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)

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**	

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, 9th Edition, Pearson, 2002.
2. Differential Calculus   S. Narayan and P.K. Mittal, S.Chand, New Delhi.
3. Vector Calculus   S. Narayan andP.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.

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) Tranquilizers
(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 Spectroscope : 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	AUTHOR
1.	Engineering Chemistry	Jain & Jain
2.	Engineering Chemistry	Sharma, B.K.
3.	Engineering Chemistry	Dara, S.S.
4.	Engineering Chemistry	Shashi, Chawla
5.	Organic Chemistry	Bahl, B.S.
6.	Environmental Chemistry	De, A.K.
7.	Spectroscopy of Organic Compounds	Silverstein
8.	Spectroscopy of Organic Compounds	Kalsi, P.S.
9.	Polymer Science	Gowrikar, V.R. etal
10.	Engineering Chemistry	Dr. Rajinder Kumar

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 IN HCI and 0.IN 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 $K_2Cr_2O_7$ (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.IN $Na_2S_2 O_3$.
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 coloumn 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	AUTHOR
1. A manual of practical Engineering Chemistry	(Dr. Rajinder Kumar)
2. Experimental Engineering chemistry	(Shashi Chawla)

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 punctuationConcept 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

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 Co-planar 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.

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.

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 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**	

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,Guass 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 Clauraut'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, Guass 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   E. Kreyszig, 2006
2. Higher Engineering Mathematics   Dr. B.S. Grewal, Khanna Publication, New Delhi
3. Engineering Mathematics -II   Dr. Bhopinder Singh
4. Partial differential equations   M.D.RaiSinghania
5. Linear Algebra   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_o & B_o , 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 : <u>APPLIED OPTICS</u>

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.

Fraunhoffer & Fresnel's diffractions, Fresnel's half period zones and rectilinear propagation of light, Fraunhoffer 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.

<div align="right">7hrs, Weightage = 20%</div>

Module VI : <u>LASERS AND FIBRE OPTICS</u>

Principal of Laser action , Einstein's co-efficients, Ruby & CO_2 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.

<div align="right">5hrs, Weightage = 10%</div>

<u>TUTORIALS</u>

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 & Chabbra
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

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/MECHANICALENGINEERING

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

CLASS: B.E. 2ND SEMESTER

BRANCH: CIVIL/MECHANICALENGINEERING

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

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, Involutes, 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 (1) 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.
6. (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>= 40%: Unsatisfactory<40%.

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:

i.   There will be an Internal MCQ/Objective type Questions based examination of 40 marks.

ii.   Evaluation: Satisfactory>= 40%: Unsatisfactory<40%.

iii. 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>= 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)
19/8   19/08/19

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 MechanicsLab.	0	0	2	75	-	75	1	100%
PME-312	Professional Core Course	Thermodynamics Lab.	0	0	2	75	-	75	1	100%
PME-313	Professional Core Course	Mechanics Of Solids Lab.	0	0	2	75	-	75	1	100%
PME-314	Professional Core Course	Workshop Practice 1	0	0	2	50	-	50	1	100%
TOTAL			**12**	**4**	**10**	**500**	**500**	**1000**	**21**	

Course Code	Course Type	Course Title	Load Allocations			Marks Distribution		Total Marks	Credits	%Change
			L	T	P	Internal	External			
BSC-403	Basic Science Course	Engg.Maths-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**	

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	

CLASS:B.E.3rd SEMESTER   **CREDITS: 4**
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: FLUID MECHANICS   **Marks**
COURSE NO.: PME-301
DURATION OF EXAMINATION: 3 HOURS.

L	T	P	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: Pressureabsolute and gauge pressure- measurement of gauge pressure-centreof pressure - buoyancy and stability of submerged and floating bodies - metacentric heights.   **[5 Hours]**

Kinematics of Fluid Flow: Eulerian&lagrangianapproaches, 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. Eulerøs equation for unsteady flow in three dimensions - one dimensional flow along a stream of velocity, Bernoulliøs 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.   **[10Hours]**

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 Hoursøduration.
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.

CLASS: B.E. 3rd SEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: ENGG.THERMODYNAMICS
COURSE NO.: PME-302
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:	
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 fuelsó 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 psychometricchart, 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 Hoursøduration
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 Steam tables, Mollier chart and scientific calculator will be allowed in the examination hall.

CLASS: B.E. 3rd SEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: MACHINE DRAWING   **CREDITS: 2**
COURSE NO.: PME-303
DURATION OF EXAMINATION: 4 HOURS.

Marks

L	T	P	Theory	Sessional
1	0	2	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

1.   Assembly Drawings of the following machines:
   a)   Steam and I.C. Engines   : Piston, Connecting Rod
   b)   Machine tools   : Tailstock, Machine vices.
   c)   Boiler Mountings   : Feed check valve, Steam stop valve, and Blow off Cock.   **[10 Hours]**

2.   Bearings: Pedestal bearing, Pivot bearing and Swivel bearing.   **[10 Hours]**
SECTION- B

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

RECOMMENDED BOOKS:
1.   Machine Drawing   P. S. Gill.
2.   Machine Drawing   N. D. Bhat.
3.   Machine Drawing   R. B. Gupta.

NOTE:
1. Question paper will be of 4 Hoursøduration.
2. 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.**
3. Students are required to attempt four questions in all, three form Section-B and one compulsory question involving assembly from **Section A.**
4.Use of scientific calculator will be allowed in the examination hall.

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 ó 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, Mohrøs 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: Lameøs 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 Winkleró 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 Hoursø 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.

CLASS: B.E. 3rd SEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE:PRODUCTION TECHNOLOGY-I   **CREDITS: 3**
COURSE NO.:PME-305   **Marks**
DURATION OF EXAMINATION: 3 HOURS.   **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 Risering: 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 cuttingArc 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 Hoursøduration
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.

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 YearDecember 2019,2020,2021,2022

CLASS: B.E. 3RD SEMESTER
BRANCH: MECHANICAL ENGINEERING
CREDITS: 1
COURSE TITLE: THERMODYNAMICS LAB
COURSE CODE: PME-312

			Marks
L	**T**	**P**	**Practical**
0	**0**	**2**	**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 practicaløs should be performed.
2. Additional lab/ experiment will be performed based on course content requirement.

CLASS: B.E. 3RD SEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: MECHANICS OF SOLID LAB.
COURSE NO.: PME-313

CREDITS: 1

Marks
L	T	P	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 practicaløs should be performed.
2.   Additional lab/ experiment will be performed based on course content requirement.

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	

CLASS: B.E. 4thSEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: ENGG. MATHEMATICS III
COURSE NO.: BSC 403
DURATION OF EXAM: 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:	
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 analyticfunctions.
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.

CLASS: B.E. 4THSEMESTER
BRANCH: MECHANICAL ENGINEERING   **CREDITS: 4**
COURSE TITLE: HEAT TRANSFER

	L	**T**	**P**	**Marks**	
				Theory	**Sessional**

COURSE NO: PME-401
DURATION OF EXAMINATION: 3 HOURS   **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 Prandtlnumber , 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, Plank's Law, Stephan Boltzman's Law, Lambert's Law, Kirchoff'sLaw. 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 Hoursøduration
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.

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

Marks

L	T	P	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, Interplaner 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 alloyEutectic 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, Tampering, 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 Hoursøduration
2. There will be 8 questions in all, four from Section- A (each of 20 marks) and four fromSection - 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.

CLASS: B.E. 4th SEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: THEORY OF MACHINES
COURSE NO.: PME-403
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:	
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, Ropeóbrake and Beltótransmission dynamometers.Gyroscopic Action in Mechanics: Gyroscope and gyroscopic couples, Gyroscopic stabilisation of ships and airplanes, Stability of moving automobile.   **[10Hours]**
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:

1. Question paper will be of 3 Hoursø 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.

CLASS: B.E. 4ᵀᴴSEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: MAINTENANCE ENGINEERING
COURSE NO.: PME-404
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:	
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, Prentic-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. 4THSEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: HEAT TRANSFER LAB.
COURSE NO: PME-411
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:	
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 withthose given by theoretical predictions.
6. To analyse the temperature distribution, heat transfer coefficient and efficiency of a pin fin innatural and forced convection heat transfer.
7. To calculate overall heat transfer coefficient for both parallel/counter flow arrangement type of heat exchangerduring the operation of heat transfer form 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 emmisivity of test plate.
12. To determine overall heat transfer coefficient of composite wall.

NOTE:
1. At least eight practicalǿs should be performed.
2. Additional labs/ experiment will be performed based on course content requirements.

CLASS B.E. 4TH SEMESTER
BRANCH: MECHANICAL ENGINEERING   **CREDITS: 1**
COURSE TITLE: METALLURGY AND MATERIAL SCIENCE LAB.   **Marks**
COURSE NO: PME-412
DURATION OF EXAMINATION: 3 HOURS.

	L	T	P	Practical
	0	0	2	50

COURSE OUTCOMES	
At the end of the course student will be able to:	
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 BrinellHardness 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.

CREDITS: 1

CLASS: B.E. 4THSEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: THEORY OF MACHINES LAB
COURSE NO: PME-413
DURATION OF EXAMINATION: 3 HOURS.

	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 Governoriii) 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 theCorrollis 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.

<div align="center">

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

</div>

CLASS: B.E. 4THSEMESTER
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: MAINTENANCE ENGINEERING LAB.
COURSE NO: PME-414
DURATION OF EXAMINATION: 3 HOURS.

CREDITS: 1

	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 practicaløs 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.

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 Practical
	0	0	2	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:

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

NOTE:

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

CLASS: B.E. 4thSEMESTER   **CREDITS: 1**
BRANCH: MECHANICAL ENGINEERING
COURSE TITLE: MOOC   **Marks**
COURSE NO.: MOC- 415   L   T   P   **Practical**
                                 0   0   2   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 4thsemester. 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**