Suryanarayana – B S Publications
6. Material Science and Metallurgy   U. C. Jindal – Pearson Publication

NOTE:
1. There will be 8 questions in all, four from **Section-A** (each of 15 marks) and four from **Section–B** (each of 15 marks).
2. Students are required to attempt five questions in all, atleast two questions from each section
3. Use of scientific calculator will be allowed in the examination hall.

CLASS: B.Tech. 5th SEMESTER   CREDITS: 3
BRANCH: E&C/IT/Mechanical/Civil/Electrical
COURSE NO. CS0-3505

L	T	P	External	Internal
2	1	0	75	25

COURSE TITLE: PYTHON PROGRAMMING

DURATION OF EXAM: 3 HOURS

COURSE OUTCOMES	
At the end of the course the student will be able to: -	
CO1	Describe the syntax and semantics of Python programming language.
CO2	Understand the use of loops and decision-making statements to solve problems.
CO3	Identify the methods to create and manipulate lists, tuples and dictionaries.
CO4	Demonstrate proficiency in handling and creation of functions.

Detailed Syllabus
Section-A

Introduction to Python: Introduction to Python, history of Python, Unique features of Python, Python Syntax compared to other programming languages, First Python Program.   **(4Hours)**

Beginning Python Basics: Python Identifiers, Keywords and Indentation, Python Data Types, The Integer, Floating-Point, and String Data Types, String Operations in Python, Storing Values in Variables, Comments, Simple Input & Output, Operators in python.   **(7 Hours)**

Flow control: Boolean Values, Comparison Operators, Boolean Operators, Mixing Boolean and Comparison Operators, Indentation, The If statement and its related statement, an example with If and its related statement, the while loop, the for loop, the range statement, Break & Continue, Examples for looping   **(7 Hours)**

Section – B
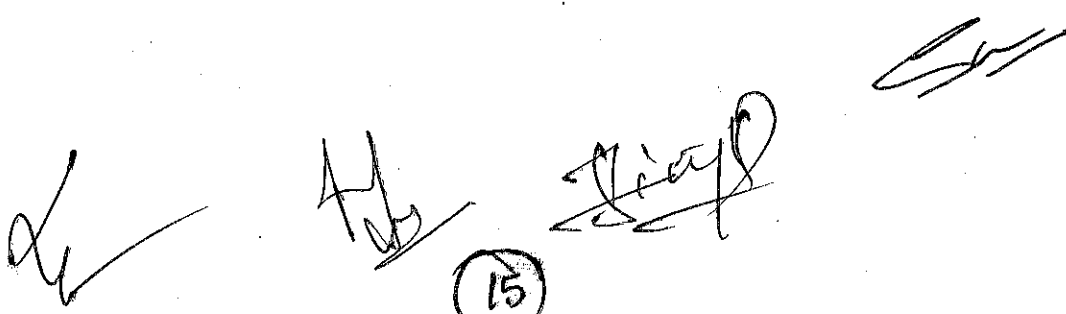
Python Data Structures: Lists: Definition and syntax, Indexing and slicing, List methods (e.g., append(), extend(), insert(), remove(), pop(), clear(), index(), count(), sort(), reverse()), Iterating through lists; Tuples: Definition and syntax, Immutable nature, Accessing elements, Tuple methods (e.g., count(), index()); Dictionaries: Definition and syntax, Key-value pairs, Accessing elements by key, Adding, updating, and deleting key-value pairs, Dictionary methods (e.g., keys(), values(), items()), Iterating through dictionaries.   **(10 Hours)**

Functions in Python: Function definition, Function calling, Return statement, Scope, Default arguments, Variable-length arguments (Using *args and **kwargs), Docstrings, Lambda functions, Recursion, Function composition, Built-in functions (like print(), input(), len(), range(), map(), filter(), sorted())   **(10 Hours)**

BOOKS RECOMMENDED:
1. Gowrishankar S, Veena A, "Introduction to Python Programming", 1st Edition, CRC Press/Taylor & Francis, 2018. ISBN-13: 978-0815394372

NOTE: There will be eight questions of 15 marks each, four from each section. Students are required to attempt five questions selecting at least two questions from each section. Use of Calculator is allowed.

B.Tech. Mechanical Engineering 5th Semester Examination to be held in the Year

December 2024, 2025, 2026, 2027

C ASS: B.E. 5th SEMESTER

BRANCH: CSE/IT/Mechanical/Civil/Electrical

COURSE NO: ECO-1505

COURSE TITLE: Introduction to the Internet of Things

DURATION OF EXAM: 3 HOURS

CREDITS:3

L	T	P	Theory	Sessional
2	1	0	75	25

Course Outcome (CO)	
At the end of the semester, the students will be able to	
CO 1	Demonstrate basic concepts, principles, and challenges in IoT.
CO 2	Illustrate the functioning of hardware devices and sensors used for IoT.
CO 3	Analyze network communication aspects and protocols used in IoT.
CO 4	Apply IoT for developing real-life applications using Arduino programming.

Detailed Course Syllabus:

Section-A

Unit-I Introduction to IOT

Vision, Definition, Conceptual framework, Architecture view, Sources of IoT, Understanding IoT fundamentals, IOT Architecture and communication protocols, Various Platforms for IoT and cloud computing benefits, Real-time examples of IoT, Overview of IoT components and IoT Communication Technologies, Challenges in IoT **(10 Hours)**

Unit-II Arduino Simulation Environment

Arduino Uno Architecture and platform Board Anatomy, Setup the IDE, coding using an emulator. Overview of IOT- supported Hardware platforms such as Raspberry pi, and ARM cortex. **(06Hours)**

Unit-III Sensor & Actuators with Arduino

Overview of Sensors working, Analog and Digital Sensors, Actuators, Interfacing of Temperature, Humidity, Motion, Light and Gas Sensor with Arduino, Interfacing of Relay Switch and Servo Motor with Arduino. Interfacing LED, push button, buzzer with Arduino along with LCD and DC motor. **(08 Hours)**

Section-B

Unit-IV Basic Networking with ESP8266 Wi-Fi module

Basics of Wireless Networking, Introduction to ESP8266 Wi-Fi Module, Various Wi-Fi libraries, Web server- introduction, installation, configuration, posting sensor(s) data to the web server platforms, Thing Speak API and MQTT, Interfacing ESP8266 with Web services. **(11 Hours)**

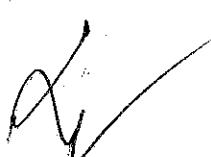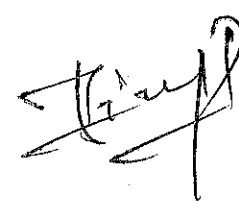**Unit V -Challenges in IoT Design challenges:**

Development Challenges, Security Challenges, Other challenges IoT Applications: Smart Metering, E-health, City Automation, Automotive Applications, home automation, smart cards, communicating data with H/W units, mobiles, tablets, Designing of smart street lights in a smart city. **(10Hours)**

Textbooks:

1. Olivier Hersent, David Boswarthick, Omar Elloumi "The Internet of Things key applications and protocols", Willey
2. Boswarthick, Omar Elloumi "The Internet of Things key applications and protocols", Willey
3. Jeeva Jose, Internet of Things, Khanna Publishing House
4. Michael Miller "The Internet of Things" by Pearson
5. Raj Kamal "INTERNET OF THINGS", McGraw-Hill, 1ST Edition, 2016
6. Arshdeep Bahga, Vijay Madisetti "Internet of Things (A hands-on approach)" 1ST edition, VPI publications,2014

NOTE: There shall be a total 8 questions, four from each section. Each question carries 15 marks. Five questions have to be attempted by the students selecting at least two questions from each section. Use of a calculator is allowed.

B.Tech. Mechanical Engineering 5th Semester Examination to be held in the Year
December 2024, 2025, 2026, 2027

CLASS: B.Tech. 5th SEMESTER   CREDITS: 3
BRANCH: E&C/Computers/IT/Mechanical/Civil
COURSECODE: EEO-2505
TITLE: NON CONVENTIONAL ENERGY SOURCES
AND INSTRUMENTATION
DURATION OF EXAM: 3 HOURS

L	T	P	Theory	Sessional
2	1	0	75	25

Course Outcomes: Student will be able to	
CO1	Understand the need of energy, Various types of energy and scenario.
CO2	Identify non-conventional energy as alternate form of energy and to know how it can be tapped.
CO3	Understanding various methods of measurement and instrumentation.
CO4	Understanding different types of wattmeter and their errors.

SECTION-A

Module 1: Introduction: Limitations of conventional energy sources need & growth of alternate energy sources, basic schemes and applications of direct energy conversion. Photovoltaic effect, characteristics of photovoltaic cells, conversion efficiency, solar batteries and applications. Solar energy in India, solar collectors, solar furnaces & applications. Geothermal system, Characteristics of geothermal resources, choice of generators, electric equipment and precautions. Low head hydro plants, definition of low head hydropower, choice of site and turbines.   **(12 hrs)**

Module 2: Wind Energy & MHD Generators: History of wind power, wind generators, theory of wind power, characteristics of suitable wind power sites, scope in India. Basic Principles and Half effect, generator and motor effect, different types of MHD generators, conversion effectiveness. Practical MHD generators, applications and economic aspects.   **(10 hrs)**
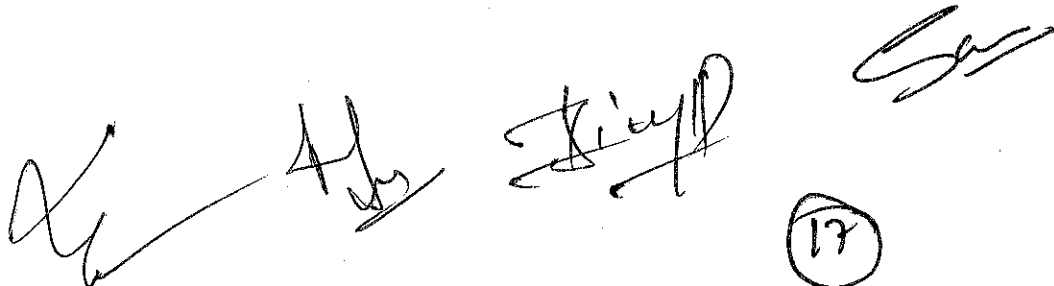
SECTION-B

Module 3: MEASURING INSTRUMENTS: Classification, effects utilized in measuring instruments .Indicating instruments: Deflection, controlling and damping forces, various damping's. Measurement of low resistance: - Potentiometer method, Kelvin double bridge. Ammeters and Voltmeters: Moving coil, moving iron ammeter and voltmeters, Errors in Ammeters and Voltmeters.   **(11 hrs)**

Module 4: MEASUREMENT OF POWER: Wattmeter measurement in single phase A.C. circuits, Watt meter errors. Measurement of three phase power by two watt meter methods. Energy meters for A.C. circuits, Theory of Induction type meters.   **(10hrs)**

RECOMMENDEDBOOKS:

1. Non-conventional Energy Resources   D.S. Chauhan
2. Conventional energy sources   G.D. Rai
3. Non-Conventional energy sources   B.H. Khan
4. Solar Energy Fundamentals and Applications   H.P. Gargand Jai Prakash
5. A course in Electrical and Electronics Measurement & instrumentation   A.K. Sawhney

NOTE: There will be eight questions of 15 marks each, four from each section. Students are required to attempt Five questions selecting at least two questions from each section. Use of calculator is allowed.

CLASS	5th SEMESTER						
BRANCH	E&C/ELECTRICAL/COMPUTERS/IT/MECHANICAL ENGINEERING						
COURSE TITLE	ESSENTIALS OF CIVIL ENGINEERING						
COURSE NO.	CEO-6505	L	T	P	Marks		
DURATION OF EXAM	3 HOURS	2	1	0	Theory	Sessional	Credit
					75	25	3

COURSE OUTCOMES:	
On completion of the course the students will be able to:	
CO1	Able To Identify The Properties Of Building Materials.
CO2	Perform various tests on building materials.
CO3	Acquaint With The Masonry Construction And Finishes
CO4	Carry Out Surveying In The Field For Engineering Projects.

SECTION-A

Brick: Classification of Bricks, Constituents of Good Brick Earth, Harmful Ingredients, Manufacturing of Bricks, Testing of Bricks.

Timber: Classification of Timber, Structure of Timber, Seasoning of Timber, Defects in Timber and Prevention Of Timber.

Aggregates: Classification of Aggregates and Various Tests Conducted On Aggregates

Cement: Composition of Cement, Types of Cement, Manufacturing of Cement, Tests On Cement.

Concrete: Grades Of Concrete, Strength Of Concrete, RMC (Manufacturing Of RMC, Transportation), Tests On Concrete.

(20 hrs)

SECTION-B

Masonry Construction Introduction: Various Terms Used, Stone Masonry-Dressing of Stones, Classifications of Stone Masonry, Safe Permissible Loads, Brick Masonry-Bonds in Brick Work, Laying Brick Work, Defects in Brick Masonry, Composite Stone and Brick Masonry.

Foundations: Purpose, Site Exploration, Methods of Testing Bearing Capacity of Soils, Types of Foundations.

Introduction to Surveying: Principles of Surveying, Measurement of Distance. Chain Surveying, Field Equipment, Methods of Chain Surveying, Plotting from The Field Books and Degree of Accuracy, Tape Corrections.

Levelling: Instruments Used and Field Book Recording, Height of Instrument Method, Rise and Fall Method, Temporary and Permanent Adjustments in Levels.

(20 hrs)

BOOKS RECOMMENDED:

1	BUILDING MATERIAL & CONSTRUCTION	SUSHIL KUMAR
2	BUILDING MATERIAL	PRABIN SINGH
3	SURVEYING VOL.- I	B.C PUNMIA.
4	CONCRETE TECHNOLOGY	M.L GAMBHIR

NOTE: There shall be a total 8 questions, four from each section. Each question carries 15 marks. Five questions have to be attempted by the students selecting at least two questions from each section. Use of a calculator is allowed.

B.Tech. Mechanical Engineering 5th Semester Examination to be held in the Year December 2024, 2025, 2026, 2027

BRANCH: E&C/Computers/Electrical/Mechanical/Civil   CREDITS: 3
CLASS: 5th SEMESTER
COURSE TITLE: LINUX PROGRAMMING
COURSE CODE: ITO-4505
DURATION OF EXAMINATION: 3 HOURS

L	T	P	Marks	
			External	Internal
3	0	0	75	25

COURSE OUTCOMES	
At the end of the course the student will be able to: -	
CO1	Explain multi user OS LUNIX and its basic features
CO2	Interpret LUNIX Commands, Shell basics, and shell environments
CO3	Design and develop shell programming, communication, System calls and terminology.
CO4	Design and develop LINUX File I/O and LUNIX Processes.

Detailed Syllabus

Section- A

Overview of Linux: What is Linux, Linux, s root in Unix, Common Linux Features, advantage of Linux, Overview of Unix and Linux architectures, Overview of Unix and Linux architectures, hardware requirements for Linux, hardware requirements for Linux, Commands for files and directories cd, ls, cp, rm, mkdir, rmdir, pwd, file, more, less, Creating and viewing files using cat, file comparisons   (06 hours)
Essential Linux commands: Processes in Linux Process fundamentals, Connecting processes with pipes, l Redirecting input, Redirecting output Background processing , Managing multiple processes, Process scheduling – (at,batch), nohupcommand, kill, ps, who, find, sort, touch, file,File processing commands – wc, cut, paste etc ,Mathematical commands – expr, factor etc, Creating files with vi editor. Editing files with vi editor   (06 hours)
Shell programming: Basics of shell programming ,various types of shell available in Linux,Comparisons between various shells ,Shell programming in bash ,Conditional statements ,Looping statements, Case statement ,Parameter passing and arguments, Shell variables ,System shell variables shell keywords ,Creating Shell
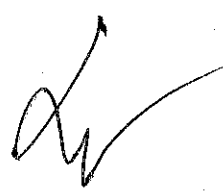programs for automating system tasks   (08 hours)

Section- B

System administration: Common administrative tasks ,identifying administrative files, Configuration and log files, Role of system administrator ,Managing user accounts -adding users ,Managing user accounts deleting users, Changing permissions and ownerships ,Creating and managing groups ,Temporary disabling of users accounts, Creating and mounting file system, Checking and monitoring system performance, file security & Permissions, becoming super user using su, Getting system information with uname, host name, Disk partitions & sizes, rpm command.   (12 hours)
Simple filter commands & Understanding various Servers. Filter Commands-pr, head, tail, Filter Commands - cut, sort. Filter Commands- uniq, tr, Filter using regular expression grep, DHCPDNS, ApacheSquid, Apache,Telnet, FTP, Samba.   (8 hours)

NOTE: There shall be a total 8 questions, four from each section. Each question carries 15 marks. Five questions have to be attempted by the students selecting at least two questions from each section. Use of a calculator is allowed.

B.Tech. Mechanical Engineering 5th Semester Examination to be held in the Year

December 2024, 2025, 2026, 2027

BRANCH: MECHANICAL ENGINEERING
CLASS: 5th SEMESTER
COURSE TITLE: FLUID MACHINERY LAB.
COURSE CODE: MEP-5511

CREDITS: 1

L	T	P	Marks
			Internal
0	0	2	25

COURSE OUTCOMES	
On completion of the course the students will be able to:	
CO1	Analyze a variety of practical fluid flow devices and utilize fluid mechanics principles in design and calculate performance analysis of turbines.
CO2	Analyze a variety of practical fluid flow devices and utilize fluid mechanics principles in design and calculate performance analysis of Pumps.
CO3	Understand and analyze practical problems in all power plants and chemical industries and perform modern computational techniques in fluid dynamics.
CO4	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.

LISTOF EXPERIMENTS:
1. To study and find the performance characteristics of Pelton Wheel/ Turbine (Tangential flow) test rig.
2. To study and find the performance characteristics of Francis Turbine (Radial Flow) test rig.
3. To study and analysis the Kaplan Turbine (Axial Flow) test rig
4. To study and find the performance characteristics of Centrifugal Pump.
5. To study and find the performance characteristics of Positive displacement drive pump.
6. To study and find the performance characteristics of Series and Parallel Centrifugal pump.
7. To find out the bursting pressure of PVC pipe. (V labs.)
8. To conduct the performance test on hydraulic ram and to plot the operating characteristics. (V labs)

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

B.Tech. Mechanical Engineering 5ᵗʰ Semester Examination to be held in the Year

December 2024, 2025, 2026, 2027

BRANCH: MECHANICAL ENGINEERING

CLASS: 5ᵗʰ SEMESTER

COURSE TITLE: MATERIAL SCIENCE AND METALLURGY LAB

COURSE CODE: MEP-5512

CREDITS: 1

L	T	P	Marks
			Internal
0	0	2	25
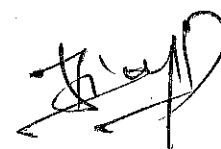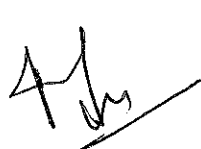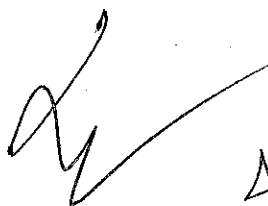
COURSE OUTCOMES	
On completion of the course the students will be able to:	
CO1	To gain knowledge about the microstructure of different materials
CO2	To understand various crystal structures and their relationship to properties.
CO3	To gain knowledge about various concepts of physical properties like hardness, impact strength and compression etc.
CO4	Understanding metals and their uses in industries.

LIST OF EXPERIMENTS:

1. To study microstructure of various types of metals under binoculars metallurgical microscope.

2. To determine the tensile strength of given sample and calculate its various types of mechanical properties.

3. To Analyze microstructure of Brass ,aluminum and cast iron under inverted metallurgical microscope.

4. To study the test hardness of ferrous and nonferrous alloys with the help of Rockwell hardness tester.

5. To study the test and find the impact of different metals with the help of izod and charpy testing machine.

6. To find the both surface as well as internal cracks of given sample by using ultrasonic flaw detector.

7. To determine the compression test of a given sample and calculate its various mechanical property.

NOTE:

1. At least six practical's should be performed.

2. Additional labs/experiment can be performed based on course content requirements.

3. Simulation/virtual labs can have used to enhance the practical ability of students.

CLASS: B.Tech. 5ᵗʰ SEMESTER   CREDITS: 1

BRANCH: E&C/IT/Mechanical/Civil/Electrical

COURSE NO. CSO-3515

COURSE TITLE: Python Programming (Lab)

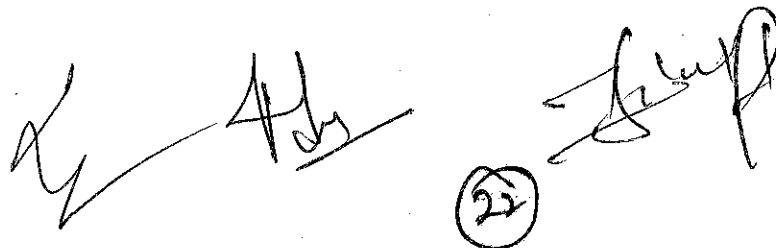| L	T	P	Practical Marks
0	0	2	25

COURSE OUTCOMES	
At the end of the course the student will be able to: -	
CO1	To write, test, and debug simple Python programs.
CO2	To implement Python programs with conditions and loops.
CO3	Use functions for structured Python programs.
CO4	Represent compound data using Python lists, tuples, and dictionaries.

Lab Experiments:

Experiment 1	Write a program to demonstrate different number data types in Python.
Experiment 2	Write a program to perform different Arithmetic Operations on numbers in Python.
Experiment 3	Write a python program to find largest of three numbers.
Experiment 4	Write a Python program to convert temperatures to and from Celsius, Fahrenheit. [Formula: c/5 = f-32/9]
Experiment 5	Write a program to create, concatenate and print a string and accessing sub-string from a given string
Experiment 6	Write a program to create, append, and remove lists in python.
Experiment 7	Write a program to demonstrate working with tuples in python.
Experiment 8	Write a program to demonstrate working with dictionaries in python.
Experiment 9	Write a Python program to construct the following pattern, using a nested for loop:

```
*
* *
* * *
* * * *
* * *
* *
*
```

Experiment 10	Write a python program to find factorial of a number using Recursion.

NOTE: Additional Lab Experiments/Practical will be performed based on the course contents requirements.

CLASS: 5thSEMESTER
BRANCH: CSE/IT/Mechanical/Civil/Electrical
COURSE TITLE: Introduction to the Internet of Things Lab
COURSE NO: ECO-1515

CREDITS:1

L	T	P	Marks
			Internal
0	0	2	25

COURSE OUTCOMES	
At the end of the semester, the students will be able to	
CO 1	To develop the knowledge and interfacing of components using embedded C
CO 2	To know about XBEE and its communication devices
CO 3	To have the knowledge about Arduino module and its interfacing with GSM and Bluetooth
CO 4	To demonstrate the ESP8266 module and its interfacing with Arduino.

LIST OF PRACTICALS:

SECTION -A
Embedded Experiments

1. Learning the Embedded C programming concepts
2. Interfacing of peripherals like LEDs, seven segment and LCD.
3. Interfacing of Relay and Buzzer Module.
4. Interfacing of various Sensors with Arduino Board.
5. Interfacing of Temperature Humidity Sensors and turning on Relay at threshold level.

SECTION -B
Wireless Experiments
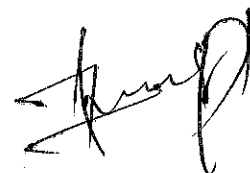
6. How to communicate two XBEE modules in AT mode
7. How to configure a XBEE module in Broadcast and API Mode
8. How to read the destination address of XBEE module using API mode
9. Data sharing using Bluetooth module to the Android APP
10. Making a call and receiving a call using GSM module

SECTION -C
IoT Experiments

11. Interfacing Wi-Fi with Arduino Module
12. Study of various AT Commands for Wi-Fi
13. Setting a Link with things Speak Server.
14. Updating Data of Sensors on Thing Speak cloud using Wi-Fi Module
15. Study of AT commands for the GSM Module.
16. Updating data on Cloud using GSM module.

NOTE: Each student has to perform at least ten experiments at least two from each section, out of which 40% shall be simulation-based. Additional Practicals / Experiments will be performed based on the course content requirements.

BRANCH: E&C/Computers/ IT/ Mechanical/ Civil   CREDITS: 1

CLASS: 5th SEMESTER

COURSE TITLE: NON-CONVENTIONAL ENERGY
RESOURCES AND INSTRUMENTATION LAB

COURSE CODE: EEO-2515

L	T	P	Marks
			Internal
0	0	2	25

COURSE OUTCOMES	
Student will be able to	
CO1	Measure phase and frequency using CRO and Multimeter
CO2	Students will be able to understand Solar Radiation, distillation
CO3	To study Solar Energy solar cooker, street light and its applications
CO4	To study Fuel Cells

LIST OF PRACTICALS:

1. To study the extension of Ammeter and voltmeter ranges.
2. To Study Block Wise Construction of Multimeters &Frequency Counter
3. To Study Block Wise Construction of Analog Oscillo scope &Function Generator.
4. To study the connection of solar panels.
5. To study overall efficiency of solar PV and battery integrated system
6. To Study of Solar Radiation by using Pyranometer.
7. To Study of Solar Distillation or Solar Still.
8. To study the constructional detail so faboxtype solar cooker.
9. To Study of Solar Street Lighting and Lanterns.
10. To Study of Fuel cells.

NOTE: Additional Lab Experiments/Practical will be performed based on the course content requirements.
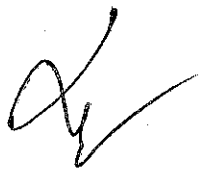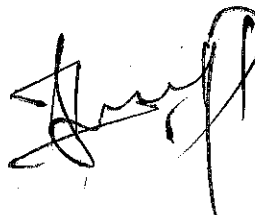
CLASS	5ᵗʰ SEMESTER					
BRANCH	E&C/ELECTRICAL/COMPUTERS/IT/MECHANICAL ENGINEERING					
COURSE TITLE	ESSENTIALS OF CIVIL ENGINEERING LAB					
COURSE NO.	CEO-6515	L	T	P	Marks	
DURATION OF EXAM	3 HOURS	0	0	2	25	Credit
						1

COURSE OUTCOMES	
On completion of the course the students will be able to:	
CO1	Perform tests on bricks and aggregates
CO2	Determine the physical properties of cement.
CO3	Determine the Workability and Compressive strength of concrete
CO4	Determine the Specific gravity, Atterberg limits, Compaction characteristics of Soil

LIST OF THE EXPERIMENTS

1. To determine water absorption and compressive strength of bricks
2. To determine the consistency and initial and final setting time of a given sample of cement using Vicat's apparatus.
3. To determine the Soundness and Compressive strength of cement.
4. To determine the fineness modulus and bulk density of fine and coarse aggregates.
5. To determine flakiness index and Impact value of coarse aggregates.
6. To determine Workability and Compressive strength of concrete
7. To determine the tensile strength of the steel.
8. To determine the Specific gravity and Atterberg limits of Soil.
9. To determine the compaction characteristics of soil by proctor's test.
10. To determine Cd for Venturi meter
11. To determine Cd for Orifice meter
12. To determine Cd for a Notch

23

CLASS	5th SEMESTER					
BRANCH	E&C/ELECTRICAL/COMPUTERS/IT/MECHANICAL ENGINEERING					
COURSE TITLE	BASIC CIVIL TESTING LAB					
COURSE NO.	CEO-6515	L	T	P	Marks	
DURATION OF EXAM	3 HOURS	0	0	2	25	Credit
						1

COURSE OUTCOMES	
On completion of the course the students will be able to:	
CO1	Perform tests on bricks and aggregates
CO2	Determine the physical properties of cement.
CO3	Determine the Workability and Compressive strength of concrete
CO4	Determine the Specific gravity, Atterberg limits, Compaction characteristics of Soil

LIST OF THE EXPERIMENTS

1. To determine water absorption and compressive strength of bricks
2. To determine the consistency and initial and final setting time of a given sample of cement using Vicat's apparatus.
3. To determine the Soundness and Compressive strength of cement.
4. To determine the fineness modulus and bulk density of fine and coarse aggregates.
5. To determine flakiness index and Impact value of coarse aggregates.
6. To determine Workability and Compressive strength of concrete
7. To determine the tensile strength of the steel.
8. To determine the Specific gravity and Atterberg limits of Soil.
9. To determine the compaction characteristics of soil by proctor's test.
10. To determine Cd for Venturi meter
11. To determine Cd for Orifice meter
12. To determine Cd for a Notch

B.Tech. Mechanical Engineering 5th Semester Examination to be held in the Year December 2024, 2025, 2026, 2027

BRANCH:

CREDITS: 1

E&C/ELECTRICAL/COMPUTERS/CIVIL/MECHANICAL
CLASS: 5th SEMESTER
COURSE TITLE: LINUX PROGRAMMING LAB
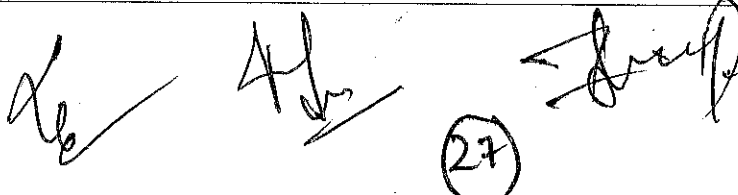COURSE CODE: ITO-4515

L	T	P	Marks
			Internal
0	0	2	25

LABORATORY OUTCOMES	
After Completion of this course the student will be able to: -	
CO1	Install LINUX and its working environment.
CO2	Understand Linux commands to manage files and file systems
CO3	Write a shell programs to solve a given problems
CO4	Write Regular expressions for pattern matching and apply them to various filters for a specific task
CO5	Analyze a given problem and apply requisite facets of SHELL programming in order to devise a SHELL script to solve the problem

Lab Experiments:

Experiment 1	Implement the Linux Shell Commands: ls, mkdir, rmdir, cd, cat, banner, touch, file, wc, sort, cut, grep, dd, dfspace, du, ulimit , Commands related to inode, I/O redirection, piping, process control commands, mails,manage the password,Vieditors,wild card characters used in Linux.
Experiment 2	Write a shell programs to perform operations using case statement such as 1)Addition 2)subtraction 3)multiplication 4)Division
Experiment 3	Write a shell scripts to see current date,time username and directory.
Experiment 4	Write a shell programs to find maximum of three numbers
Experiment 5	Write a script to check whether the given no. is even/odd
Experiment 6	Write a script to calculate the average of n numbers
Experiment 7	Write a script to check whether the given number is prime or not
Experiment 8	Write a script to calculate the factorial of a given number
Experiment 9	Write a script to calculate the sum of digits of the given number
Experiment 10	Write a shell script to print file names in directory showing date of creation & serial no. of file.

(27)

BRANCH: MECHANICAL ENGINEERING   **CREDITS: 1**
CLASS: 5th SEMESTER
COURSE TITLE: SUMMER TRAINING-I
COURSE CODE: SIT-5511

L	T	P	Marks
			Internal
0	0	0	25

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO1	Interact and study with a range of students and to practice multiple management skills, including communication, independent action and teamwork.
CO2	Understand the engineering code of ethics and be able to apply them as necessary.
CO3	Demonstrate knowledge of practical application of training.

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

OR

The students can opt to undertake an online course / MOOC (related to the discipline) from a reputed platform of not less than 40 hours (with Certificate).

OR

The students have an option to take a 4 week SWAYAM/NPTEL Course and earn a certificate for the same.

Guidelines for evaluation of Practical Training: The evaluation shall be done by the departmental committee during 5th semester. The committee shall have a convener and at least two members.

Distribution of Marks as per University statues:

Total marks of evaluation   =25

i)	Report	=7.5	30%
ii)	Viva-Voce & Presentation	=12.5	50%
iii)	Level of IT	=5	20%

NOTE:

- In Case a student has earned a certificate from Swayam / Nptel Platform, the marks so obtained shall be awarded on a proportionate basis.
- Due weightage will be given to those who have opted for 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

B.Tech. 6th Semester Mechanical Engineering
Examination to be held in the Year May 2025, 2026, 2027, 2028

B. Tech. Mechanical Engineering 6th Semester
Contact Hours: 24

COURSE CODE	COURSE TYPE	COURSE TITLE	LOAD ALLOCATIONS			MARKS DISTRIBUTION		TOTAL MARKS	CREDITS	% CHANGE
			L	T	P	INTERNAL	EXTERNAL			
MET-5601	Professional Core Course	Quality and Reliability Engineering	2	1	0	25	75	100	3	100%
MET-5602	Professional Core Course	Industrial Engineering	2	1	0	25	75	100	3	100%
MET-5603	Professional Core Course	Mechatronics	2	1	0	25	75	100	3	100%
MET-5604/ MOC 5601	Professional Elective Course / Massive Open Online Course	Maintenance Engineering	2	1	0	25	75	100	3	100%
		SWAYAM/NPTEL				0*	100*			
MET-5605	Professional Core Course	Automobile Engineering	2	1	0	25	75	100	3	100%
HMT-7601	Humanities & Social Science & management course	Fundamentals of Economics	2	1	0	25	75	100	3	100%
MOC-5611	Massive Open online course	MOOC	0	0	2	25	-	25	1	100%
MEP-5611	Professional Core Course	Mechatronics Lab	0	0	2	25	-	25	1	100%
MEP-5612	Professional Core Course	Automotive Lab	0	0	2	25	-	25	1	100%
TOTAL			12	6	6	225/200*	450/475*	675	21	

*In case of SAYAM/NPTEL

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B.Tech. Mechanical Engineering 6th Semester Examination to be held in the Year
May 2025, 2026, 2027, 2028

BRANCH: MECHANICAL ENGINEERING
CLASS: 6th SEMESTER
COURSE TITLE: QUALITY AND RELIABILITY
ENGINEERING
COURSE CODE: MET-5601
DURATION OF EXAMINATION: 3 HOURS

CREDITS:3

L	T	P	Marks	
			External	Internal
2	1	0	75	25

COURSE OUTCOMES	
On completion of the course the students will be able to:	
CO 1:	To acquire the basic techniques of quality improvement, fundamental knowledge of statistical process control charts.
CO 2:	Use of control charts and sampling process to analyse for improving process quality.
CO 3:	To acquire knowledge of various quality management techniques and systems.
CO 4:	Understand the concepts of reliability and maintainability and approaches and techniques to assess and improve process and/or product quality and reliability

Detailed Syllabus

SECTION-A

Quality: Concept and definitions, Quality dimensions, Views of various quality Gurus. Economics of cost of quality.
Total Quality Management: Definitions and principles, Tools and Techniques related to TQM. Implementation of TQM in various productions systems.

[10 hrs]

Quality Control: Use of statistical methods in process control charts like X, R, P, C and D charts. Acceptance Sampling by attributes and variables, Single and double sampling plans and OC curves.
Quality Standards and Trends: Concept and principles of various quality standards like ISO 9000, ISO 14000 and QS 9000, Six Sigma Technology: Concepts, Scope and limitations, Introduction to JIT and KANBAN production systems.

[10 hrs]

SECTION-B

Reliability: Reliability and Quality, Reliability in terms of hazard rate and failure functions, various reliability concepts like MTBF, MTTR and MTTF, Availability and its relation to reliability.
Reliability Analysis: Introduction to reliability distribution functions and their numerical analysis. Reliability estimation of different combinations of systems and stand by systems.

[09 hrs]

Maintenance: Concepts and types of maintenance, Reliability Centered Maintenance (RCM), various costs associated with maintenance.
Advanced Trends: Acceleration Life Testing methods, Reliability evaluation using Markov Analysis. **[09 hrs]**

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. There will be 8 questions in all, four from **Section-A** (each of 15 marks) and four from **Section-B** (each of 15 marks).
2. Students are required to attempt five questions in all, at least two questions from each section
3. Use of scientific calculator will be allowed in the examination hall.
4. Use of Steam tables, Mollier chart and scientific calculator will be allowed in the examination all.

BRANCH: MECHANICAL ENGINEERING   CREDITS:3
CLASS: 6th SEMESTER
COURSE TITLE: INDUSTRIAL ENGINEERING
COURSE CODE: MET-5602
DURATION OF EXAMINATION: 3 HOURS

L	T	P	Marks	
			External	Internal
2	1	0	75	25

COURSE OUTCOMES	
On completion of the course the students will be able to:	
CO1	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.
CO2	Use the techniques, skills and modern engineering tools necessary for engineering practice.
CO3	Develop understanding of professional and ethical responsibility and function on multi-disciplinary teams.

Detailed Syllabus

SECTION-A

Introduction to industrial engineering and its various techniques ,Roles of industrial Engineering, Applications of Industrial Engineering, definitions and explanation of productivity with significance in industries, productivity measurements, factors affecting productivity, industrial applications to calculate total and partial productivies.

Work Study: Introduction to work study and its basic procedures, definitions and concept of work study with examples, human factors in the application of work study, factors for selecting the work study.

[10 hrs]

Method Study : Introduction to method study and the selection of jobs, record, examine and develop, objectives and basic procedure of method study, recording techniques (process charts and diagrams), outline PC, flow process charts, two hand process charts, MAC, SIMO chart, flow diagram, string diagram, cycle graph, principles of moon economy.

Work–Measurement: Definition, various techniques of work-measurement work-sampling, stopwatch time study & its procedure, Job selection, Equipment and forms used for time study, rating, methods of rating, , standard time, numerical problems, Elementary ideas of linear Programming, Simplex Method,

[10 hrs]

SECTION-B

Incentive: Meaning, objectives of an incentive plan, various types of incentive plans.

Material Management and Inventory control, Integrated Materials Management & their components, Functions and objectives of Material Management, Introduction and Concept of inventory Management, purchase model with instantaneous replenishment and without shortage, manufacturing model without shortages, purchase model with shortage, Manufacturing models with shortages, Probabilistic inventory concepts with lead time, Selective inventory management -ABC, FSN, VED analyses.

[11 hrs]

Ergonomics: Definition of ergonomics, scope and objectives of ergonomics, application of human factors in engineering workplace design, etc.

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.

[10 hrs]

RECOMMENDEDBOOKS:
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
6.   IndustrialEngineering& Management Science A.P.Verma

NOTE:
1.   There will be 8 questions in all, four from **Section-A** (each of 15 marks) and four from **Section–B** (each of 15 marks).
2.   Students are required to attempt five questions in all, atleast two questions from each section
3.   Use of scientific calculator will be allowed in the examination hall.

B.Tech. Mechanical Engineering 6th Semester Examination to be held in the Year May 2025, 2026, 2027, 2028

BRANCH: MECHANICAL ENGINEERING
CLASS: 6th SEMESTER
COURSE TITLE: MECHATRONICS
COURSE CODE: MET-5603
DURATION OF EXAMINATION: 3 HOURS

CREDITS: 3

L	T	P	Marks	
			External	Internal
2	1	0	75	25

COURSE OUTCOMES	
On completion of the course the students will be able to:	
CO1	Understand the fundamentals of mechatronics and work with pneumatic and hydraulic systems...
CO2	Use control charts for various engineering purposes.
CO3	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 based controller, Response of systems, mechatronic approach. Basic system model: Mathematical Block diagram, Mechanical system building block

[10 Hours]

Sensors and Transducers: Performance terminology, displacement, velocity, position, proximity, force, fluid pressure, liquid small, temp, light sensors, selection of sensor, Inputting data by switches.

[9 Hours]

SECTION-B

Pneumatic and hydraulic systems: Actuation system, Directional control valves, pressure presses control value, **process control valves**, pneumatic & Hydraulic actuation system. Mechanical Actuation systems: Mechanical systems, types of motion, kinematic chains, Cam, gear train, belt and chain drive

[11 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
2. There will be 8 questions in all, four from Section- A (each of 15 marks) and four from Section B (each of 15 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.

B.Tech. Mechanical Engineering 6th Semester Examination to be held in the Year
May 2025, 2026, 2027, 2028

BRANCH: MECHANICAL ENGINEERING
CLASS: 6th SEMESTER
COURSE TITLE: MAINTENANCE ENGINEERING
COURSE CODE: MET-5604
DURATION OF EXAMINATION: 3 HOURS

L	T	P	Marks	
			External	Internal
2	1	0	75	25

COURSE OUTCOMES	
On completion of the course the students will be able to:	
CO1	To enable the student to understand the principles, functions and practices of maintenance activities
CO2	To develop ability in formulating suitable maintenance strategies to achieve reliable MANUFACTURING SYSTEM
CO3	To introduce the different maintenance categories and failure analysis tools.
CO4	To equip with essential system diagnosis techniques so as to identify and take appropriate actions on error symptoms and causes of failures.
CO5	To illustrate the techniques used for maintenance management & To empower with the skills to manage a manufacturing system to achieve continuous system availability for production.

Detailed Syllabus

SECTION-A

Maintenance – basic concepts, purpose, functions and objectives of maintenance. Principles, benefits and effects of maintenance. Interrelationship between productivity, quality, reliability and maintainability – maintenance productivity – quality in maintenance.

Reliability – basic concepts – bathtub curve – failure rate –mean time before failure. System reliability – reliability of series and parallel systems. Maintainability – mean time to failure – mean time to repair. **[10 hrs]**

Availability – inherent, achieved and operational availability –reliability, availability and maintainability (RAM).

Maintenance strategies Breakdown maintenance – corrective maintenance -Preventive maintenance – process flow – frequency in preventive maintenance. Predictive maintenance – components – advantages and disadvantages. Reliability centered maintenance (RCM)

Defect and failure – definitions – basics of failures – failure generation – failure analysis. Fault tree analysis (FTA) Event tree analysis (ETA), Root cause analysis (RCA), Failure modes and effects analysis (FMEA), Failure mode effect criticality analysis (FMECA). **[10 hrs]**

SECTION-B

Terotechnology process – strategies. Total productive maintenance (TPM) – features –methodology– basic systems of TPM – TPM and terotechnology.
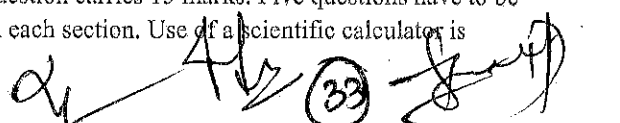**[06 hrs]**

Maintenance effectiveness – overall equipment effectiveness –key performance indicators – maintenance performance measuring indices.
[07 hrs]

Maintenance costs – classification of maintenance costs –maintenance cost analysis – cost effectiveness analysis. Maintenance budgeting – types of maintenance budget –preparation of maintenance budget. **[08 hrs]**

Text Books:
1. Gupta A. K., Reliability, Maintenance and Safety Engineering, University Science Press, NewDelhi, 2009.
2. Rao S. S., Reliability-Based Design, McGraw-Hill, Inc, New York, 1992.
3. Srivastava S. K., Maintenance Engineering and Management, S. Chand & CompanyLtd., New Delhi, 1998.
4. Venkataraman, Maintenance Engineering and Management, Prentic-Hall of India Pvt. Ltd.,New Delhi, 2007. 1 Ltd., New Delhi, 2009.

NOTE: There shall be a total 8 questions, four from each section. Each question carries 15 marks. Five questions have to be attempted by the students selecting at least two questions from each section. Use of a scientific calculator is allowed.

B.Tech. Mechanical Engineering 6th Semester Examination to be held in the Year May 2025, 2026, 2027,2028

CLASS: 6th Semester
COURSE TITLE: SWAYAM/NPTEL
COURSE CODE: MOC-5601
DURATION OF EXAMINATION: 3 HOURS

L	T	P	Marks	
			External	Internal
2	1	0	100	0

The department shall offer the 12 weeks NPTEL course, out of the list of courses listed by NPTEL around the time of commencement of the semester.

The courses offered shall be related to the core stream but 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 faculty Incharge of the department.

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

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

Note :- The Course is declared pass in the semester only after the production of the NPTEL Certificate, by the student. The marks obtained by the student in the NPTEL certification course will be tabulated by the concerned department.

The students must select their College name from the drop down box while registering for a particular course. Only those certificates will be accepted and validated by the department whose information will be shared by NPTEL to college authorities.

No certificate will be accepted without this and student will be marked absent in the college record.

In case the student does not pass the certification exam or remains absent in the proctored examination, no certificate will be awarded by NPTEL and hence the student will be deemed to have failed in the said Course.

The student has to appear again in the NPTEL examination conducted either in the same course or any other course as per the next semester schedule of NPTEL and earn the certificate by passing the exam.

BRANCH: MECHANICAL ENGINEERING
CLASS: 6ᵗʰ SEMESTER
COURSE TITLE: AUTOMOBILE ENGINEERING
COURSE CODE: MET-5605
DURATION OF EXAMINATION: 3 HOURS

CREDITS : 3

L	T	P	Marks	
			External	**Internal**
2	1	0	75	25

COURSE OUTCOMES	
On completion of the course the students will be able to:	
CO1	To gain concept about various types of vehicles.
CO2	To get familiar with engine block and its parts in detail.
CO3	To acquire knowledge about fuel system in SI and CI engines
CO4	Getting familiar with the lubrication system in the automobiles.
CO5	To get knowledge about the power transmission system.

Detailed Syllabus

SECTION–A

Introduction: General classification of vehicles, layout of passenger car- Major parts. Automotive chassis Engine block (crank- shaft, crane, shaft, piston, conceding rod valves-material and construction). Working of petrol and diesel Engines.
Fuel system: Air filter, fuel pump (S.I engine), Carburetor and its types, Fuel Injection pump (C.I engine). Nozzles, inlet and exhaust manifolds.

[11 hrs]

Cooling and lubrication system: Cooling systems types and working principles, various types of lubricating systems, Properties of lubricants. Concept of Octane and Cetane Number.
Electrical system: Ignition system types and its significance in automobiles, Battery construction and working. Concept of Hybrid Electric Vehicles (HEV).

[10 hrs]

SECTION-B

Transmission system: Types and working principles Clutches, Gear-box, Overdrive- Propeller shaft, Differential rear-axle, front axle. Torque convertors and automatic transmission, concepts of Transfer Gear- box.
Brakes: Hydraulic and Pneumatic brakes. Drum type, Concept of Antilock Braking System in Automobiles.

[10 hrs]

Suspension system: Purpose of suspension, leaf and helical spring systems. Automobile Safety and its precautions.
Steering System: Ackerman's steering, Davis Steering system, Toe-in and Toe-out, Camber and Castor.
Tyres: Tyres and their types, selection of types, Wheel alignmentand servicing of worn out tyres.
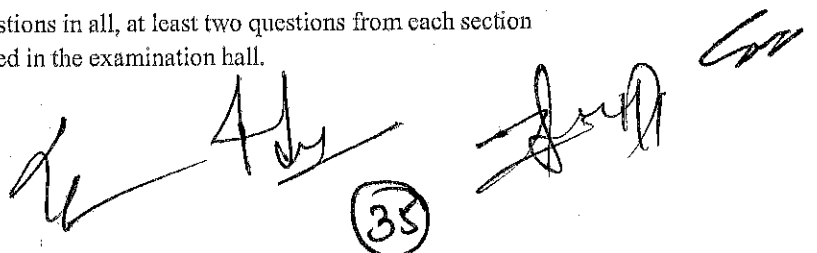
[11 hrs].

RECOMMENDED BOOKS:

1.	Automobile Engineering	Joseph Heitner- East West Press Pvt. Ltd.
2.	Automobile Engineering (Vol. I & II)	Kirpal Singh- Standard Publishers, Delhi.
3.	Automobile Engineering	G.B.S.Narang-Khnna Publishers.
4.	Automobile Engineering	R.K. Rajput
5.	The Motor Vehicle	Newton and Steed.

NOTE:

4. There will be 8 questions in all, four from **Section-A** (each of 15 marks) and four from **Section–B** (each of 15 marks).
5. Students are required to attempt five questions in all, at least two questions from each section
6. Use of scientific calculator will be allowed in the examination hall.

.. 6th SEMESTER
BRANCH : ELECTRICAL/IT/COMPUTER/ECE/MECHANICAL
COURSE TITLE: FUNDAMENTALS OF ECONOMICS
COURSE NO. : HMT-7601
DURATION OF EXAM : 3 HOURS

CREDITS: 3

L	T	P	Marks	
			External	Internal
2	1	0	75	25

COURSE OUTCOMES: STUDENT WOULD BE ABLE:

CO1	To understand the basic concepts of economics such as demand analysis, utility analysis and its role in decision making process.
CO2	To develop skills to create the goods and services at minimum cost by studying in detail about the production and cost analysis.
CO3	To understand about the market structure and pricing decisions.
CO4	To understand the concepts of National Income, Banking, Inflation, Problem of Unemployment and Poverty in India.

SECTION A

Unit 1-Meaning and Importance of Economics: Introduction, Meaning, Scope of Economics; Role and responsibilities of economist, Relationship of economics with other disciplines: Importance of 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- 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)

SECTION B

Unit 5- 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 in Oligopoly(Sweezy's model) (5hrs)

Unit 6-Macroeconomics-Meaning & Concept of National Income; Different methods of calculating national income and difficulties in measuring national income. (5hrs)

Unit 7-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)

Unit 8- Problem of Unemployment and Poverty in India: Meaning, types and causes of Unemployment; Poverty: meaning and causes. Poverty alleviation and employment generation programmes in India (6 Hrs)

BOOKS RECOMMENDED :
1. K.K.Dewett : Modern Economic Theory
2. H.L Ahuja : Advanced Economic Theory
3. M.L. Jhingan : Macro Economic Theory
4. P.N Chopra : Business Economics/Advanced Eco. Theory
5. D.N. Dwivedi :Managerial Economics
6. A. Koutsoyiannis : Modern microeconomics
7. Meenu Agrawal: Economic Reforms, Unemployment and Poverty
8. K.R. Gupta: Poverty in India

NOTE: There shall be total eight questions, four from each section. Each question carries 15 marks. Five questions will have to be attempted, selecting at least two from each section. Use of calculator is allowed.

BRANCH: MECHANICAL ENGINEERING   CREDITS: 1

CLASS: 6th SEMESTER

COURSE TITLE: Mechatronics Lab

COURSE CODE: MEP-5611

L	T	P	Marks Internal
0	0	2	25

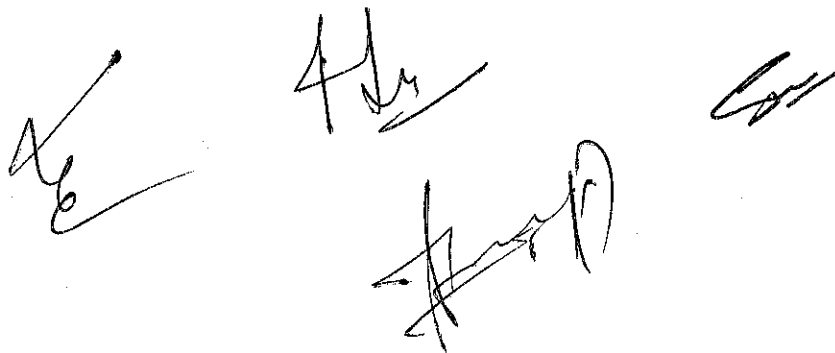| COURSE OUTCOMES	
On completion of the course the students will be able to:	
CO1	Understand the basics of mechatronics through learning by doing
CO2	Understand the basic pin diagram and architecture of microprocessor
CO3	Understand the construction, working and characteristics of different sensors and transducers
CO4	Getting acquittance with handling, working and various components of Arduino training kit

LIST OF EXPERIMENTS:

1. To study and find characteristics of Temperature Sensor (RTD).
2. To study and find characteristics of LVDT.
3. To study and find characteristics of Strain Gauge Sensor.
4. To study and find characteristics of Temperature Sensor (Thermocouple)
5. To study of different types of pneumatic and Hydraulic valve.
6. To study various components and architecture of Arduino Training Kit
7. To study and design circuits with Arduino for the display and blinking of light.
8. To study various components and architecture of 8085 Microprocessor

NOTE:

1. At least six practical should be performed.
2. Additional labs/experiment can be performed based on course content requirements.
3. Simulation/virtual labs can have used to enhance the practical ability of students.

BRANCH: MECHANICAL ENGINEERING

CREDITS: 1

CLASS: 6th SEMESTER

COURSE TITLE: Automotive Lab

COURSE CODE: MEP-5612

L	T	P	Marks Internal
0	0	2	25

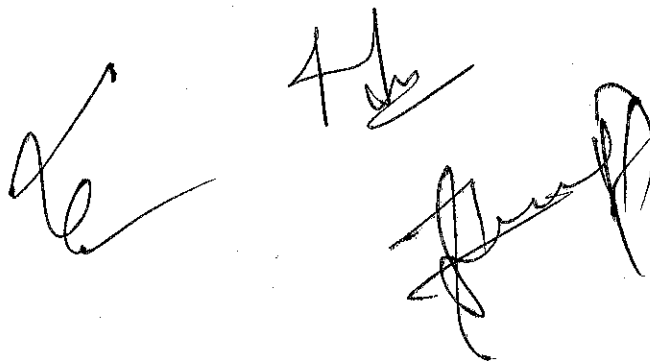| COURSE OUTCOMES	
On completion of the course the students will be able to:	
CO1	Familiar with various types of gears and their uses.
CO2	Familiar with braking system of automotive
CO3	Familiar with various types of cams and followers and their uses
CO4	Familiar with fuel supply of IC and SI Engines
CO5	Familiar with various types of clutches and their uses

LIST OF EXPERIMENTS:

1. Analyze different parameter of gear box

2. To study different types of brake system

3. To study different type of gear train

4. To study various types of cams and followers

5. To study Quick return mechanism.

6. To study of fuel supply in case of

   a. Petrol Engine

   b. Diesel engine

7. To study of bleeding of hydraulic system to remove air blockage

8. To Study static and dynamic balancing apparatus

9. To study various clutches

NOTE:

1. At least six practical's should be performed.

2. Additional labs/experiment can be performed based on course content requirements.

3. Simulation/virtual labs can have used to enhance the practical ability of students.

B...ANCH: MECHANICAL ENGINEERING   **CREDITS: 1**
CLASS: 6th SEMESTER
COURSE TITLE: MOOC
COURSE CODE: MOC-5611

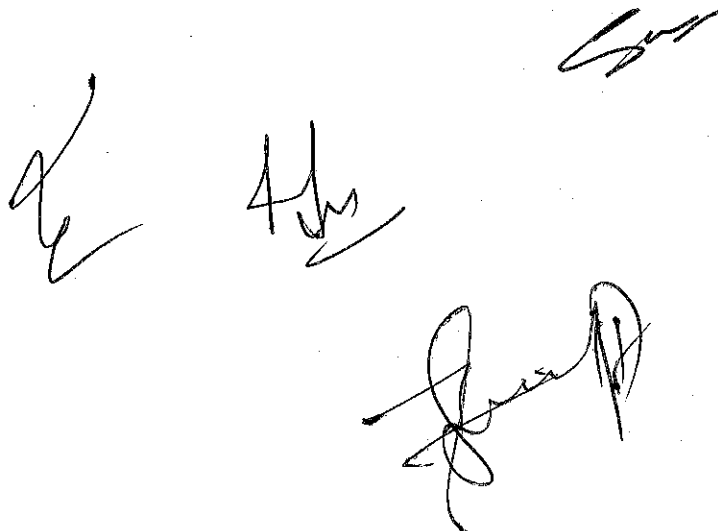| L	T	P	Marks Internal
0	0	2	25

The students shall select a MOOC of 4 weeks/minimum 40 hours; available at the time on any reputed platform and shall pursue the same after due approval, from the departmental Academic Committee. However, the selected MOOC course should not be similar to the regular courses offered as a part of the department curriculum.

The overall monitoring of the MOOC course will be under the supervision of the teacher in charge of the department. The Departmental Academic Committee shall assess the student work based on a presentation of the course undertaken/ project completed along with a relevant course completion certificate.

Note:- In Case a student opts for a 4 week NPTEL Course the following points need to be followed:

i. The Course is declared pass in the semester only after the production of the NPTEL Certificate, by the student. In case the student does not pass the certification exam or remains absent in the proctored examination, no certificate will be awarded by NPTEL and hence the student will be deemed to have failed in the said Course. The student has to appear again in the NPTEL examination conducted either in the same course or any other course as per the next semester schedule of NPTEL and earn the certificate by passing the exam.

ii. The students must select their College name while registering for a particular course. Thereafter, the option of sharing the result with the institute also needs to be selected. Only those certificates will be accepted and validated by department whose information is shared by NPTEL to college authorities.

No certificate will be accepted without this and student will be marked absent in college records.

B.Tech. Mechanical Engineering 7th Semester
Examination to be held in the Year December 2025, 2026, 2027, 2028

B. Tech Mechanical Engineering 7th Semester　　　　　　　　　**Contact Hours: 26**

Course Code	Course Type	Course Title	Load Allocations			Marks Distribution		Total Marks	Credits	% Change
			L	T	P	Internal	External			
MET-5701	Professional Course	CAD/CAM	2	1	0	25	75	100	3	100%
MET-5702	Professional Elective Course	Plant Layout and Material Handling	2	1	0	25	75	100	3	100%
MET-5703		Advance Manufacturing								
MET-5704		Production Planning and Control								
MET-5705	Professional Course	Refrigeration and Air conditioning	2	1	0	25	75	100	3	100%
MET-5706	Professional Elective Course/ Massive Open Online Course	Product Design & Development	2	1	0	25	75	100	3	100%
MET-5707		Engineering Metrology								
MOC-5701		SWAYAM/NPTEL				0*	100*			
HMT-7703	Humanities Elective Course	Entrepreneurship and Industrial Management	2	1	0	25	75	100	3	100%
HMT-7704		Organizational Behavior								
MEP-5711	Professional Core Course	CAD/CAM Lab	0	0	3	50	-	50	1.5	100%
MEP-5712	Professional Core Course	Refrigeration and Air conditioning Lab	0	0	2	25	-	25	1	100%
SEM-5711	Seminar	Seminar	0	0	4	50	-	50	2	100%
SIT-5711	Summer Internship Training	Summer Training- II*	0	0	0	50	-	50	2	100%
NCC-5701	Non Credit course	Employability Skill	2	0	0	Satisfactory/Unsatisfactory			Non Credit	100%
TOTAL			12	5	09	300/275*	375/400*	675	21.5	

*In case of SWAYAM/NPTEL

Ritu Sharma
19/07/2024

B.Tech. Mechanical Engineering 7th Semester
Examination to be held in the Year December 2025, 2026, 2027, 2028

B. Tech Mechanical Engineering 7th Semester   **Contact Hours: 26**

Course Code	Course Type	Course Title	Load Allocations			Marks Distribution		Total Marks	Credits	% Change
			L	T	P	Internal	External			
MET-5701	Professional Course	CAD/CAM	2	1	0	25	75	100	3	100%
MET-5702	Professional Elective Course	Plant Layout and Material Handling	2	1	0	25	75	100	3	100%
MET-5703		Advance Manufacturing								
MET-5704		Production Planning and Control								
MET-5705	Professional Course	Refrigeration and Air conditioning	2	1	0	25	75	100	3	100%
MET-5706	Professional Elective Course/ Massive Open Online Course	Product Design & Development	2	1	0	25	75	100	3	100%
MET-5707		Engineering Metrology								
MOC-5701		SWAYAM/NPTEL				0*	100*			
HMT-7703	Humanities Elective Course	Entrepreneurship and Industrial Management	2	1	0	25	75	100	3	100%
HMT-7704		Organizational Behavior								
MEP-5711	Professional Core Course	CAD/CAM Lab	0	0	3	50	-	50	1.5	100%
MEP-5712	Professional Core Course	Refrigeration and Air conditioning Lab	0	0	2	25	-	25	1	100%
SEM-5711	Seminar	Seminar	0	0	4	50	-	50	2	100%
SIT-5711	Summer Internship Training	Summer Training- II	0	0	0	50	-	50	2	100%
NCC-5701	Non Credit course	Employability Skill	2	0	0	Satisfactory/Unsatisfactory			Non Credit	100%
TOTAL			12	5	09	300/275*	375/400*	675	21.5	

*In case of SWAYAM/NPTEL

BRANCH: MECHANICAL ENGINEERING
CLASS: 7th SEMESTER
COURSE TITLE: CAD/CAM
COURSE CODE: MET-5701
DURATION OF EXAMINATION: 3 HOURS

CREDITS-3

L	T	P	Marks	
			External	Internal
2	1	0	75	25

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO1	Apply/develop solutions or to do research in the area of design and simulation in mechanical engineering.
CO2	Have abilities and capabilities in developing and applying computer software and hardware to mechanical design and manufacturing fields.
CO3	Review and document the knowledge developed by scholarly predecessors and critically assess the relevant technological issues.
CO4	Formulae relevant research problems; conduct experimental and/or analytical study and analyzing results with modern mathematical/scientific methods and use of software tools.
CO5	Design and validate technological solutions to defined problems and communicate clearly and effectively for the practical applications of their work.

Detailed Syllabus

SECTION – A

Product cycle, CAD work station. System configuration computer memory input output device and display device. CAD Tools, CAM Tools, Utilization in an industrial environment. CAD standards, CAD data structure.

[10 Hours]

Windowing clipping & zooming 2D&3D transformation, Translation, Scaling, Rotating Mirroring and Inversing. Modeling wire frame, Surface and solid Shading model; Diffused and specter reflection coloring models RGB, CMV, HIS.

[11 Hours]

SECTION - B

Automaton in manufacturing, basic concepts of numerical control system and machine CNC and DNC, advantages of NC system. Fundamental of numerical control Co-ordinate system and motion control system ATC.

[10 Hours]

NC part programming, manual part programming, G&M codes. Group Technology and FMS. Basic concepts of CAPP, CIPP, CIMS and MRP.
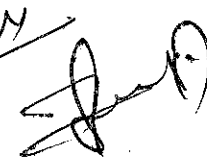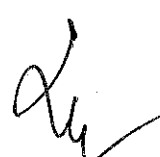
[09 Hours]

RECOMMENDED BOOKS:

1. Numerical control and CAM   : T.K. kundra P.N Rao & N.K. Tiwari
2. CAD/CAM   : M.Grover & J.P.A. Zimmerman (PHI)\

NOTE:

1. Question paper will be of 3 Hours' duration
2. There will be 8 questions in all, four from **Section- A** (each of 15 marks) and four from **Section – B** (each of 15 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.

B.Tech. Mechanical Engineering 7th Semester Examination to be held in the Year December 2025, 2026, 2027, 2028

BRANCH: MECHANICAL ENGINEERING
CLASS: 7th SEMESTER
CREDITS-3
COURSE TITLE: PLANT LAYOUT AND MATERIAL HANDLING (PLMH)
COURSE CODE: MET-5702
DURATION OF EXAMINATION: 3 HOURS

L	T	P	Marks	
			External	Internal
2	1	0	75	25

COURSE OUTCOMES	
At the end of course, student is expected to	
CO1	Identify the rule that each department plays in achieving the goal of an organization.
CO2	Explain the problems in organizing, planning and controlling the use of man, money, material and machines for industrial production
CO3	Apply industrial engineering principles to solve the problems in organizing, planning and controlling the use of man, money, material and machines for industrial production.
CO4	Design material handling system for a variety of scenarios pertaining to manufacture and service industry.
CO5	Develop and analyze plant layouts using manuals and computers aided software methodologies.

Detailed Syllabus
SECTION-A

Plant Layout: Concept of plant layout and its various principles, objectives and criteria for facilities planning and design.
Overview of the plant layout: Different types of layout models, selection, specification, implementation and follow up, comparison of product and process layout with different production systems. **[09 Hours]**
Heuristics for Plant layout: Systematic layout planning (SLP), Computerized faculty locations Models like ALDEP, CORELAP, CRAFT, and Gibson and Brown Model.
Layout planning: Factor influencing plant layout. Design considerations. Steps in planning, safety requirements. Analytical evaluation of plant layout. **[11 Hours]**
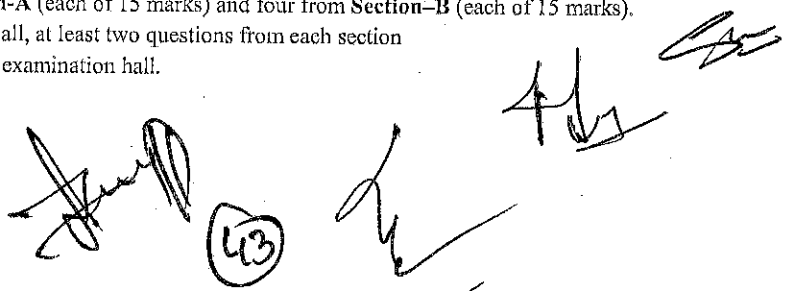
SECTION-B

Material Handling: Principles of material handling, classification of Material handling equipment, Relationship of material handling to plant layout.
Material handling Equipment: Selection, types of material handling equipment, Hoisting appliance cranes and elevators integration of material handling equipment. **[11 Hours]**
Conveyors: General theory of conveyed machines component's part, types of conveyors and their applications. Driving mechanism of belts and conveyors.
Methods to minimize cost of material handling: Maintenance of Material Handling Equipment, Elementary concepts pertaining to ergonomics of Material Handling equipment.

[10 Hours]

RECOMMENDED BOOKS:

1. Plant layout and Material Handling   Apple -Ronald
2. Plant layout and Design: Moore G.F - McGraw Hill
3. Material Handling Equipments: Rudenko - Peace Publications Moscow.
4. Practical Plant Layout: Muther - McGraw Hill
5. Material Handling Handbook   Bolz and Hugeman –Ronaldo

NOTE:

1. There will be 8 questions in all, four from **Section-A** (each of 15 marks) and four from **Section–B** (each of 15 marks).
2. Students are required to attempt five questions in all, at least two questions from each section
3. Use of scientific calculator will be allowed in the examination hall.

BRANCH: MECHANICAL ENGINEERING CREDITS-3
CLASS: 7ᵗʰ SEMESTER
COURSE TITLE: ADVANCED MANUFACTURING
COURSE CODE: MET-5703
DURATION OF EXAMINATION: 3 HOURS

L	T	P	Marks	
			External	Internal
2	1	0	75	25

COURSE OUTCOMES	
On completion of the course the students will be able to:	
CO1	Understand the fundamentals of non - conventional machining processes.
CO2	Understand the working and uses of various mechanical machining processes such as AJM, USM, etc.
CO3	Understand the purpose of chemical and electrochemical machining.
CO4	Understand the purpose of electric discharge machining.
CO5	Understand the fundamentals of electron beam and laser beam machining.

Detailed Syllabus

SECTION-A

Introduction to Advanced Manufacturing Processes: Mechanical Processes, Abrasive Jet Technology, Ultrasonic Machining, Water Jet Machining. Fundamental principles, processes parameters, characteristics, Tool design, Metal removal rate analysis, Part design, Analysis of the processes.

[11 Hours]

Chemical and Electro-chemical machining: Introduction, Principles & Scheme, Process parameters, Material removal rate, dynamic and hydro-dynamic & hydro-optimization, electrolytes.

[10 Hours]

SECTION-B

EDM: Introduction, basic principles & scheme, circuitry controls, material removal rate, machining accuracy, optimization, selection of tool material and tool design, Di-electric analysis.

[07 Hours]

Beam Machining: Laser Beam Machining & Electron beam machining background, production of laser, machining by Laser and other applications, Electron beam action, dimensionless analysis to establish correlation behavior EBM parameters.

[06 Hours]

Forming: High Velocity forming of metals, explosive forming principles and applications, Electro-hydraulic and other applications, Analysis of the process.

[06 Hours]

RECOMMENDED BOOKS:

1. Non-traditional machining methods: ASME.
2. New Technology Bhattayacharya. (India)
3. Ultrasonic cutting Rozenberg; Consultants Bureau
4. Advanced Manufacturing Process V.K.Jain
5. Fundaments of Modern Manufacturing Processes Mikell Groover

NOTE:

1. There will be 8 questions in all, four from **Section-A** (each of 15 marks) and four from **Section–B** (each of 15 marks).
2. Students are required to attempt five questions in all, atleast two questions from each section
3. Use of scientific calculator will be allowed in the examination hall.
4. Use of Steam tables, Mollier chart and scientific calculator will be allowed in the examination all.

B.Tech. Mechanical Engineering 7th Semester Examination to be held in the Year December 2025, 2026, 2027, 2028

BRANCH: MECHANICAL ENGINEERING
CLASS: 7th SEMESTER
COURSE TITLE: PRODUCTION, PLANNING AND CONTROL
COURSE CODE: MET-5704
DURATION OF EXAMINATION: 3 HOURS

CREDITS-3

L	T	P	Marks	
			External	Internal
2	1	0	75	25

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO1	Apply the system concept of design of production and service systems.
CO2	Make forecast in the manufacturing and service sector using selective quantitative and qualitative techniques.
CO3	Apply the principles and techniques for planning and control of the production and service system to optimize /make best use of resources.
CO4	Understand the importance and the function of inventory and to be able to apply selected techniques for its control and management under dependent and independent circumstances.
CO5	Apply the principles and techniques for planning and control of the production and service system to optimize /make best use of resources.

Detailed Syllabus
SECTION – A

Introduction: Objectives and Function of PPC. Types of Production: Job, Batch & Continuous.
Forecasting, Methods of forecasting and its advantages,

[10 Hours]

Materials planning and Control: Need and its advantages in manufacturing, Inventories: Types and Classification. **Inventory Control:** - Effect of demand on inventory and purpose of holding stock, Economic Order quantity and its estimation, Break Even Analysis Introduction to computer integrated production planning systems. [10 Hours]

SECTION - B

Project management: concepts of project planning, monitoring and control. Introduction to network analysis: PERT and CPM, Benefits of critical path analysis.
Material Selection: - Procedure & methods in material selection. Concept of Routing, Scheduling and Dispatching in manufacturing.

[10 Hours]

Method Study: - General procedure, Selection of process, work measurement, techniques of work measurement. Introduction to Linear Programming: Problem Formulation, Simplex method, Transportation models and advantages of linear programming in production. [10 Hours]

RECOMMENDED BOOKS:

1. Elements of Production Planning: Eilon-McMillan & Control
2. Production and Operations Management: Raymond R. Meyer- McGraw Hill
3. Material Management: A. K Dutta Prentice Hall India.
4. Operations Management: Buffa-John Wiley.
5. Production Management: Hedge- John Wiley.

NOTE:

1. Question paper will be of 3 Hours' duration
2. There will be 8 questions in all, four from **Section- A** (each of 15 marks) and four from **Section – B** (each of 15 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.

B.Tech. Mechanical Engineering 7th Semester Examination to be held in the Year December 2025, 2026, 2027, 2028

BRANCH: MECHANICAL ENGINEERING
CLASS: 7th SEMESTER
COURSE TITLE: REFRIGERATION AND AIR CONDITIONING (RAC)
COURSE CODE: MET-5705
DURATION OF EXAMINATION: 3 HOURS

CREDITS-3

L	T	P	Marks	
			External	Internal
2	1	0	75	25

COURSE OUTCOMES	
On completion of the course the students will be able to:	
CO1	Differentiate between vapour compression and Vapour absorption cycles.
CO2	Analyse thermodynamically, vapour compression systems
CO3	Understand the purpose of condensers, compressors, expansion devices etc.
CO4	Recall and differentiate various refrigerants.
CO5	Do psychometric analysis of various air-conditioning processes.

Detailed Syllabus

SECTION-A

Refrigeration: Basic concept and principle, heat pump and refrigeration machine, types of refrigeration system, COP and power requirement calculations for different systems. Thermodynamic analysis of vapour compression system. Effects of Operating variables on the performance of vapour compression system. **[08 Hours]**

Refrigeration equipment: Expansion devices- types and their operating characteristics. Evaporators-types and heat transfer in them, Condenser-Types and heat transfer in them, Compressors- Types and capacity control, system balancing, Cooling tower types and their working. **[07 Hours]**

Refrigerants: Designation and selection of a refrigerant, thermodynamic chemical and physical requirements, secondary refrigerants and alternative refrigerants. **[05 Hours]**

SECTION-B

Psychrometry: Psychrometry of air conditioning processes, adiabatic mixing of air streams. Basic processes in conditioning of air, air-conditioning load calculation and applied psychometrics. Summer and winter air-conditioning. Numericals based on load analysis and psychrometric calculations for cooling and dehumidification. **[07 Hours]**

Human Comfort: Thermodynamics of human body, comfort and comfort chart, factors affecting human comfort, concept of infiltration and ventilation, indoor air quality requirements. Indoor and Outdoor design conditions. **[05 Hours]**

Air Ducts: Methods of duct system design: equal friction, velocity reduction, static regain method (numerical on duct system design) Air handling unit, Fan coil unit, types of fans used air conditioning applications. **[05 Hours]**

Applications of Refrigeration-Ice and ice cream manufacture, dairy refrigeration, poultry products, fishery products, Modern techniques of food preservation. **[04 Hours]**

RECOMMENDED BOOKS:

1.	Refrigeration and Air-conditioning	C.P Arora-Tata McGraw Hill
2.	Refrigeration and Air-conditioning	Manohar Prasad-Wiley Eastern
3.	Refrigeration and Air-conditioning	Jennings and Rogers
4.	Refrigeration and Air-conditioning	Stoecker- McGraw Hill
5.	Refrigeration and Air-conditioning Data Book	Manohar Prasad-Wiley Eastern

NOTE:

1. There will be 8 questions in all, four from **Section-A** (each of 15 marks) and four from **Section-B** (each of 15 marks).
2. Students are required to attempt five questions in all, at least two questions from each section
3. Use of scientific calculator will be allowed in the examination hall.
4. Use of Steam tables, psychometric charts and scientific calculator will be allowed in the examination all.

BRANCH: MECHANICAL ENGINEERING
CLASS: 7th SEMESTER
COURSE TITLE: PRODUCT DESIGN AND DEVELOPMENT
COURSE CODE: MET-5706
DURATION OF EXAMINATION: 3 HOURS

CREDITS-3

L	T	P	Marks	
			External	Internal
2	1	0	75	25

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO1	To understand fundamental principles and applications of Traditional and Modern Design Processes in industry.
CO2	To study the importance of Product Modelling and Reverse Engineering in Production process
CO3	To understand the importance of design process in manufacturing
CO4	To study different types of product data exchange formats
CO5	To understand various principles of rapid prototyping methods.

Detailed Syllabus

Section A

Product Design: Traditional and Modern Design Processes, Product life cycle, Innovation, Creation and Diffusion Techniques and Functional, Technological, Ecological, Evaluation of New Product Ideas.

[11 Hours]

Product Modelling and Reverse Engineering: Wireframe modelling, Surface and Solid Modelling Techniques and Reverse Engineering.

[10 Hours]

Section B

Design For Manufacture: Estimating manufacturing costs, Reducing Component, Assembly and Support Cost Design for Assembly, Design for Disassembly, Design for Environment, Design for Graphics and Packaging, Effective Prototyping Principle and Planning.

[07 Hours]

Product Data Exchange: Neutral File Format such as DXF, IGES, STEP, Concurrent Engineering- Concept Design For X, DFM, DFA, DFR, DFQ.

[6 Hours]

Rapid Prototyping Methods: Liquid Based RP Methods such as SLA, SGC and SCS, Solid Based RP Methods such as FDM and LOM, Powder Based RP Methods such as SLS, 3DP and BPM.
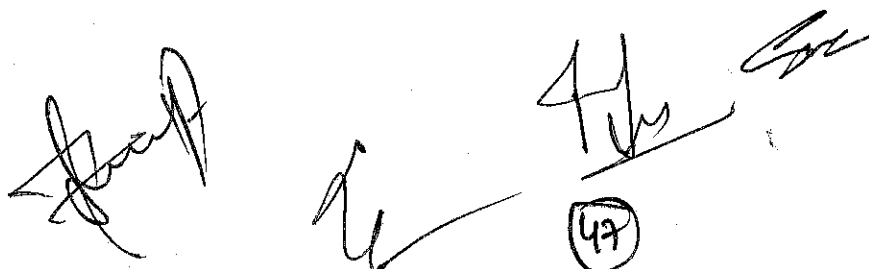
[07 Hours]

Recommended Books:

1. Product Design and Manufacturing: A.K.Chitab and R.C.Gupta,, PHI (EEE)
2. The Technology of Creation Thinking: R.P.Crewford – Prentice Hall
3. Product Design and Decision Theory: M.K.Starr – Prentice Hall
4. Engg. Product Design: C.D.Cain, Business Books

Notes:

1. There will be 8 questions in all, four from **Section-A** (each of 15 marks) and four from **Section–B** (each of 15 marks).
2. Students are required to attempt five questions in all, at least two questions from each section
3. Use of scientific calculator will be allowed in the examination hall.

BRANCH: MECHANICAL ENGINEERING   **CREDITS-3**
CLASS: 7th SEMESTER
COURSE TITLE: ENGINEERING METROLOGY
COURSE CODE: MET-5707
DURATION OF EXAMINATION: 3 HOURS

L	T	P	Marks	
			External	Internal
2	1	0	75	25

COURSE OUTCOMES	
On completion of the course the students will be able to:	
CO1	To understand the students about the requirement of metrology and the concepts of limit, fits and gauges.
CO2	To study the linear and angular measurements and the optical measurement tools and techniques
CO3	To understand how to use surface roughness and thread measuring instruments.
CO4	To study the comparators, measurement through comparators and the advanced metrology concepts.

Detailed Syllabus

SECTION–A

Introduction to Metrology: Definition, types, need of inspection, terminologies, methods of measurement, selection of instruments, measurement errors, units, Measurement standards, calibration, statistical concepts in metrology.   **[06 Hours]**

Systems of Limits and Fits: Introduction, nominal size, tolerance limits, deviations, allowance, fits and their types unilateral and bilateral tolerance system, hole and shaft basis systems - interchangeability and selective assembly.   **[05 Hours]**

Linear Measurement: Length standard, line and end standards, slip gauges-calibration of the slip gauges, dial indicator, micrometer. Measurement of angles and tapers: Different methods - bevel protractor-angle slip gauges - spirit levels- sine bar sine plate, rollers and spheres.   **[06 Hours]**

Flat Surface Measurement: Measurement of flat surfaces - instruments used-straight edges-surface plates-optical flat and auto collimator.   **[05 Hours]**

SECTION–B

Surface Roughness Measurement: Introduction, terminology, specifying roughness on drawings, surface roughness parameters, factors affecting surface roughness, ideal surface roughness, roughness measurement methods, precautions in measurement, surface microscopy, surface finish softwares.   **[06 Hours]**

Screw Thread Measurement: Elements of measurement - errors in screw threads - measurement of effective diameter, angle of thread and thread pitch, profile thread gauges.   **[04 Hours]**

Measurement through Comparators: Comparator: Features of comparators, classification of comparators, different comparators, advanced comparators, thread comparators.   **[06 Hours]**

Gear Measurement: Gear measuring instruments, gear tooth profile measurement, measurement of diameter, pitch, pressure angle and tooth thickness.   **[05 Hours]**

RECOMMENDED BOOKS:

1. Engineering Metrology   : IC Gupta (Danapath Rai & Co.)
2. Engineering Metrology   : R.K. Jain
3. Engineering Metrology   : M. Mahajan (Dhanapati Rai publications)
4. Engineering Metrology and Instrumentation : R.K Rajput

NOTE:

1. Question paper will be of 3 Hours duration
2. There will be 8 questions in all, four from Section- A (each of 15 marks) and four from Section – B (each of 15 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.

B.Tech. Mechanical Engineering 7th Semester Examination to be held in the Year December 2025, 2026, 2027, 2028

BRANCH: MECHANICAL ENGINEERING
CLASS: 7th SEMESTER
COURSE NO: MOC-5701 COURSE
TITLE: SWAYAM/ NPTEL

CREDITS: 3

L	T	P	Theory
2	1	0	100

The department shall offer the 12 weeks NPTEL course out of the list of courses listed by NPTEL around the time of commencement of the semester.

The courses offered shall be related to the core stream but 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 faculty in charge of the department.

The NPTEL 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 notified schedule.

Note: -

The Course is declared pass in the semester only after the production of the NPTEL Certificate, by the student.

The marks obtained by the student in the NPTEL certification course will be tabulated by the concerned department.
The students must select their College name from the drop down box while registering for a particular course. Only those certificates will be accepted and validated by the department whose information will be shared by NPTEL to college authorities.

No certificate will be accepted without this and student will be marked absent in the college record.

In case the student does not pass the certification exam or remains absent in the proctored examination, no certificate will be awarded by NPTEL and hence the student will be deemed to have failed in the said Course.

The student has to appear again in the NPTEL examination conducted either in the same course or any other course as per the next semester schedule of NPTEL and earn the certificate by passing the exam.

BRANCH: MECHANICAL ENGINEERING
CLASS: 7ᵗʰ SEMESTER
COURSE TITLE: ENTREPRENEURSHIP AND INDUSTRIAL MANAGEMENT
COURSE NO.: HMT-7703

CREDITS:3

L	T	P	Marks	
			External	Internal
2	1	0	75	25

COURSE OUTCOMES:	
Student will be able	
CO1	To Acquire qualities of a good entrepreneur and opt entrepreneurship as a career option and shall be able to start his own business venture.
CO2	To Work as a sole proprietor, in partnership and in joint stock companies
CO3	To Know about industrial policies, various concepts of industrial relations and shall be able to resolve conflicts emerging while working in groups within the organizations
CO4	Analyze about the concept of Management & HRM, Wage Payment and Job evaluation, Authority relationships & Departmentation.

Detailed Syllabus

SECTION-A

Unit-1: Entrepreneurship: Definition and types, Difference Between Intrapreneur & Entrepreneur, Qualities of good Entrepreneurs -Role of Entrepreneurs in the economic development of a country, Functions of entrepreneur, Factors affecting entrepreneurship, Entrepreneurship as a career option for technocrats in India, Schemes and policies for entrepreneurship development. Women Entrepreneur: Classification of Women Entrepreneur in India, Problems of Women Entrepreneur, steps for promoting women entrepreneurship. **(6 Hours)**

Unit-2: Legal Forms of Industrial Ownership: Sole Proprietorship, Partnership and Joint Stock Company (Features, merits & demerits). **(4 Hours)**

Unit-3: Industrial Development in India after Independence: Industrial Policy of the Five-Year Plans - Industrial Policy (1956, 1977, 1991), Need for Economic Reforms and their Assessment, Industrial policy 2004-Jammu & Kashmir, Industrial policy 2021-30 ,Jammu & Kashmir , Multi-National Corporations (MNCs) - Concept, Merits & Demerits of MNCs. **(5 Hours)**

Unit-4: Industrial Relations: Workers participation in management: Meaning, Objectives & Forms, Trade Union: Objectives, Functions, Present Position and Weaknesses. Industrial Conflict: Sources and managing conflict, Arbitration-a conflict resolution mechanism, Collective Bargaining: Meaning, Process, Essential conditions for effective bargaining. **(6 Hours)**

SECTION-B

Unit-5: Management: Meaning, Characteristics, Objectives and Functions of management. Classical Theory of Management: Henry Fayol's Administrative Management Theory & Taylor's Scientific Management Theory. Elton Mayo's Neo-Classical Theory of Human Relations Prospective. **MBO–** Definition, Features, Process, Advantages & Limitations of MBO. **(6 Hours)**

Unit-6 : Departmentation & Delegation of Authority: Meaning, Importance, Basis or pattern of Depart mentation.
Delegation of Authority: Meaning, Characteristics, Importance, Process, Obstacles/ Barriers to effective delegation of authority.
Authority Relationships - Line Organization, Line & Staff Organization, Functional Organization. **(6 Hours)**

Unit 7: Personnel Management & Decision Making: Meaning, Objectives, Characteristics, Principles & Functions of Personal department.
Decision making- Meaning, Importance & Steps in Decision Making. **(4 Hours)**

Unit 8: Wage Administration & Job Analysis: Concept of Wages, Characteristics of good wage, Factors affecting wages, Methods of wage payments. **Job Evaluation-**Objectives, Principles & Methods of job evaluation **(5 Hours).**

BOOKS RECOMMENDED:
1. George Terry & Stephen G. Franklin   –Principles of Management.
2. Harold Koontz & Heinz   –Essentials of Management
3. S. A .Sherlekar   –Principles of Business   Management
4. M. Mahajan   –Industrial Engineering & Production Management
5. Dr. Neeru Vasisth   –Principles of Management
6. Dr. B. P. Singh & Dr. T. N. Chhabra –Business Organisation & Management

NOTE: There shall be total eight questions, four from each section. Each question carries 15 marks. Five questions will have to be attempted, selecting at least two from each section. Use of scientific calculator is allowed.

B.Tech. Mechanical Engineering 7th Semester Examination to be held in the Year December 2025, 2026, 2027, 2028

BRANCH: MECHANICAL ENGINEERING
CLASS: 7th SEMESTER
COURSE TITLE: ORGANISATIONAL BEHAVIOUR
COURSE NO.: HMT-7704
DURATION OF EXAM :3 HOURS

CREDITS: 3

L	T	P	Marks	
			External	Internal
2	1	0	75	25

COURSE OUTCOMES:	
Student would be able to:	
CO1	Understand how to work in organizations by acquiring proper knowledge about organizational behaviour and individual differences.
CO2	Have good knowledge about the concepts of personality, perception, attitude and learning.
CO3	Develop their organization properly after acquiring good knowledge about managing change and resolving conflicts.
CO4	Understand and develop leadership concepts and organizational culture.

Detailed Syllabus
SECTION –A

Unit1: Organisational Behaviour -Concept, Meaning, Nature and Scope of Organisational Behaviour, Models of organizational behavior, Individual Difference: Meaning, Factors & implications of individual differences **(5 Hours)**
Unit 2: Individual behavior and its determinants: Personality-Concept & Determinants; Perception-Meaning, Definition, Perceptual Process, internal & external factors in perceptual selectivity; Attitude–Features, Components, Formation of Attitudes. **(7 Hours)**
Unit3: Learning and Motivation: Definition, Theories of learning- Classical Conditioning, Operant Conditioning, Observational learning, Reinforcement- Concept, Types, Importance. Motivation: Concept & importance, Theories of motivation: Maslow's need hierarchy Herzberg's motivation hygiene theory, Mcclelland's need theory. **(8 Hours)**

SECTION-B

Unit4: Organizational development: Concept, Characteristics & Objectives of Organization Development, Organization Development Process. Organizational Change: Nature of Organizational Change, Forces to Change, Causes of Resistance to Change, Techniques of overcoming Resistance to Change, Response & Reactions to Change. Dynamics of Conflict – Nature of Conflict, Types of Conflict, Stages in conflict, Resolution of conflict. **(6 Hours)**
Unit5: Leadership and Communication–Characteristics and Functions of Leader, Qualities of a good Leader, importance of leadership, Styles of Leadership; Communication: Meaning, Types, Barriers and importance of communication **(7 Hours)**
Unit6: Organisational Climate and Culture: Concept, Dimensions and factors influencing climate, Meaning, definition, Elements & Characteristics of organizational culture, Functions of Culture in Management. **(7 Hours)**

BOOKS RECOMMENDED:

1. Organizational Behavior – John R.Schermerhorn, jrJames , G.Hunt,Richard N - Osborn
2. Organizational Behaviour - Stephen P. Robbins
3. Principles of Management - Dr. NeeruVaisisth
4. Organizational Behaviour (Humane Behaviour at work) - Keith Davis

NOTE: There shall be total eight questions, four from each section. Each question carries 15 marks. Five questions will have to be attempted, selecting at least two from each section. Use of calculator is allowed

BRANCH: MECHANICAL ENGINEERING
CLASS: 7th SEMESTER
COURSE TITLE: CAD/CAM LAB
COURSE NO.: MEP-5711

CREDITS: 1.5

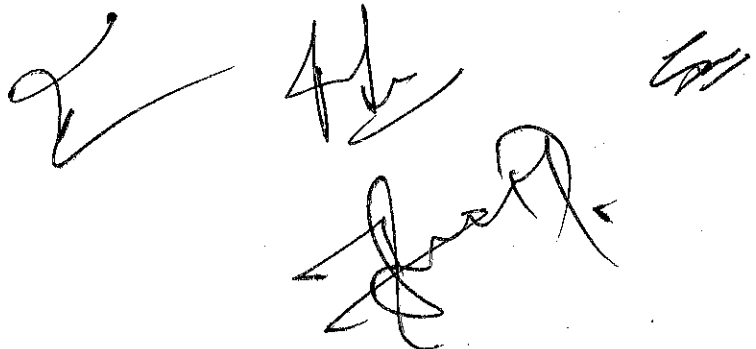| L	T	P	Marks	
			External	Internal
0	0	3	-	50

COURSE OUTCOMES:	
Student would be able to:	
CO1	Analyze the input and output devices of workstation.
CO2	Demonstrate the knowledge on basic drafting software tools and ability to use them accordingly.
CO3	Approach a design problem successfully, taking decisions when to use a specific tool.
CO4	Be proficient in the use of part programming in NC/CNC lathe, drilling and milling.

LIST OF EXPERIMENTS:

1. Study of the CAD workstation on various components including the various types of input and output devices.

2. Study of the drafting using latest drafting and designing softwares.

3. Simple exercises of drawing through the same packages-two dimensional drafting and three dimensional modeling.

4. Study of working mechanism of NC, CNC and DNC machine tools,

5. Part programming for a job of drilling and milling on CNC machine.

6. Exercise on manual part-programming for CNC machines like Centre Drill, end mill Cutter, Use of various codes.

7. Simulation of the cutting process and determination of the Tool-path graphics using simulation packages for the above cutting processes (MATLAB Software).

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.

BRANCH: MECHANICAL ENGINEERING
CLASS: 7th SEMESTER
COURSE TITLE: REFRIGERATION AND AIR CONDITIONING LAB   **CREDIT:1**
COURSE NO.: MEP-5712

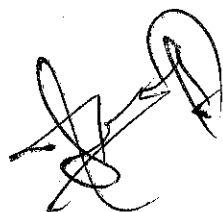| L	T	P	Marks	
			External	Internal
0	0	2	–	25
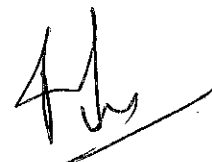
COURSE OUTCOMES	
At the end of the course student will be able to:	
CO1	Understand the principles and applications of refrigeration systems
CO2	Evaluate performance of Vapour compression refrigeration system.
CO3	Apply working principle of VAR/VCR system to solve numerical based on VCR and VAR system.
CO4	Understand basics of psychrometry, air conditioning processes and different air-conditioning systems.
CO5	Analyze different psychrometric processes on general cycle air conditioning trainer.

LIST OF EXPERIMENTS:

1. Study of Simple Vapor Compression Refrigeration System and its components.
2. Performance test on General cycle refrigeration trainer.
3. Study of Cascade Refrigeration system for producing low temperature.
4. Study of Vapor Absorption refrigeration system.
5. Study of different psychometric terms and processes.
6. Performance Test on General Cycle air-conditioning trainer.
7. Study and Design of Air Conditioning System and load calculation for residential and commercial buildings.

NOTE:

1. Additional lab/ experiment will be performed based on course content requirement.

B.Tech. Mechanical Engineering 7th Semester Examination to be held in the Year

December 2025, 2026, 2027, 2028

BRANCH: MECHANICAL ENGINEERING

CLASS: B.E. 7th SEMESTER

COURSE TITLE: SEMINAR

COURSE NO.: SEM-5711

CREDITS: 2

L	T	P	Marks	
			External	**Internal**
0	0	4	--	50

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO1	Identify and compare technical and practical issues related to the area of program specialization.
CO2	Outline annotated bibliography of research demonstrating scholarly skills.
CO3	Prepare a well-organized report employing elements of technical writing and critical thinking
CO4	Demonstrate the ability to describe, interpret and analyze technical issues and develop competence in presenting.
CO5	Understand the need to be knowledgeable of contemporary issues.

This will involve a detailed study of a topic of interest reproduced in the candidate's own style. For this, a student has to prepare a seminar by doing proper survey of literature, compilation of information so gathered and then presentation of the same followed by question-answer session.

The report of which has to be submitted by the student well before the conduct of seminar. The handout submitted by the student will be in accordance with the standards of technical papers.

Guidelines and evaluation of Seminar in 7th semester:

The topic of the Seminar is to be finalized and approved by the departmental committee by the end of 6th Semester. The committee shall have a convener and at least two members.
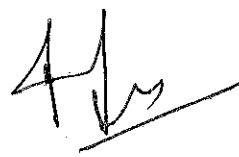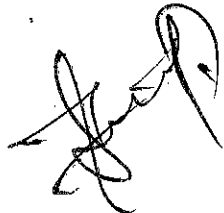
Distribution of Marks:

Total Marks for Seminar Evaluation = 50 marks

1.	Project Report	=	15 marks
2.	Presentation	=	25 marks
3.	Attendance	=	10 marks.

Award of Marks:

- Marks Under (1) will be awarded by the Seminar Incharge.

- Marks Under (2) and (3) will be awarded by the Departmental committee constituted for the purpose.

(54)

CLASS: 7ᵗʰ SEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: EMPLOYABILITY SKILL.
COURSE NO.: NCC-5701

CREDITS: 0

L	T	P	Marks	
			External	Internal
2	0	0	Satisfactory/Unsatisfactory	

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO1	Understand the basic concepts of Quantitative Ability, Verbal Reasoning and Logical Reasoning.
CO2	Solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning and Verbal Ability
CO3	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. Analytical Reasoning   M K Pandey
3. Verbal & Non-Verbal Reasoning   R S Aggarwal
4. Quantitative Aptitude for CAT   Arun Sharma

Evaluation of the course:

There will be internal evaluation based on two internal sessional tests. Students are required to score at least 40% or above in totality to be considered qualified in the course.

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B.Tech. Mechanical Engineering 7ᵗʰ Semester Examination to be held in the Year December 2025, 2026, 2027, 2028

CREDIT: 2

CLASS: 7th SEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE NO.: SIT-5711
COURSE TITLE: SUMMER TRAINING-II

Hours/ Week		Marks Distribution	
L	T	P	Practical
-	-	-	50

COURSE OUTCOMES	
At the end of the course the student will be able to: -	
CO1	Interact and study with a range of students and to practice multiple management skills, including communication, independent action and teamwork.
CO2	Understand the engineering code of ethics and be able to apply them as necessary.
CO3	Demonstrate knowledge of practical application of training.

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

Guidelines for evaluation of Practical Training:

The evaluation shall be done by the departmental committee during 7ᵗʰ semester. The committee shall have a convener and at least two members.

Distribution of Marks as per University statues:
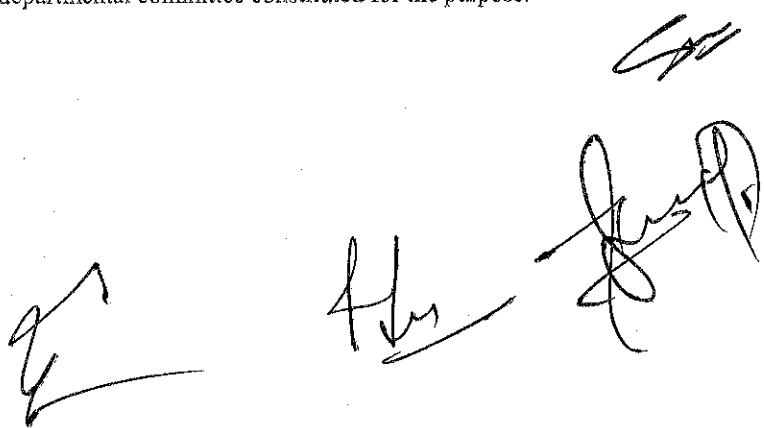
Total marks of evaluation =   50

i.	Report	= 15	(30%)
ii.	Viva-Voce & Presentation	= 10	(20%)
iii.	Level of IT	= 25	(50%)

NOTE
- In Case a student has earned a certificate from Swayam/ Nptel Platform, the marks so obtained shall be awarded on a proportionate basis.
- Due weightage will be given to those who have opted for 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.

B. Tech. Mechanical Engineering 8th Semester
Examination to be held in the Year May 2026, 2027, 2028, 2029

SCHEME -I

B. Tech. Mechanical Engineering 8th Semester **Contact Hours: 28**

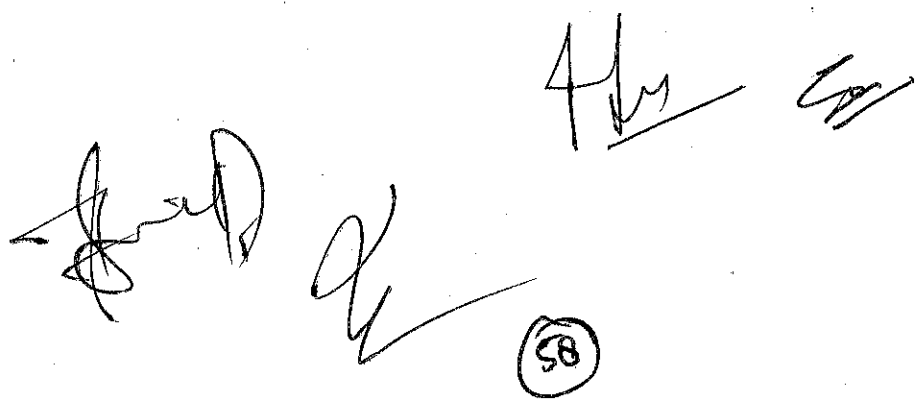| COURSE CODE	COURSE TYPE	COURSE TITLE	LOAD ALLOCATIONS			MARKS DISTRIBUTION		TOTAL MARKS	CREDITS	% CHANGE
			L	T	P	INTERNAL	EXTERNAL			
MET-5801	Professional Elective Course/ Massive Open Online Course	Optimization Techniques	2	1	0	25	75	100	3	100%
MET-5802		Tribology								
MOC-5801		SWAYAM/ NPTEL				0*	100*			
MET-5803	Professional Core Course	Additive Manufacturing	2	1	0	25	75	100	3	100%
PRJ-5811	PROJECT	Project	0	0	16	150	50	200	8	100%
MOC-5811	Massive Open Online Course	MOOC	0	0	2	25	0	25	1	100%
MEP-5811	Professional Core Course	3D Printing Lab	0	0	2	25	0	25	1	100%
NCC-5801	Non Credit Course	Disaster Management	2	0	0	Satisfactory/ Unsatisfactory			Non-Credit	100%
TOTAL			06	02	20	250/225*	200/225*	450	16	

*In case of SWAYAM/NPTEL.

OR

SCHEME - II

B.Tech. Mechanical Engineering 8th Semester **Contact Hours: 26**

Course Code	Course Type	Course Title	Load Allocations			Marks Distribution		Total Marks	Credits	% Change
			L	T	P	Internal	External			
PII-5811	Professional Industry Internship	Industry Internship	0	0	24	325	100	425	15	100%
MOC-5811	Massive Open Online Course	MOOC	0	0	2	25	0	25	1	100%
TOTAL			0	0	26	350	100	450	16	

B. Tech. Mechanical Engineering 8th Semester
Examination to be held in the Year May 2026, 2027, 2028, 2029

SCHEME -I

B. Tech. Mechanical Engineering 8th Semester　　　　　　　　**Contact Hours: 28**

COURSE CODE	COURSE TYPE	COURSE TITLE	LOAD ALLOCATIONS			MARKS DISTRIBUTION		TOTAL MARKS	CREDITS	% CHANGE
			L	T	P	INTERNAL	EXTERNAL			
MET-5801	Professional Elective Course/ Massive Open Online Course	Optimization Techniques	2	1	0	25	75	100	3	100%
MET-5802		Tribology								
MOC-5801		SWAYAM/ NPTEL				0*	100*			
MET-5803	Professional Core Course	Additive Manufacturing	2	1	0	25	75	100	3	100%
PRJ-5811	PROJECT	Project	0	0	16	150	50	200	8	100%
MOC-5811	Massive Open Online Course	MOOC	0	0	2	25	0	25	1	100%
MEP-5811	Professional Core Course	3D Printing Lab	0	0	2	25	0	25	1	100%
NCC-5801	Non Credit Course	Disaster Management	2	0	0	Satisfactory/ Unsatisfactory			Non-Credit	100%
TOTAL			06	02	20	250/225*	200/225*	450	16	

*In case of SWAYAM/NPTEL.

SCHEME - II

B.Tech. Mechanical Engineering 8th Semester　　　　　　　　**Contact Hours: 26**

Course Code	Course Type	Course Title	Load Allocations			Marks Distribution		Total Marks	Credits	% Change
			L	T	P	Internal	External			
PII-5811	Professional Industry Internship	Industry Internship	0	0	24	325	100	425	15	100%
MOC-5811	Massive Open Online Course	MOOC	0	0	2	25	0	25	1	100%
TOTAL			0	0	26	350	100	450	16	

BRANCH: MECHANICAL ENGINEERING

CREDITS: 3

CLASS: 8th SEMESTER
COURSE TITLE: OPTIMISATION TECHNIQUES
COURSE CODE: MET-5801
DURATION OF EXAMINATION: 3 HOURS

L	T	P	Marks	
			External	Internal
2	1	0	75	25

COURSE OUTCOMES	
On completion of the course the students will be able to:	
CO1	Identify necessity and development of mathematical models for various industries.
CO2	Describe basic optimization and simulation techniques applied to various industries.
CO3	Recall investment analysis and game theory.
CO4	Predict the industrial systems under the conditions of certainty, uncertainty and risk.
CO5	Propose a queuing model based upon given data.

Detailed Syllabus

SECTION–A

Introduction to Optimization: Nature and Historical Development of Optimization sciences, Types of Optimization problems. Project Scheduling: Planning and Scheduling with the basic network models incorporation probabilities and costs, PERT and CPM, Network crashing. **[08 Hours]**
Linear Distribution: Linear Programming Optimization models, Geometric solution in two and three dimensional space, Simplex algorithm Solution. **[07 Hours]**
Advanced Optimization Techniques: Multi stage optimization – dynamic programming, stochastic programming, Multi objective optimization. **[05 Hours]**

SECTION-B

Optimization Models: Transportation models, Variations and selected applications, Assignment models. **[05 Hours]**
Waiting Line models: Queuing System, Features of queuing process, Classification of models and their solution, M/M/I and M/M/C Models. **[09 Hours]**
Techniques of unconstrained minimization – Golden section, Random, pattern and gradient search methods. **[06 Hours]**
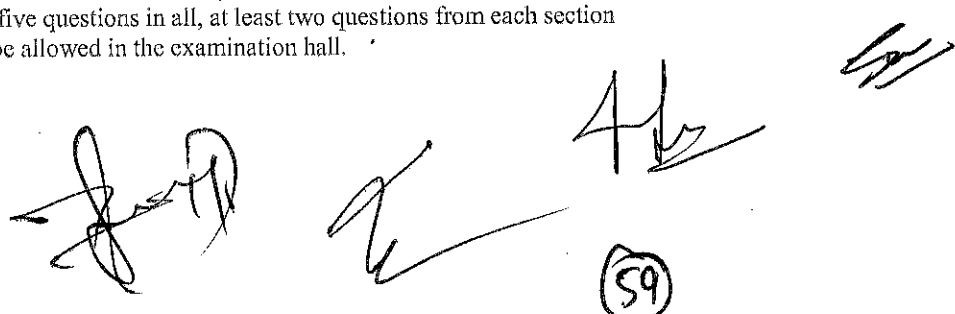
RECOMMENDEDBOOKS:

1.	Operation Research	:	Hamdy H Taha- McMillan pub. Co.
2.	Industrial Engineering & Management	:	O.P. Khanna.
3.	Operation Research	:	S.D. Sharma
4.	Fundamental of Operation Research	:	R.L.Ackoff & M.W.Sasieni-Wiley Eastern
5.	Theory and Problem of Operation Research	:	R.Bronson –Schaums Outline Series

NOTE:

1. Question paper will be of 3 Hours' duration
2. There will be 8 questions in all, four from Section- A (each of 15 marks) and four from Section – B (each of 15 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.

CREDITS: 3

BRANCH: MECHANICAL ENGINEERING
CLASS: 8th SEMESTER
COURSE TITLE: TRIBOLOGY
COURSE CODE: MET-5802
DURATION OF EXAMINATION: 3 HOURS

L	T	P	Marks	
			External	Internal
2	1	0	75	25

COURSE OUTCOMES	
On completion of the course the students will be able to:	
CO1	Understand the mechanism of friction, wear and lubrication and can develop analytical relation between the variables.
CO2	Understand hydrodynamic and hydrostatic lubrication.
CO3	Illustrate the behavior of tribological components subjected to different working conditions and describe different tribological measures.
CO4	Understand the concept of types of wear and their measurement under different environments
CO5	Understand the mechanism of lubrication, their performance w.r.t. different variables. Role of lubricants and their applications.

Detailed Syllabus

SECTION–A

Introduction to tribology and its main elements,i.e., Friction, wear and lubrication, Conformal and non-conformal contacts. Types of motion; rubbing sliding, oscillating and rolling. Surface interactions: elastic and plastic deformations. Properties of materials and there relevance in tribology. **[10 Hours]**

Surface energy and flash temperature theory. Friction: Laws of sliding friction, concept of adhesion, rolling friction, measurement of friction. Wear: Laws of wear, Types of wear such as adhesive, delamination, abrasive, fatigue, corrosive, fretting, erosive, and oxidative. **[10 Hours]**

SECTION–B

Prevention and control of wear and friction in machines, wear of cutting tools and dies, study of abrasion in grinding, lapping and honing. Lubrication: Types of Lubrication, Mechanisms of lubrication, Boundary. Squeeze film hydrodynamic, elasto hydro-dynamic and hydro static lubrications, and plasto hydrodynamic lubrication. Solid lubricants types and applications. **[07 Hours]**

Viscosity of lubricants, effect of temperature, pressure and shear rates on viscosity, measurement of viscosity, relative density, specific heat and thermal conductivity, acidity and alkalinity, oxidation stability. **[06 Hours]**

Flash point, foaming, pour point, demulsibility, extreme pressure additives. Lubrication between the piston rings and cylinder wall of a running engine, effect of speed, effect of viscosity and temperature, lubrication between a journal and bearing, effect of load, speed, viscosity and temperature, effect of temperature on lubricant films. **[07 Hours]**
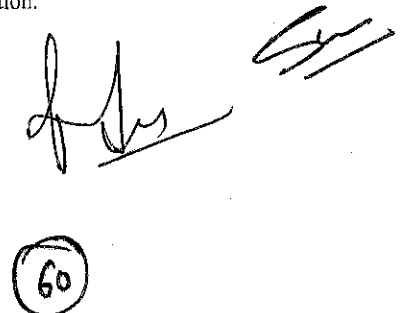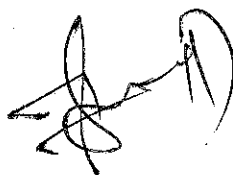
RECOMMENDED BOOKS:

1. Sharma Aggarwal, A Test Book, Kataria
2. Main Engg. Hand Book, A M/c Design.'., McGraw Hill.
3. Industrial Tribology, Tribology failures and their analysis, Dr. B.S. Prabhu
4. Czichos, H., "Tribology:A system approach to the science & technology of friction, lubrication and wear", Series 1, Elsevier Publications,1982.
5. Glaeser,W. A., "Tribology series – Vol. 20," Elsevier Publications,1992.
6. Neale, M.J., "The Tribology Hand Book," Butterworth Heinemann, London, 1995.

Reference Books:

1. Peterson, M. B., Winer, W.O., "Wear Control Handbook," ASME, NY. 1980.

NOTE:

1. There will be 8 questions in all, four from **Section-A** (each of 15 marks) and four from **Section–B** (each of 15 marks).
2. Students are required to attempt five questions in all, at least two questions from each section.
3. Use of scientific calculator will be allowed in the examination hall.

BRANCH: MECHANICAL ENGINEERING
CLASS: 8th SEMESTER
COURSE TITLE: SWAYAM/NPTEL
COURSE CODE: MOC-5801
DURATION OF EXAMINATION: 3 HOURS

CREDITS: 3

L	T	P	Marks	
			External	Internal
2	1	0	75	25

The department shall offer the 12 weeks NPTEL course out of the list of courses listed by NPTEL around the time of commencement of the semester.
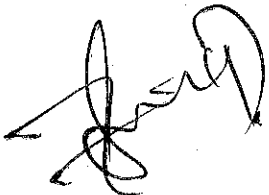
The courses offered shall be related to the core stream but should not be similar to the regular courses offered as a part of the department curriculum.

The overall monitoring of the NPTEL course will be under the supervision of the faculty in charge of the department.

The NPTEL 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 notified schedule.

Note: -

- The Course is declared pass in the semester only after the production of the NPTEL Certificate, by the student.

- The marks obtained by the student in the NPTEL certification course will be tabulated by the concerned department.
- The students must select their College name from the drop down box while registering for a particular course. Only those certificates will be accepted and validated by the department whose information will be shared by NPTEL to college authorities.
- No certificate will be accepted without this and student will be marked absent in the college record.
- In case the student does not pass the certification exam or remains absent in the proctored examination, no certificate will be awarded by NPTEL and hence the student will be deemed to have failed in the said Course.

- The student has to appear again in the NPTEL examination conducted either in the same course or any other course as per the next semester schedule of NPTEL and earn the certificate by passing the exam.

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B.Tech. Mechanical Engineering 8th Semester Examination to be held in the Year
May 2026, 2027, 2028, 2029

CREDITS: 3

BRANCH: MECHANICAL ENGINEERING
CLASS: 8th SEMESTER
COURSE TITLE: ADDITIVE MANUFACTURING
COURSE CODE: MET-5803
DURATION OF EXAMINATION: 3 HOURS

L	T	P	Marks External	Marks Internal
2	1	0	75	25

COURSE OUTCOMES

On completion of the course the students will be able to:

CO1	Understanding the basics of additive manufacturing/rapid prototyping and its advantages and disadvantages
CO2	Understanding the role of additive manufacturing in the design process and the implications for design
CO3	Understanding the processes used in additive manufacturing for a range of materials and applications
CO4	Understand the various software tools, processes and techniques that enable advanced/additive manufacturing and personal fabrication.
CO5	Apply knowledge of additive manufacturing for various real-life applications

Detailed Syllabus

SECTION-A

Introduction History and advantages of Additive Manufacturing, Types of Additive Manufacturing Technologies, Nomenclature of AM Machines, Direct and Indirect Processes; Prototyping, Manufacturing and Tooling. **[07 Hours]**
Layer Manufacturing Processes: Polymerization, Sintering and Melting, Extrusion, Powder Binder Bonding, Layer Laminate Manufacturing, Other Processes; Aerosol printing and Bio plotter. **[06 Hours]**
Development of Additive Manufacturing Technology Computer Aided Design Technology, Other Associated Technology, Metal and Hybrid Systems. **[05 Hours]**
Additive Manufacturing Processes Vat Photo polymerization; Materials, Reaction Rates, Photo polymerization Process Modelling, Scan Patterns. **[04 Hours]**

SECTION-B

Powder Bed Fusion Processes; Material, Powder Fusion Mechanism, Process Parameters and Modeling, powder Handling Extrusion Based System; Basic principles, plotting and Path Control. **[06 Hours]**
Design & Software Issues Additive Manufacturing Design and Strategies; Potentials and Resulting Perspectives, AM based New Strategies, Material Design and Quality Aspects for Additive Manufacturing; Material for AM, Engineering Design Rules for AM. **[05 Hours]**
Preparation of CAD Models: The STL file, Problem with STL file, STL files Manipulation, Beyond the STL file, Additional Software to Assist AM Material Design & Quality Aspects. **[06 Hours]**
Machines for Additive Manufacturing, Printers, Secondary Rapid Prototyping processes, Trends and Future Directions in Additive Manufacturing. **[05 Hours]**

Books and References:

1. Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, by- Ian Gibson, David W. Rosen, Brent Stucker, Springer.
2. Understanding Additive Manufacturing, by- Andreas Gebhardt, Hanser.
3. Additive Manufacturing, by- Amit Bandyopadhyay, Susmita Bose, CRC Press
4. Rapid Prototyping: Principles and Applications, by -Chee Kai Chua, Kah Fai Leong, Chu

NOTE:
- There will be 8 questions in all, four from **Section-A** (each of 15 marks) and four from **Section-B** (each of 15 marks).
- Students are required to attempt five questions in all, at least two questions from each section.
- Use of scientific calculator will be allowed in the examination hall.

BRANCH: MECHANICAL ENGINEERING   CREDITS: 8

CLASS: 8th SEMESTER

COURSE TITLE: PROJECT

COURSE CODE: PRJ-5811

DURATION OF EXAMINATION: 3 HOURS

L	T	P	Marks	
			External	Internal
0	0	16	50	150

COURSE OUTCOMES	
At the end of the project work, students will demonstrate the ability to	
CO1	Identify a problem statement from a rigorous literature survey or the industry requirements analysis
CO2	Simulate and design a solution for the identified problem by applying acquired technical knowledge.
CO3	Develop and test the prototype/algorithm to solve the engineering problem.
CO4	Accomplish all objectives of the project in an allocated period with efficient teamwork.
CO5	Present project work orally and through a comprehensive report.

After interactions with project guides/industry experts, based on a comprehensive literature survey/ Industry requirements analysis, the student shall identify the title and define the aim and objectives of a project. The student is expected to work on details specifications, methodology, resources required, critical issues in design and implementation, and submit the project proposal within the first two weeks of semester. The student is expected to work on the design, development, and testing of the proposed project work as per the schedule. The project report is to be submitted at the end of the semester.

The project will be assigned to the students towards the end of 7th semester and will start working on those projects at the commencement of their 8th semester. The topic of the project will be decided as per the developments taking place in the field of Mechanical Engineering. The Project involves innovation, fabrication, design, case study in any relevant field of Engineering. This report includes a summary of the literature survey, detailed objectives, project specifications, design, developed system/Algorithm, results, contributions, and innovations in project work.

Guidelines for evaluation of Project Work in 8th semester:

There shall be a mid-semester evaluation, followed by an End Semester (Final) Evaluation

Sub-distribution of marks:

- For External Examiner   :   50
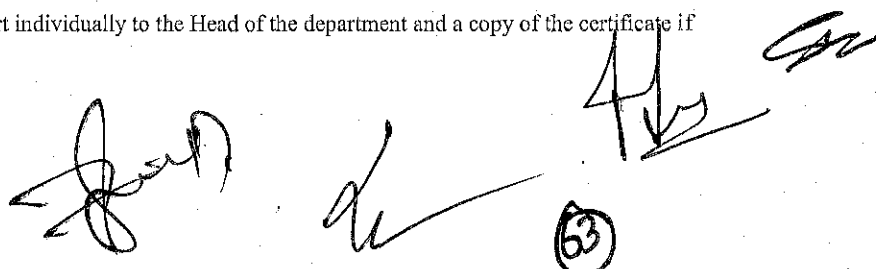- For Internal Examiner   :   150

Sub-distribution of Internal Marks:
- Out of the total 150 marks for internal evaluation, 50 marks are for mid-semester evaluation and 50 marks are for final internal evaluation
- Mark distribution of internal Project work as per the University statues shall be based on:

	Distribution	Mid-Semester		Internal Final	
a.	Viva-Voce	15	30%	30	30%
b.	Presentation	15	30%	30	30%
c.	Report	20	40%	40	40%
		50		100	
	Total Internal	150			

NOTE:

The students will submit a detailed project report individually to the Head of the department and a copy of the certificate if awarded should also be appended to the report

CLASS: B.Tech. 8th SEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE NO: MOC-5811
COURSE TITLE: MOOC

CREDIT: 1

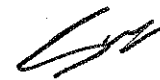| Hours/ Week			Marks
L	T	P	Total Marks
0	0	2	25

The students shall select a MOOC of 4 weeks/minimum 40 hours available at the time on any reputed platform and shall pursue the same after due approval, from the departmental Academic Committee. However, the selected MOOC course should not be similar to the regular courses offered as a part of the department curriculum.
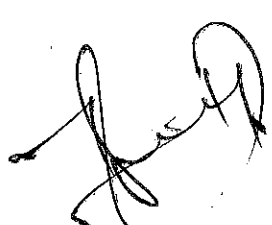
The overall monitoring of the MOOC course will be under the supervision of the teacher in in charge of the department. The Departmental Academic Committee shall assess the student work based on a presentation of the course undertaken/ project completed along with a relevant course completion certificate.

Note:- In Case a student opts for a 4 week NPTEL Course the following points need to be followed:

i.   The Course is declared pass in the semester only after the production of the NPTEL Certificate, by the student. In case the student does not pass the certification exam or remains absent in the proctored examination, no certificate will be awarded by NPTEL and hence the student will be deemed to have failed in the said Course. The student has to appear again in the NPTEL examination conducted either in the same course or any other course as per the next semester schedule of NPTEL and earn the certificate by passing the exam.

ii.   The students must select their College name while registering for a particular course. Thereafter, the option of sharing the result with the institute also needs to be selected. Only those certificates will be accepted and validated by department whose information is shared by NPTEL to college authorities.

No certificate will be accepted without this and student will be marked absent in college records.

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CREDIT 1

BRANCH: MECHANICAL ENGINEERING
CLASS: 8th SEMESTER
COURSE TITLE: 3D PRINTING LAB
COURSE CODE: MEP-5811

L	T	P	Marks	
			External	Internal
0	0	2	0	25

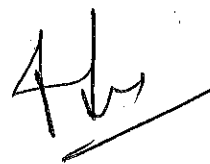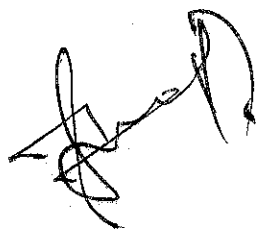| COURSE OUTCOMES	
At the end of the course student will be able to:	
CO1	Develop CAD models for 3D printing and import and export AD data and generate .stl file.
CO2	Selecta specific material and a 3D printing process for the given application.
CO3	Produce a product sing 3D Printing.

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 study the various type of 3D Printing Machine and material used in 3D Printing Machine
4. To print a 3D model of nut/bolt using PLA/ others material.
5. To print a 3D model of spanner using PLA/ others material.
6. To print a 3D model of pyramid using PLA/ others material.
7. To print a 3D model of gear using PLA/ others material.
8. To print a 3D model of bearing using PLA/ others 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 student

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BRANCH: MECHANICAL ENGINEERING
CLASS: 8th SEMESTER
COURSE TITLE: DISASTER MANAGEMENT
COURSE CODE: NCC-5801

CREDITS-0

L	T	P	Marks	
			External	Internal
2	0	0	Satisfactory/Unsatisfactory	

COURSE OUTCOMES	
On completion of the course the students will be able to:	
CO1	Identify various types of disasters, their causes and Impacts
CO2	To understand the disaster management principles, objectives and approaches
CO3	To understand various elements of disaster management.
CO4	To study the modern techniques used in disaster mitigation and management.

Module I

Introduction to Disaster Management: Define and describe disaster, hazard, emergency, vulnerability, risk and disaster dimensions. Important phases of Disaster Management Cycle.

Disasters classification- Natural disaster (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.)

Module II

Disaster Management: Principles, objectives, and approaches. Element of disaster management; role of NGOs, community – based organizations and media; central, and state.

Disaster Mitigation: Hazard assessment, Vulnerability assessment, and Risk assessment. Emergency Management Systems (EMS): Emergency medical and essential public health services, response and recovery operations, reconstruction and rehabilitation.
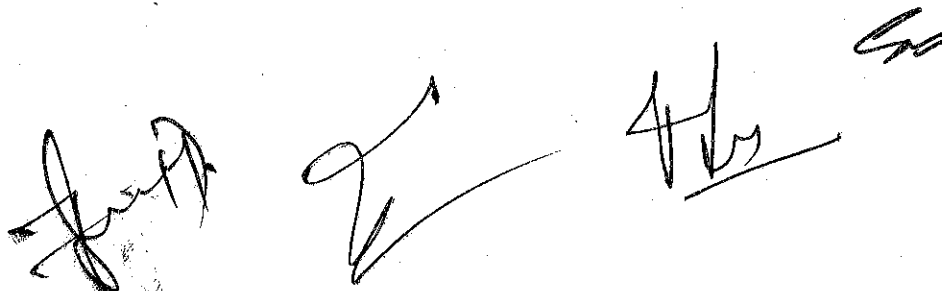
BOOKS RECOMMENDED:

1. Disaster Management   BY Harsh K Gupta
2. Disaster Management Techniques and Guidelines   BY B K Singh
3. Disaster Risk Reduction in South Asia   BY Pradeep Sahni
4. Disaster management, A P H Publishers   BY Sharma.S.R

NOTE:

There will be internal evaluation based on two internal sessional tests. Students are required to score at least 40% or above in totality to be considered qualified in the course.

CREDIT:15

BRANCH: MECHANICAL ENGINEERING
CLASS: 8ᵗʰ SEMESTER
COURSE TITLE: INDUSTRY INTERNSHIP
COURSE CODE: PII-5811

L	T	P	Marks	
			External	Internal
0	0	24	100	325

COURSE OBJECTIVES	
CO1	Practical implementation of theoretical knowledge gained during study
CO2	Implement ideas/real time industrial problem/ current application
CO3	Evaluate better solution for selected problem using state of the art topics in a broad area of his/her specialization.
CO4	Internship helps students to build confidence in handling and finding feasible solution of a real time industrial problem

The project will be assigned to the students towards the end of 7ᵗʰ semester and they will start working on those projects at the commencement of their 8ᵗʰ semester.

The students will submit the details of the company / industry where they intend to do their project work along with company's consent letter in the 7ᵗʰ semester. The Departmental Academic Committee will finalize and approve the projects. However, an internal guide will be allotted to each project who shall periodically evaluate the student's performance during the project. The topic of the project will be decided as per the developments taking place in the field of Mechanical Engineering. This may require complete literature survey, design, manufacturing, simulation of some models and/or some preliminary lab experiments etc.

The students will have to submit a detailed project report individually to their internal guide and a copy of the certificate if awarded should also be appended to the report. They should also submit a monthly progress of their project duly signed by the concerned authority via mail to their respective guide.
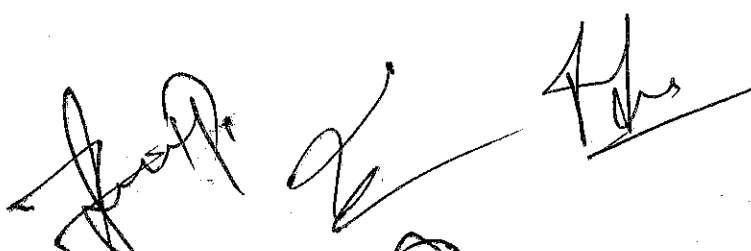
NOTE:

Students are also allowed to start their start up, provided they submit a DPR with a detailed proposal of their start up that would define their action plan and idea to the start-up cell. Only after the submitted proposal has been approved by the start-up cell will the students be allowed to work on their project.

Total Internal Marks = 325
Mark distribution of Industry internship (internal) as per the University statues shall be based on:

	Distribution	Mid-Semester		Internal Final	
a.	Viva-Voce	22.5	30%	75	30%
b.	Presentation.	22.5	30%	75	30%
c.	Report	30	40%	100	40%
		75		250	
	Total Internal	325			

BRANCH: MECHANICAL ENGINEERING

CLASS: 8th SEMESTER

COURSE TITLE: MOOC

COURSE CODE: MOC-5811

CREDITS: 1

L	T	P	Marks	
			External	Internal
0	0	2	0	25

The Students shall select a MOOC available at the time on any reputed platform and shall pursue the same after due approval of the same from the departmental Committee. However, the selected MOOC course should not be similar to the regular courses offered as a part of the department curriculum.

The overall monitoring of the MOOC course will be under the supervision of the teacher in charge of the department The Departmental Academic Committee shall assess the student work based on a presentation of the Course undertaken/Project completed along with a relevant course completion certificate.

Note:- In Case a student opts for a 4 week NPTEL Course the following points need to be followed:

i.   The Course is declared pass in the semester only after the production of the NPTEL Certificate, by the student. In case the student does not pass the certification exam or remains absent in the proctored examination, no certificate will be awarded by NPTEL and hence the student will be deemed to have failed in the said Course. The student has to appear again in the NPTEL examination conducted either in the same course or any other course as per the next semester schedule of NPTEL and earn the certificate by passing the exam.

ii.   The students must select their College name while registering for a particular course. Thereafter, the option of sharing the result with the institute also needs to be selected. Only those certificates will be accepted and validated by department whose information is shared by NPTEL to college authorities.

No certificate will be accepted without this and student will be marked absent in college records.