



UNIVERSITY OF JAMMU

NOTIFICATION (18/Oct/Adp/73)

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 Engineering (Mechanical Engineering)** for Semester I & II under the **Choice Based Credit System** as per the model curriculum of the **AICTE (as given in the Annexure Pages 01 to 25)** for the candidates of **all (Govt./Pvt./UIET) 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-I	December 2018, 2019, 2020 and 2021
	Semester-II	May 2019, 2020, 2021 and 2022

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

s/d-
DEAN ACADEMIC AFFAIRS

No. F.Acd/III/18/10827-10838

Dated: 31/10/2018

Copy for information & necessary action to:-

1. Dean Faculty of Engineering
2. Principal, GCET/MIET/MBSCET/UIET/BCET/YCET
3. C.A to the Controller of Examinations
4. Assistant Registrar (Exams/Confidential)
5. Section Officer (Confidential)
6. Incharge University Website


Assistant Registrar (Academics)

31/10/18
31/10/18
31/10/18

**B.E. Mechanical Engineering First Semester Examination to be held in the Year
December 2018,2019,2020,2021**

B.E. Mechanical Engineering 1st Semester

Contact Hrs.: 26

COURSE CODE	COURSE TYPE	COURSE TITLE	LOAD ALLOCATIONS			MARKS DISTRIBUTION		TOTAL MARKS	CREDITS	% CHANGE
			L	T	P	INTERNAL	EXTERNAL			
BSC-101	Basic Science Course	Engineering Mathematics-I	3	2	0	50	100	150	5	100
BSC-103	Basic Science Course	Engineering Chemistry	3	1	0	50	100	150	4	100
BSC-113	Basic Science Course	Engineering Chemistry (Lab)	-	-	3	50	-	50	1.5	100
HMC-101	Humanities & Social Science & Management Courses	Communication Skill	2	-	-	25	50	75	2	100
HMC-111	Humanities & Social Science & Management Courses	Communication Skill (Lab)	-	-	2	25	-	25	1	100
ESC-103	Engineering Science Course	Engineering Mechanics	3	1	0	50	100	150	4	100
ESC-113	Engineering Science Course	Engineering Mechanics (Lab)	-	-	2	50		50	1	100
ESC-112	Engineering Science Course	Workshop Technology	1	-	3	50	-	50	2.5	100
TOTAL			12	4	10	350	350	700	21	

First Semester Examination to be held in the Year December 2018,2019,2020,2021

CLASS: B.E. 1ST SEMESTER

BRANCH: COMMON TO ALL BRANCHES

COURSE TITLE: ENGINEERING MATHEMATICS-I

CREDITS: 5

COURSE No.: BSC-101

DURATION EXAM.: 3 HRS

L	T	P	MARKS	
			THEORY	SESSIONAL
3	2	0	100	50

Course Outcomes: At the end of the course the Student will be able to

- CO 1 Learn the rules of nth derivative, to find maximum and minimum value of any function, to trace the curves.
- CO 2 Understand the concept of definite integrals and find arc length, area, surface area and volume of various curves.
- CO 3 Solve the differential equations of first order and higher order.
- CO 4 differentiate the concept of scalars , vectors, gradient, divergence and curl.
- CO 5 Evaluate the complex no. in polar form and understand the idea of hyperbolic functions

Detailed Syllabus

UNIT - I Differential Calculus – I

(07 hrs)

Leibnitz theorem (without proof) , Partial differentiation, Euler's theorem on homogeneous functions, Asymptotes, Double points, curvature, Curve tracing in Cartesian, polar and parametric forms.

UNIT – II Differential Calculus – II

(07 hrs)

Rolle's theorem , Mean value theorem , Taylor's and Maclaurin's series with remainder , Indeterminate forms , Taylor's series in two variables , Maxima and Minima of functions of two variables , Method of Lagrange's multiplier's.

UNIT – III Integral Calculus

(08 hrs)

Definite integrals with important properties, differentiation under the integral sign, Gamma, Beta and error functions with simple problems, applications of definite integrals to find length, area, volume and surface area of revolutions, transformation of coordinates, double and triple integrals with simple problems.

UNIT –IV Vector Calculus

(06 hrs)

Scalar and vector product of vectors, Derivatives of vectors, Partial derivatives of vectors, Directional derivatives and Gradient, Divergence and Curl of a vector, Vector Integration ; Gauss's Divergence theorem, Green's theorem, Stoke's theorem,

UNIT – V Complex Trigonometry

(05 hrs)

Hyperbolic functions of a complex variable, Inverse Hyperbolic functions, Logarithmic function of a complex variable; Summation of series by C+ iS method.

UNIT – VI Ordinary Differential Equations

(08 hrs)

Differential equations of first order and first degree: Exact and non-exact differential equations, Linear and Bernoulli's differential equations. Higher order linear differential equations: Complementary solution, particular integral and general solution of these equations, variation of parameters technique to find particular integral of second order differential equations, Cauchy's and Lagrange's differential equations. Applications of ordinary differential equations to simple Electrical and Mechanical Engg. Problems.

BOOKS RECOMMENDED:

- | | |
|-----------------------------------|--|
| 1. Calculus and Analytic Geometry | Thomas and Finney, 9 th Edition, Pearson, 2002. |
| 2. Differential Calculus | S. Narayan and P.K. Mittal, S.Chand, New Delhi. |
| 3. Vector Calculus | S. Narayan and P.K. Mittal, S.Chand, New Delhi. |
| 4. Higher Engineering Mathematics | B.S Grewal, Khanna Publishers, New Delhi |
| 5. Engineering Mathematics-I | Dr. Bhopinder Singh |
| 6. | |

NOTE: (I) There shall be total seven questions. Question no.1 is compulsory and short answer/ objective type .It will consists of 10 questions each of 01 mark (Total: 10 marks)

(II) There will be two questions from each unit. Attempt one question from each unit. Each question carry 15 marks.



First Semester Examination to be held in the Year December 2018,2019,2020,2021

CLASS: B.E. 1ST SEMESTER

BRANCH: CIVIL/MECHANICAL/ELECTRICAL ENGINEERING

COURSE TITLE: ENGINEERING CHEMISTRY

CREDITS: 4

COURSE No.: BSC-103

DURATION EXAM.: 3 HRS

L	T	P	MARKS	
			THEORY	SESSIONAL
3	1	0	100	50

Course Outcomes : At the end of the course the student will be able to -

- CO 1** Know the importance of stereochemistry in organic compound and apply the knowledge gain in this course to the variety of chemical compounds.
- CO 2** Summarize the chemical structure, molecular properties, vulcanization process and application of major type of rubber.
- CO 3** The different polymerisation processes used to make thermoplastic and thermosetting plastics.
- CO 4** Through Spectroscopy, One could acquire Knowledge about the identification of newly synthesized products.
- CO 5** Explain the air quality, emission, pollution control and Environmental health.
- CO 6** Define basic knowledge on cement, its production, characteristics, properties etc.
- CO 7** Recognise the common physical, chemical process encountered in treatment process of water.

SECTION – A

Module – I

STEREOCHEMISTRY AND DRUGS

Optical isomerism, enantiomerism and diastereoisomerism, racemisation, Methods for resolution of racemic mixture, asymmetric synthesis.

Definition and synthesis of a drug, structure and applications of following drugs:-

- (a) Antipyretic
- (b) Narcotics
- (c) Tranquillizers
- (d) Antibiotics

6hrs

Module – II

PLASTICS, RUBBER AND PAINTS

- Plastics :** Introduction, importance and uses of plastics, classification of plastics, moulding constituents of a plastic, moulding of plastic into articles (compression, injection, transfer and extraction mouldings).
- Rubber :** Introduction, types of rubber, treatment of latex, vulcanization of rubber.
- Paints :** Introduction, requisites of a good paint, constituents of a paint, manufacture of paint, a brief idea of manufacture, properties and uses of white pigments such as white lead and lithopone.

9hrs



Module – III

SPECTROSCOPIC TECHNIQUES AND APPLICATIONS

- UV Spectroscopy : Principle, Laws of absorption, Band nature of UV Spectrum, types of electronic transitions, applications.
I R Spectroscopy : Principle, molecular vibrations, applications.
NMR Spectroscopy : Principle and applications. 8hrs

SECTION – B

Module – IV

ENVIRONMENTAL SCIENCE

Concepts of Environmental Chemistry, Segments of environment (a brief idea about atmosphere, hydrosphere and Lithosphere).

Air Pollution : Types and control of Air Pollution.

Water Pollution: Classification and control of Water Pollution.

Chemical Toxicology : Biochemical effects of Pb, Hg, As, Zn & CN. 8hrs

Module – V

ALLOYS AND CEMENT

Alloys : Introduction, purpose of making alloys, preparation of alloys, classification of alloys (Ferrous & Non-Ferrous alloys), alloy steels and copper alloys (Brass & Bronze).

Cement & its types, manufacture of Portland cement, setting and hardening of cement. 5hrs

Module – VI

WATER TREATMENT

Introduction, softening of water by Lime-Soda, zeolite & ion-exchange processes, priming and foaming, sludge & scale formation, determination of hardness of water by EDTA method, Numericals on hardness and softening of water. 6hrs

NOTE: The paper will be divided into two sections. There shall be a total of eight questions, four from each section A and B, selecting at least one question from each module. Each question carries 20. Five questions will have to be attempted, selecting at least two questions from each section. marks Use of calculator is allowed.

Books Recommended:

S.No. BOOKS RECOMMENDED

1. Engineering Chemistry
2. Engineering Chemistry
3. Engineering Chemistry
4. Engineering Chemistry
5. Organic Chemistry
6. Environmental Chemistry
7. Spectroscopy of Organic Compounds
8. Spectroscopy of Organic Compounds
9. Polymer Science
10. Engineering Chemistry

AUTHOR

Jain & Jain
Sharma, B.K.
Dara, S.S.
Shashi, Chawla
Bahl, B.S.
De, A.K.
Silverstein
Kalsi, P.S.
Gowrikar, V.R. et al
Dr. Rajinder Kumar



First Semester Examination to be held in the Year December 2018,2019,2020,2021

CLASS: B.E. 1ST SEMESTER

BRANCH: CIVIL/MECHANICAL/ELECTRICAL ENGINEERING

COURSE TITLE: ENGINEERING CHEMISTRY LAB

CREDITS: 1.5

COURSE No.: BSC-113

DURATION EXAM.: 3 HRS

L	T	P	MARKS	
			THEORY	PRACTICAL
0	0	3	0	50

Course Outcomes : At the end of the course the student will be able to -

- CO 1 Capability to visualize and understand chemical engineering unit, operations related to fluid and practical mechanics and mass transfer.
- CO 2 To provide an overview of preparation and identification of organic compound.
- CO 3 This course relies on quantitative analysis and makes use of simple equation to illustrate the concept involved.
- CO 4 Handling different types of instruments for analysis of materials, using small quantity of material involved for quick and accurate results.
- CO 5 Estimation of total hardness of water by EDTA complex metric method.
- CO 6 Detection of various elements and functional groups in unknown organic compound.
- CO 7 To determine the alkali content in antacid tablets.

S. No.	TITLE OF EXPERIMENT
1.	Determine the percentage of CaCO_3 in precipitated chalk. You are provided with 1N HCl and 0.1N NaOH.
2.	To analyse the given antacid tablets.
3.	Determine Volumetrically the number of molecules of water of crystallization present in the given sample of Mohr's salt, x gms. of which have been dissolved per litre provided N/10 $\text{K}_2\text{Cr}_2\text{O}_7$ (using an external indicator).
4.	Determine Volumetrically the percentage of Cu in a sample of CuSO_4 crystals, Z gms of which have been dissolved per litre, provided 0.1N $\text{Na}_2\text{S}_2\text{O}_3$.
5.	To determine the coefficient of viscosity of an unknown liquid using Ostwald Viscometer.
6.	Determine the surface tension of a unknown liquid Stalagmometer.
7.	To prepare a pure and dry sample of Aspirin.
8.	To prepare a pure and dry sample of Glucosazone.
9.	Determine the method of purification of organic compounds by column chromatography.
10.	Organic Analysis: Identify the following organic compounds (preparation of at least one derivative).
11.	Determine the total hardness of a sample of water by complexometric method (using EDTA).
12.	Determine the percentage of calcium oxide in cement.

Note:- A minimum of ten experiments to be performed.

BOOKS RECOMMENDED:-

TITLE

1. A manual of practical Engineering Chemistry
2. Experimental Engineering chemistry

AUTHOR

(Dr. Rajinder Kumar)
(Shashi Chawla)

***First Semester Examination to be held in the Year December 2018,2019,2020,2021**

CLASS: B.E. 1ST SEMESTER

BRANCH: MECHANICAL/CIVIL ENGINEERING

COURSE TITLE: COMMUNICATION SKILLS

CREDITS: 2

COURSE No.: HMC-101

DURATION EXAM: 3 HRS

L	T	P	MARKS	
			THEORY	SESSIONAL
2	0	0	50	25

COURSE OUTCOME OF COMMUNICATION SKILLS

The student would be able to:

1. Acquire proficiency in reading, speaking and writing skills.
2. Equip themselves with grammatical and communicative competence.
3. Adept in communication skills required for the competence in present scenario.
4. Acquire proficiency in listening skills and professional etiquettes.
5. Enhance their linguistic competence for Group Discussions and public speaking.

SECTION-A

UNIT I

Writing Practice: Comprehension, Notices, Memos, Précis writing, Types of Letter- Enquiry letter, Reply to enquiry, Claims letter; Adjustment and sales letter, Job letter; E-mail writing.

5 hrs

UNIT II

Introduction to grammar: Use of phrase and clauses in sentences, use of proper punctuation Concept of word formation, Synonyms, Antonyms, Prefix, Suffix; Articles, Prepositions, Clichés, Subject-verb Agreement.

6 hrs

SECTION-B

UNIT III

Communication: Introduction, Elements of Business Communication, Media of verbal communication (oral & written), Barriers of Communication, Guidelines to improve Business communication.

5 hrs

UNIT IV

Professional Etiquettes- Meaning and types. **Listening skills:** Process of listening, types of listening, techniques to improve listening ability, skills of effective listening, **Group Discussion-** Advantages, Purpose, Group Dynamics, and Guidelines for Effective Group discussion.

5 hrs

UNIT V

Speaking Skills- Skills of Effective speaking, Components of Effective talk and body language; **Interviews-** Meaning, Types of interview, tips for giving an interview and handling questions. **Meeting skills:** purpose of meeting- procedures, notices, agenda, venue of meeting; minutes of meeting. **Brain Storming-** Purpose and techniques.

5 hrs

NOTE: The question paper shall consist of two questions from each unit (total 10 questions). Students have to attempt one question from each unit (total no. of questions to be attempted shall be five) i.e there shall be internal choice within each unit. Students have to attempt two questions from Section A and three questions from section B. Each question carries equal marks (10 marks).

BOOKS RECOMMENDED

- Communication Skills by Dr. Nageshwar Rao & Dr. Rajendra Prasad.
- Functional Aspects of Communication Skills by Dr. Prajapati Prasad, Published by S.K Kataria & Sons.
- An Approach to Communication Skills by Indrajit Bhattacharya, Published by Dhanpat Rai & Co. Ltd.
- Communication Skills by Varinder Kumar and Bodh Raj, Published by Kalyani Publishers.
- An Approach to Communication Skills by Bhanu Ranjan
- Communication Skills and Functional Grammar by Sadhna Gupta.
- Remedial English Grammar by F.T.Wood. Macmillan
- On Writing Well. William Zinsser. Harper resource Book



First Semester Examination to be held in the Year December 2018,2019,2020,2021

CLASS: B.E. 1ST SEMESTER

BRANCH: MECHANICAL/CIVIL ENGINEERING

COURSE TITLE: COMMUNICATION SKILLS

CREDIT: 1

COURSE No.: HMC-111

DURATION EXAM: 3 HRS

L	T	P	MARKS	
			THEORY	PRACTICAL
0	0	2	0	25

COURSE OUTCOME OF COMMUNICATION SKILLS LAB

The student would be able to:

1. Identify difficult sounds, words and phrases and shall acquire proficiency in pronouncing the words correctly with proper stress and intonations.
2. Equip themselves with art of making resume/cv which can aptly highlight their self-introduction and their strongest attributes.
3. Make use of latest technology to communicate effectively in various settings and contexts.
4. Face their interviews confidently and shall acquire proficiency in Group Discussions and public speaking.
5. Acquire the art of holding meetings as well as preparing the annual reports of the organizations.

List of Practical:

1. Listening Comprehension.
2. Pronunciation, Intonation, Stress & Rhythm.
3. Common everyday situations and conversations & Dialogues.
4. Power point presentation
5. Resume/Bio data preparation including SWOT analysis.
6. Vocabulary improvement programs, Role play
7. Mock interviews
8. Group discussions
9. Minutes of Meeting
10. Annual Reports



First Semester Examination to be held in the Year December 2018,2019,2020,2021

CLASS: B.E. 1ST SEMESTER

BRANCH: CIVIL/MECHANICAL ENGINEERING

COURSE TITLE: ENGINEERING MECHANICS

CREDITS: 4

COURSE No.: ESC-103

DURATION EXAM.: 3 HRS

L	T	P	MARKS	
			THEORY	SESSIONAL
3	1	0	100	50

Course Outcomes: At the end of this course, students will demonstrate the ability to:-

1. Analyze the system of units and the conversion of units from one to another.
2. Demonstrate knowledge on basic calculation of forces and their resultant and resolution.
3. Approach to a conclusion of forces causing equilibrium.
4. Be proficient in the use of integral and moment methods for calculating centre of gravity.
5. Develop a stable, environment friendly structure for various engineering purpose using various modern tools.

SECTION-A

(STATICS)

Scope and basic concepts (Rigid body, force, units, etc), concept of free body diagram, Resultant of Coplanar concurrent forces in a plane and space, moment of force, Principle of Moments, Coplanar applications. Equilibrium and its equations for planar and spatial systems, Analysis of trusses, Method of Joints & Sections.

Theory of friction, its laws and applications (inclined plane), Centroids and center of gravity, centroids of lines and composite areas, centroids determined by integration.

Moment of inertia, Area M.O.I, Transfer theorems, Polar M.O.I, Product of inertia, Principal M.O.I. Transfer theorems and axes M.O.I of composite bodies. Moment of inertia of standard sections and composite sections.

SECTION-B

(DYNAMICS)

Kinematics of a particle rectilinear motion, motion curves, Rectangular components of curvilinear motion, Flight of Projectile, Normal and tangential components of acceleration, Radial and transverse components, Newton's Laws. D'Alembert's Principle.

Kinematics of rigid bodies: Types of rigid body motion, Angular motion, fixed axis rotation, Analysis of plane motion and its applications, Instantaneous center and Instantaneous axis of rotation.

Kinetics of Particle: Translation, Analysis of a particle as a rigid body.

Kinetics of rigid bodies: Equations of plane motion, fixed axis rotation, Rolling bodies, General plane motion, Impulse and momentum in plane motion, Angular momentum.

RECOMMENDED BOOKS:

- | | |
|---|----------------------------------|
| 1. Engineering Mechanics (Statics & Dynamics) | Beer and Johnson |
| 2. Engineering Mechanics (Statics & Dynamics) | Mariam and Kraige |
| 3. Engineering Mechanics (Statics and Dynamics) | Timoshenko and Young |
| 4. Engineering Mechanics (Statics and Dynamics) | Ferdinand L Singer. |
| 5. Engineering Mechanics (Statics and Dynamics) | Sarbjeet Singh and Pardeep Singh |
| 6. Engineering Mechanics (Statics and Dynamics) | A.K Tayal |

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

First Semester Examination to be held in the Year December 2018,2019,2020,2021

CLASS: B.E. 1ST SEMESTER

BRANCH: CIVIL/MECHANICAL ENGINEERING

COURSE TITLE: ENGINEERING MECHANICS LAB

CREDIT: 1

COURSE No.: ESC-113

DURATION EXAM: 3 HRS

L	T	P	MARKS	
			THEORY	PRACTICAL
0	0	2	0	50

Course Outcomes (COs): At the end of the course the Student will be able to-

- CO 1 Apply the fundamentals of statics and motion principles of various engineering problems related to statics and motion.
- CO 2 Have the knowledge of finding the stable structures of various engineering purposes and bending of beams by using bending moment apparatus.
- CO 3 Solve engineering problems related to motion.
- CO 4 Demonstrate the knowledge on basic calculation of forces and their resultant and resolution.
- CO 5 Solve the engineering problems related to friction and analyze it in real life situation.

ENGINEERING MECHANICS PRACTICAL:

1. To verify Parellogram law of forces.
2. To verify LAMIS THEOREM.
3. To verify bending Moment.
4. To find out the coefficient of friction between Glass and wooden surface on an incline plane.
5. To find out the velocity ratio, and Mechanical Advantage of Single/Double purchase Winch Crab
6. To find the coefficient of friction between Glass and steel roller on an inclined plane.
7. To find the velocity ratio, and Mechanical advantage of a worm & Worm Wheel.
8. To find the reactions at supports in case of simply supported beam.



First Semester Examination to be held in the Year December 2018,2019,2020,2021

CLASS: B.E. 1ST SEMESTER

BRANCH: CIVIL/MECHANICAL ENGINEERING

COURSE TITLE: WORKSHOP TECHNOLOGY

CREDITS: 2.5

COURSE No.: ESC-112

DURATION EXAM: 3 HRS

L	T	P	MARKS	
			THEORY	PRACTICAL
1	0	3	0	50

Course Objectives:-

1. To train the students in various manufacturing practices and to impart basic knowledge of workshop technology .
2. To develop right attitude, team work, precision and safety at work place.
3. To explain the construction, function, use and application of different working tools, Equipment and machines
4. To have practical exposure to various manufacturing practices such as welding ,fitting, carpentry, pattern making, casting, smithy and machining.

Course Outcomes:-

At the end of the course, the student will demonstrate the ability to :-

1. Understanding different manufacturing techniques and their relative Advantages/disadvantages with respect to different applications.
2. Selection of a suitable technique for meeting a specific fabrication need.
3. Acquire a minimum practical skill with respect to the different manufacturing methods and develop the confidence to design& fabricate small components for their project work and also to participate in various national and international technical competitions.
4. Introduction to different manufacturing methods in different fields of engineering.
5. Practical exposure to different fabrication techniques
6. Creation of simple components using different materials. Exposure to some of the advanced and latest manufacturing techniques being employed in the industry.

Shop Practice :-

Unit I CARPENTRY:-

1. Different joints :- a) Middle/cross lap joint
b) Mortise and Tenon T -joint
2. Pattern making of open bearing

Unit II CASTING:-

1. Casting of open bearing (single piece pattern)
2. Casting of split piece pattern

Unit III SMITHY:-

1. Cubical block from a cylindrical section
2. L - shaped hook from cylindrical section

Unit IV WELDING:-

1. Preparation of single V - Butt joint by gas and arc welding processes
2. Preparation of Double V-Butt joint , T-joint and corner joint by gas and arc welding

Unit V FITTING:-

1. Assembly of snap fitting of MS-Flat pieces (Male and Female)
2. Assembly and fitting of two L- shaped rectangular MS flat pieces

Unit VI MACHINE SHOP:-

1. Operation like turning, step turning on MS round
2. Operation like taper turning , Knurling on MS round
3. Introduction to CNC machines

Books Recommended :-

- Workshop Technology by Hajra and Chowdhary
- Manufacturing Technology Vol I & II by Rao. P.N
- Manufacturing Technology by Gowri .P. Hariharan and A. Suresh Babu

**B.E. Mechanical Engineering Second Semester Examination to be held in the Year
May 2019,2020,2021,2022**

B.E. Mechanical Engineering 2nd Semester

Contact Hrs.: 24

COURSE CODE	COURSE TYPE	COURSE TITLE	LOAD ALLOCATIONS			MARKS DISTRIBUTION		TOTAL MARKS	CREDITS	% CHANGE
			L	T	P	INTERNAL	EXTERNAL			
BSC-201	Basic Science Course	Engineering Mathematics-II	3	2	-	50	100	150	5	100
BSC-202	Basic Science Course	Engineering Physics	3	1	-	50	100	150	4	100
BSC-212	Basic Science Course	Engineering Physics (Lab)	-	-	3	50	-	50	1.5	100
ESC-201	Engineering Science Course	Computer Programming	3	1	-	50	100	150	4	100
ESC-211	Engineering Science Course	Computer Programming (Lab)	-	-	2	50	-	50	1	100
ESC-202	Engineering Science Course	Engineering Graphics	1	-	3	50	100	150	2.5	100
NCC-201	Non-Credit Course	Mentoring and Professional Development	-	-	2	Satisfactory / Un-Satisfactory			Non-Credit	-
NCC-202		Environmental Sciences								
NCC-203		Indian Constitution								
TOTAL			10	4	10	300	400	700	18	



Second Semester Examination to be held in the Year May 2019,2020,2021,2022

CLASS: B.E. 2ND SEMESTER

BRANCH: COMMON TO ALL BRANCHES

COURSE TITLE: ENGINEERING MATHEMATICS-II

CREDITS: 5

COURSE No.: BSC-201

DURATION EXAM.: 3 HRS

L	T	P	MARKS	
			THEORY	SESSIONAL
3	2	0	100	50

Course Outcomes: At the end of the course the Student will be able to

- CO 1 Learn the rules of nth derivative, to find maximum and minimum value of any function, to trace the curves.
- CO 2 Understand the concept of definite integrals and find arc length, area, surface area and volume of various curves.
- CO 3 Solve the differential equations of first order and higher order.
- CO 4 differentiate the concept of scalars, vectors, gradient, divergence and curl.
- CO 5 Evaluate the complex no. in polar form and understand the idea of hyperbolic functions

Detailed Syllabus

UNIT- I Introduction to infinite series & sequences

(06 hrs)

Convergence and divergence of a series, p-test, comparison test, Cauchy's root test, D' Alembert Ratio Test, Raabe's Test, Gauss test, Logarithmic test, Leibnitz test on alternating series.

UNIT- II Fourier series and Power Series Solutions of Second order O.d.e

(10 hrs)

- (i) Fourier series: Euler's formula, sufficient conditions for a Fourier expansion, functions having points of discontinuity, change of intervals. Odd and even functions, Fourier expansion of Odd and even periodic functions, half range series, typical wave forms, Parseval's formula, complex form of Fourier -series.
- (ii) Power series: Analytic function, ordinary point, singular point, regular and irregular singular points of o.d.e. $Y'' + P(x) Y' + Q(x) Y = 0$, Series solution of differential equations about an ordinary point, Frobenius series solution about a regular singular point. Examples of Legendre and Bessel's differential equations.

Unit – III First Order partial differential equations

(05 hrs)

Formation of p.d.e, First order linear p.d.e, Non-Linear p.d.e. of 1st order, solution by Charpit's method, Four Standard forms of non-linear p.d.e with reference to Charpit's technique: $f(p, q) = 0$, $f(z, p, q) = 0$, $f(x, p) = g(y, q)$ and Clairaut's form.

Unit – IV Higher Order Linear p.d.e

(07 hrs)

Homogenous and Non-homogenous higher order linear partial differential with constant coefficients Rules for finding P.I and C.F, Non-Linear equations of 2nd order. Application of p.d.e, method of separation of variables to solve equations of vibrations of strings (or one dim wave equation), one dim heat flow equations, Laplace equations.

Unit – V Matrices

(08 hrs)

Introduction, Rank of matrix, Elementary transformations, Elementary matrices, Inverse using elementary transformation, Normal form of a matrix, Linear dependence and independence of vectors, consistency of linear system of equations, Gauss Jordan method, Gauss elimination method, Eigen values and Eigen vector, Properties of Eigen value, Cayley Hamilton Theorem, Reduction to diagonal form, Reduction of quadratic form to canonical form.

Unit – VI Vector Spaces

(5 hrs)

Definition, Linear transformation, basis, dimensions of a vector space, Range and Kernel of a linear transformation, Rank, Nullity, Rank-Nullity theorem, Matrix associated with a linear transformation.

NOTE: (I) There shall be total seven questions. Question no.1 is compulsory and short answer/ objective type. It will consist of 10 questions each of 1 mark (Total: 10 marks)

(II) There will be two questions from each unit. Attempt one question from each unit. Each question carry 15 marks.

BOOKS RECOMMENDED:

1. Advanced Engineering Mathematics
2. Higher Engineering Mathematics
3. Engineering Mathematics -II
4. Partial differential equations
5. Linear Algebra

E. Kreyszig, 2006

Dr. B.S. Grewal, Khanna Publication, New Delhi

Dr. Bhopinder Singh

M.D.RaiSinghanian

D.Poole, 2nd Edition, 2005



CLASS: B.E. 2ND SEMESTER

BRANCH: CIVIL/MECHANICAL/ELECTRICAL ENGINEERING

COURSE TITLE: ENGINEERING PHYSICS

CREDITS: 4

COURSE No.: BSC-202

DURATION EXAM.: 3 HRS

L	T	P	MARKS	
			THEORY	SESSIONAL
3	1	0	100	50

Course Outcomes (CO) : At the end of the course the Student will be able to -

- CO 1 Understand the significance of Maxwell's equations as the basis of Electromagnetic theory.
Gain the knowledge on the basic concepts of Quantum Mechanics and its applications.
Acquire the concepts of different types of oscillations.
- CO 2 Assimilates the basic concepts of Semiconductor Physics.
Get familiar with different aspects of applied optics & their applications.
Understand the working principle of various lasers and optical fibres and their applications in various fields.

SECTION – A

Module -I: ELECTROMAGNETIC FIELDS AND WAVES

Concepts of Del Operator- gradient, divergence, curl and their physical significances, Displacement Current. Maxwell's equations in vacuum and non conducting medium, Electromagnetic wave propagation in free space (e.m wave equations for electric & magnetic fields for free space) & their solutions (plane wave solution) , velocity of E.M. waves, Relation between E_0 & B_0 , definition of Poynting vector, Poynting theorem.

8hrs, Weightage = 20%

Module –II : QUANTUM MECHANICS

Inadequacies of Classical Mechanics ,De-broglie's concept of Matter waves, Wave-packet (Wavegroup), Phase and Group velocity, Heisenberg's uncertainty Principle, Experimental illustration of Uncertainty principle using single slit, Wave-function definition, interpretation and significance of wave-function, Schrodinger's wave equation (Steady-state and Time dependent) for one- dimensional case, Concept of Operators and Expectation values, Applications of Schrodinger's equation (Time independent) to ;

- i) Particle in a one-dimensional box of infinite height, ii) Single step potential barrier, iii) Tunnel effect,

9hrs, Weightage = 20%

Module-III : OSCILLATIONS

Damped and Forced oscillations and their differential equations , Logarithmic decrement, Relaxation time & Quality factor, Ultrasonic waves and their production by Piezoelectric method and general applications.

4hrs, Weightage = 10%

SECTION – B

Module –IV: SEMICONDUCTOR PHYSICS

Structure of Atoms, Energy Band diagram, Metal, Insulator and Semiconductor, Intrinsic and Extrinsic semiconductors , Direct & Indirect semiconductors , Bond in semiconductor & effect of temperature on semiconductors, Hole & Electron description , Charge densities in semiconductor , Generation & Recombination of charge carrier, Law of mobility & conductivity, Current densities in semiconductors , Fermi levels, Mass action law, Drift & Diffusion currents, Hall effect, Hall co-efficient & its applications .

9hrs, Weightage = 20%

Module –V : APPLIED OPTICS

Interference in thin films (by reflection and transmission of light), Theory of Newton's rings by reflected light, Determination of wavelength and refractive index of monochromatic light by Newton's rings theory.

Fraunhofer & Fresnel's diffractions, Fresnel's half period zones and rectilinear propagation of light, Fraunhofer diffraction due to a single slit, Plane diffraction grating & its theory for secondary maxima & minima.

Unpolarised and polarised light, Double refraction phenomenon, Nicol Prism, Mathematical representation of elliptically and circularly polarized light, Quarter and Half wave plates.

7hrs, Weightage = 20%

Module VI : LASERS AND FIBRE OPTICS

Principal of Laser action, Einstein's co-efficients, Ruby & CO₂ Lasers, Holography, Propagation of Light in Optical fibres, Acceptance angle & acceptance cone, Numerical Aperture, Single mode & Multimode fibres, Characteristics and General applications of Lasers & Optical fibres.

5hrs, Weightage = 10%

TUTORIALS

S.No	TOPICS
------	--------

- | | |
|-----|---|
| T-1 | Numerical Problems pertaining to topics in Unit-I |
| T-2 | Numerical Problems based on topics in Unit-II |
| T-3 | Numerical Problems related to topics in Unit-III |
| T-4 | Numerical Problems based on topics in Unit-IV |
| T-5 | Numerical Problems associated with topics in Unit-V |
| T-6 | Numerical Problems related to topics in Unit-VI |

NOTE: There shall be a total of eight questions, four from Each Section A & Section B selecting at least one question from each module. Each question carries 20 marks. Five questions will have to be attempted. Selecting at least two from each section. Use of Scientific calculator is allowed.

Books Recommended:

TITLE	AUTHOR
1. Physics	Reisnick & Halliday
2. Fundamentals of Electricity & Magnetism	Duggal & Chhabra
3. Modern Physics	Beiser
4. Modern Physics	Blatt
5. Modern Physics	Gupta & Gupta
6. Sound	Subramaniam
7. Basic Electronics	Millman & Halkias
8. Semi conductor Physics and Devices: Basic Principles	Donald A. Neamen
9. Optics	Brijlal & Subramaniam
10. Fibre Optics	Ghatak, Tyagrajan
11. Lasers	K.R. Nambiyar
12. Modern Engineering Physics	A.S. Vasudeva

Second Semester Examination to be held in the Year May 2019,2020,2021,2022

CLASS: B.E. 2ND SEMESTER

BRANCH: CIVIL/MECHANICAL/ELECTRICAL ENGINEERING

COURSE TITLE: ENGINEERING PHYSICS

CREDITS: 1.5

COURSE No.: BSC-212

DURATION EXAM.: 3 HRS

L	T	P	MARKS	
			THEORY	PRACTICAL
0	0	3	0	50

Course Outcomes:

At the end of the course the Student will be able to -

- CO-1 Gain knowledge about the scientific methods of measuring different physical parameters based on the concepts of Physics.
- CO-2 Develop the experimentation skills by displaying minimized measurement errors.
- CO-3 Demonstrate & improve the practical skills to use the appropriate physical concepts to obtain the solutions pertaining to different physics experiments.
- CO-4 Acquire a sense of scientific temper infused with innovation & creativity.

Experiment No.	Title of Experiment
Exp- I	To find the frequency of A.C. mains using an electrical vibrator.
Exp-II	To study the variation of magnetic field.
Exp-III	To verify the Faraday's laws.
Exp-IV	To find the co-efficient of self induction of a coil by Anderson's bridge using head phone.
Exp-V	To find the impedance of LCR circuit.
Exp-VI	To evaluate the value of Planck's constant using a photo-cell.
Exp-VII	To study the characteristics of a Solar cell.
Exp-VIII	To draw the V-I characteristics of a P-N junction diode.
Exp-IX	To study the common base/ common emitter characteristics of PNP/NPN junction transistor.
Exp-X	To study the Zener diode characteristics.
Exp-XI	To find the dispersive power of a given prism using a spectrometer.
Exp-XII	To find the wavelength of monochromatic light using Newton's rings apparatus.
Exp-XIII	To determine the wavelength of sodium light using a plane transmission grating.
Exp-XIV	To determine the specific rotation of sugar/glucose using Laurent's Half shade Polarimeter.
Exp-XV	To find the wavelength of He-Ne laser.

NOTE : A MINIMUM OF EIGHT EXPERIMENTS IS TO BE PERFORMED COVERING THE DIVERSE ASPECTS OF ENGINEERING PHYSICS.

BOOKS RECOMMENDED:

	TITLE	AUTHOR
1.	B.Sc. Practical Physics	C.L. Arora
2.	Practical Physics	Warsnop & Flint
3.	Practical Physics	Chauhan & Singh (Vol. I & Vol. II)

Second Semester Examination to be held in the Year May 2019,2020,2021,2022

CLASS: B.E. 2ND SEMESTER

BRANCH: CIVIL/MECHANICAL ENGINEERING

COURSE TITLE: COMPUTER PROGRAMMING

CREDITS: 4

COURSE No.: ESC-201

DURATION EXAM.: 3 HRS

L	T	P	MARKS	
			THEORY	SESSIONAL
3	1	0	100	50

Course Outcomes : At the end of the course the student will be able to-

- CO 1 Understand, analyze and implement software development tools like algorithm, pseudo codes and flow charts.
- CO 2 Understand the use of loops and decision making statements to solve the problems.
- CO 3 Apply different operations on arrays and user-defined functions to solve real-time problems.
- CO 4 Analyze the operation of pointers, structures and unions.
- CO 5 Implement file operations in C programming for a given application.

Detailed Syllabus **Section-A**

Introduction to Programming (Flow chart/pseudocode, compilation etc.

Evolution of programming languages, structured programming, the compilation process, object code, source code, executable code, operating systems, fundamentals of algorithms, flow charts.

Introduction to C, Data Types, Constants, Variables, Expressions, Statements, Operators, Data Input and Output.

Character set, Identifiers, Keywords, Data Types, Constant and Variables, Statements, Expressions, Operators, Precedence of operators, Input-output Assignments. (10 hrs)

Control Statements, Storage Classes, Library Functions.

Control structures, Decision making and Branching, Decision making & looping.

Storage Classes: Types of storage class, Scoping rules.

Standard Library Functions, advantages and use of various library functions (I/O functions, String, Character, Mathematics, Time and Date, functions) (10 hrs)

Section-B

Functions, Arrays, Recursion, User Defined Data Types, Structures, Unions, Passing Structure to Functions.

User defined and standard functions, Formal and Actual arguments, Functions category, function prototypes, parameter passing, Call-by-value, Call-by-reference, Nested functions.

One dimensional Array, Multidimensional Array declaration and their applications, String Manipulation, Recursion, Passing array to a function. Declaration of structures, declaration of unions, pointer to structure & unions. (10hrs)

Pointers, Operation on Pointers, Passing Pointers to Functions, Data Files – Opening, Closing, Creating Data Files

Pointer variable and its importance, Pointer Arithmetic, passing parameters by reference, pointer to pointer, pointers to functions, Dangling pointer, dynamic memory allocation.

Console input output functions, Disk input output functions, opening closing and creating Data files.
(10 hrs)

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

BOOKS RECOMMENDED:

- | | |
|--|----------------------|
| 1. C How to Program, 7/e | - Paul J. Deitel |
| 2. Programming With C | - Byron Gottfried. |
| 3. Programming With C | - E. Balaguruswamy. |
| 4. C The Complete Reference | - Herbert Schildt. |
| 5. Let us C | - Yashwant Kanitkar. |
| 6. Programming in C : A Practical Approach | - Ajay Mittal |



Second Semester Examination to be held in the Year May 2019,2020,2021,2022

CLASS: B.E. 2ND SEMESTER

BRANCH: CIVIL/MECHANICAL ENGINEERING

COURSE TITLE: COMPUTER PROGRAMMING LAB

CREDIT: 1

COURSE No.: ESC-211

Duration Exam: 3 HRS

L	T	P	MARKS	
			THEORY	PRACTICAL
0	0	2	0	50

Laboratory Outcomes : After Completion of this course the student will be able to –

- CO 1 Read, understand and trace the execution of programs written in C language.
- CO 2 Exercise conditional and iterative statements to write C programs.
- CO 3 Implement Programs using operators, arrays and pointers to access functions.
- CO 4 Write programs that perform operations using derived data types and files.

Lab Experiments

Experiment 1: Problem solving using computers: Familiarization with programming Environment.

Experiment 2: Variable types and type conversions: Simple computational problems using arithmetic expressions.

Experiment 3: Branching and logical expressions: Problems involving if-then-else Structures.

Experiment 4: Loops, while and for loops: Iterative problems e.g., sum of series

Experiment 5: 1D Arrays: searching, sorting: 1D Array manipulation

Experiment 6: 2D arrays and Strings, memory structure: Matrix problems, String Operations

Experiment 7: Functions, call by value: Simple functions

Experiment 8: Recursion, structure of recursive calls: Recursive functions

Experiment 9: Pointers, structures and dynamic memory allocation: Pointers and Structures

Experiment 10: File handling: File creation, writing and reading a file, File manipulation Operations



Second Semester Examination to be held in the Year December 2018,2019,2020,2021

CLASS: B.E. 2ND SEMESTER

BRANCH: CIVIL/MECHANICAL ENGINEERING

COURSE TITLE: ENGINEERING GRAPHICS

CREDITS: 2.5

COURSE No.: ESC-202

DURATION EXAM.: 3 HRS

L	T	P	MARKS	
			THEORY	SESSIONAL
1	0	3	100	50

Course Outcomes (COs): At the end of the course the Student will be able to-

- CO 1 Draw orthographic projections of sections.
- CO 2 Use architectural and engineering scales with accuracy.
- CO 3 Work with zeal of office practices and standards.
- CO 4 Convert sketches to engineered drawing.
- CO 5 Perform auto cad two dimensional drawing.

SECTION A

Engineering Curves: Conventional lines and signs used in Engineering Drawing, Dimension and Tolerances, Printing and Lettering, Curves used in Engineering Practice: Cycloidals, Involutess, Spirals and Hellices,

Loci-Conic section: Terms used in conic-conic curves curved defined as Loci, Practical application of conics, Ellipse, Parabola, Hyperbola

Projection of Planes: Projections of a plane w.r.t. the principle planes in simple and inclined positions. Rotation method and the Auxiliary plane method. Space relation of a plane. To locate a point on a plane given its projections. Parallel relation of planes. Projection of planes inclined to different principal plane.

Projection of Solids: Classification and main features-Prisms and Pyramids. Projection of solids inclined to both the reference planes by (I) Rotation Method, and (II) Auxiliary plane method. Projection of solids in combination (Co-axial) in simple and inclined positions.

Sectioning of Solids: Object of sectioning, Types of cutting planes, True shape of section, Auxiliary views of sections of multiple co-axial solids in simple and titled conditions.

SECTION B

Interpenetration of Solids and Intersection of Surface: Intersection of geometrical solids/hollow sections, Tracing of lines of intersection by line method and by section method.

Development of Surfaces: Classification of surfaces, Methods of development-Straight line method and Radial line method, Development of solids and hollow sections in full or part development of transition pieces. To draw projections from given development.

Isometric Projection: Isometric scale, Isometric axes and Isometric planes, Isometric projection of solids and simple machine blocks.

Overview of Computer Graphics covering:

Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.

Orthographic Projections: Orthographic projection of simple blocks (First & Third angles), to draw the third view from given two views. Missing lines in projection.

Text/ Reference Books

1. Engineering Drawing by P.S GILL
2. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
3. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
4. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
5. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
5. (Corresponding set of) CAD Software Theory and User Manuals

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

Second Semester Examination to be held in the Year May 2019,2020,2021,2022

CLASS: B.E. 2ND SEMESTER

BRANCH: MECHANICAL/CIVIL ENGINEERING

COURSE TITLE: MENTORING & PROFESSIONAL DEVELOPMENT

CREDIT: Non-Credit

COURSE No.: NCC-201

L T P

DURATION EXAM: 3 HRS

0 0 2

Detailed Syllabus

- iv. Mentoring: - Meaning and importance of mentoring, Stress management, Conflict management, Time management .Role of mentor in: mitigating stress and conflict in time management, in confidence building, in overall personality development, in developing life skills and emotional intelligence.
(7)

- v. Meaning and components of personality, Personality development models – Johari Window and Transactional analysis, Motivation – meaning and approaches, Leadership –meaning and style.
(8)

Note: -

- i. There shall be a case study, viva –voce of the students by internal examiner consisting of 40 marks each.
- ii. There will be an Internal MCQ/Objective type Questions based examination of 40 marks.
- iii. Evaluation: Satisfactory $\geq 40\%$: Unsatisfactory $<40\%$.

Second Semester Examination to be held in the Year May 2019,2020,2021,2022

CLASS: B.E. 2ND SEMESTER

BRANCH: MECHANICAL/CIVIL ENGINEERING

COURSE TITLE: ENVIRONMENTAL SCIENCES

CREDIT: Non-Credit

COURSE No.: NCC-202

L T P

DURATION EXAM: 3 HRS

0 0 2

Detailed Syllabus

1. Introduction

Definition and scope and importance of multidisciplinary nature of environment. Need for public awareness. (2)

2. Natural Resources

Natural Resources and associated problems, use and over exploitation. (2)

3. Ecosystems

Concept of Ecosystem, Structure, interrelationship, producers, consumers and decomposers, biodiversity and importance. (2)

4. Environmental Pollution

Definition, Causes, effects and control measures of air pollution, Water pollution, Soil pollution, Noise pollution, Thermal pollution, nuclear hazards. Solid waste Management: Causes, effects and control measure of urban and industrial wastes. Disaster Management: Floods, earthquake, cyclone and landslides. (4)

5. Social Issues

Water conservation, rain water harvesting, Climate change, global warming, acid rain. Environment Protection Act: Air (Prevention and Control of Pollution) Act, Water (Prevention and control of pollution) Act, Wildlife Protection Act, Forest Conservation Act. (3)

6. Human Population and the Environment

Population growth, Population explosion. Environment and human health, Human Rights. Role of Information Technology in Environment and human health. (2)

Note:

- There will be an Internal MCQ/Objective type Questions based examination of 40 marks.
- Evaluation: Satisfactory $\geq 40\%$: Unsatisfactory $< 40\%$.
- A field visit of students to make them aware about the environmental issues is compulsory.

BOOKS RECOMMENDED:

- | | |
|--|----------------|
| 1. Environmental Sciences | - Basak, A |
| 2. Environmental Studies | - Benny Joseph |
| 3. Environment Pollution Control Engineering | - Rao, C.S. |
| 4. Perspectives in Environmental Studies | - Kaushik, A. |
| 5. Elements of Environment Science & Engineering | - Meenakshi. |
| 6. Elements of Environment Engineering | - Duggal. |



Second Semester Examination to be held in the Year May 2019,2020,2021,2022

CLASS: B.E. 2ND SEMESTER

BRANCH: MECHANICAL/CIVIL ENGINEERING

COURSE TITLE: INDIAN CONSTITUTION

CREDIT: Non-Credit

COURSE No.: NCC-203

L T P

DURATION EXAM: 3 HRS

0 0 2

Detailed Syllabus

1. Indian Constitution-Sources and Features, Preamble (2)
2. Fundamental Rights, Fundamental Duties (2)
3. Directive Principles of state policy (2)
4. Structure of State and Central Government (4)
5. Judiciary-Supreme court, High court, Judicial Review and Judicial Activism (5)

Note:

- i) There will be an Internal MCQ/Objective type Questions based examination of 40 marks.
- ii) Evaluation: Satisfactory $\geq 40\%$: Unsatisfactory $< 40\%$.





UNIVERSITY OF JAMMU

NOTIFICATION

(19/Aug/Adp/30)

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 revised Syllabus of **Bachelor of Engineering (Mechanical Engineering)** for Semester III & IV under the **Choice Based Credit System** as per the model curriculum of the AICTE (as given in the Annexure) for the candidates of all (Govt./Pvt./UIET) 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-III	December 2019, 2020, 2021 and 2022
	Semester-IV	May 2020, 2021, 2022 and 2023

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

Sd/-
DEAN ACADEMIC AFFAIRS

No. F.Acd/III/19/4780-4792

Dated: 20/08/2019

Copy for information & necessary action to:-

1. Dean Faculty of Engineering
2. Principal, GCET/MIET/MBSCET/UIET/BCET/YCET
3. C.A to the Controller of Examinations
4. Assistant Registrar (Exams/Confidential)
5. Section Officer (Confidential)
6. Incharge University Website

Assistant Registrar (Academics)

[Signature]
19/8
18 19/8/19
19/8

**B.E. Mechanical Engineering 3rd Semester Examination to be held in the Year
December 2019,2020,2021,2022**

B.E. Mechanical Engineering 3rd Semester

Contract Hrs.: 26

COURSE CODE	COURSE TYPE	COURSE TITLE	LOAD ALLOCATIONS			MARKS DISTRIBUTION		TOTAL MARKS	CREDITS	% CHANGE
			L	T	P	INTERNAL	EXTERNAL			
PME-301	Professional Core Course	Fluid Mechanics	3	1	0	50	100	150	4	100%
PME-302	Professional Core Course	Thermodynamics	3	1	0	50	100	150	4	100%
PME-303	Professional Core Course	Machine Drawing	1	0	2	25	100	125	2	100%
PME-304	Professional Core Course	Mechanics Of Solids	3	1	0	50	100	150	4	100%
PME-305	Professional Core Course	Production Technology-I	2	1	0	50	100	150	3	100%
PME-311	Professional Core Course	Fluid Mechanics Lab.	0	0	2	75	0	75	1	100%
PME-312	Professional Core Course	Thermodynamics Lab.	0	0	2	75	0	75	1	100%
PME-313	Professional Core Course	Mechanics Of Solids Lab.	0	0	2	75	0	75	1	100%
PME-314	Professional Core Course	Workshop Practice 1	0	0	2	50	0	50	1	100%
TOTAL			12	4	10	500	500	1000	21	

3rd Semester Examination to be held in the Year December 2019,2020,2021,2022

CLASS: B.E. 3rd SEMESTER

CREDITS: 4

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: FLUID MECHANICS

COURSE NO.: PME-301

DURATION OF EXAMINATION: 3 HOURS.

L	T	P	Marks	
			Theory	Sessional
3	1	0	100	50

COURSE OUTCOMES

At the end of the course student will be able to:

CO301.1:	Determine the fluid flow as it is the main component which decides power associated with the fluid.
CO301.2:	Determined energy associated with fluid flow in a channel or a steam.
CO301.3:	Know the nature fluid in order to choose appropriate fluid as per need.
CO301.4:	Determine losses occurred when dealing with a fluid flowing in a channel.
CO301.5:	Determine friction factor from Darcy-Weisbach equation.

Detailed Syllabus

SECTION - A

Fluids and their properties, Fluids-shear stress in a moving fluid-difference between solids and fluids-viscosity - Newtonian and Non-Newtonian fluids - viscosity in liquids and gases - density-surface tension - capillarity. [5 Hours]

Fluid Statics: Pressure absolute and gauge pressure- measurement of gauge pressure-centre of pressure - buoyancy and stability of submerged and floating bodies - metacentric heights. [5 Hours]

Kinematics of Fluid Flow: Eulerian & Lagrangian approaches, classification of fluid flow as steady and unsteady flow, uniform and non-uniform flow, laminar and turbulent flow - pathline, stream line, streak line and stream tube - one, two and three dimensional flow - velocity and acceleration in steady and unsteady flow. Basic hydrodynamics: ideal fluids - equation of continuity in the differential form .stream function. Euler's equation for unsteady flow in three dimensions - one dimensional flow along a stream of velocity, Bernoulli's equation and its applications - pitot and pitot-static tubes - venturimeter, flow nozzles. [10 Hours]

SECTION - B

Basic equations of Fluid Mechanics : equation of continuity, momentum equation and energy equation for a control volume, adoption of these equation to one dimensional flow - velocity and momentum correlation - application of momentum equation to straight and bent, uniform and reducing conduits, path of trajectory of a free liquid jet. [10 Hours]

Steady flow of incompressible fluids in Pipes, Laminar and Turbulent flows, critical Reynold's number - hydraulic radius - general equation for friction, friction in non-circular pipes - Darcy Weisbach equation - development of boundary layer in pipe's flow, smooth and round pipes, Minor losses in pipes. [10 Hours]

RECOMMENDED BOOKS:

- | | |
|--|----------------------|
| 1. Fluid Mechanics | VL Streeter |
| 2. Fluid Mechanics with Engineering Applications | Dougherty & Franzini |
| 3. Engineering Fluid Mechanics | Roberson & Crowe |
| 4. Fluid Mechanics | Massey |
| 5. Fluid Mechanics | KL Kumar |

NOTE:

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

3rd Semester Examination to be held in the Year December 2019,2020,2021,2022

CLASS: B.E. 3rd SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: ENGG.THERMODYNAMICS

COURSE NO.: PME-302

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 4

Marks	
Theory	Sessional
L 3	T 1 P 0 Theory 100 Sessional 50

COURSE OUTCOMES

At the end of the course student will be able to:

CO302.1:	Apply fundamental concepts of thermodynamics to engineering applications.
CO302.2:	Estimate thermodynamic properties of substances in gas and liquid states..
CO302.3:	Determine thermodynamic efficiency of various energy related processes.
CO302.4:	Observe and distinguish the different thermodynamic processes around them and think creatively.
CO302.5:	Read data from various defined steam tables and psychometrics tables.

Detailed Syllabus

SECTION - A

Concept of work-first law of thermodynamics, concept of energy, definition of heat open system, concept of enthalpy, specific heats, steady flow energy equation and related applications. Second law of thermodynamics and applications, various statements and their equivalence, reversible process and reversible cycle, Carnot theorem, concept of thermodynamic temperature scale, Clausius theorem. [5 Hours]

Entropy, Concept of entropy, calculations of change in entropy, reversibility and irreversibility, Clausius inequality, Law of increase in entropy of universe. Applications of entropy principle. Introduction to solid, liquid and gaseous fuels– Stoichiometry, exhaust gas analysis- Heat calculations using enthalpy tables. [10 Hours]

Vapor power cycles Rankine cycle with superheat, reheat and regeneration, energy analysis. Super-critical and ultra-super-critical Rankine cycle- Gas power cycles, Air standard Otto, Diesel and Dual cycles-Air standard Brayton cycle effect of reheat, regeneration and intercooling- [5 Hours]

SECTION - B

Combined gas and vapor power cycles- Vapor compression refrigeration cycles, refrigerants and their properties.

Properties of dry and wet air, use of psychometric chart, processes involving heating/cooling and humidification/dehumidification, dew point. [10 Hours]

Vapor compression refrigeration cycles, refrigerants and their properties.

Analysis of steam turbines, velocity and pressure compounding of steam turbines.

Reciprocating compressors, staging of reciprocating compressors, Optimal stage pressure ratio, effect of intercooling, Minimum work for multistage reciprocating compressors.

I.C engines & S.I engines.

[12 Hours]

RECOMMENDED BOOKS:

- | | |
|-------------------------------|---------------|
| 1. Engineering Thermodynamics | R.K Rajput |
| 2. A Course in Thermodynamics | Joseph Kestin |
| 3. Heat and Thermodynamics | M.W. Zemansky |

NOTE:

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

3rd Semester Examination to be held in the Year December 2019,2020,2021,2022

CLASS: B.E. 3rd SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: MACHINE DRAWING

COURSE NO.: PME-303

DURATION OF EXAMINATION: 4 HOURS.

CREDITS: 2

		Marks	
L	T	Theory	Sessional
1	0	100	25

COURSE OUTCOMES

At the end of the course student will be able to:

CO303.1:	Understand about design aspect
CO303.2:	Understand 2D and 3D views of assembly
CO303.3:	Draw different views of assembly.
CO303.4:	Draw disassembly from assembled view.
CO303.5:	Differentiate between different types of coupling, bearing and pulleys.

Detailed Syllabus

SECTION-A

- Assembly Drawings of the following machines:
 - Steam and I.C. Engines : Piston, Connecting Rod
 - Machine tools : Tailstock, Machine vices.
 - Boiler Mountings : Feed check valve, Steam stop valve, and Blow off Cock. [10 Hours]
- Bearings: Pedestal bearing, Pivot bearing and Swivel bearing. [10 Hours]

SECTION- B

- Simple assemblies: Shaft couplings, Muff Coupling, Split muff, Flange Couplings, Protected and Unprotected, Universal Coupling [6 Hours]
- Construction of Profiles for (a) Spur Gear Teeth (Involute), (b) Cams [6 Hours]
- Different types of Joints: Riveted joints, Threaded fasteners, Knuckle joint, Cotter Joints: Gib and Cotter. [4 Hours]

RECOMMENDED BOOKS:

- Machine Drawing P. S. Gill.
- Machine Drawing N. D. Bhat.
- Machine Drawing R. B. Gupta.

NOTE:

- Question paper will be of 4 Hours' duration.
- There will be Six questions in all, five from **Section- B** (each of 15 marks) and one Compulsory question of 55 marks from **Section - A**.
- Students are required to attempt four questions in all, three from Section-B and one compulsory question involving assembly from **Section A**.
- Use of scientific calculator will be allowed in the examination hall.

3rd Semester Examination to be held in the Year December 2019,2020,2021,2022

CLASS: B.E. 3rd SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: MECHANICS OF SOLIDS

COURSE NO.:PME-304

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 4

Marks				
L	T	P	Theory	Sessional
3	1	0	100	50

COURSE OUTCOMES

At the end of the course student will be able to:

CO304.1:	Analyze problems related to mechanics of solid engineering bodies & Differentiate between principal stresses.
CO304.2:	Analyze and solve problems related to statically determinate and indeterminate beams.
CO304.3:	Describe and use of torsional effects on beams
CO304.4:	Understanding the effects of strain energy in beams
CO304.5:	Understand the mechanics behind the cylinder design.

Detailed Syllabus

SECTION - A.

Stresses and Strains: Stress and Strain, Stress – Strain Diagram, Material properties. Hooke's Law, Poisson's ratio, Transformation of stresses and strains (Two dimensional case only), Relation between elastic constants. Stresses in axially loaded members. Thermal stresses. Principal stresses, Mohr's circle of stress. **[10 Hours]**

Shear force and Bending moment diagrams. Bending of Beam: Normal and shear stresses in bending of beams. Torsion of circular sections, Torsion formula, Angle of twist, Shearing stresses. Combined Bending and Torsion. Columns & Struts : Theory, Buckling, Euler's formulae for different end conditions.

[10Hours] SECTION - B.

Thick Cylinders: Lamé's Theorem for determining the Principle Stress in a thick cylinder (Open ended and Ends Closed) under Internal and External Pressures, Strains and radial reflection. Curved Beams : Bending of curved bars, Determination of bending stress as through Winkler– Bach Solution, Radial Stresses, Location of Neutral axis, Thick Rings and Chain links. **[12 Hours]**

Statically Indeterminate Beams: Theorem of Three moments and applications. Theories of failure: Theories of failure as applicable to ductile and brittle materials, their significance and comparison. **[8 Hours]**

RECOMMENDED BOOKS:

- | | |
|--------------------------------------|--------------------|
| 1. Advanced Mechanics of Solids | L.S.Srinath |
| 2. Elements of Strength of Materials | Timoshenko & Young |
| 3. Mechanics of Material | Beer & Johnson |
| 4. Mechanics of Solids | Popov |
| 5. Strength of Materials | 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 20 marks) and four from **Section –B**(each of 20 marks).
3. Students are required to attempt five questions in all, atleast two questions from each section
4. Use of scientific calculator will be allowed in the examination hall.

3rd Semester Examination to be held in the Year December 2019,2020,2021,2022

CLASS: B.E. 3rd SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: PRODUCTION TECHNOLOGY-I

COURSE NO.: PME-305

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 3

Marks				
L	T	P	Theory	Sessional
2	1	0	100	50

COURSE OUTCOMES

At the end of the course student will be able to:

CO305.1:	Recognize the different types of casting process.
CO305.2:	Select suitable manufacturing process for typical components.
CO305.3:	Describe the various welding process.
CO305.4:	Explain the concept of forging, rolling process and drawing.
CO305.5:	Explain various production technique used in various engineering communities.

Detailed Syllabus

SECTION - A

Introduction: Definition, primary and secondary processes, criteria for selection.

Casting: As a production process, patterns, allowances, design and layout.

Moulds: Types, materials, foundry sands, Properties of moulding materials, and testing cores, core making process, melting furnace, Cupola.

Gating and Riser: Types of gating systems, pouring time and temperature. Design criteria for pouring basin, sprue, runner gate and riser, problems on gating design, directional principle; Special casting processes: shell, investment, centrifugal, permanent mould castings and die castings, defects and inspection of castings.

[20 HOURS]

SECTION - B

Mechanical, working processes: Plastic deformation, hot and cold working, forming processes. Rolling, drawing, deep drawing, extrusion, Analysis of forces and pressure based on equilibrium equation in strip rolling, drawing and extrusion (simple cases)

Forging operation: Drop forging, press forging, die forging, sheet metal operations, punching, piercing operations.

Welding processes: Definition, classification, and selection. Types of flames, gas cutting Arc welding, principle of arc welding, arc initiation, arc welding equipment, power sources and their selection, manual metal arc welding, submerged arc welding, shielded arc welding (TIG & MIG), resistance welding, soldering and brazing, welding inspection and defects.

[20 HOURS]

NOTE:

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

3rd Semester Examination to be held in the Year December 2019,2020,2021,2022

CLASS: B.E. 3rd SEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: FLUID MECHANICS LAB.
COURSE NO.: PME-311

CREDITS: 1

L	T	P	Marks Practical
0	0	2	75

COURSE OUTCOMES

At the end of the course student will be able to:

CO311.1	Estimate the friction and measure the frictional losses in fluid flow.
CO311.2	Experiment with flow measurement devices like venturimeter and orifice meter.
CO311.3	Predict the coefficient of discharge for flow through pipes.

LIST OF EXPERIMENTS:

1. To find out the Metacentric Height of the floating pontoon.
2. To verify the Bernoulli's Equation.
3. To find out the co-efficient of discharge using Venturimeter.
4. To find out the co-efficient of discharge using Orificemeter.
5. To find out the co-efficient of discharge using Pitot tube.
6. To analyse the regimes of flow using Reynold's Experiment.
7. To find out the viscosity of a fluid using Redwood Viscometer.
8. To find out the Friction factor of a pipe and compare the resistances to flow in various pipes
9. To find out discharge through Notches.

NOTE:

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

3rd Semester Examination to be held in the Year December 2019,2020,2021,2022

CLASS: B.E. 3RD SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: THERMODYNAMICS LAB

COURSE CODE: PME-312

CREDITS: 1

L	T	P	Marks
0	0	2	Practical 75

COURSE OUTCOMES

At the end of the course student will be able to:

CO312.1	Compute the property of real gases.
CO312.2	Demonstrate the performance of Refrigerator and Heat pump.
CO312.3	Interpret the characteristics of Boiler.

LIST OF EXPERIMENTS:

1. To verify Second law of thermodynamics with the help of heat engine.
2. To analyse the p-v-T behavior of real gases in comparison with Ideal gases.
3. To analyse steam boiler and its accessories and determination of:
 - i) Equivalent Evaporation
 - ii) The dryness fraction of steam using Throttling Calorimeter
4. To find out the COP of the Refrigerator.
5. To find out the COP of the Heat Pump.
6. To analyse isentropic flow of a perfect gas through a nozzle.
7. To find volumetric and isothermal efficiency of reciprocating air compressor.
8. To find COP of air conditioning unit.
9. To study and calculate the efficiency of Petrol engine.
10. To study and calculate the efficiency of Diesel engine.

NOTE:

1. Atleast six practical's should be performed.
2. Additional lab/ experiment will be performed based on course content requirement.

3rd Semester Examination to be held in the Year December 2019,2020,2021,2022

CLASS: B.E. 3RD SEMESTER

CREDITS: 1

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: MECHANICS OF SOLID LAB.

COURSE NO.: PME-313

L	T	P	Marks Practical
0	0	2	75

COURSE OUTCOMES

At the end of the course student will be able to:

CO312.1	Describe the behavior of materials upon normal external loads.
CO312.2	Predict the behavior of the material under impact conditions.
CO312.3	Recognize the mechanical behavior of materials.

LIST OF EXPERIMENTS:

1. To conduct the tensile test on a M.S. specimen and draw the load extension diagram using a UTM.
2. To conduct the compression test on a concrete specimen and draw the load compression diagram using a UTM.
3. To conduct torsion test on mild steel or cast iron specimen to determine modulus of rigidity.
4. To find the hardness of a specimen using Rockwell Hardness Tester.
5. To find the hardness of a specimen using Brinell Hardness Tester.
6. To find the hardness of a specimen using Vickers Hardness Tester
7. To conduct the Izod and Charpy Tests on a notched M.S. specimen
8. To conduct simple bending experiments for different types of loading.

NOTE:

1. At least six practical's should be performed.
2. Additional lab/ experiment will be performed based on course content requirement.

ANNEXURE II

**B.E. Mechanical Engineering 4th Semester Examination to be held in the Year
MAY 2020,2021,2022,2023**

B.E. Mechanical Engineering 4thSemester

Contract Hrs.: 25

COURSE CODE	COURSE TYPE	COURSE TITLE	LOAD ALLOCATIONS			MARKS DISTRIBUTION		TOTAL MARKS	CREDITS	%CHANGE
			L	T	P	INTERNAL	EXTERNAL			
BSC-403	Basic Science Course	EnggMaths-III	2	1	0	50	100	150	3	50%
PME-401	Professional Core Course	Heat Transfer	3	1	0	50	100	150	4	100%
PME-402	Professional Core Course	Metallurgy & Material Science	2	1	0	50	100	150	3	100%
PME-403	Professional Core Course	Theory of M/c	3	1	0	50	100	150	4	100%
PME-404	Professional Core Course	Maintenance Engineering	2	1	0	50	100	150	3	100%
PME-411	Professional Core Course	Heat Transfer Lab	0	0	2	75	-	75	1	100%
PME-412	Professional Core Course	Metallurgy & Material Science Lab	0	0	2	50	-	50	1	100%
PME-413	Professional Core Course	Theory of M/c Lab	0	0	2	75	-	75	1	100%
PME-414	Professional Core Course	Maintenance Engineering Lab/Automotive Lab.	0	0	2	50	-	50	1	100%
MOC-415	Massive Open Online Course	MOOC	-	-	-	-	-	-	-	100%
TOTAL			12	5	8	500	500	1000	21	

4th Semester Examination to be held in the Year MAY 2020,2021,2022,2023

CLASS: B.E. 4th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: ENGG. MATHEMATICS III

COURSE NO.: BSC 403

DURATION OF EXAM: 3 HOURS

CREDITS: 3

L	T	P	Marks	
			Theory	Sessional
2	1	0	100	50

COURSE OUTCOMES

At the end of the course student will be able to:

CO403.1:	Understand the concept of limit, continuity and derivative of the complex functions
CO403.2:	To evaluate the various integrals using the concept of analytic functions.
CO403.3:	Understand the concept of random variables.
CO403.4:	To learn about the different distributions and their properties.

Detailed Syllabus

SECTION - A

Complex Variables:

Limits, Continuity, Derivatives, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties.

[10 Hours]

Line Integral, Cauchy's theorem, Cauchy Integral formula, Liouville's theorem and Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem and Contour integral

[10 Hours]

SECTION - B

Probability:

Discrete random variables, independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sum of independent random variables, Expectation of Discrete Random variables, Moments, Variance of a sum, Correlations coefficient.

[10 Hours]

Continuous random variables and their properties, distribution functions and densities, Normal, exponential and gamma densities. Bayes' rule.

[10 Hours]

Text / References:

1. Dr. Bhopinder Singh, "A textbook on complex variables and Numerical methods, Kirti Publishers.
2. N.P. Bali and M. Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 2008.
3. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 2010.
4. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.

NOTE:

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

4th Semester Examination to be held in the Year MAY 2020,2021,2022,2023

CLASS: B.E. 4TH SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: HEAT TRANSFER

COURSE NO: PME-401

DURATION OF EXAMINATION: 3 HOURS

CREDITS: 4

L	T	P	Marks	
			Theory	Sessional
3	1	0	100	50

COURSE OUTCOMES

At the end of the course student will be able to:

CO401.1:	Apply principles of heat and mass transfer to basic engineering systems.
CO401.2:	Analyse heat transfer by conduction, convection.
CO401.3:	Analyse and design heat exchangers
CO401.4:	Analyse diffusional process and calculate the flux in diffusion process.
CO401.5:	Analyse black body and its application.

Detailed Syllabus

SECTION - A

Introduction: Basic modes of heat transfer.

Conduction: General heat conduction equation in Cartesian and Cylindrical co-ordinates, One dimensional steady state conduction with and without heat generation, Critical insulation thickness, Extended surface heat transfer, Variable thermal conductivity. **[10 Hours]**

Convection: Newton's Law, Concept of boundary layer, Significance of Prandtl number, Boundary layer equations, Flat plate heat transfer solutions by integral method, Laminar and Turbulent flow of heat transfer in tubes.

Natural convection: Heat transfer from vertical plate by integral method, Empirical relations in free convection, Condensation and Boiling, Film and Dropwise condensation, Film boiling and pool boiling. **[10 Hours]**

SECTION - B

Radiation: Radiation spectrum, Thermal radiation, Concept of black body, Monochromatic emissive power, Absorptivity, Reflectivity, Transmissivity, Emissivity, Planck's Law, Stephan Boltzman's Law, Lambert's Law, Kirchoff's Law. Radiation between two real surfaces, Geometrical factors for simple configuration, Heat transfer in presence of re-radiating surfaces, Radiation shields. **[10 Hours]**

Heat exchangers: Types of heat exchangers, Log mean temperature difference, Overall heat transfer coefficient, Fouling and scaling of heat exchangers, N.T.U. method of evaluation of heat exchangers. Heat exchanger effectiveness. **[10 Hours]**

RECOMMENDED BOOKS:

- | | |
|----------------------------------|--------------------------|
| 1. Heat Transfer | J.P. Holman |
| 2. Heat Transfer | Frank Krieth |
| 3. Engineering Heat Transfer | Gupta and Prakash . |
| 4. Fundamentals of Heat Transfer | Frank P. David P. Dewitt |
| 5. Heat Transfer | B. Gebhart |

NOTE:

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

4th Semester Examination to be held in the Year MAY 2020,2021,2022,2023

CLASS: B.E. 4th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: METALLURGY AND MATERIAL SCIENCE

COURSE NO.: PME-402

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 3

L	T	P	Marks	
			Theory	Sessional
2	1	0	100	50

COURSE OUTCOMES

At the end of the course student will be able to:

CO402.1:	Analyse the structure of material at different levels, basic concepts of crystalline materials like unit cell, FCC, BCC, HCP, APF, Co-ordination number etc.
CO402.2:	Understand the concept of mechanical behavior of material and calculation of same appropriate equations.
CO402.3:	Explain the concept phase diagram and understand the basic technologies associated with the metallurgy. Construction and identification of phase diagram and reactions.
CO402.4:	Understand and suggest the heat treatment process and types .Significance of properties Vs microstructure. Surface hardening and its type. Introduce the concept of hardenability and demonstrate the test used to find hardenability of steels
CO402.5:	Explain features, classification, application of newer class material like smart materials, piezoelectric materials, biomaterials, composite materials etc.

Detailed Syllabus

SECTION - A

Crystal structure : Space Lattice, Crystal Systems, crystal directions and planes, Miller indices, Planar density of crystallographic planes, Interplanar spacing, Stacking sequence. Solidification of metals: Homogeneous and Heterogeneous nucleation, Crystal growth, Dendritic pattern.

Crystal Imperfections : Point defect , Line defect, Edge dislocation, Screw dislocation, Interactions between dislocations, Planar defects, Stacking fault, Twinning, Grain boundary, Diffusion, Mechanism of diffusion in crystals, Fick's laws of diffusion. **[10 Hours]**

Phase: Equilibrium between phases, Gibb's phase rule, Solid solutions, Interstitial, Substitutional, Ordered and disordered types, Hume-Rothery rules. Equilibrium phase Diagrams of Binary Alloys: Construction from cooling curves, Phase diagram of Cu-Ni system, Lever rule, Coring, Eutectic alloy Eutectic reaction, Partial solid solubility, Iron-Iron carbide diagram, Peritectic and Eutectoid reactions. **[10 Hours]**

SECTION - B

T-T-T-Diagram and its uses : Heat Treatment of Carbon steel, Annealing, Normalising, Hardening, Tempering, Austempering, Martempering, Hardenability, Case hardening, Surface treatment of steel, metallic coating, Electroplating, Metal facing and cladding. Failure of metals: Creep, Mechanism of creep, Creep curves, Creep resistance materials, Fracture, Brittle fracture, Griffith's theory, Ductile fracture. **[10 Hours]**

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, Cold working, Hot working. **[10 Hours]**

RECOMMENDED BOOKS:

- | | |
|--|--------------|
| 1. Science of Engineering (Vol. I, II & III) | ManasChanda |
| 2. Elements of Material Science | LH Van Vlack |
| 3. Physical Metallurgy Principles | Reed Hill |

NOTE:

1. Question paper will be of 3 Hours' duration
2. There will be 8 questions in all, four from Section- A (each of 20 marks) and four from Section - B.
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.

4th Semester Examination to be held in the Year MAY 2020,2021,2022,2023

CLASS: B.E. 4th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: THEORY OF MACHINES

COURSE NO.: PME-403

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 4

L	T	P	Marks	
			Theory	Sessional
3	1	0	100	50

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO403.1:	Be familiar with common machine elements and Analysis of different mechanisms used in various types of machines.
CO403.2:	Be familiar with concepts of gears, cams, governors. Be aware of common machine elements & to solve problems related to motion transmission
CO403.3:	Dynamically analyze common mechanisms.
CO403.4:	Conceptualize gyroscopic effect& Mathematically solve problems of flywheel.
CO403.5:	Conceptualize static and dynamic balancing of rotating and reciprocating& Identify various types of mechanical vibrations, their causes and solutions

Detailed Syllabus

SECTION - A

Mechanisms and machines, plane mechanisms, kinematic pairs, kinematic chains and their classification, kinematic inversion. Introduction, general case of plane motion, velocity, acceleration, velocity and acceleration images, velocity analysis using instantaneous centres(Graphical method only). Cams: Classification of cams and followers, geometry of radial cam, displacement diagram, uniform, simple harmonic, graphical layout of cam profiles with different followers, follower velocity. **[10 Hours]**

Governors: Purpose, comparison with flywheel, Porter, Proell, Governor effort and power. Friction:

Friction devices, Clutches, Brakes and their applications. Spur gears: Gear terminology, types of gears, Involute and Cycloid, comparison of characteristics of involute & cycloid profile, interference, Gear trains: Introduction, simple gear trains, calculation of gear ratios. **[10 Hours]**

SECTION - B

Dynamics of Reciprocating Engines: Inertia forces and Equivalent masses for different members. Turning moment diagram, Flywheel. Dynamometers: Types, Analysis of Prony-brake, Rope-brake and Belt-transmission dynamometers. Gyroscopic Action in Mechanics: Gyroscope and gyroscopic couples, Gyroscopic stabilisation of ships and airplanes, Stability of moving automobile. **[10 Hours]**

Balancing : Static and Dynamic balancing, Balancing of several masses in a plane, Balancing of masses rotating in different planes, Conditions for complete balancing of an engine, Reciprocating and rotating parts. Damped vibrations :Viscous damping, Logarithmic decrement. Equivalent damping co-efficients. **[10 Hours]**

RECOMMENDED BOOKS:

- | | |
|--|-----------------------------|
| 1. Kinematic Analysis of Mechanisms | JE Shigley |
| 2. Kinematics & Dynamics of Machines | George H martin |
| 3. Mechanics of Machinery | CW Ham, EJ Craw & WL Rogers |
| 4. Theory of Machines | Thomas Bevan |
| 5. Elementary Kinematics of Mechanisms | Zimmerman |

NOTE:

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

4th Semester Examination to be held in the Year MAY 2020,2021,2022,2023

CLASS: B.E. 4TH SEMESTER

CREDITS: 3

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: MAINTENANCE ENGINEERING

COURSE NO.: PME-404

DURATION OF EXAMINATION: 3 HOURS.

L	T	P	Marks	
			Theory	Sessional
2	1	0	100	50

COURSE OUTCOMES

At the end of the course student will be able to:

CO404.1:	To enable the student to understand the principles, functions and practices of maintenance activities.
CO404.2:	To develop ability in formulating suitable maintenance strategies to achieve reliable manufacturing system.
CO404.3:	To introduce the different maintenance categories and failure analysis tools.
CO404.4:	To equip with essential system diagnosis techniques so as to identify and take appropriate actions on error symptoms and causes of failures.
CO404.5:	To illustrate the techniques used for maintenance management.

Detailed Syllabus

SECTION A

Maintenance – basic concepts, purpose, functions and objectives of maintenance.

Principles, benefits and effects of maintenance. Inter-relationship 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. Availability – inherent, achieved and operational availability – reliability, availability and maintainability (RAM). **[10 Hours]**

Maintenance strategies / systems – types – basis for selection. Breakdown maintenance – corrective maintenance

Preventive maintenance – process flow – frequency in preventive maintenance.

Predictive maintenance – components – advantages and disadvantages. Condition based maintenance and condition monitoring – monitoring systems.

Performance monitoring – visual, tactile and audio monitoring – leakage monitoring. Temperature monitoring – thermography – advantages. **[10 Hours]**

SECTION - B

Vibration monitoring – vibration fundamentals – vibration analysis.

Vibration transducers – types. Machinery vibration trouble shooting – machinery vibration standard, severity chart and acceptable limits. Lubricant monitoring – components and techniques – filter debris analysis & filtergrams. Introduction to Ferrography. **[10 Hours]**

Reliability centered maintenance (RCM) – steps – flow diagram – basic guidelines.

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), Overall equipment effect **[14 Hours]**

Text Books:

1. Gupta A. K., Reliability, Maintenance and Safety Engineering, University Science Press, New Delhi, 2009.
2. Rao S. S., Reliability-Based Design, McGraw-Hill, Inc, New York, 1992.
3. Srivastava S. K., Maintenance Engineering and Management, S. Chand & Company Ltd., New Delhi, 1998.
4. Venkataraman, Maintenance Engineering and Management, Prentice-Hall of India Pvt. Ltd., New Delhi, 2007.
5. Davies, Handbook of Condition Monitoring, Chapman & Hall, 1996.
6. Garg M. R., Industrial Maintenance, S. Chand & Co., 1986.
7. Higgins L. R., Maintenance Engineering Hand book, McGraw Hill, 5th Edition, 1988.
8. Mishra R. C. and Pathak K., Maintenance Engineering and Management, PHI Learning Pvt. Ltd., New Delhi, 2009.

NOTE:

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

4th Semester Examination to be held in the Year MAY 2020,2021,2022,2023

CLASS: B.E. 4TH SEMESTER

CREDITS: 1

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: HEAT TRANSFER LAB.

COURSE NO: PME-411

DURATION OF EXAMINATION: 3 HOURS.

L	T	P	Marks
0	0	2	Practical 75

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO411.1:	Develop concept of boundary layer formation over heated surfaces during forced and free convection, formulation of momentum and energy equations of the laminar boundary layers and their solution by approximate method.
CO411.2:	Calculate fluid temperatures, mass flow rates, pressure drops, heat exchange and effectiveness during parallel, counter and cross flow in simple and baffled-shell and tube type heat exchangers, condensers, evaporators, etc.
CO411.3:	Describe film wise and drop wise condensation in condensers, pool, forced, sub-cooled and saturated boiling in boilers and evaporators, bubble formation and critical heat flux. Model laminar film condensation and its application in the design of condensers. Evaluation of Reynolds and Nusselt numbers for boiling and condensation.
CO411.4:	Develop concept of monochromatic and total radiations, intensity of radiation, shape factor, radiation shields, solar radiation and estimation of radiative heat exchange between two or more surfaces of different geometries.
CO411.5:	Formulate and predict heat conduction problems with and without heat generation in composite walls and extended surfaces subjected to convective boundaries. Analyse 1-D unsteady and 2-D steady conduction problems.

LIST OF EXPERIMENTS:

1. To find the thermal conductivity of a given insulating material.
2. To analyse heat transfer characteristics of horizontal cylindrical fins.
3. To analyse natural heat transfer from a vertical pipe.
4. To analyse the working of a natural convection solar water heater.
5. To analyse experimentally cooling rates of a metallic plate and compare the result with those given by theoretical predictions.
6. To analyse the temperature distribution, heat transfer coefficient and efficiency of a pin fin in natural and forced convection heat transfer.
7. To calculate overall heat transfer coefficient for both parallel/counter flow arrangement type of heat exchanger during the operation of heat transfer from air to air, air to water, water to water.
8. To determine:
 - 8.1 The cooling tower characteristic value.
 - 8.2 To determine the heat transfer Co-efficient.
 - 8.3 To determine the mass transfer Co-efficient
9. To determine:
 - 9.1 The convective heat transfer co-efficient for heated vertical cylinder losing heat to the ambient by free or natural convection.
 - 9.2 To find the theoretical convective heat transfer co-efficient and to compare with the experimental value.
10. To determine the value of Stefan-Boltzman constant radiation heat transfer.
11. To determine the emissivity of test plate.
12. To determine overall heat transfer coefficient of composite wall.

NOTE:

1. At least eight practical's should be performed.
2. Additional labs/ experiment will be performed based on course content requirements.

4th Semester Examination to be held in the Year MAY 2020,2021,2022,2023

CLASS B.E. 4TH SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: METALLURGY AND MATERIAL SCIENCE LAB.

COURSE NO: PME-412

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 1

L	T	P	Marks
0	0	2	Practical 50

COURSE OUTCOMES

At the end of the course student will be able to:

CO412.1:	Qualitatively describe the bonding schemes and its general physical properties as well as possible applications.
CO412.2:	Describe physical origin as well as strength of a bond.
CO412.3:	Qualitatively derive a material's Young's modulus from a potential energy curve.
CO412.4:	Index peaks and infer the structure from a simple set of diffraction data.

LIST OF EXPERIMENTS:

1. To determine the tensile strength of a given sample.
2. Hardness Testing of Ferrous and Non-Ferrous Alloys with the help of Brinell Hardness testing.
3. Hardness Testing of Ferrous and Non-Ferrous Alloys with the help of Rockwell Hardness testing.
4. Hardness Testing of Ferrous and Non-Ferrous Alloys with the help of Vickers Hardness testing.
5. To test and find the impact strength of a given steel sample (both Izod and Charpy Tests)
6. To prepare specimens for micro-structural studies.
7. To analyze Microstructure of Steel and Cast Iron under Optical Microscope.
8. To find the surface cracks by Dye Penetration test.
9. To know the position of cracks using magnetic particle inspection test.

NOTE:

1. At least six practical's should be performed.
2. Additional labs/ experiment will be performed based on course content requirements.

4th Semester Examination to be held in the Year MAY 2020,2021,2022,2023

CLASS: B.E. 4TH SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: THEORY OF MACHINES LAB

COURSE NO: PME-413

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 1

L	T	P	Marks Practical
0	0	2	75

COURSE OUTCOMES

At the end of the course student will be able to:

CO413.1:	Understand the kinematics of Quick Return Motion.
CO413.2:	Know about gyroscopic effect.
CO413.3:	Familiar with various cases of vibrating motion.
CO413.4:	Describe the mechanics behind the Governors

LIST OF EXPERIMENTS:

1. Find displacement, velocity and acceleration of slider of the Quick-return motion mechanism.
2. To analyse the motorized gyroscope.
3. To analyse static and dynamic balancing apparatus.
4. To analyse the torsional vibration (undamped) of single rotor shaft system.
5. To analyse various types of cams and followers.
6. To analyse various types of gear trains.
7. To analyse various types of Governors with the help of stroboscope and to determine sleeve displacement, speed of Governor and corresponding radius of Governor in case of:
i) Watt Governor ii) Porter Governor iii) Proell Governor
8. To analyse Gearbox.
9. To analyse various types of brake systems.
10. To study the phenomenon of whirling of shafts.
11. To study the Corollis components of acceleration.

NOTE:

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

4th Semester Examination to be held in the Year MAY 2020,2021,2022,2023

CLASS: B.E. 4TH SEMESTER

CREDITS: 1

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: MAINTENANCE ENGINEERING LAB.

COURSE NO: PME-414

DURATION OF EXAMINATION: 3 HOURS.

L	T	P	Marks Practical
0	0	2	50

COURSE OUTCOMES

At the end of the course student will be able to:

CO414.1:	Know about the types of maintenance associated with engineering plant, equipment and systems.
CO414.2:	Know about maintenance frequency, the cost of maintenance and its effects on production.
CO414.3:	Be able to produce a maintenance plan for a specific engineering system
CO414.4:	Understand how data gathered from monitoring the performance and condition of engineering plant, equipment and systems can be used.

LIST OF EXPERIMENTS:

1. Industrial visit to identify the various types of maintenance associated with equipment and systems.
2. Collection of maintenance data from the industry.
3. To carry out Root Cause Analysis (RCA) & Failure mode and effect analysis (FMEA) to identify the possible failure and root causes of the problem.
4. To evaluate the availability and reliability of critical machine components.
5. To evaluate the OEE of an equipment/machine.
6. To evaluate the MTBF, MTTR for an equipment/machine.
7. To perform the Pareto analysis for an equipment/machine.
8. To study different probability distribution for reliability analysis.

NOTE:

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

4th Semester Examination to be held in the Year MAY 2020,2021,2022,2023

CLASS: B.E. 4th SEMESTER

CREDITS: 1

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: AUTO MOTIVE LAB.

COURSE NO.: PME-414

DURATION OF EXAMINATION: 3 HOURS.

L	T	P	Marks
0	0	2	Practical 50

COURSE OUTCOMES

At the end of the course student will be able to:

CO408.1:	Familiar with various types of gears and their uses.
CO408.2:	Familiar with various types of clutches and their uses.
CO408.3:	Familiar with various steering geometry parameters.
CO408.4:	Familiar with fuel supply systems of IC Engines.
CO408.5:	Familiar with braking system of automotive.

LIST OF EXPERIMENTS:

- Study of different types of gears:
 - Spur gear
 - Helical gear
 - Bevel gear
 - Worm and Worm wheel
- Study of different types of clutches:
 - Cone clutch
 - Single plate clutch
 - Multi plate clutch
 - Toggle clutch
- Study of different types of Steering mechanisms:
 - Study of different parts of a steering
 - Check steering geometry
 - Camber angle
 - Caster angle
 - King pin inclination
 - Toe-in & Toe-out
- Study of Fuel supply system in both CI and SI engines:
 - Find the consumption of:
 - Fuel in petrol engine
 - Air consumption, etc.
- Maintenance of fuel system in both diesel and Petrol engines.
- Tuning of carburetor of Petrol engine and fuel pump of Diesel engine
- Speedy Hydraulic Brake System and bleeding of Hydraulic system to remove air block.
- Speedy Checking Hand Brake applied as an emergency brake in cars and vehicles.
- Study of fuel efficiency of petrol and diesel engine.

NOTE:

- At least six practical's should be performed.
- Additional labs/ experiment will be performed based on course content requirements.

4th Semester Examination to be held in the Year MAY 2020,2021,2022,2023

CLASS: B.E. 4th SEMESTER

CREDITS: 1

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: MOOC

COURSE NO.: MOC- 415

L	T	P	Marks
0	0	2	Practical 50

MOOC

OBJECTIVE: A massive open online course (MooC) is a model for delivering learning content to any person who wants to take a course by means of the web. It has been incorporated in the 4th semester. Here the students will have a choice to choose between Material Science Lab Course no. PME-412 and a MooC course. To evaluate a MooCs course following is the scheme proposed:

NOTE: MOOC Adopted should be relevant to the current semester

MARKS DISTRIBUTION

- **Attendance- [10 marks]**

Students will have to visit the lab twice a week as per the time table and pursue their respective online course.

- **Report file- [15 marks]**

A detailed report of about 20-25 pages has to be submitted to the department at the end of the semester. It should contain details about the course that was undertaken by the student. A copy of the assignments with solutions that have been uploaded on the MooC platform should also be included in the final report. A copy of the certificate if awarded should also be appended to the report.

- **Presentation- [15 marks].**

The presentation should be given to the peers/students focusing on the key points of the course with an aim to share the knowledge.

Certification- [10 marks]

The students awarded with the certificate will be given 10 marks.(Copy to be attached in the report.)

REFERENCES:

1. NPTEL

2. COURSERA

UNIVERSITY OF JAMMU, JAMMU**COURSE SCHEME****B.E. 5th Semester Mechanical Engineering****For Examination to be held in the Year December 2020,2021,2022,2023****Contract Hours/Week: 25**

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

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

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

CLASS: B.E. 5th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: SWAYAM/ NPTEL

COURSE NO.: MOC-506

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 3

			Marks
L	T	P	Sessional
3	0	0	100

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

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

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

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

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

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

CLASS: B.E. 5th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: APPLIED THERMODYNAMICS

COURSE NO.: PME-501

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 4

Marks				
L	T	P	Theory	Sessional
3	1	0	100	50

COURSE OUTCOMES

At the end of the course student will be able to:

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

Detailed Syllabus

SECTION - A

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

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

SECTION - B

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

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

RECOMMENDED BOOKS:

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

NOTE:

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

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

CLASS: B.E. 5th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: MACHINE DESIGN

COURSE NO.: PME-502

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 4

Marks				
L	T	P	Theory	Sessional
3	1	0	100	50

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

Detailed Syllabus

SECTION - A

Introduction to the design procedures, design requirement. theories of failure, creep, stress concentration, cyclic loading and endurance limit. Design of machine elements like screw joints, cotter and Knuckle joints, riveted, Keys and couplings.

[10 Hours]

Design of flat belts, clutches like single and multiple disc and brakes like single and pivoted block. Design and selection of sliding and roller bearings.

[10 Hours]

SECTION - B

Design of coil i.e. helical and leaf springs, Use of compound or concentric springs, Design of chains and ropes i.e fiber ropes. Analysis of forces and bearing reactions for gears, Design of spur, Helical, Worm and Bevel gearing. [10 Hours]

Design of main engine components like cylinder, Pistons, Connecting rods, Crank shafts (centre), Flywheels. Design of shafts and levers. [10 Hours]

RECOMMENDED BOOKS:

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

NOTE:

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

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

CLASS: B.E. 5th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: PRODUCTION TECHNOLOGY- II

COURSE NO.: PME-503

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 3

Marks				
L	T	P	Theory	Sessional
2	1	0	100	50

COURSE OUTCOMES

At the end of the course student will be able to:

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

Detailed Syllabus

SECTION - A

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

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

SECTION - B

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

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

RECOMMENDED BOOKS:

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

NOTE:

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

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

CLASS: B.E. 5th SEMESTER

CREDITS: 3

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: BASIC ELECTRICAL ENGINEERING

COURSE NO.: EEE-501

DURATION OF EXAMINATION: 3 HOURS.

Marks				
L	T	P	Theory	Sessional
2	1	0	100	50

COURSE OUTCOMES

At the end of the course student will be able to:

CO501.1:	Understand and analyze the DC, AC and three phase circuits.
CO501.2:	Understand the working principle of transformer and electrical machines.
CO501.3:	Understand the electrical components installation for low-voltages.

Detailed Syllabus

Section-A

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

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

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

Section-B

Module 4: Transformers::Principle of operation, ideal and practical transformer (no-load & on-load phasor diagrams), equivalent circuit, losses in transformers, Transformer test (open circuit & short circuit), regulation and efficiency. **(6 hours)**

Module 5: Electrical Machines: DC Machines- Principle of operation, emf equation, torque production. AC Machines- Three-phase induction motor, principle of operation, slip and rotor frequency. Synchronous machines- Principle of operation and emf equation. **(6 hours)**

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

Text / References:

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

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

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

CLASS: B.E. 5th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: FLUID MACHINERY LAB

COURSE NO.: PME-511

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 1.5

L	T	P	Marks
0	0	3	Practical 75

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

LIST OF EXPERIMENTS:

Study and analysis of:

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

NOTE:

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

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

CLASS: B.E. 5th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: APPLIED THERMODYNAMICS LAB.

COURSE NO.: PME-512

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 1.5

L	T	P	Marks
0	0	3	Practical 75

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

LIST OF EXPERIMENTS:

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

NOTE:

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

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

CLASS: B.E. 5th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: INDUSTRIAL TRAINING - I.

COURSE NO.: PIT-506

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 1

L	T	P	Marks
0	0	0	Practical 50

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

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

Guidelines for evaluation of Practical Training:

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

Distribution of Marks as per the University statutes:

Total Marks for Evaluation = 150 marks

i)	Report	= 60	40%
ii)	Viva-Voce	= 45	30%
iii)	Miscellaneous Marks	= 45	30%

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

Award of the Marks:

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

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

CLASS: B.E. 5th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

COURSE NO.: NCC-501

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 0

Marks

L	T	P	Theory	Sessional
2	0	0	Satisfactory/Unsatisfactory	

COURSE OUTCOMES

At the end of the course student will be able to:

CO501.1:	Know about the Vedic philosophy in detail and its relevance in present scenario.
CO501.2:	Strengthen their mind and body through the knowledge of yoga.

Detailed Syllabus

SECTION - A

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

SECTION - B

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

Note for Teacher:

The course should aim at enlightening students with the importance of ancient traditional knowledge.

Evaluation of the course:

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

UNIVERSITY OF JAMMU, JAMMU**COURSE SCHEME****B.E. 6th Semester Mechanical Engineering****For Examination to be held in the Year May 2021,2022,2023,2024.****Contract Hours/Week: 27**

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

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

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

CLASS: B.E. 6th SEMESTER

BRANCH: MECHANICAL ENGINEERING

CREDITS: 3

COURSE TITLE: QUALITY AND RELIABILITY ENGINEERING

COURSE NO.: PME-601

DURATION OF EXAMINATION: 3 HOURS.

Marks				
L	T	P	Theory	Sessional
3	0	0	100	50

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

Detailed Syllabus

SECTION – A

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

SECTION - B

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

RECOMMENDED BOOKS:

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

NOTE:

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

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

CLASS: B.E. 6th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: INDUSTRIAL ENGINEERING

COURSE NO.: PME-602

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 3

Marks				
L	T	P	Theory	Sessional
3	0	0	100	50

COURSE OUTCOMES

At the end of the course student will be able to:

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

Detailed Syllabus

SECTION - A

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

[18 Hours]

SECTION - B

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

[18 Hours]

RECOMMENDED BOOKS:

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

NOTE:

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

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

CLASS: B.E. 6th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: MECHATRONICS

COURSE NO.: PME-603

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 4

Marks				
L	T	P	Theory	Sessional
3	1	0	100	50

COURSE OUTCOMES

At the end of the course student will be able to:

CO603.1:	Understand the fundamentals of mechatronics and work with pneumatic and hydraulic systems..
CO603.2:	Use control charts for various engineering purposes.
CO603.3:	Differentiate between various sensors, transducers and various electrical actuation systems.

Detailed Syllabus

SECTION – A

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

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

SECTION - B

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

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

RECOMMENDED BOOKS:

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

NOTE:

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

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

CLASS: B.E. 6th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: SWAYAM/ NPTEL

COURSE NO.: MOC-606

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 3

			Marks
L	T	P	Sessional
3	0	0	100

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

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

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

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

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

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

CLASS: B.E. 6th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: MANAGERIAL ECONOMICS

COURSE NO.: HMC-601

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 4

Marks				
L	T	P	Theory	Sessional
3	1	0	100	50

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

Detailed Syllabus

SECTION – A

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

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

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

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

SECTION – B

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

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

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

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

BOOKS RECOMMENDED :

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

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

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

CLASS: B.E. 6th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: INDUSTRIAL ENGG. LAB.

COURSE NO.: PME-611

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 1

L	T	P	Marks
0	0	2	Practical 50

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

LIST OF EXPERIMENTS:

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

NOTE:

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

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

CLASS: B.E. 6th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: ENGG. METROLOGY LAB.

COURSE NO.: PME-612

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 1.5

L	T	P	Marks
0	0	3	Practical 75

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

LIST OF EXPERIMENTS:

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

NOTE:

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

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

CLASS: B.E. 6th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: 3D PRINTING LAB.

COURSE NO.: PME-613

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 1.5

L	T	P	Marks
0	0	3	Practical 75

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

LIST OF EXPERIMENTS:

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

NOTE:

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

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

CLASS: B.E. 6th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: EMPLOYABILITY SKILL.

COURSE NO.: NCC-606

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 0

			Marks
L	T	P	-
2	0	0	

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

Detailed Syllabus

SECTION A

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

SECTION B

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

RECOMMENDED BOOKS:

- | | |
|--|--------------|
| 1. Quantitative Aptitude for Competitive Exams | R S Aggarwal |
| 2. Quantitative Aptitude for CAT | Arun Sharma |
| 3. Verbal & Non-Verbal Reasoning | R S Aggarwal |
| 4. Analytical Reasoning | M K Pandey |

Evaluation of the course:

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

ANNEXURE - I

**B.E. Mechanical Engineering 7th Semester Examination to be held in the Year
December 2021,2022,2023,2024**

B.E. Mechanical Engineering 7th Semester**Contact Hours: 26 hours/week**

COURSE CODE	COURSE TYPE	COURSE TITLE	LOAD ALLOCATIONS			MARKS DISTRIBUTION		TOTAL MARKS	CREDITS	% CHANGE
			L	T	P	INTERNAL	EXTERNAL			
PME-701	Professional Elective Course	A) Computer Aided Design and Manufacturing B) Robotics C) Computer Integrated Manufacturing Systems	3	1	0	50	100	150	4	100%
PME-702	Professional Elective Course	A) Plant Layout and Material Handling B) Production Planning & Control C) Total Quality Management	3	0	0	50	100	150	3	100%
PME-703	Professional Elective Course	A) Energy Resources and Utilization B) Advance Machining Processes C) Refrigeration and Air conditioning	3	0	0	50	100	150	3	100%
PME-714	Professional Core Course	Refrigeration and Air conditioning Lab	0	0	4	75	-	75	2	100%
HMC-702	Humanities Elective Course	A) Industrial Management B) Organizational Behavior	2	2	0	50	100	150	4	100%
PME-715	Professional Core Course	Computer Aided Design and Manufacturing Lab	0	0	4	75	-	75	2	100%
SEM-705	Seminar	Seminar	0	0	2	50	-	50	1	100%
SII-705	Summer Industry Internship	Industry Training- II	0	0	0	50	-	50	1	100%
ECO-711	Open Elective Lab	Matlab Programming	0	0	2	50	-	50	1	100%
EEO-712		Instrumentation & Non-Conventional Energy Resources Lab								
CSO-713		Programming Lab								
ITO-714		Linux Shell Programming								
CEO-716		Basic civil testing lab								
TOTAL			11	3	12	500	400	900	21	

CLASS: B.E. 7th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: COMPUTER AIDED DESIGN AND MANUFACTURING

COURSE NO.: PME-701-A

DURATION OF EXAMINATION: 3 HOURS

CREDITS: 4

L	T	P	Marks	
			Theory	Sessional
3	1	0	100	50

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO701-A.1:	Apply/develop solutions or to do research in the area of design and simulation in mechanical engineering.
CO701-A.2:	Have abilities and capabilities in developing and applying computer software and hardware to mechanical design and manufacturing fields.
CO701-A.3:	Review and document the knowledge developed by scholarly predecessors and critically assess the relevant technological issues.
CO701-A.4:	Formulate relevant research problems; conduct experimental and/or analytical study and analyzing results with modern mathematical/scientific methods and use of software tools.
CO701-A.5:	Design and validate technological solutions to defined problems and communicate clearly and effectively for the practical applications of their work.

Detailed Syllabus

SECTION – A

CAD: Introduction, Organization of computer CAD work station. System configuration computer memory input output device and display device, VDU-DVST, DBRT, Raster and Digital display. Windowing clipping & zooming 2D&3D transformation, Translation, Scaling, Rotating Mirroring and Inversing. Modeling wire frame, Surface and solid Shading model; Diffused and specular reflection coloring models RGB, CMV, HIS. [18Hours]

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. NC part programming manual part programming G&M codes F,S,T. symbol in programming datum in NC machine tools offsets radius compensation examples of manual part programming. [19 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 20 marks) and four from **Section – B** (each of 20 marks).
3. Students are required to attempt five questions in all, at least two question from each section
4. Use of scientific calculator will be allowed in the examination hall.

Paulson

CLASS: B.E. 7th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: ROBOTICS

COURSE NO.: PME-701-B

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 4

Marks				
L	T	P	Theory	Sessional
3	1	0	100	50

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO701-B.1:	Classify robots based on joints and arm configurations.
CO701-B.2:	Design application specific End Effectors for robots.
CO701-B.3:	Compute forward and inverse kinematics of robots and determine trajectory plan.
CO701-B.4:	Understand different controls of robots.
CO701-B.5:	Design and select robots for Industrial and Non-Industrial applications.

Detailed Syllabus

SECTION – A

Automation and Robotics, An Overview of Robotics- Present and future applications. Classification and structure of robots, robotic system configuration fundamental motion. Components of industrial robotics: common types of arms. Components, Architecture, number of degrees of freedom, Requirements and challenges of end effectors, Design of end effectors.. End effectors, application of robotics. Grippers- different methods of gripping. Sensors in robot- Touch sensors, tactile sensors, Proximity and range sensors, Robotic vision sensor, Force sensor, Light sensors, Pressure sensors.

[20 Hours]

SECTION – B

Matrix representation, Forward and Reverse Kinematics of Three degree of Freedom, Homogeneous Transformations, Inverse kinematics of Robot, Robot arm dynamics, D-H representation of robots, Basics of Trajectory Planning. Robot controls- Point to point control, Continuous path control, Intelligent robot, Control system for robot joint, Control actions, Feedback devices, Encoder, Resolver.

[20 Hours]

RECOMMENDED BOOKS:

1. Introduction to Robotics :James Rehg
2. Industrial Robotics, 'Technology Programming and Applications' : Mikell P Groover

NOTE:

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

Paulan

7th Semester Examination to be held in the Year December 2021,2022,2023,2024

CLASS: B.E. 7th SEMESTER

BRANCH: MECHANICAL ENGINEERING

CREDITS: 4

COURSE TITLE: COMPUTER INTEGRATED MANUFACTURING SYSTEMS

COURSE NO.: PME-701-C

DURATION OF EXAMINATION: 3 HOURS

Marks				
L	T	P	Theory	Sessional
3	1	0	100	50

COURSE OUTCOMES

At the end of the course student will be able to:

CO701-C.1:	Understand the effect of manufacturing automation strategies and derive production metrics.
CO701-C.2:	Analyze automated flow lines and assembly systems, and balance the line.
CO701-C.3:	Design automated material handling and storage systems for a typical production system.
CO701-C.4:	Design a manufacturing cell and cellular manufacturing system.
CO701-C.5:	Develop CAPP systems for rotational and prismatic parts.

Detailed Syllabus

SECTION – A

Introduction- Production System Facilities, Automation in Production System, Manual labour in Production systems, Automation Principles and strategies; Manufacturing operations. Production concepts and Mathematical models, Cost of manufacturing operations. Group technology and Cellular manufacturing, Parts classification and Coding, Production Flow analysis, cellular manufacturing.

[20 Hours]

SECTION - B

Definition and Broad Characteristics of Flexible Manufacturing cells, Systems, Flexible Transfer Lines, Place of Flexible Manufacturing systems in CIM, Economics and Technological Justification for FMS, Design and Planning, Role of Associated Technologies such as GT, JIT and Simulation, Operation and Evaluation, Scheduling Problems, FMS Hardware, Control Aspects of FMS, Flexible Machining Cells.

[19 Hours]

RECOMMENDED BOOKS:

- | | |
|--|------------------------|
| 1. Automation Production Systems and Computer Integrated Manufacturing | Groover, M.P, Pearson |
| 2. CAD/CAM- Theory and Practice | Zeid,I., McGraw Hill |
| 3. CAD/CAM | Rao, P.N., McGraw Hill |
| 4. Computer Integrated Manufacture | Ranky, P.G, Prentice |

NOTE:

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

Paulson

CLASS: B.E. 7th SEMESTER

BRANCH: MECHANICAL ENGINEERING

CREDITS: 3

COURSE TITLE: PLANT LAYOUT AND MATERIAL HANDLING

COURSE NO.: PME-702-A

DURATION OF EXAMINATION: 3 HOURS

Marks				
L	T	P	Theory	Sessional
3	0	0	100	50

COURSE OUTCOMES

At the end of the course student will be able to:

CO702-A.1:	Identify the rule that each department plays in achieving the goal of an organization.
CO702-A.2:	Explain the problems in organizing, planning and controlling the use of man, money, material and machines for industrial production.
CO702-A.3:	Apply industrial engineering principles to solve the problems in organizing, planning and controlling the use of man, money, material and machines for industrial production.
CO702-A.4:	Design material handling system for a variety of scenarios pertaining to manufacture and service industry.
CO702-A.5:	Develop and analyze plant layouts using manuals and computers aided software methodologies.

Detailed Syllabus

SECTION – A

Plant Layout: objective and criteria for facilities planning and industrial plant design.

Site Selection: Factors affecting site selection, Application of transportation problem. Decision matrix.

Types of Production Activities: Job Shop, Batch. Mass and continuous flow production.

Types of Layout: Similar products, Special Product, Fixed Process and product type. Layout and their combinations.

Layout Planning: Factor influencing plant layout. Design considerations. Cross-chart technique to plant layout problems. Analytical evaluation of plant layout. **[20 Hours]**

SECTION - B

Material Handling: Role application study of problem. Calculation of handling costs interplant transporting facilities and handling equipment, Factors in Equipment selection, Types of material handling equipment Hoisting appliance cranes and elevators integration of material handling equipment. **[10 Hours]**

Conveyors: General theory of conveyed machines components part. Belt conveyors, Bucket and swing conveyors. Screw conveyors, Roller conveyors, Oscillating conveyors and Vibratory conveyors, Hydraulic and Pneumatic conveyors. **[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 Equipment | :Rudenko- Peace Publications Moscow. |
| 4. Practical Plant Layout: | :Muther- McGraw Hill |
| 5. Material Handling Handbook | : Bolz and Hugeman –Ronaldo |

NOTE:

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

CLASS: B.E. 7th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: PRODUCTION, PLANNING AND CONTROL

COURSE NO.: PME-702-B

DURATION OF EXAMINATION: 3 HOURS

CREDITS: 3

Marks				
L	T	P	Theory	Sessional
3	0	0	100	50

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO702-B.1:	Apply the system concept of design of production and service systems.
CO702-B.2:	Make forecast in the manufacturing and service sector using selective quantitative and qualitative techniques.
CO702-B.3:	Apply the principles and techniques for planning and control of the production and service system to optimize /make best use of resources.
CO702-B.4:	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.
CO702-B.5:	Apply the principles and techniques for planning and control of the production and service system to optimise /make best use of resources.

Detailed Syllabus

SECTION – A

Introduction: Objectives and Function of PPC. Types of Production: Job, Batch & Continuous. Product development and its design:- Marketing aspects, Functional aspects and Operational aspects. Forecasting, Methods of forecasting and its advantages, Break even analysis-Economics of a new design. Material Selection:- Procedure & methods in material selection. Concept of Routing, Scheduling and Dispatching in manufacturing. **[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. Introduction to computer integrated production planning systems. **[09 Hours]**

SECTION - B

Project management: concepts of project planning, monitoring and control. Introduction to network analysis: PERT and CPM, Benefits of critical path analysis. Method Study:- General procedure, Selection of process. Micro motion and memo motion study – work measurement – Techniques of work measurement. Introduction to Linear Programming: Problem Formulation, Simplex method, Transportation models and advantages of linear programming in production. Early start and finish time. **[18 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: | Buffn-John Wiley. |
| 5. Production Management: | Hedge- John Wiley. |
| 6. Scientific Inventory: | Bachan & Kesnigsberg- Prentice Hall India. |
| 7. Principles & Design of Production Planning & Control: | Westerman & Wimnest- Prentice Hall |

NOTE:

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

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CLASS: B.E. 7th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: TOTAL QUALITY MANAGEMENT

COURSE NO.: PME-702-C

DURATION OF EXAMINATION: 3 HOURS

CREDITS: 3

Marks				
L	T	P	Theory	Sessional
3	0	0	100	50

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO702-C.1:	To use the tools and techniques of TQM in manufacturing and service sectors.
CO702-C.2:	Outlines the dimensions and barriers regarding the quality.
CO702-C.3:	Illustrate the TQM principles.
CO702-C.4:	Demonstrate the tools utilization for quality improvement.
CO702-C.5:	Explain the various types of techniques used to measure the quality.

Detailed Syllabus

SECTION – A

Introduction, need for quality, evolution of quality; Definitions of quality, product quality and service quality; Basic concepts of TQM, TQM framework, contributions of Deming, Juran and Crosby. Barriers to TQM; Quality statements, customer focus, customer orientation & satisfaction, customer complaints, customer retention; costs to quality.

[08 Hours]

TQM principles; leadership, strategic quality planning; Quality councils- employee involvement, motivation; Empowerment; Team and Teamwork; Quality circles, recognition and reward, performance appraisal; Continuous process improvement; PDCA cycle, 5S, Kaizen; Supplier partnership, Partnering, Supplier rating & selection.

[12 Hours]

SECTION - B

The seven traditional tools of quality; New management tools; Six sigma- concepts, methodology, applications to manufacturing, service sector including IT, Bench marking process; FMEA- stages, types. TQM tools and techniques, control charts, process capability, concepts of six sigma, Taguchi quality loss function; TPM- concepts, improvement needs, performance measures.

[10 Hours]

Quality systems, need for ISO 9000, ISO 9001-9008; Quality system- elements, documentation,; Quality auditing, QS 9000, ISO 14000- concepts, requirements and benefits; TQM implementation in manufacturing and service sectors.

[09 Hours]

RECOMMENDED BOOKS:

1. Besterfield D.H. et al., Total quality Management, 3rd ed., Pearson Education Asia, 2006.
2. Evans J.R. and Lindsay W.M., The management and Control of Quality, 8th ed., first Indian edition, Cengage Learning, 2012.
3. Janakiraman B. and Gopal R.K., Total Quality Management, Prentice Hall India, 2006.
4. Suganthi L. and Samuel A., Total Quality Management, Prentice Hall India, 2006.

NOTE:

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

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CLASS: B.E. 7th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: ENERGY RESOURCES & UTILISATION

COURSE NO.: PME-703-A

DURATION OF EXAMINATION: 3 HOURS

CREDITS: 3

Marks				
L	T	P	Theory	Sessional
3	0	0	100	50

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO703-A.1:	Select the suitability of site for a power plant.
CO703-A.2:	Calculate performance of thermal power plant.
CO703-A.3:	Explain the major type of hydro power and wind power turbines and estimate power generation potential.
CO703-A.4:	Explain working principle of different type of nuclear power plant.
CO703-A.5:	Calculate load factor, capacity Factor, average load and peak load on a power plant.

Detailed Syllabus

SECTION – A

Conventional energy resources, Types of power plants, Selection of site for steam, Hydro, Nuclear and standby power plants. Special features of modern steam boilers, circulation principle, Steam separation and purification, Economizer and air pre-heaters and super heat control, Fuel preparation and burning, Furnaces and combustion equipment, Water treatment plant, Condensers and air pumps, Performance estimation, Spray ponds and cooling tower.

[20 Hours]

SECTION - B

Components of nuclear power plant & solar power plants, moderators, coolants, reflectors and other components, control of nuclear plants, Different kinds of nuclear reactors, Disposal of radioactive waste. Economic of power generation, operational and maintenance various power plants. Non-conventional energy sources Biomass, Solar, Wind, Tidal, Geothermal and MHD.

[19 Hours]

RECOMMENDED BOOKS:

- | | | |
|--------------------------------------|---|-----------------|
| 1. Power Plant Engineering | : | Morse |
| 2. Power Plant Technology | : | E.Iwakil |
| 3. Power station engineering economy | : | VopatSkotzki |
| 4. Power station engineering economy | : | John F lee |
| 5. Nuclear power plant | : | Robert loftness |
| 6. Modern power plant engineering | : | Weisman eskarf |

NOTE:

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

CLASS: B.E. 7th SEMESTER

BRANCH: MECHANICAL ENGINEERING

CREDITS: 3

COURSE TITLE: ADVANCE MACHINING PROCESS

COURSE NO.: PME-703-B

DURATION OF EXAMINATION: 3 HOURS

Marks				
L	T	P	Theory	Sessional
3	0	0	100	50

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO703-B.1:	Understand the fundamentals of non - conventional machining processes.
CO703-B.2:	Understand the working and uses of various mechanical machining processes such as AJM, USM etc.
CO703-B.3:	Understand the purpose of chemical and electrochemical machining.
CO703-B.4:	Understand the purpose of electric discharge machining.
CO703-B.5:	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. Chemical and Electro-chemical machining:- Introduction, Principles & Scheme, Process parameters, Material removal rate, dynamic and hydro-dynamic & hydro-optimization, electrolytes.

[19 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. 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.

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

[20 Hours]

RECOMMENDED BOOKS:

1. Non-traditional machining methods: ASME.
2. New Technology by Bhattayacharya; I.E. (India)
3. Ultrasonic cutting by Rozenberg; Consultants Bureau; N.Y.

NOTE:

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

Paulson

CLASS: B.E. 7th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: REFRIGERATION & AIR CONDITIONING

COURSE NO.: PME-703-C

DURATION OF EXAMINATION: 3 HOURS

CREDITS: 3

Marks				
L	T	P	Theory	Sessional
3	0	0	100	50

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO703-C.1:	Differentiate between vapour compression and vapour absorption cycles.
CO703-C.2:	Analyze thermodynamically, vapour compression systems.
CO703-C.3:	Understand the purpose of condensers, compressors, expansion devices etc.
CO703-C.4:	Recall and differentiate various refrigerants.
CO703-C.5:	Do psychometric analysis.

Detailed Syllabus

SECTION – A

Refrigeration: Principle, Heat pump and refrigeration machine, Vapour compression system, Vapour Absorption system, Air cycle refrigeration, Steam jet refrigeration, solar refrigeration, thermo-electric refrigeration. COP and power requirement calculations for different systems. Thermodynamic analysis of vapor compression system. Actual cycle, Effects of operating variables on the performance of vapour compression system, Compound systems with inter-cooling for single and multiple evaporators, Cascading. [20 Hours]

SECTION – B

Refrigerants: Designation and selection of a refrigerant, thermodynamic chemical and physical requirements, secondary refrigerants and alternative refrigerants. [10 Hours]

Air conditioning- Psychometric of Air-conditioning process, Mixing process, Basic processes in conditioning of air, air-conditioning load calculation and applied psychometrics. Summer and winter air-conditioning. [10 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 | : Stoccker - McGraw Hill |

NOTE:

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

CLASS: B.E. 7th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: REFRIGERATION AND AIR CONDITIONING LAB

COURSE NO.: PME-714

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 2

L	T	P	Marks Practical
0	0	4	75

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO704.1:	Understand the principles and applications of refrigeration systems
CO704.2:	Evaluate performance of Vapour compression refrigeration system.
CO704.3:	Apply working principle of VAR/VCR system to solve numerical based on VCR and VAR system.
CO704.4:	Understand basics of psychrometry, air conditioning processes and different air conditioning systems.
CO704.5:	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 psychrometric 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.

Paulson

CLASS: B.E. 7th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: INDUSTRIAL MANAGEMENT

COURSE NO.: HMC – 702-A

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 4

					Marks
L	T	P	Theory	Sessional	
2	2	0	100	50	

COURSE OUTCOMES

At the end of the course student will be able to:

CO701-A.1:	Acquire qualities of a good entrepreneur and opt entrepreneurship as a career option and shall be able to start his own business venture.
CO701-A.2:	Work as a sole proprietor, in partnership and in joint stock companies
CO701-A.3:	Know about industrial policies, various concepts of industrial relations and shall be able to resolve conflicts emerging while working in groups within the organizations
CO701-A.4:	Work as a good manager in companies, and shall become a good decision maker.
CO701-A.5:	Analyze about the concept of HRM, Wage Payment and Job evaluation.

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. **(6hrs)**

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

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. **(5hrs)**

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. **(6hrs)**

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. **(6hrs)**

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

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

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. (5hrs)

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 20 marks. Five questions will have to be attempted, selecting at least two from each section. Use of calculator is allowed

Paulson

CLASS: B.E. 7th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: ORGANIZATIONAL BEHAVIOUR

COURSE NO.: HMC-702-B

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 4

Marks				
L	T	P	Theory	Sessional
2	2	0	100	50

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO701-B.1:	Understand how to work in organizations by acquiring proper knowledge about organizational behaviour and detail knowledge about personality, perception etc.
CO701-B.2:	Apply and transmit their ideas, facts, thoughts, feelings, and values effectively.
CO701-B.3:	Bring change in organizations, learn to work in groups and shall also be able to resolve organizational conflicts.
CO701-B.4:	Be a good team leader and have effective motivation skills.
CO701-B.5:	Mitigate their stress and will also have good tactics of organizational culture.

Detailed Syllabus

SECTION – A

Unit 1: Basic concept of organizational behavior -Concept, Meaning, Nature and Scope of organizational behavior, Models of organizational behavior, Individual Difference: Meaning, Factors & implications of individual differences.

[5Hours]

Unit 2: Personality and Perception:- Personality: - Meaning , Characteristics, Determinants , Development of personality and Theories of personality (Behavioral , Self - concept theory) Perception-Meaning, Definition, Perceptual Process, internal & external factors in perceptual selectivity.

[6 Hours]

Unit 3: Values and Attitudes: Concept, features, importance, sources and types of Values: Terminal values and Instrumental Values, Attitude—Features, Components, functions, sources, Formation of Attitudes and job related attitudes.

[5 Hours]

Unit 4: Learning: Definition, Theories of learning- Classical Conditioning, Operant Conditioning, Observational learning, Reinforcement- Concept, Types, and Importance.

[5 Hours]

SECTION – B

Unit 5: 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.

[6 Hours]

Unit 6: Leadership and Motivation :- Leadership—Characteristics and Functions of Leader, Qualities of a good Leader, Importance of leadership, Styles of Leadership; **Motivation:** Concept & importance, theories of motivation Maslow's Need Hierarchy Theory and Herzberg's Motivation Hygiene Theory, McClelland's need theory. **[5 Hours]**

Unit 7: Group Behaviour and conflicts:: Concept of group, Definition, Types of groups, Five stage model of group development, Teams- Concept, Importance, Difference between Groups and Teams, Dynamics of conflicts: Nature of Conflict, Types of Conflict, Stages in conflict, Resolution of conflicts. **[5Hours]**

Unit 8: Organizational culture: Meaning, definition, Elements& Characteristics of organizational culture, Functions of Culture in Management. **Stress management-** Individual and Organizational factors to stress Prevention and Management of stress **[5 Hours]**

BOOKS RECOMMENDED:

- | | |
|---|--------------------------------|
| 1. Organizational Behavior (Human Behavior at work) | John W. Newstrom & Keith Davis |
| 2. Organizational Behavior | Stephen p. Robbins |
| 3. Principles of Management | Dr. Neeru Vaisisth |
| 4. Management | G. S. Sudha |
| 5. Organizational Theory & Behavior | T.N. Chabbra, B.P Singh |
| 6. Organizational Behaviour | L.M.Prasad |

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

B.E. Mechanical Engineering 7th Semester Examination to be held in the Year December 2021,2022,2023,2024

CLASS: B.E. 7th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: CAD-CAM LAB

COURSE NO.: PME-715

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 2

L	T	P	Marks Practical
0	0	4	75

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO705.1:	Analyse the input and output devices of workstation.
CO705.2:	Demonstrate the knowledge on basic drafting software tools and ability to use them accordingly.
CO705.3:	Approach a design problem successfully, taking decisions when to use a specific tool.
CO705.4:	Be proficient in the use of part programming in NC/CNC lathe, drilling and milling.
CO705.5:	Understand the working mechanism of AUTOMAT.

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 softwares.
3. Simple exercises of drawing through the same packages-two dimensional drafting and three dimensional modeling.
4. Working mechanism of NC machine tools, Part programming for a job on NC/CNC lathe, drilling and milling machine.
5. Working mechanism of an Automat.
6. Exercise on manual part-programming for CNC machines like turning center and the 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.

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.

B.E. Mechanical Engineering 7th Semester Examination to be held in the Year December 2021,2022,2023,2024

CLASS: B.E. 7th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: SEMINAR

COURSE NO.: SEM-705

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 1

L	T	P	Marks
0	0	2	Practical
			50

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO705.1:	Identify and compare technical and practical issues related to the area of program specialization.
CO705.2:	Outline annotated bibliography of research demonstrating scholarly skills.
CO705.3:	Prepare a well-organized report employing elements of technical writing and critical thinking
CO705.4:	Demonstrate the ability to describe, interpret and analyze technical issues and develop competence in presenting.
CO705.5:	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 atleast 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.

B.E. Mechanical Engineering 7th Semester Examination to be held in the Year December 2021,2022,2023,2024

CLASS: B.E. 7th SEMESTER

BRANCH: MECHANICAL ENGINEERING

CREDITS: 1

COURSE TITLE: INDUSTRIAL TRAINING - II

COURSE NO.: SII-705

DURATION OF EXAMINATION: 3 HOURS.

L	T	P	Marks Practical
0	0	0	50

COURSE OUTCOMES

At the end of the course student will be able to:

CO.1:	Students should be able to work in industry with any hesitation.
CO.2:	Apply ethical principles and commit to responsibilities and norms of engineering practice.
CO.3:	Recognition of the need for, and an ability to engage in life-long learning.
CO.4:	To use the techniques, skills, and modern engineering tools necessary for engineering practice.
CO.5:	To identify, formulate, and solve engineering problems.

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

Guidelines for evaluation of Practical Training:

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

Distribution of Marks as per the University statutes:

Total Marks for Evaluation = 50 marks

i)	Report	= 20	40%
ii)	Viva-Voce	= 15	30%
iii)	Miscellaneous Marks	= 15	30%

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

Award of the Marks:

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

OPEN ELECTIVE LAB

B.E. Mechanical Engineering 7th Semester Examination to be held in the Year December 2021,2022,2023,2024

CLASS: B.E. 7th SEMESTER

BRANCH: Electrical/Computers/Mechanical/IT/Civil

COURSE NO.: ECO-711

COURSE TITLE: MATLAB PROGRAMMING

CREDIT: 1

Hours/ Week

L	T	P
0	0	2

Marks Distribution

Practical
50

COURSE OUTCOMES

At the end of the course the student will be able to: -	
CO1	Perform various arithmetic calculations.
CO2	Find importance of this software for generating equations of vectors and other mathematical expressions.
CO3	Articulate importance of software's in creating and printing simple,2D &3D plots and execution functions
CO4	Do various library blocks and their interconnections

LIST OF EXPERIMENTS:

Experiment 1	1. Study of arithmetic, exponential, Logarithmic, Trigonometric, complex number calculation.
Experiment 2	2. To generate equation of straight line, Geometric series, points on circle, multiply, divide and exponential vectors.
Experiment 3	3. To create and print simple plots and execution of functions.
Experiment 4	4. To generate matrices and vectors, array operations, inline functions anonymous functions etc.
Experiment 5	5. To generate functions like execution a function, global variable, structures.
Experiment 6	6. To generate 2D, 3D plots.
Experiment 7	7. Study of various library blocks and their interconnections.

NOTE: Each student has to perform all the aforementioned Practical / Experiments. Additional Practical / Experiments will be performed based on the course content requirements.

OPEN ELECTIVE LAB

B.E. Mechanical Engineering 7th Semester Examination to be held in the Year December 2021,2022,2023,2024

CLASS: B.E. 7TH SEMESTER

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

COURSE CODE: EEO-712

TITLE: NON-CONVENTIONAL ENERGY RESOURCES AND INSTRUMENTATION and LAB

CREDITS: 1

MARKS

L	T	P	PRACTICAL
0	0	2	50

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 Multi meters & Frequency Counter
3. To Study Block Wise Construction of Analog Oscilloscope & 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 details of a box type solar cooker.
9. To Study of Solar Street Lighting and Lanterns.
10. To Study of Fuel cells.

OPEN ELECTIVE LAB

B.E. Mechanical Engineering 7th Semester Examination to be held in the Year December 2021,2022,2023,2024

CLASS: B.E. 7th SEMESTER

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

COURSE NO.: CSO-713

COURSE TITLE: PROGRAMMING LAB

CREDIT: 1

Hours/ Week

Marks Distribution

L T P Practical

0 0 2 50

LABORATORY OUTCOMES

After Completion of this course the student will be able to: -

CO1	Remember the role of languages like C++/ Java/Python/HTML & DHTML/Android
CO2	Understand the syntax and Develop the programs on specific language.
CO3	Implement various programs using C++/Java/Python/HTML.

Lab Experiments:

Experiment 1	WAP To use different arithmetic operation in java/C++/Python or use different tags in HTML.
Experiment 2	WAP to perform manipulation on strings in java / C++ / Python.
Experiment 3	WAP to demonstrate Exception handling in java / C++.
Experiment 4	Program to create frame and table using HTML
Experiment 5	Design a website on your own using HTML and CSS
Experiment 6	Develop an application representing a simple calculator
Experiment 7	Develop an application for working with notification
Experiment 8	Develop an application for connecting to internet and sending e-mail.
Experiment 9	Develop an application for working with device camera

NOTE: Additional Lab experiments/practical will be performed based on the course requirements.

OPEN ELECTIVE LAB

B.E. Mechanical Engineering 7th Semester Examination to be held in the Year December 2021,2022,2023,2024

CLASS: B.E. 7th SEMESTER

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

COURSE NO.: ITO-714

COURSE TITLE: LINUX SHELL PROGRAMMING

CREDIT: 1

Hours/ Week

Marks Distribution

L	T	P	Practical
0	0	2	50

COURSE OUTCOMES

At the end of the course the student will be able to: -	
CO1	Understand Linux commands to manage files and file systems
CO2	Write a shell programs to solve a given problems
CO3	Write Regular expressions for pattern matching and apply them to various filters for a specific task.
CO4	Analyze a given problem and apply requisite facets of SHELL programming in order to devise a SHELL script to solve the problem

LIST OF EXPERIMENTS:

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, Vi editors, wild card characters used in Linux.
2. Write a shell programs to perform operations using case statement such as
1)Addition 2)subtraction 3)multiplication 4)Division
- 3 Write a shell scripts to see current date,time username and directory
- 4 Write a shell programs to find maximum of three number
- 5 Write a script to check whether the given no. is even/odd
- 6 Write a script to calculate the average of n numbers
- 7 Write a script to check whether the given number is prime or not
- 8 Write a script to calculate the factorial of a given number
- 9 Write a script to calculate the sum of digits of the given number
- 10 Write a shell script to print file names in directory showing date of creation & serial no. of file.

OPEN ELECTIVE LAB

B.E. Mechanical Engineering 7th Semester Examination to be held in the Year December 2021,2022,2023,2024

CLASS	7 th SEMESTER					
BRANCH	E&C/Electrical/Computers/Mechanical/IT					CREDITS: 1
COURSE TITLE	BASIC CIVIL TESTING LAB					
COURSE NO.	CE0- 716	L	T	P	Marks	
		0	0	2		
					Internal	External
					50	00

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

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 by 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 C_d for Venturimeter
11. To determine C_d for Orificemeter
12. To determine C_d for a Notch.

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ANNEXURE – II

**B.E. Mechanical Engineering 8th Semester Examination to be held in the Year
May 2022,2023,2024,2025**

SCHEME A**B.E. Mechanical Engineering 8th Semester****Contact Hours: 22 hours/week**

COURSE CODE	COURSE TYPE	COURSE TITLE	LOAD ALLOCATIONS			MARKS DISTRIBUTION		TOTAL MARKS	CREDITS	% CHANGE
			L	T	P	INTERNAL	EXTERNAL			
PME-801	Professional Elective Course	A) Optimization Techniques B) Jigs and Fixtures C) Tribology	3	0	0	50	100	150	3	100%
ECO-801	Open Elective Course	The Embedded System.	3	0	0	50	100	150	3	100%
EEO -802		Non Conventional Energy resources and Instrumentation								
CSO -803		Web Technology								
ITO-804		Python Programming								
CEO-806		Essentials of Civil Engineering								
HOE-806		International Economics								
PRJ-805	PROJECT	Project	0	0	16	150	100	250	8	100%
MOC-805	Massive Open Online Course	SWAYAM/ NPTEL/Any other MOOC platform	2	0	0	50	0	50	2	100%
NCC-806	Non-Credit Course	Disaster Management & Mitigation	2	0	0	-	-	-	-	100%
TOTAL			10	0	16	300	300	600	16	

SCHEME B**B.E. Mechanical Engineering 8th Semester**

Course Code	Course Type	Course Title	Load Allocations			Marks Distribution		Total Marks	Credits	% Change
			L	T	P	Internal	External			
PII-805	Professional Industry course	Industry Internship	0	0	0	350	200	550	14	100%
MOC-805	Massive Open Online Course	SWAYAM/ NPTEL/Any other MOOC platform	2	0	0	50	0	50	2	100%
TOTAL			3	0	0	400	200	600	16	

B.E. Mechanical Engineering 8th Semester Examination to be held in the Year May 2022,2023,2024,2025

CLASS: B.E. 8th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: OPTIMISATION TECHNIQUES

COURSE NO.: PME-801-A

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 3

Marks				
L	T	P	Theory	Sessional
3	0	0	100	50

COURSE OUTCOMES

At the end of the course student will be able to:

CO801-A.1:	Identify necessity and development of mathematical models for various industries.
CO801-A.2:	Describe basic optimization and simulation techniques applied to various industries.
CO801-A.3:	Recall investment analysis and game theory.
CO801-A.4:	Predict the industrial systems under the conditions of certainty, uncertainty and risk.
CO801-A.5:	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. **Linear Distribution:** Linear Programming Optimization models. Problem formulation, Geometric solution in two and three dimensional space, Simplex algorithm Solution.[19 Hours]

SECTION – B

Optimization Models: Transportation models, Variations and selected applications, Assignment models, Waiting Line models: Queuing System, Features of queuing process, Classification of models and their solution, M/M/I and M/M/C Models.[18 Hours]

RECOMMENDED BOOKS:

- | | | |
|---|---|--|
| 1. Operation Research | : | Hamdy H Taha- McMillan pub. Co. |
| 2. Industrial Engineering & Management | : | O.P. Khanna. |
| 3. Fundamental of Operation Research | : | R.L.Ackoff & M.W.Sasieni-Wiley Eastern |
| 4. 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 20 marks) and four from **Section – B** (each of 20 marks).
3. Students are required to attempt five questions in all, at least two questions from each section
4. Use of scientific calculator will be allowed in the examination hall.

B.E. Mechanical Engineering 8th Semester Examination to be held in the Year May 2022,2023,2024,2025

CLASS: B.E. 8th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: JIGS AND FIXTURES

COURSE NO.: PME-801-B

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 3

L	T	P	Marks	
			Theory	Sessional
3	0	0	100	50

COURSE OUTCOMES

At the end of the course student will be able to:

CO801-B.1:	To understand fundamental principles and applications of Jigs and fixtures in industry.
CO801-B.2:	To study the importance of workplace location and degrees of freedom.
CO801-B.3:	To understand the requirements and types of clamping.
CO801-B.4:	To study the guiding elements of jigs.
CO801-B.5:	To understand Jigs and Fixtures and its types.

Detailed Syllabus

SECTION – A

Jigs and Fixtures:- Elements of jigs and fixtures, costs calculations. Locating element, clamping elements, procedure in designing Jig and fixtures, Fits and tolerances analysis. Non-Standard clamping devices, centralizers, equalizers, actuators (Pneumatic, hydraulic, electric and electronic) Automatic loading and unloading devices. Types of Fixtures: Single, double and multi-axis, and indexers. **[20 Hours]**

SECTION – B

Transfer line jigs & fixtures for the operation of Multi-drilling, boring, milling, and grinding. Assembly line fixtures, Universal Jigs and Fixtures. Transfer-devices, transfer machine, modulation-design concept, in process gauging. Design of Dies: Elements of Dies and Punch. Types and design procedure, progressive dies, drawing die, bending die etc. Analysis **[20 Hours]**

RECOMMENDED BOOKS:

1. Jigs and Fixtures Design by Franklin-D-Jones.
2. Jigs and Fixtures by Colovin; F.H. and Massachusettes Institute of Technology.
3. Jigs and Fixtures Design by Hardy; H.W.
4. Jigs and Fixtures Design by Haughton; P.S.
5. Jigs and Fixtures by Parson.

NOTE:

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

B.E. Mechanical Engineering 8th Semester Examination to be held in the Year May 2022,2023,2024,2025

CLASS: B.E. 8th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: TRIBOLOGY

COURSE NO.: PME-801-C

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 3

Marks				
L	T	P	Theory	Sessional
3	0	0	100	50

COURSE OUTCOMES	
At the end of the course student will be able to:	
CO801-C.1:	Understand the mechanism of friction, wear and lubrication and can develop analytical relation between the variables
CO801-C.2:	Understand hydrodynamic and hydrostatic lubrication
CO801-C.3:	Illustrate the behavior of tribological components subjected to different working conditions and describe different tribological measures.
CO801-C.4:	Understand the concept of types of wear and their measurement under different environments.
CO801-C.5:	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 their relevance in tribology. 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. **[21 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. **[20 Hours]**

RECOMMENDED BOOKS:

1. Sharma Aggarwal, A Text 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

NOTE:

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

OPEN ELECTIVE COURSE

B.E. Mechanical Engineering 8th Semester Examination to be held in the Year May 2022,2023,2024,2025

CLASS: B.E. 8th SEMESTER

CREDITS: 3

BRANCH: Electrical/Computers/Mechanical/IT/Civil

COURSE NO: ECO-801

COURSE TITLE: EMBEDDED SYSTEM

DURATION OF EXAM: 3 HOURS

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
2	1	0	100	50

COURSE OUTCOMES

At the end of the course the student will be able to: -

CO1	Understand the concept of Microcontroller 8051, learn to write simple programs.
CO2	Understand the concept and applications of DC motor and indicators and use in project work.
CO3	Understand the concept of hardware details of ARM7.
CO4	Write the algorithm and design a system based on 8051.

Detailed Syllabus

SECTION-A

Definition of Embedded system, macro and micro embedded systems: Architecture of 8031/8051/8751. Comparison of Microprocessors and Microcontroller Data types and Directives. Pin description of 8051, I/O port functions, Time Delay Generation and calculation. Addressing modes, Logic instructions and programs, single bit instructions and programs, Programming using 8051 timers, counter programming, simplex, half duplex, full duplex transmission, synchronous and asynchronous communication. [16 Hours]

SECTION-B

Architecture: Block Diagram and Pin Diagram of ARM7, Instruction Set, Addressing Modes ARM Processor. System Design based on 8051/ARM Processor. Peripheral Interfaces: LCD, Seven Segment Display, Sensor: IR, temperature. Relays, analog to digital converter, digital to analog converter interfaces with 8051 and ARM7. [14 Hours]

BOOKS RECOMMENDED:		
1.	The 8051 Microcontroller (architecture, Programming and Applications)	Kenneth J. Ayala -----Penram International
2.	The 8051 Microcontroller and Embedded Systems	Muhammed Ali Mazidi & Janice Gillispie Mazdi
3.	ARM system development guide	Andrew-n-sloss& Dominic Symes Publisher –Morgan Aausamann.

NOTE: There will be eight questions of 20 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.

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OPEN ELECTIVE COURSE

B.E. Mechanical Engineering 8th Semester Examination to be held in the Year May 2022,2023,2024,2025

CLASS: B.E. 8TH SEMESTER

CREDITS: 3

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

MARKS

COURSE CODE: EEO-802

TITLE: NON-CONVENTIONAL ENERGY SOURCES AND INSTRUMENTATION

L	T	P	THEORY	SESSIONAL
3	0	0	100	50

DURATION OF EXAM: 3 HOURS

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 about illumination and other lighting schemes.

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 hydro power, choice of site and turbines. Tidal energy, idea of tidal energy, Tidal electric generator, limitations. [8 Hours]

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. [5 Hours]

Module 3: Fuel Cells & Thermo-electric, Generators: Principle of action, Gibbs free energy, general description of fuel cells, types, Construction, operational characteristics and applications. Seebeck effect, peltier effect, Thomson effect, thermoelectric convertors, brief description of the construction of thermoelectric generators, applications & economic aspects. [5 Hours]

SECTION-B

Module4: MEASURING INSTRUMENTS: Classification, effects utilized in measuring instruments. Indicating instruments: Deflection, controlling and damping forces, various dampings. Measurement of low resistance: - Potentiometer method, Kelvin double bridge. Ammeters and Voltmeters: Moving coil, moving iron ammeter and voltmeters, Errors in Ammeters and Voltmeters. [7 Hours]

Module 5: MEASUREMENT OF POWER: Wattmeter measurement in single phase A.C. circuits, Wattmeter errors. Measurement of three phase power by two wattmeter methods. Energy meters for A.C. circuits, Theory of Induction type meters. [5 Hours]

Module 6: Illumination: Nature and production of light. Photometric definitions. Incandescent lamps, arc and discharge lamps. Design of illumination schemes for indoor and outdoor uses. Flood lighting. [4 Hours]

RECOMMENDED BOOKS:

Non-conventional Energy Resources

D.S. Chauhan

Conventional energy sources

G.D. Rai

Non-Conventional energy sources

B.H. Khan

Solar Energy Fundamentals and Applications

H.P. Garg and Jai Prakash

A course in Electrical and Electronics Measurement & instrumentation A.K. Sawhney

NOTE: There shall be total eight questions; five questions have to be attempted selecting at least two questions from each section.

OPEN ELECTIVE COURSE

B.E. Mechanical Engineering 8th Semester Examination to be held in the Year May 2022,2023,2024,2025

CLASS: B.E. 8th SEMESTER

CREDITS: 3

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

COURSE NO: CSO-803

COURSE TITLE: WEB TECHNOLOGY

DURATION OF EXAM: 3 HOURS

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
2	1	0	100	50

COURSE OUTCOMES

At the end of the course the student will be able to: -

CO1	Remember the role of languages like HTML, DHTML, CSS and android
CO2	Analyze a web page and identify its elements and attributes.
CO3	Implement web pages using HTML, DHTML and Cascading Style Sheets.
CO4	Develop Web applications using HTML/CSS/Javascript.

Detailed Syllabus

Section- A

Introduction to WWW :- Protocols and programs, Secure connections, Application and development tools, The web browser, What is server, Choices, Dynamic IP.

Web Design: Web site design principles, Planning the site and navigation.

[6 Hours]

Introduction to HTML:- The development process, HTML tags and simple HTML forms, Web site structure. Introduction to XHTML: XML, Move to XHTML, Meta tags, Character entities, Frames and frame sets, Inside browser. [7 Hours]

Style Sheets:- Need for CSS, Introduction to CSS, Basic syntax and structure, Using CSS, Background images, Colors and properties, Manipulating texts, Using fonts, Borders and boxes, Margins, Padding lists, Positioning using CSS, CSS2.

[7 Hours]

Javascript:-Client side scripting, What is Javascript, How to develop Javascript, Simple Javascript, variables, Functions, Conditions, Loops and repetition.

[3 Hours]

Section- B

Advance script: Javascript and objects, Javascript own objects, The DOM and web browser environments, forms and validations.

DHTML: Combining HTML, CSS and Javascript, events and buttons, controlling your browser, Ajax: Introduction, advantages &disadvantages ,Purpose of it ,ajax based web application, alternatives of ajax. **XML**: Introduction to XML, uses of XML, simple XML, XML key components, DTD and schemas, Well formed, using XML with application XML, XSL and XSLT, Introduction to XSL, XML transformed simple example, XSL elements, Transforming with XSLT. [7 Hours]

PHP:- Starting to script on server side, Arrays, Function and forms, Advance PHP.

Databases:- Basic command with PHP examples, Connection to server, Creating database, Selecting a database, Listing database, Listing table names, Creating a table, Inserting data, Altering tables, Queries, Deleting database, Deleting data and tables, PHP myadmin and database bugs.

[10 Hours]

BOOKS RECOMMENDED:		
1.	"HTML Black Book"	Steven Holzner, Dremtech press.
2.	Web Technologies, Black Book.	Dreamtech Press
3.	Web Applications: Concepts and Real-World Design	Knuckles, Wiley-India
4.	Internet and World Wide Web How to program	P.J. Deitel & H.M. Deitel Pearson.

NOTE: There will be eight questions of 20 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.

OPEN ELECTIVE COURSE

B.E. Mechanical Engineering 8th Semester Examination to be held in the Year May 2022,2023,2024,2025

CLASS: B.E. 8th SEMESTER

CREDITS: 3

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

COURSE NO: ITO-804

COURSE TITLE: Python Programming

DURATION OF EXAM: 3 HOURS

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
2	1	0	100	50

COURSE OUTCOMES	
At the end of the course the student will be able to: -	
CO1	To Understand basics of python.
CO2	To develop console application in python
CO3	To develop database application in python
CO4	Apply the concept of file handling in python and basic machine learning application

Detailed Syllabus

Section- A

Introduction to Python Programming Language: -Introduction to Python Language, Strengths and Weaknesses, IDLE, Dynamic Types, Naming Conventions, String Values, string Operations, String Slices, String Operators, Numeric Data Types, Built In Functions. **[10 Hours]**

Data Collections and Language Component: -Introduction, Control Flow and Syntax, Indenting, The if Statement, Relational Operators, Logical Operators, True or False, Bit Wise Operators, The while Loop, break and continue, The for Loop, Lists, Tuples, Sets, Dictionaries, Sorting Dictionaries, Copying Collections. **[5 Hours]**

Functions and Modules :- Introduction Defining Your Own Functions Parameters Function Documentation Keyword and Optional Parameters Passing Collections to a Function Variable Number of Arguments Scope Functions - "First Class Citizens" Passing Functions to a Function Mapping Functions in a Dictionary Lambda Modules Standard Modules – sys Standard Modules – math Standard Modules – time The dir Function **[6 Hours]**

SECTION- B

Object and Classes: -Classes in Python, Principles of Object Orientation, Creating Classes, Instance Methods Special Methods Class Variables, Inheritance, Polymorphism. **[6 Hours]**

I/O and Error Handling InPython: Introduction, Data Streams, Creating Your Own Data Streams, Access Modes, Writing Data to a File, Reading Data From a File, Additional File Methods, Handling IO Exceptions, Working with Directories, Errors, Run Time Errors, The Exception Model, Exception Hierarchy, Handling Multiple Exceptions. **[10 Hours]**

Text Book:

1. Think Python, by Allen B. Downey ,second edition ,O'Reilly, Sebastopol, California.
 2. Online Version www.greenteapress.com/thinkpython2.pdf.
 3. How to think like a computer Scientist, by Brad Miller and David Ranum.
 4. Python Programming: An Introduction to Computer Science, by John Zelle.
- Online Version:www.interactivepython.org/runstone/static/thinkscpy/index.html.

NOTE: There will be eight questions of 20 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.**

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OPEN ELECTIVE COURSE

B.E. Mechanical Engineering 8th Semester Examination to be held in the Year May 2022,2023,2024,2025

CLASS	8th SEMESTER						
BRANCH	E&C/Electrical/Computers/Mechanical/IT					CREDITS: 3	
COURSE TITLE	ESSENTIALS OF CIVIL ENGINEERING						
COURSE NO.	CEO- 806	L	T	P		Marks	
DURATION OF EXAM	3 HOURS	3	0	0	Theory	Sessional	
					100	50	

COURSE OUTCOMES : On completion of the course the students will be able to:	
CO1	Able to identify the properties of building materials.
CO2	Acquaint with the masonry construction and finishes
CO3	Carry out surveying in the field for engineering projects.
CO4	Plan and schedule the Project by various network techniques of construction planning

MODULE –I

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 **[9 Hours]**

MODULE -II

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, Combined Footing and Raft Foundation. Pile Foundation and its types, Pile Driving, Cofferdams. **[9 Hours]**

Module -III

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, Methods of Levelling, height of Instrument method and Rise and Fall method, Temporary and permanent adjustments in levels. **[9 Hours]**

Module -IV

Network techniques in construction management

Bar Charts and Mile stone charts, Elements of network, Development of network, Network rules, Network techniques CPM and PERT, Network analysis, Time estimates, Time computations, classification of activities, Determination of Slack and float, Critical Path. **[9 Hours]**

BOOKS RECOMMENDED:

- | | |
|---|-----------------|
| 1. BUILDING MATERIAL & CONSTRUCTION | BY SUSHIL KUMAR |
| 2. BUILDING MATERIAL | BY PRABIN SINGH |
| 3. SURVEYING VOL.- I | BY B.C PUNMIA. |
| 4. PERT & CPM - Principles & Applications | BY L SRINATH |

NOTE: There shall be total eight questions of 20 marks each, two from each module. Five questions have to be attempted selecting at least one from each module. Use of Calculator is allowed.

OPEN ELECTIVE COURSE

B.E. Mechanical Engineering 8th Semester Examination to be held in the Year May 2022,2023,2024,2025

Class: B.E. 8th semester

Branch: E&C/Electrical/Computers/Mechanical/IT/Civil

Course No.: HOE-806

Course title: International Economics

Duration: 3 hours

CREDIT: 3

L	T	P
2	1	0
Marks		
Theory	Sessional	
100	50	

At the end of the course, Students shall be able to:

CO1	Understand the concept of international trade in general as well as with the classical and modern theories.
CO2	Analyze the concept of foreign exchange and foreign trade multiplier in detail and hence shall be able to understand the international market conditions.
CO3	Compete in international corporate world by understanding the various concepts of terms of trade like tariffs, quotas, balance of payment and international organisations, etc.

SECTION A

UNIT - I: Concept of International Trade

Meaning, Significance and scope of International Economics, concepts of internal, interregional and international trade and their comparison, Theories of international trade: Absolute Cost Advantage, Comparative Cost Advantage, Opportunity cost theory (features, assumptions and limitations) **(6 hours)**

UNIT - II: Theories of International Trade

Modern Theories of International Trade: General equilibrium theory, Heckscher- Ohlin Theory, Rybznski Theorem, The Stolper – Samuelson Theorem, Factor Price-Equalization Theorem. **(5 hours)**

UNIT- III: Foreign Exchange and Foreign Trade Multiplier.

Foreign Exchange: Meaning and problems of foreign exchange, Methods of foreign payment, Demand and Supply of foreign currency, Foreign Trade-Multiplier, Exchange control (concept, features, objectives, and methods). **(7 hours)**

SECTION B

Unit- IV: Terms of trade

Meaning, Different Terms of Trade Indexes (Net Barter, Gross Barter, Income, Single and Double Factoral), Factors influencing Terms of Trade; Prebisch-Singer Thesis; Doctrine of reciprocal demand-importance and limitations. **(6 hours)**

Unit- V: Trade barriers

Tariffs and Quotas (Meaning, classifications and their impact), theory of optimum tariff, devaluation (concept, merits, demerit and limitations) **(5 hours)**

Unit VI: Balance of payment and International organisations

Concept and components of balance of trade and balance of payment, equilibrium and disequilibrium in BOP, consequences of disequilibrium in BOP, Various measures to correct deficit in BOP. International organisations: IMF, World bank, World Trade organisations- objectives, functions. **(7 hours)**

Suggested Readings

International Economics	-H.G Mannur
International Economics	-Paul R. Krugman and Maurice Obstfeld
International Economics	- Dominick Salvatore
International Economics	- Sodersten Bo
International Economics	- Os Shrivastva

NOTE: There will be eight questions of 20 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.E. Mechanical Engineering 8th Semester Examination to be held in the Year May 2022,2023,2024,2025

CLASS: B.E. 8th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: PROJECT

COURSE NO.: PRJ-805

DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 8

Marks				
L	T	P	Internal	External
0	0	16	150	100

COURSE OUTCOMES

At the end of the course student will be able to:

CO805.1:	Identify methods and materials to carry out experiments/develop code.
CO805.2:	Reorganize the procedures with a concern for society, environment and ethics.
CO805.3:	Analyze and discuss the results to draw valid conclusions.
CO805.4:	Prepare a report as per recommended format and defend the work.
CO805.5:	Explore the possibility of publishing papers in peer reviewed journals/conference proceedings.

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. It must comprise up of name of Project, Introduction, methodology, literature survey, problem formulation, experimentation work (if any), conclusion, future scope of work, reference.

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 : 100
- 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 100 marks are for final internal evaluation
- Mark distribution of internal Project work as per the University statutes 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.

B.E. Mechanical Engineering 8th Semester Examination to be held in the Year May 2022,2023,2024,2025

CLASS: B.E. 8th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: SWAYAM/NPTEL/ANY OTHER MOOC PLATFORM

COURSE NO.: MOC-805

CREDITS: 2

Marks				
L	T	P	Internal	External
2	0	0	50	0

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 he selected MOOC course should not be similar to the regular courses offered as a part of the department curriculum.

The overall monitoring of the OOC course will be under the supervision of the teacher Incharge 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.

Paulan

B.E. Mechanical Engineering 8th Semester Examination to be held in the Year May 2022,2023,2024,2025

CLASS: B.E. 8th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: Industry Internship

COURSE NO.: PII-805

CREDITS: 14

Marks				
L	T	P	Internal	External
0	0	0	350	200

COURSE OBJECTIVES	
CO805.1:	Practical implementation of theoretical knowledge gained during study
CO805.2:	Implement ideas/real time industrial problem/ current application
CO805.3:	Evaluate better solution for selected problem using state of the art topics in a broad area of his/her specialization.
CO805.4:	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 = 350

Mark distribution of Industry internship (internal) as per the University statutes shall be based on:

	Distribution	Mid-Semester		Internal Final	
a.	Viva-Voce	30	30%	75	30%
b.	Presentation	30	30%	75	30%
c.	Report	40	40%	100	40%
		100		250	
	Total Internal	350			

B.E. Mechanical Engineering 8th Semester Examination to be held in the Year May 2022,2023,2024,2025

CLASS: B.E. 8th SEMESTER

BRANCH: MECHANICAL ENGINEERING

COURSE TITLE: SWAYAM/NPTEL/ANY OTHER MOOC PLATFORM

COURSE NO.: MOC-805

CREDITS: 2

L	T	P	Marks	
			Internal	External
2	0	0	50	0

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 he selected MOOC course should not be similar to the regular courses offered as a part of the department curriculum.

The overall monitoring of the OOC course will be under the supervision of the teacher Incharge 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.

Pawan

B.E. Mechanical Engineering 8th Semester Examination to be held in the Year May 2022,2023,2024,2025

CLASS	8th SEMESTER				
BRANCH	MECHANICAL ENGINEERING	CREDITS: 0			
COURSE TITLE	DISASTER MANAGEMENT & MITIGATIONS	CATEGORY: NCC			
COURSE NO.	NCC-806	L	T	P	Marks
		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 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: Evaluation of the course. There will be internal evaluation based on two internal sessional tests of 30 marks each

Pawan