SEMESTER - I

MODULE CODE	CATEGOR Y	SUB- CATEGORY	MODULE		Т	Р	С	INTERNAL MARKS	EXTERNAL MARKS	TOTAL
ENGL0101	G		ENGLISH	3	0	0	3	25	75	100
MATH0101	G		APPLIED MATHEMATICS - I	3	1	0	3.5	50	100	150
CHEM0101	G		INDUSTRIAL CHEMISTRY	3	0	0	3	25	75	100
CHEM0102	G		INDUSTRIAL CHEMISTRY LAB	0	0	2	1	25	25	50
PHYS0101	G		APPLIED PHYSICS – I	IED PHYSICS – I 3 1 0 3.5 50				50	100	150
PHYS0102	G		APPLIED PHYSICS – I LAB	0	0	2	1	25	25	50
ECEN1101	G		ELECTRICAL TECHNOLOGY	2	0	0	2	25	50	75
ECEN1102	G		ELECTRICAL TECHNOLOGY	0		2	1	25	25	50
CSEN1101	G		FUNDAMENTALS OF COMPUTERS AND PROGRAMMING (WITH C)	4	0	0	4	50	100	150
CSEN1102	G		FUNDAMENTALS OF COMPUTERS AND PROGRAMMING (WITH C) LAB	0	0	2	1	25	25	50
	G		FOREIGN LANGUAGE-PART-I#	2	0	0	2	25	50	75
TOTAL			20	2	8	25	350	650	1000	

L =

Lecture

T =

Tutorial

C = Credit Point

FOREIGN LANGUAGE One foreign language out of the following

 MODULE CODE
 MODULE NAME

 LANF0101
 French

 LANG0102
 German

 LANS0103
 Spanish

SEMESTER-1

English

L T P 3 0 0

MODULE CODE	ENGL0101
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to vocabulary, synonyms, anatomize and to enhance English language skills as mentioned below:

- 1. To achieve knowledge and understanding on fundamentals of English Language and various aspects of it.
- 2. To get familiar with the rules of Grammar and their correct usage.
- 3. To enhance the creativity of the students related to verbal ability and reasoning or fluency of language.
- 4. To acquire knowledge and understanding the basic concepts of English language and its application in Science and & Engineering.
- 5. To acquire knowledge for the correct usage of technical English.

- 1. Able to achieve knowledge and understanding on fundamentals of English Language.
- 2. Able to get familiar with the rules of Grammar and their correct usage.
- 3. Enhance the creativity of the students related to verbal ability and reasoning or fluency of English.
- 4. Ability to acquire knowledge for the correct usage of technical English.

MODULE CONTENTS:

Unit I: Communicative Grammar

Communicative Grammar: Spotting the errors pertaining to parts of speech, nouns, pronouns, adjective, adverbs, preposition, conjunction, genders, infinitives, participles, form of Tenses, use of articles; Concord - grammatical concord, notional Concord and the principle of proximity between subject and verb and other exceptional usages.

Unit II: Lexis

Lexis: Words often confused; One-Word Substitutes; Foreign Words (A selected list may be included for all the above components); Formation of Words (suffixes, prefixes and derivatives)...

Unit III: Introduction to principal components of spoken English

Introduction to principal components of spoken English – Phonetics, Word-stress patterns, Intonation, Weak forms in English.

Unit IV: Developing listening and speaking skills through various activities

Developing listening and speaking skills through various activities, such As: Role play activities Practicing short dialogues Group discussion Debates Speeches Listening to news bulletins Viewing and reviewing T.V. programs etc.

Unit V: Written Communication

Written Communication: Developing reading and writing skills through such tasks/activities as developing outlines, key expressions, situations, slogan writing and theme building exercises. Reading verbal and non-verbal texts like cartoons, Graphs and tabulated data etc.

Unit VI: Technical Writing

Business Letters, Format of Business letters and Business letter writing-Fully- blocked layout

may be used-mail writing; Reports, Types of Reports and Format of Formal Reports; Press

Report Writing.

RECOMMENDED BOOKS:

	1. Basic Business Communication: Raymond V Lesikar Mc A
	Graw Hill publications.
TEXT BOOKS	2. Communication Skills: D G Saxena, Kuntal Tamang Top
	Quark,New Delhi.
	3. A textbook of English Phonetics for Indian Students: T
	Balasubramanian Macmillan India Limited, New Delhi.
	1. Living English Structures: W S Allen Pearson Publications, New
	Delhi.
REFERENCE BOOKS	2. High School English Grammar and Composition: P C Wren and
	H Martin S.Chand Publications, New Delhi.
	3. Essentials of Communication: B R Sharma and Sanjeev Gandhi
	Bharat publications, Yamuna Nagar

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	G	h	i	j	k
Course Learning	1,2,3	1,2,3	1,2,	123	24	34	14	3.4	25	1,2,	15
Outcomes	,4	,4	3	1,2,5	2,4	5,7	1,4	5,7	2,5	3,5	1,5

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark		
1.	Class Test	4	05		
2.	Sessional Test	2	15		

3.	Group Discussion	4	05
4.	End Semester Exam	1	75

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6
Class Test	х		Х		Х	
Quiz			Х		Х	Х
Assignment	Х	Х		X		

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER-I

Applied Mathematics-I

L T P 3 1 0

MODULE CODE	MATH0101
CREDIT POINTS	3.5
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. To achieve knowledge and understanding on fundamentals of matrices, their various properties and capabilities to model and solve wide range of problems in science and engineering.
- 2. To get familiar with concepts of differential calculus and develop ability to solve simple problems.
- 3. To understand multiple integrals and their applications in engineering problems.
- 4. To learn basic concepts of probability and its application in realistic decision making.
- 5. To acquire knowledge of statistical hypothesis testing and assess their effectiveness in problem solving.

- 1. Able to understand the evolution of matrices and their applications.
- 2. Exposure to differential calculus and their capabilities to solve problems.
- 3. Enhance the knowledge of multiple integrals.
- 4. Able to understand concepts of probability and its application.
- 5. Ability to acquire knowledge of statistical hypothesis testing and assess their effectiveness.

MODULE CONTENTS:

UNIT-I: Matrices &their Applications

Rank of a matrix, elementary transformations, elementary matrices, inverse using elementary transformations, normal form of a matrix, linear dependence and in dependence of vectors, consistency of linear system of equations, linear and orthogonal transformations, Eigen values and Eigen vectors, properties of Eigen values, Cayley - Hamilton theorem and its applications. Determinants and their evaluations.

UNIT-II: Applications of Differentiation

Taylor's and McLaurin's series, Asymptotes and Curvature.

Partial Differentiation & its Applications : Functions of two or more variables; partial derivatives, Total differential and differentiability, Derivatives of composite and implicit functions, Jacobians, Higher order partial derivatives.

UNIT-III: Applications of Differentiation contd.

Homogeneous functions, Euler's theorem, Taylor's series for functions of two variables (without proof), maxima-minima of function of two variables, Lagrange's method of undetermined multipliers, Differentiation under integral sign.

UNIT-IV: Multiple Integration

Double integral, change of order of integration, Double integral in polar coordinates, Applications of double integral to find area enclosed by plane curves and volume of solids of revolution.

UNIT-V: Multiple Integration contd.

Triple integral, volume of solids, change of variables, Beta and gamma functions and relationship between them.

UNIT-VI: Probability Distributions & Hypothesis Testing

Conditional probability, Bayes theorem and its applications, expected value of a random variable. Properties and application of Binomial, Poisson and Normal distributions.

Testing of a hypothesis, tests of significance for large samples, Student's t-distribution (applications only) and Chi-square test of goodness of fit. Chi-square test of independent events, F- Test.

RECOMMENDED BOOKS:

	1. Higher Engineering Mathematics: B.S.
	Grewal, Khanna Publishers, New Delhi.
TEXT BOOKS	2. Advanced Engineering Mathematics, Erwin Kreyszig,
	JohnWiley & Sons, Inc., New York.
	3. Advanced Engineering Mathematics, Peter V.
	O'Neil, Thomson Learning, Inc., Singapore.

	1.	Advanced	Engineering	Mathematics,	R.K.	Jain				
DEFEDENCEDOOVS	andS.R.K.Iyengar, Alpha science International Ltd. Pang									
REFERENCEBOORS		Bourne, Eng	gland.							
	2.	Advanced	Engineering	Mathematics	s, M	ichael				
		DGreenberg, Prentice-Hall, Englewood Cliffs, NJ.								

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	c	d	e	f	g	h	Ι	j	k
Course Learning Outcomes	1,2,3, 4,5	1,2, 3,4, 5	1, 3, 5	1,2,5	1,2,4	2,3	1,4,5	1,3	1,2, 5	1,2, 3	2,4

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6
Class Test	Х		Х		Х	
Quiz			Х		Х	Х
Assignment	х	Х		х		

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER-I

Industrial Chemistry

L T P

3 0 0

MODULE CODE	CHEM0101
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to fuel, lubricants and to enhance skills of industrial chemistry as mentioned below:

- 1. To achieve knowledge and understanding the phase rule for different systems and further for various engineering applications.
- 2. To get familiar with the importance of water, impurities in water & their effects like hardness, alkalinity & biological effects.
- 3. To understand & solve the problems like scale and sludge formation, boiler corrosion due to impurities present in water used for industrial purpose.
- 4. To learn basic concepts about the process of corrosion of different metals & its types with mechanism and cause.
- 5. To know various factors that can effect corrosion and to be able to produce different methods for prevention of corrosion of different metals used in machines.
- 6. To have knowledge of different lubricants and to use different lubricants for different machines.
- 7. To gain knowledge of different fuels and their efficiency.
- 8. To acquire knowledge about the preparation & properties of different polymers and to be able to recognize the use of different polymers & their composites for engineering applications.

- 1. Students will be able to develop an insight about the way the chemistry is connected to other occupations and appreciation of the role of chemistry in day to day life in society and the skills of solving related industrial problems.
- 2. Students will be able to demonstrate their knowledge of removal of hardness of water and different water treatments methods in energy and environment related industries.
- 3. Graduates will be able to apply their knowledge of preventions of corrosions in different machinery systems.
- 4. Students will be able to demonstrate the application of different lubricants for various machinery problems and energy usage as well as the influence of human and industrial activities on the environment.
- 5. Students will show their interest in manufacturing different polymers and polymer composites by using different polymerization techniques and their application in industries.
- 6. Graduates will be able to develop their challenging careers in the field of chemicals, petroleum, petrochemical, polymer, pharmaceutical, food, biotechnology, microelectronics, energy and nano-materials processing.
- 7. Graduates will be able to perform laboratory experiments and proper use of standard chemistry glassware and equipment compare and collect quantitative data obtained from experimentation and using various analytical techniques.
- 8. Graduates will be able to communicate effectively through assignments, presentations and discussions in technical as well as in non technical domain.

MODULE CONTENTS:

UNIT-I: Phase Rule

Terminology, Gibb's phase rule equation, One component system (H₂O system and CO₂– system), Two components system: simple eutectic system (Pb–Ag), system with congruent melting point (Zn–Mg), system with incongruent melting point (Na–K), Applications of these systems and phase rule, Cooling curves.

UNIT-II: V Water & its treatment

Impurities in water & their effects, hardness of water and its determination (EDTA method), alkalinity of water and its determination, treatment of water for domestic use: coagulation, sedimentation, filtration and disinfection, water softening methods: Lime-Soda process, Zeolite process, Ion–exchange process, Related numerical problems.

UNIT-III: Corrosion and its prevention

Introduction, Chemical and Electrochemical corrosion, Types of corrosion: oxidation corrosion, galvanic corrosion, differential aeration corrosion, pitting corrosion, waterline corrosion, stress corrosion (caustic embrittlement), Factors affecting corrosion, preventive measures (Cathodic& anodic protection, electroplating, tinning, galvanization).

UNIT-IV: Lubricants and Fuels

Need for lubricants, Classification, general properties & applications of lubricants, Properties of lubricating oils (Flash & Fire point, Viscosity and Viscosity index, Saponification value, Iodine value, Acid value, Aniline point), Definition and classification of fuel, Calorific value of fuels, Dulong' formula, Determination of calorific value of fuels (Bomb's calorimeter & Boy's Gas calorimeter), Related numerical problems.

UNIT-V: Polymers and Composites

Classification of polymers, types & mechanism of polymerization (Addition and condensation), preparation properties and technical application of thermoplastics (PE, PVC, Teflon), thermosets (UF, PF) and elastomers (synthetic rubbers: SBR, Nitrile rubber), Inorganic polymers (silicones), Polymeric composites (composition, advantages and application areas), Introduction to conducting polymers and conducting polymer composites.

UNIT-VI: Instrumental Methods of Analysis

Principle, instrumentation & general applications of thermal methods of analysis (TGA, DTA, DSC), Basic concepts of spectroscopy, Principal, instrumentation and general applications of spectroscopic techniques (UV-Vis spectroscopy, IR-spectroscopy & Flame photometery), Conductometric titrations, pH metry.

RECOMMENDED BOOKS:

TEXT BOOKS	1. Engineering Chemistry, P.C. Jain Monica Jain (DhanpatRai& Co)						
	2. Fundamentals of Engineering Chemistry, Shashi Chawla (DhanpatRai& Co)						
	3. Chemistry for Engineers, B.K. Ambasta (Luxmi Publication)						
	4. <i>Chemistry in Engineering & Tech</i> , Vol. I & II, Kuriacose (TMH)						
	1. Instrumental methods of Chemical analysis, MERITT &						
REFERENCES	WILLARD (EAST – WEST press)						
	2. Physical Chemistry, P.W Atkin (ELBS, OXFORD Press)						
	3. Physical Chemistry, W.J.Moore (Orient Longman)						

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	c	d	e	f	g	h	i	j	K
Course Learning Outcomes	1,2 ,3, 4,5 ,6, 7	1,2 ,5, 6,7	1,3 ,5, 7	1,2,7	2,4,6	1,2 ,3, 7	1,4,6.7	1, 3, 4, 5,	2,5 ,6, 8	1,2 ,4, 7,8	2,3 ,4

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	05
2.	Sessional Test	2	15
3.	Group Discussion	4	05
4.	End Semester Exam	1	75

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	a	b	c	d	e	f	G	Н
Class Test		Х	Х	Х		Х	Х	
Quiz	Х	х	х	Х		Х		
Assignment	Х		Х					Х

EVALUATION

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER-I

INDUSTRIAL CHEMISTRY LAB

L T P 0 0 2

MODULE CODE	CHEM0102
CREDIT POINTS	1
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to chemistry as mentioned below:

- 1. To achieve the practical knowledge of the importance of water and it's, impurities in water & their effects like hardness, alkalinity & biological effects.
- 2. To be able to understand & solve the problems like scale and sludge formation, boiler corrosion due to impurities present in water used for industrial purpose.
- 3. To get familiar with experimental methods for treatment of domestic water, water for industrial purpose.
- 4. To have knowledge of different properties of lubricants and further to use different lubricants for different machines.
- 5. To obtain data by cooling method for constructing a phase diagram which indicates the solid and liquid phase that is present at each temperature and composition.
- 6. To be effective in applying the basic concept of different polymerization synthesis techniques for preparation of different polymers and their applications.

- 1. Able to develop an insight about the way the chemistry is connected to other occupations and appreciation of the role of chemistry in day to day life in society and the skills of solving related industrial problems.
- 2. Able to perform laboratory experiments and proper use of chemicals in removal of hardness of water and different water treatments methods in energy and environment related industries.
- 3. Able to check the water samples for various purposes in industries, like chemical industry, Construction Company, pharmaceutical company and demonstrate the role of pure water in day to day life.
- 4. Able to demonstrate the application of different lubricants for various machinery problems.
- 5. Enhance the knowledge of different polymers by using some polymerization techniques in industries.
- 6. Ability to develop their challenging careers in the chemical, petroleum, petrochemical, polymer, pharmaceutical, food and other related industries compare quantitative data collected in the lab and interpret the data obtained from experimentation and using various analytical techniques.

MODULE CONTENTS:

- 1. Determination of Ca^{+2} and Mg^{+2} hardness of water using EDTA solution
- 2. Determination of alkalinity of water sample.
- 3. Determination of dissolved oxygen (DO) in the given water sample.
- 4. To determine TDS of Water samples of different sources.
- 5. To find the eutectic point for a two component system by using method of cooling curve.
- 6. To Prepare Urea formaldehyde and Phenol-formaldehyde resin.
- 7. Determination of viscosity of lubricant by Red Wood Viscosity (No. 1 & N0. 2).
- 8. To find out saponification no. of lubricating oil.
- 9. Determination of concentration of KMnO4 solution spectrophotomererically.
- 10. Determination of strength of HCl solution by titrating against NaOH solution conductometerically.
- 11. To determine amount of sodium & potassium in given water sample by flame photometer.
- 12. Determination of dissociation constant of a weak acid by pH-meter.
- 13. Estimation of total iron in an iron alloy

Any other experiment carried out in the laboratory.

RECOMMENDED BOOKS:

TEXT BOOKS	 Essential of Experimental Engineering Chemistry, Shashi Chawla (DhanpatRai& Co.) Experiments in Applied Chemistry, SunitaRatan (S.K. Kataria& Sons)
REFRENCE BOOKS	 Vogel's Text Book of Quantitative Chemical Analysis, A. I. Vogel, G. H. Jeffery Published by Longman Scientific & Technical, 5th Edition, 1989. Theory & Practice Applied Chemistry – O.P.Virmani, A.K. Narula (New Age). A Text book on Experiments and Calculation–Engineering Chemistry, S.S.Dara, (S.Chand & Company Ltd).

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	Ι	j	k
Course Learning Outcomes	1,2,3 ,4,6	1,2, 4	1,3,6	1,2,4	2,4, 6	1,4	1,2, 4,6	1,2,5	1,3	1,2 ,3, 6	1,2 ,3

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks.

Practical

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER-I

Applied Physics I

L T P

3 1 0

MODULE CODE	PHYS0101
CREDIT POINTS	3.5
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to modern physics, interference, difference, polarization and to enhance skills of different type of laser and its applications as mentioned below:

- 1. To make students aware about Modern Physics, their various properties and capabilities to model and solve wide range of problems in science and engineering.
- 2. To acquire knowledge polarization and their applications in engineering problems.
- 3. To get familiar with concepts of interference and diffraction and develop ability to solve simple problems.
- 4. To learn basic concepts of different types of laser and its application in scientific problems.
- 5. To acquire knowledge of superconductivity implementation and assess their effectiveness in science and Technology.

- 1. Able to apply knowledge in developing advanced materials and devices.
- 2. Able to apply fundamental laws of superconductivity in engineering.
- 3. Able to identify and solve applied physics problems.
- 4. Able to apply knowledge to understand the concepts of fiber optics.
- 5. Ability to create new problems and solve with the help of applications used.

MODULE CONTENTS:

Unit I: Interference

Coherent sources, conditions for sustained interference. Division of Wave-Front, Fresnel's Biprism, Division of Amplitude- Wedge-shaped film, Newton's Rings, Michelson Interferometer, applications, Resolution of closely spaced spectral lines, determination of wavelengths.

Unit II: Diffraction

Difference between interference and diffraction, Fraunhofer and Fresnel diffraction, Zone Plate, Fraunhofer diffraction through a single slit, Plane transmission diffraction grating, absent spectra, dispersive power, resolving power and Rayleigh criterion of resolution.

Unit III: Polarization

Polarized and unpolarised light, Uni-axial crystals double refraction, Nicol prism, quarter and half wave plates, Detection and Production of different types of polarized light, Polarimetry, Optical and specific rotation, Biguartz and Laurent's haled shade polar meter

Unit IV: Laser & Fibre Optics

Absorption of radiation, spontaneous and stimulated emission, Laser action, Einstein Coefficient, characteristics of laser beam-concept of coherence, spatial and temporal coherence.

He-Ne and semiconductor lasers (simple ideas), applications of Laser. Propagation of light in

optical fibres, numerical aperture, V-number, single and multimode fibres, attenuation dispersion, applications.

Unit V: Nuclear Physics

Introduction, Radioactivity, Alpha decay, Gama decay, Q value, Threshold energy, Nuclear reactions, Nuclear fission: Liquid drop model, Nuclear fusion, Particle accelerators: Linear accelerator, Cyclotron.

Unit VI: Theory of Relativity

Introduction, Frame of reference, Galilean transformation, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Mass energy relation.

RECOMMENDED BOOKS:

TEXT BOOKS	1. Perspectives of Modern Physics, Arthur Beiser (TMH)
	2. Modern Physics for Engineers, S.P. Taneja (R. Chand).
	3. Modern Engineering Physics, A.S. Vasudeva (S. Chand).
	4. Engineering Physics, SatyaPrakash (PragatiPrakashan).
	5. Optics, Ajoy Ghatak (TMH).
	1. Fundamentals of Physics, Resnick& Halliday (Asian
REFERENCEBOOKS	Book).
	2. Introduction to Electrodynamics, D.J. Griffith (Prentice
	Hall).

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	С	D	e	f	g	h	i	j	k
Course Learning Outcomes	1,2 ,3, 4	1,3 ,5	1,2 ,4, 5	1,2,3,4, 5	1,3,4	1,4	1,2,5	1, 3, 5	1,4 ,5	1,2 ,5	1,3 ,5

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6
Class Test	х		Х		Х	
Quiz			Х		Х	Х
Assignment	Х	Х		Х		

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER-I

Applied Physics Lab I

LTP

0 0 2

MODULE CODE	PHYS0102
CREDIT POINTS	1
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

OBJECTIVES:

- 1. To achieve knowledge and understanding on Modern Physics, their various properties and capabilities to model and solve wide range of problems in science and engineering.
- 2. To get familiar with concepts of interference and diffraction and develop ability to solve simple problems.
- 3. To understand polarization and their applications in engineering problems.
- 4. To learn basic concepts of different types of laser and its application in scientific problems.
- 5. To acquire knowledge of superconductivity implementation and assess their effectiveness in science and Technology.

- 1. Able to apply knowledge for finding wavelength of sodium, colours of white light using advanced technology.
- 2. Able to apply fundamental laws of superconductivity in engineering and technology.
- 3. Able to identify new problems and solve through different techniques.
- 4. Able to apply knowledge to understand the concepts of fiber optics.
- 5. Able to develop new experiment using advances technology.

MODULE CONTENTS:

- 1. To find he wavelength of sodium light by Newton's rings experiment.
- 2. To find the wavelength of sodium light by Fresnel's biprism experiment.
- 3. To find the wavelength of various colours of white light with the help of a plane transmission diffraction grating.
- 4. To find the refractive index and cauchey's constants of a prism by using spectrometer.
- 5. To find the wavelength of sodium light by Michelson Interferometer.
- 6. To find the resolving power of a telescope.
- 7. To find the pitch of a screw using He-Ne laser.
- 8. To find the specific rotation of sugar solution by using a polar meter.
- 9. To compare the capacitances of two capacitors by De'sauty bridge and hence to find the dielectric constant of a medium.
- 10. To find the flashing and quenching potentials of Argon and also to find the capacitance of unknown capacitor.
- 11. To study the photo-conducting cell and hence to verity the inverse square law.
- 12. To find the temperature co-efficient of resistance by using platinum resistance thermometer and calendar and Griffin bridge.

RECOMMENDED BOOKS

TEXT BOOKS	1. Advanced Practical Physics - B.L. Workshop and H.T. Flint
IEAT DOORS	(КРН)
	1. Practical Physics - S.L. Gupta & V. Kumar (Pragati Prakashan).
REFERENCES	2. Advanced Practical Physics Vol. I & II- Chauhan & Singh
	(Pragati Prakashan).

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	с	D	e	f	g	h	i	j	k
Course Learning	1.2.5	1,2,	1,2,3	1.2.4	2.5	1.3.5	3.5	1.3.5	3	2	3.5
Outcomes	-,-,-	4	5	-,_, .	_,e	1,0,0	0,0	1,0,0	5	_	0,0

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks.

Practical

A	ssessment #	Type Of Assessment	Per Semester	Maximum Mark
	1	Internal Assessment	2	25
	2	External Assessment	1	25

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER-I

Electrical Technology

L T P

2 0 0

MODULE CODE	ECEN1101
CREDIT POINTS	2
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	50
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

The aim of teaching this subject is to impart knowledge primarily related to application of electricity so that learner will be able to make basic electrical circuits in real life. Some of the objectives of the course are:

- 1. To acquire basic knowledge of Electric Networks.
- 2. To inculcate the knowledge of AC and DC fundamentals.
- 3. To enable to solve electric circuit using various theorems and methods.
- 4. To get familiar with the concept of three phase circuit and its various connections.
- 5. To understand the concept of resonance in electrical network.
- 6. To gain knowledge of construction and working of Transformer.
- 7. To get exposure about working of AC and DC machines.

- 1. Able to understand basic aspects of electrical technology used in any kind of industry.
- 2. Able to understand various electrical applications in day to day life.
- 3. Get familiar with working of various components of a circuit.
- 4. Ability to analyze the behavior of electrical parameters in different forms.
- 5. Able to measure various electrical parameters.
- 6. Able to know the difference between single phase and three phase electrical supply.
- 7. Acquiring problem solving skills.

MODULE CONTENTS:

Unit I: D.C. Network Laws

Ohm's Law, Kirchhoff's Laws, Nodal and Loop methods of analysis Star to Delta & Delta to Star transformation.

Unit II: Network Theorems

Thevenin's theorem, Norton's theorem, superposition theorem, maximum power transfer theorem, Millman's theorem.

Unit III: Single Phase A.C. Circuits

Sinusoidal signal, instantaneous and peak values, RMS and average values, crest and peak factor, Concept of phase, representation-polar & rectangular.

Unit IV: Series and Parallel A.C. circuits

Series and Parallel A.C. circuits. Concept of active and reactive power, power factor, series and parallel resonance, Q factor, cut-off frequencies and bandwidth.

Unit V: Three Phase A.C. Circuits

Three phase A.C. circuit, star and delta connection, phase and line voltage and currents, balanced star and circuits, power equation, measurement of power by two wattmeter method, introduction to unbalanced circuits.

Unit VI: Transformers & Machines

Construction, EMF equation, ideal transformer, Phasor diagram on no load and full load, equivalent circuit, losses, regulation and efficiency, open and short circuit test. Introduction of AC and DC machines.

RECOMMENDED BOOKS:

	1. Electrical Technology (Vol-I), by B.L. Thareja & A. K.							
	Thareja, S. Chand publications.							
TEXT BOOKS	2. Electrical Technology (Vol-II), by B.L. Thareja& A. K							
	Thareja, S. Chand publications.							
	3. Basic Electrical Engineering, II edition, by V. N. Mittal &							
	Arvind Mittal, TMH Publications.							
	1. Electrical Engineering Fundamentals : Deltoro, PHI							
	2. Network Analysis ; Valkenburg, PHI.							
	3. Electrical and Electronic Technology (8th Edition):							
REFERENCEBOOKS	Hughes, Pearson.							
	4. A textbook of Electrical Technology, J. B. Gupta, Katson							
	publication.							
	5. Electrical Technology by Mukesh Saini.							

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 75 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	05
2.	Sessional Test	2	15
3.	Group Discussion	4	05
4.	End Semester Exam	1	50

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6	7
Class Test				Х	Х	Х	Х
Quiz	х	Х	Х				
Assignment		Х	Х			Х	Х

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	Ι	j	k
Course Learning	17	2	5	3		16		74			
Outcomes	1,7	2	5	5		1,0		7,1			

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER-I

Electrical Technology Lab

LTP

0 0 2

MODULE CODE	ECEN1102
CREDIT POINTS	1
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

OBJECTIVES:

- 1. To get familiar with various measuring instruments.
- 2. To understand practical aspects of Network theorems.
- 3. To get familiar with major parts of electrical machines.
- 4. To aware students about precautionary measures of using Electrical supply.
- 5. To analyze different components of any electrical network.
- 6. To get familiar with the constructional part of transformer.

- 1. Creates implementation skills.
- 2. Able to measure various electrical parameters.
- 3. Able to understand various electrical applications in day to day life.
- 4. Get familiar with working environment of three phase electrical supply.
- 5. Ability to analyze the electrical connections.

LIST OF EXPERIMENTS:

1.	To verify ohm's law.
2.	To verify KCL and KVL.
3.	To verify Thevenin's theorem.
4.	To verify Norton theorem.
5.	To verify superposition theorem.
6.	To verify Maximum power transfer theorem.
7.	To measure power and power factor by 3 voltmeter method.
8.	To measure power and power factor by 3 ammeter method.
9.	To study the construction of Transformer.
10.	To study about function of multimeter.
Experi	ments based on advanced topics:
11.	To perform O.C. and S.C. tests of a transformer.
12.	To study frequency response of a series R-L-C circuit and determine resonant frequency and Q-factor for various values of R, L, and C.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program	-	1		4	-	r	~	1	;	;	k
Outcomes	a	D	C	a	e	1	g	n	1	J	
Course Learning	2	2.4		1	F	1 4		1.2		2	
Outcomes	3	2,4		I	5	1,4		1,2		3	

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER-I

Fundamentals of Computers (with 'C')

MODULE CODE	CSEN0101
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to components of computers, computer languages and to enhance skills of programming in 'C' language as mentioned below:

- 1. To make students aware of the evolution of computers in different generations including its classification in different categories based on its capabilities.
- 2. To acquire knowledge on major components of computers hardware, software, data and processes.
- 3. To get familiar with concepts of microprocessor interfacing and its applications.
- 4. To achieve an understanding on basic concepts of operating system and networking.
- 5. To demonstrate the working of system software.
- 6. To understand syntax and semantics of 'C' programming language.
- 7. To enable learner to build logic for a given problem and finally develop programs.

- 1. Able to understand the evolution of computer and basic terminology.
- 2. Exposure to various hardware and software and their compatibilities.
- 3. Enhance the knowledge regarding components and connectors such as ports etc to enable communication between computers.
- 4. Able to understand the basic functionality of OS and the process of secured data management.
- 5. Ability to differentiate the class of system software, its functionality versus application software.
- 6. Ability to create programs involving file handling and to understand the scenario of sequential as well as random data retrieval approach.

MODULE CONTENTS:

Unit I: Computers system and its fundamentals

Evolution of computers, hardware organization of a computer; Introduction to microprocessors, generations of microprocessors, Input/Output devices, Input/Output ports and connectors; Programming languages- machine language, assembly language, low level languages, high level languages, types of high level languages.

Unit II: System software

Translators- complier, interpreter, assembler; Macros, Loader, Linker, Relationship between Compiler, Interpreter, Loader and Linker; Operating System-fundamentals of operating system, functions of operating system, classification of operating systems, basic introduction to DOS, UNIX/LINUX OS, Windows XP.

Unit III: An overview of 'C'

History of C, importance of C, basic structure of C programs, executing a 'C' program, character set, 'C' tokens, keywords and identifiers, constants, variables and data types, declaration of variables, declaration of storage class, operators and expressions, managing I/O operations, decision making with IF statement, the if..else statement, nesting of if...else statement, switch statement, conditional statement, GOTO statement, the while statement, the do statement, the for statement and jumps in loops.

Unit IV: Array, structure and union in 'C'

Arrays: one-dimensional arrays, two-dimensional arrays, multi-dimensional arrays, dynamic arrays, character arrays and strings, user defined functions, structure-definition and initialization, declaring variables, accessing structure members; copying and comparing structure variables; operations on individual members; array of structure; structure within structure; unions, size of structure.

Unit V: Functions in 'C'

Basics of functions, built-in and user defined functions, using string, Math and other built-in functions, advantages of using functions, working of a function, declaring, defining and calling user defined functions-The return statement, call by value and call by reference, function as an argument, recursion, advantages and disadvantages of recursion.

Unit VI: Pointers in 'C'

Pointers- accessing the address of a variable, declaration and initialization of pointer variables, accessing a variable through its pointer; pointer Expressions; pointer and arrays, pointer and character strings; arrays of pointer; pointers as function arguments; functions returning pointers; pointers to functions.

RECOMMENDED BOOKS:

	1. Fundamental of Computers and Programming with C, by									
TEVT DOOLO	A.K.Sharma, Dhanpat Rai Publications, Delhi.									
TEAT BOOKS	2. Computer Networks (4th Edition), by Andrew S.									
	Tanenbaum.									
	3. Balagurusamy-Programming in ANSI C.									
REFERENCE BOOKS	1. ANSI C, by Dennis Ritchi.									
	2. Balagurusamy-Programming in ANSI 'C'.									

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6
Class Test	х		Х		Х	
Quiz			Х		Х	Х
Assignment	Х	Х		Х		

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	C	d	e	f	g	h	i	J	k
Course Learning	2	3	5	2	5	3					
Outcomes		_			-	-					

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.
SEMESTER-I

Fundamentals of Computers (with 'C') Lab

L T P 0 0 2

MODULE CODE	CSEN0102
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to components of computers, computer languages and to enhance skills of programming in 'C' language as mentioned below:

- 1. To acquire knowledge on a programming language.
- 2. To learn problem solving techniques.
- 3. To understand syntax and semantics of 'C' programming language.
- 4. To get familiar with program writing in C.
- 5. To enable learner to build logic for a given problem and finally develop programs.

- 1. Read, understand and trace the execution of programs in C language.
- 2. Ability to write code in C for a given algorithm.
- 3. Implement programs with pointers and arrays.
- 4. Perform pointer arithmetic, and use of pre-processor.
- 5. Write programs that perform operations using derived data types.

LIST OF EXPERIMENTS

1.	Write a program to calculate Simple Interest.
2.	Write a program to print largest of three numbers (if-then-else).
3.	Write a program to print whether given number is prime or not.
4.	Write basic programs illustrating Switch Case statement.
5.	Write a program to print largest of ten numbers (for statement).
6.	Write a program to implement matrix multiplication.
7.	Write a program to print Fibonacci Series.
8.	Write a program to print factorial of a number.
9.	Write a program to implement different string functions.
10.	Write a program to check whether a string is palindrome or not.
11.	Write a program to swap two numbers using call by reference and call by value.
12.	Write a program to create records of student (Name, Roll No., DOB and Marks) using struct and union.
Experin	nents based on advanced topics:
13.	Write a program to determine the length of a character string using pointers.
14.	Write a C program to count the lines, words and characters in a given text.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	Ι	j	k
Course Learning Outcomes	3	2	4	1	1,2						

EVALUATION

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER-I

French Language – Part 1

L T P 2 0 0

MODULE CODE	LANF0101
CREDIT POINTS	2
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	50
END SEMESTER EXAM DURATION	2 hrs
LAST REVISION DATE	

INSTRUCTIONS: All questions are compulsory. Each question may have multiple options and will cover all units.

OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to oral and written skills of expressing and exchanging information / interacting in French language and to enhance skills as mentioned below:

- 1. To prepare students to develop basic understanding on French language.
- 2. To acquire knowledge on French grammar.
- 3. To understand syntax and semantics of language.
- 4. To achieve an understanding on basic communication in French language.
- 5. To understand a dialogue between two native speakers and also take part in short, simple conversations using the skills acquired.

- 1. Able to understand the basic grammar of French language and differentiation of genders and objects.
- 2. Exposure to various syntax & communication methods with others.
- 3. Ability to read, write, speak & listen the basics of French language.
- 4. Able to understand the French history.

MODULE CONTENTS

<u>UNIT I:- BASIC COMMUNICATION</u> – This module will develops oral and written skills of

understanding, expressing and exchanging information / interacting on the topics given below: -

- Establish contact with someone
- Introduce self and others
- Greet, congratulate, and express condolences
- Spell
- Count
- Exchange simple information on self, preferences, feelings, plans, dreams
- Ask for information
- Tell the time
- Advice, order, suggest
- Buy, sell
- Make a reservation
- Order food or any article
- Invite, accept or refuse invitation
- Fix an appointment
- Locate a place
- Give directions
- Give chronological order of events
- Prepare an itinerary
- Ask for / Give explanations
- Describe a person, an object, an event, a place
- Describe the weather
- Compare

UNIT II: BASIC PHONETICS - This module will develop the ability in the students: -

• To pronounce words, say sentences, questions and give orders using the right accent and intonation.

• To express surprise, doubt, fear, displeasure and all positive or negative feelings using the right intonation

- To use 'liaison' and 'enchainment'
- To distinguish voiced and unvoiced consonants
- To distinguish between vowel sounds

<u>UNIT III: BASIC GRAMMAR & FORMATION OF SENTENCES</u> – This module will develops the ability in the students to construct sentences and frame questions using: -

• Nouns – gender and number

• Articles – definite and indefinite, partitif, articles contractés

• Pronouns - personal, relative (qui, que,où), y, en

• Verbs – conjugation of regular and irregular verbs (affirmative and negative) in the following tenses (indicative mood) – present, present continuous, simple future, immediate future, recent past, simple past, past continuous

• Verbs – the imperative mood

• Adjectives – numeric, qualitative, possessive, demonstrative, interrogative – gender and number

• Adverbs - simple adverbs of time, place, quantity

- Prepositions simple prepositions (place, time)
- Interrogation interrogative words, interrogative phrases, inversion

RECOMMENDED BOOKS:

	3. Nouveau Sans Frontières 1 by Philippe Dominique &
TEXT BOOKS	Jacky Girardet
	4. "CONNEXIONS-1" by Regine Merieux & Yves Loiseau
	Published by Didier.
REFERENCE BOOKS	4. Five in one Multilingual Glossary, published by Saraswati
	House Pvt. Ltd. New Delhi 2011.

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	C	d	e	f	g	Н	i	j	k
Course Learning										12	34
Outcomes										1,2	5,4

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 75 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	1	10
2.	Sessional Test	2	15
3.	End Semester Written Exam	1	50

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4
Class Test	Х	Х	Х	
Quiz	Х	Х	Х	
Assignment			Х	Х

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER-I

German Language – Part 1

L T P 2 0 0

MODULE CODE	LANG0102
CREDIT POINTS	2
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	50
END SEMESTER EXAM DURATION	2 hrs
LAST REVISION DATE	

INSTRUCTIONS: All questions are compulsory. Each question may have multiple options and will cover all units.

OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to oral and written skills of expressing and exchanging information / interacting in German language and to enhance skills as mentioned below:

- 1. To prepare students to develop basic understanding on German language.
- 2. To acquire knowledge on German grammar.
- 3. To understand syntax and semantics of language.
- 4. To achieve an understanding on basic communication in German language.
- 5. To understand a dialogue between two native speakers and also take part in short, simple conversations using the skills acquired.

- 1. Able to understand the basic grammar of German language and differentiation of genders and objects.
- 2. Exposure to various syntax & communication methods with others.
- 3. Ability to read, write, speak & listen the basics of German language.
- 4. Able to understand the German history.

MODULE CONTENTS

<u>UNIT I:- BASIC COMMUNICATION</u> – This module will develops oral and written skills of understanding, expressing and exchanging information / interacting on the topics given below: -

- Establish contact with someone
- Introduce self and others
- Greet, congratulate, and express condolences
- Spell
- Count
- Exchange simple information on self, preferences, feelings, plans, dreams
- Ask for information
- Tell the time
- Advice, order, suggest
- Buy, sell
- Make a reservation
- Order food or any article
- Invite, accept or refuse invitation
- Fix an appointment
- Locate a place
- Give directions
- Give chronological order of events
- Prepare an itinerary
- Ask for / Give explanations
- Describe a person, an object, an event, a place
- Describe the weather
- Compare

UNIT II: BASIC PHONETICS - This module will develop the ability in the students: -

• To pronounce words, say sentences, questions and give orders using the right accent and intonation.

• To express surprise, doubt, fear, displeasure and all positive or negative feelings using the right intonation

- To use 'liaison' and 'enchainment'
- To distinguish voiced and unvoiced consonants
- To distinguish between vowel sounds

UNIT III: BASIC GRAMMAR & FORMATION OF SENTENCES - This module will develops

the ability in the students to construct sentences and frame questions using: -

- Nouns gender and number
- Articles definite and indefinite, articles
- Pronouns personal, relative

• Verbs – conjugation of regular and irregular verbs (affirmative and negative) in the following tenses (indicative mood) – present, present continuous, simple future, immediate future, recent past, simple past, past continuous

- Verbs the imperative mood
- Adjectives numeric, qualitative, possessive, demonstrative, interrogative gender and number
- Adverbs simple adverbs of time, place, quantity
- Prepositions simple prepositions (place, time)
- Interrogation interrogative words, interrogative phrases, inversion

RECOMMENDED BOOKS:

	5. Tangram, Kursbuch und Arbeitsbuch, 1A, 1B & 2A, Max						
TEXT BOOKS	Hueber Verlag						
	6. Tangram, Kursbuch und Arbeitsbuch, 2B, 3A & 3B, Ma						
	Hueber Verlag						
REFERENCE BOOKS	5. em Abschlusskurs, Kursbuch und Arbeitsbuch, Max						
	Hueber Verlag						

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	C	d	e	f	g	Н	i	J	k
Course Learning										12	34
Outcomes										1,2	5,7

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 75 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	1	10
2.	Sessional Test	2	15
3.	End Semester Written Exam	1	50

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4
Class Test	Х	Х	Х	
Quiz	Х	Х	Х	
Assignment			Х	Х

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER-I

Spanish Language – Part 1

LTP

2 0 0

MODULE CODE	LANS0103
CREDIT POINTS	2
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	50
END SEMESTER EXAM DURATION	2 hrs
LAST REVISION DATE	

INSTRUCTIONS: All questions are compulsory. Each question may have multiple options and will cover all units.

OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to oral and written skills of expressing and exchanging information / interacting in Spanish language and to enhance skills as mentioned below:

- 1. To prepare students to develop basic understanding on Spanish language.
- 2. To acquire knowledge on Spanish grammar.
- 3. To understand syntax and semantics of language.
- 4. To achieve an understanding on basic communication in Spanish language.
- 5. To understand a dialogue between two native speakers and also take part in short, simple conversations using the skills acquired.

- 1. Able to understand the basic grammar of Spanish language and differentiation of genders and objects.
- 2. Exposure to various syntax & communication methods with others.
- 3. Ability to read, write, speak & listen the basics of Spanish language.
- 4. Able to understand the Spanish history.

MODULE CONTENTS

<u>UNIT I:- BASIC COMMUNICATION</u> – This module will develops oral and written skills of understanding, expressing and exchanging information / interacting on the topics given below: -

- Establish contact with someone
- Introduce self and others
- Greet, congratulate, and express condolences
- Spell
- Count
- Exchange simple information on self, preferences, feelings, plans, dreams
- Ask for information
- Tell the time
- Advice, order, suggest
- Buy, sell
- Make a reservation
- Order food or any article
- Invite, accept or refuse invitation
- Fix an appointment
- Locate a place
- Give directions
- Give chronological order of events
- Prepare an itinerary
- Ask for / Give explanations
- Describe a person, an object, an event, a place
- Describe the weather
- Compare

UNIT II: BASIC PHONETICS - This module will develop the ability in the students: -

• To pronounce words, say sentences, questions and give orders using the right accent and intonation.

• To express surprise, doubt, fear, displeasure and all positive or negative feelings using the right intonation

- To use 'liaison' and 'enchainment'
- To distinguish voiced and unvoiced consonants
- To distinguish between vowel sounds

UNIT III: BASIC GRAMMAR & FORMATION OF SENTENCES - This module will develops

the ability in the students to construct sentences and frame questions using: -

- Nouns gender and number
- Articles definite and indefinite, articles
- Pronouns personal, relative

• Verbs – conjugation of regular and irregular verbs (affirmative and negative) in the following tenses (indicative mood) – present, present continuous, simple future, immediate future, recent past, simple past, past continuous

• Verbs – the imperative mood

• Adjectives – numeric, qualitative, possessive, demonstrative, interrogative – gender and number

• Adverbs - simple adverbs of time, place, quantity

• Prepositions – simple prepositions (place, time)

• Interrogation - interrogative words, interrogative phrases, inversion

RECOMMENDED BOOKS:

TEVT DOOVS	7. Aula Internacional 1 and 2, Novellas and short stories
IEAT BOOKS	8. Aula Internacional 3, España and Latinoamérica: Historia
	y Cultura, Novellas
REFERENCE BOOKS	5. Español sin fronteras, I, SGEL, 1997
	6. Nuevo Ven I, Edelsa 2004

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	с	d	e	F	g	Н	i	J	k
Course Learning										12	34
Outcomes										1,2	Э,т

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 75 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	1	10
2.	Sessional Test	2	15
3.	End Semester Written Exam	1	50

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4
Class Test	Х	Х	Х	
Quiz	X	Х	Х	
Assignment			Х	X

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER - II

MODULE CODE	CATEGORY	SUB- CATEGORY	MODULE	L	Т	Р	С	Internal Marks	External Marks	Total
PHYS0103	G		APPLIED PHYSICS-II	3	1	0	3.5	50	100	150
PHYS0104	G		APPLIED PHYSICS-II LAB	0	0	2	1	25	25	50
ECEN0104	G		BASICS OF ELECTRONICS	2	0	0	2	25	50	75
ECEN0105	G		BASICS OF ELECTRONICS LAB	0	0	2	1	25	25	50
MECH1101	G		WORKSHOP TECHNOLOGY	3	0	0	3	25	75	100
MECH1102	G		WORKSHOP TECHNOLOGY LAB	0	0	2	1	25	25	50
CIVL0101	G		BASICS OF CIVIL ENGINEERING	2	0	0	2	25	50	75
CIVL0102	G		BASICS OF CIVIL ENGINEERING LAB	0	0	2	1	25	25	50
MATH0116	G		APPLIED MATHEMATICS-II	4	1	0	4.5	50	100	150
MATH0117	G		NUMERICAL METHODS	3	0	0	3	25	75	100
VALU0109	G		VALUE EDUCATION	2	0	0	2	25	50	75
CSEN1103	G		PC LAB	0	0	2	1	25	25	50
	G		FOREIGN LANGUAGE PART- II #	2	0	0	2	25	50	75
		TOTAL CREDITS		21	2	10	27	375	675	1050

L = Lecture

FOREIGN LANGUAGE

T = Tutorial

P = Practical

One foreign language out of the following

C = Credit Point

MODULE CODE	MODULE NAME
LANF0104	French
LANG0105	German
LANS0106	Spanish

Applied Physics II

L T P

3 1 0

MODULE CODE	PHYS0103
CREDIT POINTS	3.5
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to solid state physics, crystal geometries, quantum physics, nano-science, energy bands and electromagnetic theory to enhance skills in the field of electricity and magnetism and its applications as mentioned below:

- 1. To achieve knowledge and understanding on soli-state physics, various properties of crystals to model and solve wide range problems in science and engineering.
- 2. To get familiar with concepts of micro and nano scales of materials and develop ability to solve simple problems.
- 3. To understand the concepts of electricity and magnetism, distribution of solids according to band theory, free electrons, and applications of maxwell's equation in engineering problems.
- 4. To learn basic concepts of different types of magnetic properties of solids in scientific problems.
- 5. To acquire knowledge of crystal structure and assess their effectiveness in science and Technology.

LEARNING OUTCOMES:

- 1. Able to apply knowledge in developing advanced materials and devices.
- 2. Able to apply fundamental laws of electricity and magnetism in engineering.
- 3. Able to identify and solve crystal structure and semiconductor physics problems.
- 4. Able to solve applications based on Maxwell's equation
- 5. Able to apply knowledge to understand the concepts of quantum physics.
- 6. Able to identify and solve concepts related to nano particles.
- 7. Ability to create new problems and solve with the help of applications used.

COURSE CONTENT:

UNIT I: Crystal Structure

Space lattice, unit cell and translation vector, Miller indices, simple crystal structure. Laue's treatment to Bragg's law, powder method, point defects in solids- Schottky and Frenkel defects, Bonding in solidsionic and covalent bonds.

UNIT II: Quantum Physics

Difficulties with classical physics, introduction to quantum mechanics simple concepts, Black body radiations Discovery of Planck's constant, phase velocity and group velocity. Schrodinger wave equations-time dependent and time independent, Expectation value, Ehrnfest Theorem, particle in a one-dimensional box. Quantum Statistics, Bose-Einstein and Fermi-Dirac Statisticsz, Elementary ideas of quark, gluons and hadrons.

UNIT III: Nano-Science

Features of nano-systems, concept of quantum size effect, quantum dots and their applications.

Free Electron Theory: Elements of classical free electron theory and its limitations. Drude's theory of conduction, quantum theory of free electrons, Fermi level, density of states, Fermi-Dirac distribution function, Thermionic emission, Richardson's equation.

UNIT IV: Band Theory of Solids

Origin of energy bonds, Kronig-Penny model (qualitative) E-K diagrams, Brillouin Zones, Concept of effective mass and holes. Classification of solids into metals, semiconductors and insulators. Fermi energy and its variation with temperature. Hall Effect and its applications.

UNIT V: Green Energy

Introduction to Green energy, types of green energy, energy conversion mechanisms for solar energy, wind energy, ocean energy and geothermal energy.

UNIT VI: Electro Magnetic Theory

Gradient, Divergence, Curl, Gauss' law, Ampere's Law, Continuity equation, Maxwell, equation (differential and integral forms), Significance of Maxwell's equations, Poynting Theorem, Electromagnetic wave propagation inn dielectrics and conductors.

RECOMMENDED BOOKS:

	1. Concepts of Modern Physics, Arthur Beiser (TMGH)
TEXT BOOKS	2. Solid State Physics, S.O. Pillai (New Age Int. Ltd. Pub.)
	3. Modern Physics for Engineers, S.P. Taneja (R. Chand)
	4. Modern Engineering Physics, A.S. Vasudeva (S. Chand)
	1. Introduction to Solid State Physics, Kittel (John Wiley)
REFERENCEBOOKS	2. Quantum Mechanics, A. Ghatak
	3. A Textbook of Engineering Physics, Avadhanulu and Kshisagar
	(S. Chand)

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning Outcomes	1,3	1,7	1	1,7	1,2,6	1,4	1,2	1,5	2,3	1,2	1,3

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6
Class Test	х		х		х	
Quiz			х		х	х
Assignment	х	х		х		

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

Applied Physics- II LAB

LTP

0 0 2

MODULE CODE	PHYS0104
CREDIT POINTS	1
	-
EORMATIVE ASSESMENT MARKS	25
	25
	25
SUIVIIVIATIVE ASSESIVIEINT IVIARKS	25
	2 h
END SEMESTER EXAM DURATION	3 nrs
LAST REVISION DATE	

OBJECTIVES

- 1. To achieve the practical knowledge of low and high resistance and resistance of galvanometer by different methods.
- 2. To be able to find characteristic of a solar cell, V-I of a p-n diode and to find the fill factor and e/m for electrons by helical method.
- 3. To get familiar with ionization potential of Argon/Mercury using a thyratron tube and find the radius of coil by Stewart and Gee's apparatus.
- 4. To have knowledge of hysteresis loss by tracing a B-H curve.
- 5. To obtain the Planck's constant, co-efficient of self-inductance by using a Rayleigh bridge, Hall Coefficient of semi-conductor.
- 6. To obtain band gap of intrinsic semi-conductor using four probe method.

LEARNING OUTCOMES:

- 1. Able to apply knowledge for finding the characteristics of solar cells and their applications.
- 2. Able to apply fundamental laws of superconductivity in engineering and technology.
- 3. Able to identify new problems and solve through different techniques.
- 4. Able to apply knowledge to understand the concepts of p-n junction diode.
- 5. Able to develop new experiment using advances technology.

COURSE CONTENT

1.	To find the low resistance by carey- Foster's bridge.
2.	To find the resistance of a galvanometer by Thomson's constant deflection method using
	a post office box.
3.	To find the value of high resistance by Substitution method.
4.	To find the value of high resistance by Leakage method.
5.	To study the characteristics of a solar cell and to find the fill factor.
6.	To find the value of e/m for electrons by Helical method.
7.	To find the ionisation potential of Argon/Mercury using a thyratron tube.
8.	To study the variation of magnetic field with distance and to find the radius of coil by
	Stewart and Gee's appratus.
9.	To study the characteristics of (Cu-Fe, Cu-Constantan) thermo couple.
10.	To find the value of Planck's constant by using a photo electric cell.
11.	To find the value of co-efficient of self-inductance by using a Rayleigh beidge.
12.	To find the value of Hall Co-efficient of semi-conductor.
13.	To study the V-I characteristics of a p-n diode.
14.	To find the band gap of intrinsic semi-conductor using four probe method.
15.	To calculate the hysteresis loss by tracing a B-H curve.
Note: At lea	ast 12 experiments out of the list must be done in the semester.

RECOMMENDED BOOKS

TEXT BOOKS	3. Advanced Practical Physics, B.L. Workshop and H.T. Flint (KPH)
REFRENCE BOOKS	 Practical Physics, S.L. Gupta & V. Kumar (Pragati Prakshan). Advanced Practical Physics Vol. I & II – Chauhan & Singh (Pragati Prakshan).

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning Outcomes	1,5	2,4	2,3,5	1,2,4	1,5	3,4	2,3,5	1,2,4	4,5	1	3,5

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks.

Practical

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

Basics of Electronics

L T P 2 0 0

MODULE CODE	ECEN0104
CREDIT POINTS	2
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	50
END SEMESTER EXAM DURATION	2 hrs
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

The aim of teaching this subject is to impart knowledge primarily related to electronic circuitry so that learner may found it's applications in real life. Some of the objectives of the course are:

- 1. To acquire knowledge about semiconductor physics for intrinsic and extrinsic materials.
- 2. To get familiar with different type of electronic displays.
- 3. To acquire the knowledge of basic digital circuitry.
- 4. To analyze the performance of negative as well as positive feedback circuits.
- 5. To describe the scientific principles that apply to the basic flow of electricity and explain the function of various materials used as conducting, semiconducting, and insulating devices in the construction of standard electronic circuits.

- 1. Able to appreciate the significance of electronics in different applications.
- 2. Able to apply method and appropriate technology to the study of physical science.
- 3. Able to compile the different building blocks in digital electronics using logic gates and implement simple logic function using basic universal gates.
- 4. Acquiring problem solving skills.
- 5. Get familiar with working of various components of a circuit.
- 6. Get familiar with measurement devices for example CRO, multi meter.

MODULE CONTENTS:

Unit I: Semiconductor Physics

Basic concepts, Intrinsic and extrinsic semiconductors, diffusion and drift currents, p-n junction under open- circuit, reverse bias and forward-bias conditions, p-n junction in the breakdown region, Ideal diode.

Unit II: Amplifiers

Introduction of different types of amplifiers and their characteristics, Principle of amplification, concept of feedback in amplifiers, frequency response of RC coupled amplifiers.

Unit III: Oscillators

Criteria for oscillations, study of different types of oscillators.

Unit IV: Digital Electronics

Binary, Octal and Hexadecimal number system and conversions, Boolean Algebra, Truth tables of logic gates (AND, OR, NOT) NAND, NOR as universal gates.

Unit V: Electronics Instruments

Role, importance and applications of general purpose test instruments viz Multimeter Digital and Analog, Cathode Ray Oscilloscope (CRO), and Function/Signal Generator.

Unit VI: Display

Seven segment display, Fourteen segment display, and Dot matrix display. LED Display: Introduction, Construction, and Advantage of LEDs in electronics display. LCD Display: Introduction, Types of LCD display- Dynamic scattering and field effect type; Types of liquid crystal cells: Transmitting type and reflective type, advantage and disadvantage of LCD display.

RECOMMENDED BOOKS:

ΤΕΧΤ ΒΟΟΚS	 Electronic Devices & Circuits - Boylstad & Nashelsky. J.S Katre "Basic Electronics" Tech Max Publications J.B Gupta, "Basic Electronics" S K kataria and sons
REFERENCEBOOKS	 Electrical and Electronic Technology (8th Edition): Hughes, Pearson. Cooper and Helfrick, "Modern Electronic Instrumentation and Measuring Techniques", 4th print Prentice Hall of India, New Delhi (1996). Cooper and Helfrick, "Modern Electronic Instrumentation and Measuring Techniques", 4th print Prentice Hall of India, New Delhi (1996).

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 75 marks.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	05
2.	Sessional Test	2	15
3.	Group Discussion	4	05
4.	End Semester Exam	1	50

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6
Class Test	х			х		
Quiz	х		х			х
Assignment		х			х	х

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning Outcomes	2	1	3	1,2	4		5,6	5			

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

Basics of Electronics Lab

L T P

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MODULE CODE	ECEN0105
CREDIT POINTS	1
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

OBJECTIVES:

- 1. To understand the practical aspects of basic electronics theory.
- 2. To Design and construct simple electronic circuits to accomplish a specific function
- 3. To understand the working of CRO and other measuring instruments.
- 4. To understand input and output characteristics of Bi-polar junction transistor.
- 5. To get familiar with ideal and practical characteristics of IC 741.
- 6. To provide experimental validation of the elementary analogue circuitry using analogue and digital testers.
- 7. To learn operation of electronic displays.
- 8. To understand their capabilities and limitations and make decisions regarding their best utilization in a specific situation.

- 1 Identify the basic tools and test equipment used to construct, troubleshoot, and maintain standard electronic circuits and systems.
- 2 Able to verify the working of diodes, transistors and their applications.
- 3 Able to design various basic circuits of digital electronics using simple gates and capable to work on IC 741.
- 4 Get familiar with the operation and applications of cathode ray oscilloscope.
- 5 To generate signals using function generator.
- 6 Build a common emitter/base/collector amplifier and measure its voltage gain.

- 7 Explore the operation and advantages of operational amplifiers.
- 8 Exploring the circuitry which converts an analog signal to digital signal.

LIST OF EXPERIMENTS:

1.	To get familiar with the working knowledge of the following instruments :
	a) Cathode ray oscilloscope (CRO) b) Multi meter (Analog and Digital)
2.	a) Plot the forward and reverse V-I characteristics of P-N junction diode.
	b) Study of Zener diode in breakdown region.
3.	To plot and study the input and output characteristics of BJT in common-emitter configuration
4.	Verification of truth tables of logic gates (OR, AND, NOT, NAND, NOR).
5.	To get familiar with the working and use of seven-segment display.
6.	Verification of truth tables of flip-flops (S-R,. J-K).
7.	To measure phase difference between two waveforms using CRO.
8.	To find frequency response of a given amplifier and calculate its bandwidth.
	To get familiar with pin-configuration of typical op-amp (741)and its use as :
9.	a) Inverting amplifier b) Non-inverting amplifier c) Summing amplifier
	d) Difference amplifier
	Use of op-amp as
10.	a) Integrator
	b) Differentiator
Experim	nents based on advanced topics:
11.	To assemble and test 5V/9 V DC regulated power supply and find its line-regulation and load-
	regulation
	To assemble Wein Bridge oscillator circuit and calculation of oscillation frequency and its verification
12.	from the observed output.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	В	с	d	e	f	g	h	i	j	k
Course Learning Outcomes	4	1	2,3	1	3	3,5	6,8,7	4,5			

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

WORKSHOP TECHNOLOGY

L T P

3 0 0

MODULE CODE	MECH1101
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. To facilitate the student with basic manufacturing processes in use today and its application in different type of Industries.
- 2. To achieve an understanding on concept of welding and allied process its application.
- 3. To demonstrate the fundamentals of machining processes and machine tools.
- 4. To understand the concepts of manufacturing processes.

- 1. Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- 2. Ability to understand the principles and techniques of casting, forming, joining and finishing operations and be able to determine their suitability.
- 3. Operate various machine tools for producing simple metal components and articles.
- 4. Ability to understand basic principles of mechanical manufacturing processes.

COURSE CONTENT:

Unit I: Manufacturing Processes

Introduction to Manufacturing Processes and their Classification. Industrial Safety; Introduction, Types of Accidents, Causes and Common Sources of Accident, Methods of Safety, First Aid, Objectives of Layout, Types of Plant Layout and their Advantages.

Unit II: Introduction to Machine tools

Introduction to Machine Tool to Commonly used Machine Tools in a Workshop: - Lathe, Shaper, Planer, Milling, Drilling, Slotter. Introduction to Metal Cutting.

Unit III : Forming Processes

Basic Principle of Hot & Cold Working, Hot & Cold Working Processes, Rolling, Extrusion, Forging, Drawing, Wire Drawing and Spinning. Sheet Metal Operations: Measuring, Layout marking, Shearing, Punching, Blanking, Piercing, Forming, Bending and Joining.

Unit IV: Foundry

Introduction to Casting Processes, Basic Steps in Casting Processes. Pattern: Types of Pattern and Allowances. Sand Casting: Sand Properties, Constituents and Preparation. Mould & Core Making with assembly and its Types.

Unit V: Gating System

Melting of Metal, Furnaces and Cupola, Metal Pouring, Fettling. Casting Treatment, Inspection and Quality Control. Sand Casting Defects & Remedies.

Unit VI: Welding

Introduction to Welding, Classification of Welding Processes, Gas Welding: Oxy-Acetylene Welding, Resistance Welding; Spot and Seam Welding, Arc Welding: Metal Arc, TIG & MIG Welding, Welding Defects and Remedies, Soldering & Brazing.

RECOMMENDED BOOKS:

ТЕХТ ВООК	 Workshop Technology Vol. 1 and 2 BY RAGHUVANSHI, Title: B.S. Dhanpat Rai & Sons Workshop practices, Author HS BAWA, TITLE: Tata McGraw-Hill
REFERENCE	 Workshop practices and materials, author BJ BLACK, Title: CRC press Mechanical practice workshop, author KC john, Title: PHI learning

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for theory.

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	05
2.	Sessional Test	2	15
3.	Group Discussion	4	05
4.	End Semester Exam	1	75

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4
Class Test	х		х	
Quiz			х	
Assignment	х	х		Х

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	С	d	e	f	g	h	i	J	k
Course Learning Outcomes	2	4		2	3		1	2		3	4

EVALUATION

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

WORKSHOP TECHNOLOGY LAB

L Т Р 0 0 2

MODULE CODE	MECH1102
CREDIT POINTS	1
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

OBJECTIVES:

- 1. To practice workshop safety rules effectively.
- 2. To acquire knowledge and use simple hand tools.
- 3. To acquire knowledge and use simple measuring and gauging instruments.
- 4. To operate simple drilling machines for producing small holes.
- 5. To understand about various machine tools for producing simple metal components and articles.

- 1. Able to understand applications of hand tools and power tools.
- 2. Able to get familiar with operations of machine tools.
- 3. Ability to select the appropriate tools required for specific operation.
- 4. Exposure to safety measures required to be taken while using the tools.
- 5. Ability to acquire knowledge and practice on foundry, forging and welding.
COURSE CONTENT:

1	Prepare carpentry and fitting shop layout.
2	Prepare one simple and another male-female type fitting jobs as per givendrawings-2 jobs.
3	Demonstrate use of different fitting tools–like work holding, marking, measuring, cutting, finishing and miscellaneous. Student will also prepare the report with sketch, specifications and applications of fitting tools demonstrated.
4	Demonstrate use of different tin smithy tools. Student will also prepare the report with sketch, specifications and applications of tin smithy tools demonstrated.
5	Prepare one tin smithy job as per drawing having shearing, bending, joining and riveting.
6	Demonstrate use of different carpentry tools. Student will also prepare the report with sketch, specifications and applications of carpentry tools demonstrated.
7	Prepare two wooden joints as per given drawings
8	Demonstrate use of different pipe fitting tools. Student will also prepare the report with sketch, specifications and applications of pipe fitting tools demonstrated.
9	Prepare pipe fitting jobs as per drawings-two jobs.
10	Prepare jobs using arc welding, gas cutting, spot welding, brazing and soldering process-three jobs.

RECOMMENDED BOOKS:

ТЕХТ ВООК	 Workshop Technology Vol. 1 and 2 BY RAGHUVANSHI, Title: B.S. Dhanpat Rai & Sons. Workshop practices, Author HS BAWA, TITLE: Tata McGraw- Hill.
REFERENCE	 Workshop practices and materials, author BJ BLACK, Title: CRC press. Mechanical practice workshop, author KC john, Title: PHI learning.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	Е	f	g	h	i	j	k
Course Learning Outcomes	2	3		2,5	4	3		2		1,3	4

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

Basics of Civil Engineering

L T P

2 0 0

MODULE CODE	CIVIL0101
CREDIT POINTS	2
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	50
END SEMESTER EXAM DURATION	2hrs
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will consist of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B & C comprise of short answer type and long answer type questions. These sections will have internal choice.

OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to basic knowledge of different sections of civil engineering as mentioned below:

- 1. To achieve knowledge and understanding about engineering aspects related to buildings.
- 2. To get familiar with different building materials and their properties.
- 3. To understand importance of surveying and the transportation systems.
- 4. To learn basic concepts related to water supply and sewage disposal.
- 5. To understand the fundamental concepts of geotechnical engineering and properties of soil.

LEARNING OUTCOMES:

- 1. Able to know about basic civil engineering terms and their applications.
- 2. Able to learn about the basic building material used in construction.
- 3. Able to understand about importance of surveying in civil engineering.
- 4. Able to know about soil behavior and soil properties in different conditions.
- 5. Able to learn about water supply system and different layout of water distribution systems.

MODULE CONTENT:

<u> UNIT -I : Building Materials</u>

Introduction of Civil Engineering materials: Bricks– composition, classifications, properties and uses. Stone – classification of rocks, quarrying, dressing properties and uses. Timber – properties, uses. Cement – grades, types, properties, uses. Steel – mild steel, medium steel, hard steel, their properties, uses. Concrete – grade designation, properties and uses.

UNIT-II: Building Components

Building – selection of site, classification, components. Foundations –functions, classification bearing capacity. Flooring – requirements, selection, types. Roof – types and requirements.

UNIT-III: Surveying

Introduction, Principles of surveying, use and adjustment of various instruments employed in chain survey, compass surveying and plane table surveying. Definition and working principles of a levelling instruments, Use and adjustment of dumpy and tilting levels, Establishment of Bench Marks by levelling.

UNIT-IV: Transportation

Highway –classification, cross section and components of roads. Railway – cross section and components of permanent way and their functions. Waterway – docks and harbour, classifications, components. Bridge – introduction and components of bridge.

UNIT-V: Water Supply And Sewage Disposal

Water supply – objective, quantity of water, sources, standards of drinking water, distribution system. Sewage – classification, technical terms, septic tank, components and functions.

UNIT-VI: Geotechnical Engineering

Soil mechanics- Introduction, formation, composition, classification and properties of soil.

RECOMMENDED BOOKS:

TEXT BOOKS	 Basics of Civil Engineering, Raju .K.V.B, Ravichandran .P.T, Ayyappa Publications. Engineering Material's, Rangwala .S.C Charotar Publishing House.
REFERENCE BOOKS	 Basics of Civil Engineering, <u>Shrikrishna</u>, <u>Kiran M. Tajne</u>, Shrikrishna A Dhale. S.Chand Publication Basic Civil Engineering, Satheesh Gopi. Publisher: Pearson India

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 75 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	5
2.	Sessional Test	2	15
3.	Group Discussion	4	5
4.	End Semester Exam	1	50

Theory:

Assessments	1	2	3	4	5	6
Class Test	х		х	х	х	
Quiz	х	х		х		х
Assignment	х		х		х	

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	С	d	e	f	g	h	i	j	k
Course Learning Outcomes	3,4,5,6	1,2,3,4,5,6	1,2,4,5	1,3	1,5	5	1,2	1,3,5	3,5	2	

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
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0 0 2

MODULE CODE	CIVIL0102
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

OBJECTIVES:

The aim of this subject is to develop understanding on different aspects of Civil Engineering field to the

students of all branches of Engineering.

- 1. To study the practical experiments in chaining, compass.
- 2. To study the basics properties of cement.
- 3. To study the practical application of theodolite.
- 4. To study the properties of soil.
- 5. To give experience in handling surveying equipments.

LEARNING OUTCOMES:

- 1. Able to determine linear measurement like horizontal distance.
- 2. Ability to determine properties of cement experimentally.
- 3. Ability to determine different properties of soil experimentally.
- 4. Ability to determine C B R value of soil.
- 5. Ability to handle different surveying instruments.

LIST OF EXPERIMENTS

1.	Linear measurement using tape, chain.
2.	Chain survey – Determination of area by perpendicular offset.
3.	Theodolite- Measurement of horizontal and vertical angles by Vernier Theodolite.
4.	To determine the normal consistency of cement paste.
5.	To determine soundness of given cement by Le-Chatelier method
6.	To determine initial and final setting time of cement
7.	To determine the fineness of cement.
8.	To determine water content of soil mass.
9.	To determine Atterberg Limit of soil.
10.	C B R Value test.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	c	d	e	f	g	h	i	j	k
Course Learning		123	1234		1,2,3,						
Outcomes		1,2,5	1,2,3,7		4						

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

Applied Mathematics-II

4 1 0

MODULE CODE	MATH0116
CREDIT POINTS	4.5
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. To achieve knowledge and understanding of differential equations, their various properties and capabilities to model and solve wide range of problems in science and engineering.
- 2. To get familiar with concepts of Laplace transforms and develop ability to solve simple and complex problems.
- 3. To understand Fourier series and their applications in engineering problems.
- 4. To learn basic concepts of Fourier Transforms and its application in scientific problems.
- 5. To acquire knowledge of complex functions and assess their effectiveness in science and Technology.

LEARNING OUTCOMES:

- 1. Able to understand differential equations and their capability to solve problems.
- 2. Exposure to Laplace transforms and their compatibilities.
- 3. Enhance the knowledge regarding Fourier series and their applications
- 4. Able to understand Fourier Transforms and its application.
- 5. Ability to acquire knowledge of complex functions and assess their effectiveness in science and Technology.

MODULE CONTENT:

UNIT-I: Ordinary Differential Equations & its Applications

Exact differential equations. Equations reducible to exact differential equations. Applications of Differential equations of first order & first degree to simple electric circuits, Newton's law of cooling, heat flow and orthogonal trajectories.

UNIT-II: Linear Differential Equations.

Linear differential equations of second and higher order. Complete solution, complementary function and particular integral, method of variation of parameters to find particular Integral, Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficient. Applications of linear differential equations to simple pendulum, oscillatory electric circuits.

UNIT-III: Partial Differential Equations and Its Applications

Formation of partial differential equations, Lagrange's linear partial differential equation, First orders non-linear partial differential equation, Char pit's method. Method of separation of variables and its applications to wave equation and one dimensional heat equation, two dimensional heat flow, steady state solutions only.

UNIT-IV: Laplace Transforms and its Applications

Laplace transforms of elementary functions, properties of Laplace transforms, existence conditions, transforms of derivatives, transforms of integrals, multiplication by tⁿ, division by t. Evaluation of integrals by Laplace transforms. Laplace transform of Unit step function, unit impulse function and periodic function. Inverse transforms, convolution theorem, application to linear differential equations and simultaneous linear differential equations with constant coefficients.

Unit –V: Fourier Series and Fourier Transforms

Euler's formulae, conditions for a Fourier expansion, change of interval, Fourier expansion of odd and even functions, Fourier expansion of square wave, rectangular wave, saw-toothed wave, half and full rectified wave, half range sine and cosine series.

Fourier integrals, Fourier transforms, Shifting theorem (both on time and frequency axes), Fourier transforms of derivatives, Fourier transforms of integrals, Convolution theorem.

UNIT-VI: Functions of Complex Variable

Definition, Exponential function, Trigonometric and Hyperbolic functions, Logarithmic functions. Limit and Continuity of a function, Differentiability and Analyticity, Cauchy-Riemann equations, necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations. Harmonic functions, application to flow problems. Integration of complex functions. Cauchy-Integral theorem and formula.

RECOMMENDED BOOKS

	1.	Higher I	Engineering	Mathematics:	B.S.	Grewal,	Khanna		
		Publishers, New Delhi.							
	2.	Advanced	Advanced Engineering Mathematics, Erwin Kreyszig, John						
TEAT DOORS		Wiley & Sons, Inc., New York.							
	3.	Advanced	d Engineering	Mathematics,	Peter V	. O'Neil,	Thomson		
		Learning,	Inc., Singapo	ore.					
	1.	Advanced	d Engineering	g Mathematics,	, R.K.	Jain and	S. R .K.		
		Iyengar,	Alpha scien	nce Internation	nal Lt	d. Pang	Bourne,		
REFERENCES		England.							
	2.	Advanced	d Engg. Math	ematics, Micha	el D. G	reenberg,	Prentice-		
		Hall, Eng	lewood Cliff	s, NJ.					

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning	125	2.5	34	1234	23	34	235	13	4 5	12	13
Outcomes	1,2,0	2, 0	5,1	1,2,0,1	2,5	5,1	2,5,5	1,5	1,0	1,2	1,5

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6
Class Test	х		х		х	
Quiz			х		х	х
Assignment	х	х		х		

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
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Numerical Methods

L T P 3 0 0

MODULE CODE	MATH0117
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

The aim of this subject is to develop understanding of different methods related to error, area numerically, using different techniques to enhance skills of numerical methods as mentioned below:

- 1. To achieve knowledge and understanding of different types of error, interpolation, extrapolation and capabilities to solve by different methods with wide range of problems in science and engineering.
- 2. To get familiar with concepts of nonlinear equations and develop ability to solve simple Complex problems.
- 3. To understand direct and indirect methods solve simultaneous linear equations and their applications in engineering problems.
- 4. To learn basic concepts of area solve by integration and its application in realistic decision making.
- 5. To acquire knowledge of ordinary and partial differential equations solve by different methods and assess their effectiveness in problem solving.

LEARNING OUTCOMES:

- 1. Able to understand the evolution of techniques and basic terminology.
- 2. Exposure to various methods and techniques and their compatibilities.
- 3. Enhance the knowledge regarding different types of error, linear, non-linear and ordinary and partial differential equations.
- 4. Able to understand the basic techniques and start to implement in real life.
- 5. Ability to find the largest Eigen values and corresponding Eigen vector.

MODULE CONTENT:

Unit I: Errors in Numerical Calculation

Introduction, Numbers and their accuracy, Absolute, relative and Percentage errors and their analysis, General error formula.

Interpolation and Curve Fitting: Newton's forward and backward; Gauss forward and backward; central difference interpolation formulae; Lagrange's and Newton divided difference interpolation formula, Interpolating with a cubic spline, Bezier curves and B-spline curves, Curve fitting by Least squares approximations.

Unit II: Nonlinear equations

Bisection method, Regula False method, Secant method, Iteration Method, Newton's Raphson method, Giraffe's methods, Muller's method.

Unit III: Simultaneous linear equations

Gauss Elimination method, Gauss-Jordan method, LU- decomposition Method, Jacobi's method, Gauss- Seidal method, Relaxation method.

Unit IV: Numerical differentiation and Integration

Derivatives from differences tables, higher order derivatives, Newton-cotes integration formula, Trapezoidal rule, Simpson's rules, Boole's rule and Weddle's rule, Romberg's Integration.

Unit V: Numerical solution of ordinary differential equations

Taylor series methods, Euler and modified Euler method, Runge-Kutta methods, Milne's method, Adams-Moulton method.

Unit VI: Numerical solution of partial differential equations

Finite difference approximation of partial derivatives, solution of Laplace equation (standard 5-point formula only), one dimensional heat equation (Schmidt method, Crank-Nicolson method, Dufort and Frankel method).

Eigen Value Problems: Power method, Jacobi, Given's and Householder's methods for symmetric matrices.

RECOMMENDED BOOKS:

	4. Applied Numerical analysis: Curtis F Gerald and Patrick, G							
TEXT BOOKS	Wheatley-Pearson Education.							
TEXT BOOKS	5. Numerical Methods: Fairs & Burden, Brooks Cole, 2001.							
	6. Numerical Methods in Engineering and Science, B S Grewal,							
	Khanna Publishers.							
	4. Numerical Methods for Scientific and Engineering							
REEEDENCE BOOKS	computations, M.K. Jain, S.R.K. Iyenger and R.K. Jain-Wiley							
REFERENCE BOOKS	Eastern Ltd.							
	5. Numerical Methods for engineers, Steven C. Chapra, Raymond							
	P. Can ale, McGraw Hill.							

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning Outcomes	1,2	1,3	1,5	1,3,5	2,3	2,3,4	1,2,4	1,4	1,3	2,5	1,4

METHODS OF TEACHING AND STUDENT LEARNING

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ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	05
2.	Sessional Test	2	15
3.	Group Discussion	4	05
4.	End Semester Exam	1	75

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6
Class Test	х		х		х	
Quiz			х		х	х
Assignment	х	х		х		

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

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L T P 2 0 0

VALUE EDUCATION

MODULE CODE	VALU0109
CREDIT POINTS	2
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	50
END SEMESTER EXAM DURATION	2 hrs
LAST REVISION DATE	

INSTRUCTIONS: All questions are compulsory. Each question may have multiple options and will cover all units.

OBJECTIVES:

The Purpose of Value Education is specifying the present deterioration in the value system in the fast changing world trends and to develop understanding of moral values in different aspects of life for inculcating the skills as mentioned below:

- 1. To prepare students to develop basic understanding of Value Education.
- 2. To acquire knowledge on Value Education.
- 3. To understand the ethics, character building, leadership & goal setting.
- 4. To understand the success & personal growth.
- 5. To support the women empowerment & environmental awareness.

LEARNING OUTCOMES:

- 1. Able to understand the Importance of Values in Life what is a Value system?
- 2. Exposure to various principles, concepts, types, advantages and disadvantages of value education.
- 3. Ability to understand the life style management & self esteem.
- 4. To behave morally in society.

MODULE CONTENTS:

<u>UNIT 1: VALUE EDUCATION</u>
Definition, Concept and Classification of values
• The need for value education
Pedagogy of Values
Challenges of Value Adoption
Life Style Management
UNIT 2: VALUE & PERSONAL DEVELOPMENT
• The principles of integrity
Character Development
• Values in everyday life
Values, Virtues, Powers & Qualities
Successful Personality
UNIT 3: VALUES IN SOCIETY
Character Building
Positive thinking & Emotional Maturity
Women Empowerment
Overcoming Addiction
Environmental Awareness
UNIT 4: PERSONAL PROGRESS & FIELD STUDY
Personal progress manual
• Field Project

RECOMMENDED BOOKS:

TEXT BOOKS	 Seven Habits of Highly Effective People, Covey Stephen, Free Press, United States, 1989 You Can Win, Khera Shiv, Macmillan India Limited, New Delhi, 1998
REFERENCE BOOKS	Mani Jacob, ed., (2002). Resource for Value Education, New Delhi: Institute of Value Education.

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning Outcomes										1,2	3,4

METHODS OF TEACHING AND STUDENT LEARNING

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ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 75 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	1	10
2.	Sessional Test	2	15
3.	End Semester Written Exam	1	50

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4
Class Test	Х	х	х	
Quiz	х	х	х	
Assignment			х	х

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

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PC Lab

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0 0 2

L

MODULE CODE	CSEN1103
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

OBJECTIVES:

The main objective of the lab is to provide the students the knowledge of computer hardware, the processors, memories, motherboards, different add-on cards, and other peripherals like printers, plotters and the scanners. The students are trained for the assembly and disassembly of PCs. Another important objective is to impart knowledge about the troubleshooting and fault finding the computers and the peripherals.

LEARNING OUTCOMES:

Following this course, students will be able to:

- 1. Learn about different hardware components of a computer and their troubleshooting.
- 2. Understand different peripherals, their performance and cost characteristics
- 3. Understand installation of various operating systems, their capabilities
- 4. Learn commonly used PC software like MS Word, Excel and PowerPoint.

LIST OF EXPERIMENTS

PC Software: Application of basics of MS Word 2013, MS Excel 2013, MS Power Point 2013, MS Access 2013.

1.	To prepare the Your Bio Data using MS Word.
2.	To prepare the list of marks obtained by students in different subjects and show with the help of chart/graph the average, min and max marks in each subject.
3.	Prepare a presentation explaining the facilities/infrastructure available in your department.
4.	Create a database of books in the library on a mini scale w.r.t. Computers and manipulate the database using different forms and reports.

PC Hardware:

1.	To check and measure various supply voltages of PC.
2.	To make the comparative study of various motherboards.
3.	To make the comparative study of various processors.
4.	To study various cables used in computer communication.
5.	To study various connections and ports used in computer communication.
6.	To study various cards used in a Computer System.
7.	To remove, study and replace CD-Rom, Hard disk.
8.	To observe various cables and connectors used in networking.
9.	To assemble a PC.
10.	Troubleshooting exercises related to various components of computer like monitor, drives, memory and printers etc.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	с	d	e	f	g	h	Ι	j	k
Course Learning Outcomes	3	2	4	1	1,2						

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
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L T P

2 0 0

French Language – Part 2

Pre-requisite - French Language - Part 1

MODULE CODE	LANF0104
CREDIT POINTS	2
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	50
END SEMESTER EXAM DURATION	2 hrs
LAST REVISION DATE	

INSTRUCTIONS: All questions are compulsory. Each question may have multiple options and will cover all units.

OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to oral and written skills of expressing and exchanging information / interacting in French language and to enhance skills as mentioned below:

- 1. To prepare students to develop advance understanding on French language.
- 2. To acquire the command over the French grammar.
- 3. To read and write short, simple texts.
- 4. To enable learner to build logic in French language.
- 5. To make students aware of the French culture, customs & traditions.

LEARNING OUTCOMES:

- 1. Able to understand the advance grammar of French language and differentiation of genders and objects.
- 2. Exposure to various syntax & communication methods with others.
- 3. Ability to read, write, speak & listen the advance of French language.
- 4. Able to understand the French history.

MODULE CONTENTS

<u>UNIT I: MODERATE COMMUNICATION</u> – This module will sharpen the communicative skills already acquired in the **PART 1 - BASIC COMMUNICATION** and further builds on them. It develops oral and written skills of understanding, expressing and exchanging information / interacting on the topics given below: -

· Describe in detail people, relationships, events, places, cultures of countries

• Compare people, relationships, events, places, cultures and the changes that they have undergone

- Apply for a job
- Exchange personal and professional information

• Express opinion on people, places, events encountered in one's personal life and on press articles, television programmes, multimedia, films, and books

- Argue, justify and substantiate a point of view
- Describe hypothetical or imaginary situations
- Express plans, dreams, aspirations of the future
- Paragraph writing
- Professional communication

<u>UNIT II: MODERATE PHONETICS</u> – This module will re-enforces all the notions introduced in the **PART 1-BASIC PHONETICS**.

<u>UNIT III: MODERATE GRAMMAR</u> – This module will sharpen the concepts introduced in the **PART 1 - BASIC GRAMMAR & FORMATION OF SENTENCES** and further develops the following linguistic skills: -

• Pronouns - relative (don't), possessive, indefinite, demonstrative and the use of double pronouns

• Verbs – conjugation of regular and irregular verbs (affirmative and negative) in the following tenses (indicative mood) – past perfect, future perfect

- Verbs the subjunctive mood (past and present)
- Verbs conditional (past and present) and gerund forms,
- Adverbs of time, place, quantity and indefinite adverbs
- Direct/indirect speech
- Comparative and superlative structures
- Active/passive structures

• Multiple clause sentences - independent clauses joined by co-ordinating conjunctions, dependant clause

(subordinate clause)

• Phrases to express cause, consequence, and objective

RECOMMENDED BOOKS:

TEXT BOOKS	 Nouveau Sans Frontières 1 by Philippe Dominique & Jacky Girardet "CONNEXIONS-1" by Regine Merieux & Yves Loiseau Published by Didier.
REFERENCE BOOKS	 Five in one Multilingual Glossary, published by Saraswati House Pvt. Ltd. New Delhi 2011.

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning Outcomes										1,2	3,4

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 75 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark		
1.	Class Test	1	10		
2.	Sessional Test	2	15		
3.	End Semester Written Exam	1	50		

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4
Class Test	х	х	х	
Quiz	х	х	х	
Assignment			х	х

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

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2 0 0

German Language – Part 2

Pre-requisite - German Language - Part 1

MODULE CODE	LANG0105
CREDIT POINTS	2
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	50
END SEMESTER EXAM DURATION	2 hrs
LAST REVISION DATE	

INSTRUCTIONS: All questions are compulsory. Each question may have multiple options and will cover all units.

OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to oral and written skills of expressing and exchanging information / interacting in German language and to enhance skills as mentioned below:

- 1. To prepare students to develop advance understanding on German language.
- 2. To acquire the command over the German grammar.
- 3. To read and write short, simple texts.
- 4. To enable learner to build logic in German language.
- 5. To make students aware of the German culture, customs & traditions.

LEARNING OUTCOMES:

- 1. Able to understand the advance grammar of German language and differentiation of genders and objects.
- 2. Exposure to various syntax & communication methods with others.
- 3. Ability to read, write, speak & listen the advance of German language.
- 4. Able to understand the German history.

MODULE CONTENTS

<u>UNIT I: MODERATE COMMUNICATION</u> – This module will sharpen the communicative skills already acquired in the **PART 1 - BASIC COMMUNICATION** and further builds on them. It develops oral and written skills of understanding, expressing and exchanging information / interacting on the topics given below: -

- Describe in detail people, relationships, events, places, cultures of countries
- Compare people, relationships, events, places, cultures and the changes that they have undergone
- Apply for a job
- Exchange personal and professional information

• Express opinion on people, places, events encountered in one's personal life and on press articles, television programmes, multimedia, films, and books

- Argue, justify and substantiate a point of view
- Describe hypothetical or imaginary situations
- Express plans, dreams, aspirations of the future
- Paragraph writing
- Professional communication

<u>UNIT II: MODERATE PHONETICS</u> – This module will re-enforces all the notions introduced in the **PART 1-BASIC PHONETICS**.

<u>UNIT III: MODERATE GRAMMAR</u> – This module will sharpen the concepts introduced in the **PART 1 - BASIC GRAMMAR & FORMATION OF SENTENCES** and further develops the following linguistic skills: -

• Pronouns - relative (don't), possessive, indefinite, demonstrative and the use of double pronouns

• Verbs – conjugation of regular and irregular verbs (affirmative and negative) in the following tenses (indicative mood) – past perfect, future perfect

- Verbs the subjunctive mood (past and present)
- Verbs conditional (past and present) and gerund forms,
- Adverbs of time, place, quantity and indefinite adverbs
- Direct/indirect speech
- Comparative and superlative structures
- Active/passive structures
- Multiple clause sentences independent clauses joined by co-ordinating conjunctions, dependant clause (subordinate clause)
- Phrases to express cause, consequence, and objective

RECOMMENDED BOOKS:

TEXT BOOKS	 Tangram, Kursbuch und Arbeitsbuch, 1A, 1B Hueber Verlag 	& 2A, Max
	2. Tangram, Kursbuch und Arbeitsbuch, 2B, 3A Hueber Verlag	& 3B, Max
REFERENCE BOOKS	 em Abschlusskurs, Kursbuch und Arbeitsbuch, Verlag 	Max Hueber

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning Outcomes										1,2	3,4

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 75 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	1	10
2.	Sessional Test	2	15
3.	End Semester Written Exam	1	50

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4
Class Test	Х	х	х	
Quiz	х	х	х	
Assignment			х	х

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

- L T P
- 2 0 0

Spanish Language – Part 2

Pre-requisite - Spanish Language - Part 1

MODULE CODE	LANS0106
CREDIT POINTS	2
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	50
END SEMESTER EXAM DURATION	2 hrs
LAST REVISION DATE	

INSTRUCTIONS: All questions are compulsory. Each question may have multiple options and will cover all units.

OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to oral and written skills of expressing and exchanging information / interacting in Spanish language and to enhance skills as mentioned below:

- 1. To prepare students to develop advance understanding on Spanish language.
- 2. To acquire the command over the Spanish grammar.
- 3. To read and write short, simple texts.
- 4. To enable learner to build logic in Spanish language.
- 5. To make students aware of the Spanish culture, customs & traditions.

LEARNING OUTCOMES:

- 1. Able to understand the advance grammar of Spanish language and differentiation of genders and objects.
- 2. Exposure to various syntax & communication methods with others.
- 3. Ability to read, write, speak & listen the advance of Spanish language.
- 4. Able to understand the Spanish history.
MODULE CONTENTS

<u>UNIT I: MODERATE COMMUNICATION</u> – This module will sharpen the communicative skills already acquired in the **PART 1 - BASIC COMMUNICATION** and further builds on them. It develops oral and written skills of understanding, expressing and exchanging information / interacting on the topics given below: -

• Describe in detail people, relationships, events, places, cultures of countries

• Compare people, relationships, events, places, cultures and the changes that they have undergone

• Apply for a job

• Exchange personal and professional information

• Express opinion on people, places, events encountered in one's personal life and on press articles, television programmes, multimedia, films, and books

• Argue, justify and substantiate a point of view

• Describe hypothetical or imaginary situations

• Express plans, dreams, aspirations of the future

• Paragraph writing

Professional communication

<u>UNIT II: MODERATE PHONETICS</u> – This module will re-enforces all the notions introduced in the **PART 1-BASIC PHONETICS**.

<u>UNIT III: MODERATE GRAMMAR</u> – This module will sharpen the concepts introduced in the **PART 1 - BASIC GRAMMAR & FORMATION OF SENTENCES** and further develops the following linguistic skills: -

• Pronouns - relative (don't), possessive, indefinite, demonstrative and the use of double pronouns

• Verbs – conjugation of regular and irregular verbs (affirmative and negative) in the following tenses (indicative mood) – past perfect, future perfect

• Verbs – the subjunctive mood (past and present)

• Verbs - conditional (past and present) and gerund forms,

• Adverbs of time, place, quantity and indefinite adverbs

• Direct/indirect speech

• Comparative and superlative structures

Active/passive structures

• Multiple clause sentences – independent clauses joined by co-ordinating conjunctions, dependant clause (subordinate clause)

· Phrases to express cause, consequence, and objective

RECOMMENDED BOOKS:

TEXT BOOKS	1. Aula Internacional 1 and 2, Novellas and short stories						
	2. Aula Internacional 3, España and Latinoamérica: Historia y						
	Cultura, Novellas						
REFERENCE BOOKS	1. Español sin fronteras, I, SGEL, 1997						
	2. Nuevo Ven I, Edelsa 2004						

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning Outcomes										1,2	3,4

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 75 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	1	10
2.	Sessional Test	2	15
3.	End Semester Written Exam	1	50

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4
Class Test	х	х	х	
Quiz	х	х	х	
Assignment			х	х

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER III

	CATEGORY	eup		L	Т	Р	С			TOTAL
CODE		CATEGORY	MODULE					IVIARKS	WARKS	
MECH2101	E	PC	THERMODYNAMICS	3	0	0	3	25	75	100
MECH2102	E	PC	COMPUTER AIDED DESIGN & GRAPHICS	3	1	0	3.5	50	100	150
MECH2103	E	PC	COMPUTER AIDED DESIGN & GRAPHICS LAB	0	0	2	1	25	25	50
MECH2104	E	PC	ENGINEERING MECHANICS	3	1	0	3.5	50	100	150
MECH2105	E	PC	ENGINEERING MECHANICS LAB	0	0	2	1	25	25	50
MGMT0101	М		MANAGEMENT & PROFESSIONAL LEADERSHIP	3	0	0	3	25	75	100
VALU0119	Р	AE	APTITUDE I	2	0	0	2	25	50	75
VALU0123	Р	SE	PROFESSIONAL COMMUNICATION-I	2	0	0	2	25	50	75
ENGL0109	Р	AE	ACADEMIC WRITING	0	0	2	1	25	25	50
	Р	AE	YOGA/NCC/NSS*	0	0	2	1	25	25	50
	E	PE	ELECTIVE-I	3	0	0	3	25	75	100
	E	PE	ELECTIVE-I LAB	0	0	2	1	25	25	50
	E	PE	ELECTIVE-II	3	1	0	3.5	50	100	150
		тот	AL	21	0	12	28.5	400	750	1150
		MODULE								

L = Lecture	CODE	MODULE NAME*
T = Tutorial	VALU0118	YOGA
P = Practical	VALU0121	NCC
C = Credit Point	VALU0122	NSS

ELECTIVES

MODULE CODE	ELECTIVE-I		
MECH2206	MATERIAL SCIENCE	MECH2210	ENERGY MANAGEMENT PRINCIPLES
MECH2207	MATERIAL SCIENCE LAB	MECH2211	RAPID PROTOTYPING
MECH2208	METAL CUTTING & TOOL DESIGN		
MECH2209	METAL CUTTING & TOOL DESIGN LAB		

THERMODYNAMICS

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3

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MODULE CODE	MECH2101
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. To understand the basic concept of thermodynamic properties of thermodynamic system.
- 2. To know the concept of thermodynamic work and heat.
- 3. To know the concept of zeroth law and first law of thermodynamic.
- 4. To understand application of first law in S.F.E.Q and Non-flow process.
- 5. To get familiar with the concept of second law of thermodynamic and its application.
- 6. To impart the knowledge about the different types of energy, availability, irreversibility.
- 7. To get familiar with the knowledge about the pure substance, their properties, formation of steam, measurement of steam.

LEARNING OUTCOMES:

- 1. Able to understand and correctly use thermodynamic terminology.
- 2. To define the concepts of heat, work, and energy
- 3. Ability to explain fundamental thermodynamic properties.
- 4. Able to develop the General Energy Equation.
- 5. Ability to derive and discuss the first law of thermodynamics.
- 6. Ability to understand the properties and relationships of thermodynamic fluids.

COURSE CONTENT:

Unit I: Basic Concepts

Macroscopic and Microscopic Approaches, Thermodynamic Systems, Surrounding and Boundary, Thermodynamic Property – Intensive and Extensive. Thermodynamic Equilibrium, State, Path, Process and Cycle, Quasi-static, Reversible and Irreversible Processes, Working Substance. Concept of Thermodynamic Work and Heat. Problems.

Unit II: Pure Substance

Pure Substance and its Properties, Phase and Phase Transformation, Vaporization, Evaporation and Boiling, Saturated and Superheat Steam, Solid – Liquid – Vapour Equilibrium, T-V, P-V and P-T Plots During Steam Formation, Properties of Dry, Wet and Superheated Steam, Property Changes During Steam Processes, Temperature – Entropy (T-S) and Enthalpy – Entropy (H-S) Diagrams, Throttling and Measurement of Dryness Fraction of Steam. Problems. Ideal and Real Gases: Concept of an Ideal Gas, Basic Gas Laws, Characteristic Gas Equation, Avogadro's law and Universal Gas Constant, P-V-T surface of an Ideal Gas. Vander Waal's Equation of state, Reduced Co-ordinates, Compressibility factor and law of corresponding states. Mixture of Gases, Mass, Mole and Volume Fraction, Gibson Dalton's law, Gas Constant and Specific Heats, Entropy for a mixture of non-reactive gases. Problems.

Unit III : 1ST Law of Thermodynamics

Equality of Temperature, Zeroth Law of Thermodynamic and its utility, Problems. First Law of Thermodynamics: Energy and its Forms, Energy and 1st law of Thermodynamics, Internal Energy and Enthalpy, PMMFK, Steady flow energy equation, 1st Law Applied to Non- flow process, Steady Flow Process and Transient Flow Process, Throttling Process and Free Expansion Process. Problems.

Unit IV: Second Law of Thermodynamics

Limitations of First Law, Thermal Reservoir, Heat Source and Heat Sink, Heat Engine, Refrigerator and Heat Pump, Kelvin - Planck and Clausius Statements and their Equivalence, PMMSK. Carnot Cycle, Carnot Heat Engine and Carnot Heat Pump, Carnot Theorem and its Corollaries, Thermodynamic Temperature Scale. Entropy, Clausius Inequality, Principle of Entropy Increase, Temperature Entropy Plot, Entropy Change in Different Processes, Introduction to Third Law of Thermodynamics. Problems.

Unit V: Availability and Irreversibility

High and Low Grade Energy, Availability and Unavailable Energy, Loss of Available Energy Due to Heat Transfer Through a Finite Temperature Difference, Dead state of a system, Availability of a Non-Flow or Closed System, Availability of a Steady Flow System, Helmholtz and Gibb's Functions, Effectiveness and Irreversibility, Second law efficiencies of processes & cycles. Problems. Thermodynamic Relations and its Applications: Maxwell Relations, Clapeyron Equation, Relations for changes in Enthalpy and Internal Energy & Entropy, Specific Heat Capacity Relations, Joule Thomson coefficient & inversion curve.

Unit VI : Introduction to Gas power Cycles

Carnot Cycle, Otto Cycle, Diesel Cycle, Dual Cycle, Stirling Cycle, Ericson cycle and Brayton cycle. Problems.

RECOMMENDED BOOKS:

TEXT BOOK	 Engineering Thermodynamics – P K Nag, Tata McGraw Hill Thermodynamics – Y. Cengel, Tata McGraw Hill
REFERENCE	 Theory and Problems of Thermodynamics – Y. V.C. Rao, Wiley Eastern Ltd., New Delhi. Engineering Thermodynamics – C P Arora, Tata McGraw Engineering Thermodynamics – Jones and Dugan, PHI, New Delhi.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	05
2.	Sessional Test	2	15
3.	Group Discussion	4	05
4.	End Semester Exam	1	75

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6
Class Test	Х		Х		Х	
Quiz			Х		Х	Х
Assignment	Х	х		Х		

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning	2	5		2,4,6	4	3	6	2		3	4
Outcomes											

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review;
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

COMPUTER AIDED DESIGN AND GRAPHICS

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MODULE CODE	MECH2102
CREDIT POINTS	3.5
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. Use AutoCAD for daily working process.
- 2. Navigate throughout AutoCAD using major navigating tools
- 3. Understand the concept and techniques to draw.
- 4. Create multiple designs using several of tools.
- 5. Create layers to control the objects' visibility
- 6. Explain drawing using annotations.
- 7. Plot or print the drawing by scale.
- 8. To use constraint for certain design

LEARNING OUTCOMES:

- 1. Read and create mechanical drawings using industry standard dimensioning techniques, from design concept through completed drawings
- 2. Draw, edit, and manipulate drawings using AutoCAD
- 3. Plot and publish scaled, fully annotated and dimensioned AutoCAD drawings
- 4. Use advanced tools to create complex and sophisticated AutoCAD drawings
- 5. Create and render three-dimensional objects using specialized techniques within AutoCAD.

COURSE CONTENT:

Unit I: About CADD

- Introduction to Engineering Drawings Projections (First &Third angle) Views (Orthographic, Isometric & Perspective)
 Introduction to AutoCAD
- 2. Infoduction to A History Exploring GUI Workspaces
- 3. Co-ordinate systems

Unit II: Orthographic Views

- 1. Drawing settings Units, Limits
- 2. Drawing Tools: Line, Circle, Arc, Ellipse, Donut, Polygon, Rectangle
- 3. Modify Tools: Erase, Oops, Undo, Redo, Explode, Move, Copy, Rotate, Mirror, Array, Align, Scale, Stretch, Lengthen, Trim, Extend, Break, Join, Chamfer, Fillet
- 4. File Management New, Qnew, Open, Save, Save as, Close, Exit, Quit
- 5. Mini Project 1 Orthographic Views

<u>Unit III : Drawing Tools</u>

Multiline, Pline, Spline, Xline, Ray, Wipe-out, Revision cloud, Modify Tools: Mlstyle, Mledit, Pedit, Splinedit, Grip Editing.

Display Control: Zoom, Pan, Redraw, Regen, Clean Screen, Steering wheels Object Properties: Color, Line type, Lt scale, Line weight, Properties, Match prop

Unit IV: Layer Management

Adding / Removing Layers Layer Status New Property Filter New Group Filter Layer Status Manager Plot Control

Unit V: Object Selection Methods

Select, Qselect, Filter, Symbol and BOM creation block, base, Wblock, Insert

Unit VI : Annotation Tools

Test, Style, Mtext, Scaletext, Spell, Table, Table style, Tabledit

RECOMMENDED BOOKS:

TEXT BOOK	1. 2.	CAD/ CAM by Groover and Zimmer, Prantice Hall. CAD/ CAM Theory and Practice by Zeid, McGraw Hill
REFERENCE	1.	Numerical Control and Computer Aided Manufacturing by
		Kundra Rao & Tiwari, ,TMH

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5
Class Test	Х		Х		Х
Quiz			Х		Х
Assignment	Х	Х		Х	

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	В	c	d	e	f	G	h	i	j	k
Course Learning Outcomes	2	5		2	4		1	2		5	4

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review;
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

COMPUTER AIDED DESIGN & GRAPHICS LABLTP

0 0 2

MODULE CODE	MECH2103
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

OBJECTIVES:

- To impart fundamental knowledge to students in the latest technological topics on Computer aided Design, Computer Aided Manufacturing and Computer Aided Engineering Analysis and to prepare them for taking up further research in the areas.
- To create congenial environment that promotes learning, growth and imparts ability to work with interdisciplinary groups in professional, industry and research organizations.
- To broaden and deepen their capabilities in analytical and experimental research methods, analysis of data, and drawing relevant conclusions for scholarly writing and presentation.
- To provide guidance to students for their choices in research and professional career outlook and to encourage students to take up research.

LEARNING OUTCOMES:

- Apply/develop solutions or to do research in the areas of Design and simulation in mechanical Engineering.
- Have abilities and capabilities in developing and applying computer software and hardware to mechanical design and manufacturing fields.
- Review and document the knowledge developed by scholarly predecessors and critically assess the relevant technological issues.
- Formulate relevant research problems; conduct experimental and/or analytical study and analyzing results with modern mathematical / scientific methods and use of software tools.

LIST OF EXPERIMENTS

1.	Setting up of drawing environment by setting drawing limits, drawing units, naming the drawing, naming layers, setting line types for different layers using various type of lines in engineering drawing, saving the file with .dwg extension
2.	Layout drawing of a building using different layer and line colors indicating all Building details. Name the details using text commands, Make a title Block.
3.	To Draw Orthographic projection Drawings (Front, Top and side) of boiler safety valve giving name the various components of the valve.
4.	Make an Isometric dimensioned drawing of a connecting Rod using isometric grid and snap.
5.	Draw quarter sectional isometric view of a cotter joint
6.	Draw different types of bolts and nuts with internal and external threading in Acme and square threading standards. Save the bolts and nuts as blocks suitable for insertion
7.	Draw 3D models by extruding simple 2D objects, dimension and name the objects
9.	Draw a spiral by extruding a circle.

RECOMMENDED BOOKS:

ТЕХТ ВООК	 CAD/ CAM by CADD CENTRE. CAD/ CAM Theory and Practice by Zeid, McGraw Hill
REFERENCE	1. CAD/CAM (Principles, Practice & Manufacturing Management) by Chirs Mc Mohan & Jimmie Browne, Published by Addison- Wesley

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	С	d	e	f	G	h	i	j	k
Course Learning Outcomes	4	2	3	1	1,2	2	4		3		3

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

ENGINEERING MECHANICS

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3 1 0

MODULE CODE	MECH2104
CREDIT POINTS	3.5
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. To get familiar with the basic concept of engineering mechanics force, moment and Couple.
- 2. To acquire knowledge about static equilibrium concepts commonly used in analysis and design of engineered structures.
- 3. To learn basic concepts of trusses and frames.
- 4. To understand the meaning of centers of gravity (mass)/centroids and moments of Inertia using.

LEARNING OUTCOMES:

- 1. Able to understand basic kinematics concepts displacement, velocity and acceleration (and their angular counterparts).
- 2. Ability to develop basic dynamics concepts force, momentum, work and energy.
- 3. Enhance the knowledge to apply Newton's laws of motion.
- 4. To acquire knowledge and understanding of applying other basic dynamics concepts the Work-Energy principle, Impulse-Momentum principle and the coefficient of restitution.
- 5. Extend all of concepts of linear kinetics to systems in general plane motion (applying Euler's Equation and considering energy of a system in general plane motion, and the work of couples and moments of forces).

COURSE CONTENT:

Unit I: Introduction

Force system, dimensions and units in mechanics, laws of mechanics, vector algebra, addition and subtraction of forces, cross and dot products of vectors, moment of a force about a point and axis, couple and couple moment, transfer of a force to a parallel position, resultant of a force system using vector method, Problems involving vector application Equilibrium: Static and dynamic equilibrium, static in determinacy, general equations of equilibrium, Varingnon's theorem, Lami's theorem, equilibrium of bodies under a force system, Problems.

Unit II: Truss and Frames

Truss, classification of truss, assumptions in truss analysis, perfect truss, analysis of perfect plane truss using method of joints and method of sections, Problems.

Unit III : Moment of Inertia

Centroid, Centre of mass and Centre of gravity, Determination of centroid, centre of mass and centre of gravity by integration method of regular and composite figures and solid objects, Area moment of inertia, mass moment of inertia, parallel axis and perpendicular axis theorems, radius of gyration, polar moment of inertia, product of inertia, principle axis, problem based on composite figures and solid objects.

Unit IV: Kinematics

Concept of rigid body, velocity and acceleration, relative velocity, translation and rotation of rigid bodies, equations of motion for translation and rotation, problems Kinetics of Particles: Equation of motion, rectilinear motion and curvilinear motion, work energy equation, conservation of energy, impulse and momentum conservation of momentum, impact of bodies, co-efficient of restitution, loss of energy during impact.

Unit V: Friction

Static and Kinetic friction, laws of dry friction, co-efficient of friction, angle of friction, angle of repose, cone of friction, friction lock, friction of flat pivot and collared thrust bearings, Belt drive- derivation of equation. T1/T2 =emq and its application

Unit VI : Variational Mechanics

Hamilton principle, Lagrange equations, principle of virtual work, methods of Minimum potential energy, stability.

RECOMMENDED BOOKS:

TEXT BOOK	 Engineering mechanics by R.K BANSAL Engineering mechanics by Dr. D.S KUMAR
REFERENCE	 Engineering Mechanics – Irving H. Shames, PHI Publication Engineering Mechanics – U.C.Jindal, Galgotia Publication Engineering Mechanics – A.K.Tayal, Umesh Publication

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5
Class Test	Х		Х		Х
Quiz			Х		Х
Assignment	Х	Х		Х	

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	В	с	d	e	f	G	h	i	j	k
Course Learning Outcomes	2	5		2	4		1	2		5	4

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review;
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

L T P 0 0 2

MODULE CODE	MECH2105
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

OBJECTIVES:

- 1. To determine the components of a force in rectangular or nonrectangular coordinates.
- 2. To determine the resultant of a system of forces.
- 3. To draw complete and correct free-body diagrams and write the appropriate equilibrium equations from the free-body diagram.
- 4. To acquire knowledge about support reactions on a structure.

LEARNING OUTCOMES:

- 1. Ability to understand measurement error, and propagation of error in processed data.
- 2. Exposure to basic kinematics concepts displacement, velocity and acceleration (and their angular counterparts).
- 3. Ability to understand basic dynamics concepts force, momentum, work and energy.
- 4. Ability to apply Newton's laws of motion.
- 5. Understand and be able to apply other basic dynamics concepts the Work-Energy principle, Impulse-Momentum principle and the coefficient of restitution.
- 6. Ability to extend all of concepts of linear kinetics to systems in general plane motion (applying Euler's Equation and considering energy of a system in general plane motion, and the work of couples and moments of forces).

1.	Verification of reciprocal theorem of deflection using a simply supported beam.
2.	Verification of moment area theorem for slopes and deflections of the beam.
3.	Elastic displacements (vertical & horizontal) of curved members.
4.	Experimental and analytical study of 3 hinged arch and influence line for horizontal thrust.
5.	Experimental and analytical study of behaviour of struts with various end conditions.
6.	To determine elastic properties of a beam.
7.	Experimental and analytical study of a 3 bar pin jointed Truss.
9.	Experimental and analytical study of deflections for unsymmetrical bending of a cantilever beam

RECOMMENDED BOOKS:

TEXT BOOK	 Engineering Mechanics – Irving H. Shames, PHI Publication Engineering Mechanics – U.C.Jindal, Galgotia Publication
REFERENCE	1. Engineering Mechanics – A.K.Tayal, Umesh Publication

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS)

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	с	d	e	f	g	h	i	j	k
Course Learning Outcomes	4	6	5	1	1,2		6		3,5		1,4

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

Management and Professional leadership

LTP

3 0 0

MODULE CODE	MGMT0101
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

The aim of this subject is to teach students how to design, write, and analyse the financial data of a firm or a company. It will also enable students to learn the complete accounting process.

- 1. To provide knowledge and understanding of the basics of management.
- 2. To develop an understanding of leadership and its styles.
- 3. To make them understand the role of planning, organizing and decision making to lead the organization.
- 4. To identity value of group involvement and team building.
- 5. To make them understand the role of communication to lead the organization.
- 6. To provide an understanding of role of motivation to lead in the organization.

Following this course student will be able to:

- 1. Develop an understanding of the process of management in the organizations and to apply that process for effective utilization of resources.
- 2. Develop an understanding of role of leadership in the organizations.
- 3. Acquaint themselves to apply leadership styles and theories as it relates to management practices.
- 4. Identify value of motivation, emotional intelligence and stability in resolving organizational problems.
- 5. Develop an understanding of communication and its role to the organization.
- 6. Analyse group formations, work team and team building strategies of the organization.

MODULE CONTENT

Unit 1: Management-introduction

Nature and functions of management, principles of management, levels of management, management as an art, management as science and profession, management process, managerial skills and roles; Evolution of Management Thoughts; Managerial competencies.

Unit II:: Basic concepts of Leadership

Leadership: Functions of leaders, styles of leadership , leadership theories- Trait theory, Behavioral Theory.

Unit III: Planning, Organizing and Decision making

Planning- process of planning, elements of planning; steps in Organizing , authority and responsibility , delegation, centralization vs. decentralization; decision making, rationality in decision making.

Unit IV:: Team Development

Work team , nature of work teams, types of team, stages of team development, role of leadership in team development.

UNIT-V: Communication

Communication: Communication process, importance of communication, communication channels, Roles and barriers to communication.

<u>Unit VI: Motivation</u> Motivation: Process and motivation models/approaches; relevance of motivation theories in Business.

ТЕХТ ВООК	 Fundamentals of Management: Robbins, S.P. and Decenzo, D.A Pearson Education Asia, New Delhi Organizational Behaviour: F Luthan's Tata McGraw Hill. New Delhi
REFERENCE	 Organizational behaviour: S P Robbins Prentice Hall of India, New Delhi Essentials of management: Chhabra T.N. , Sun India publications

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for Theory.

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	05
2.	Sessional Test	2	15
3.	Group Discussion	4	05
4.	End Semester Exam	1	75

Theory:

Assessments	1	2	3	4	5	6
Class Test	х			х		
Quiz			х			x
Assignment	х	х		х		x

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning Outcomes											

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

2 0 0

Aptitude – Part 1

MODULE CODE	VALU0119
CREDIT POINTS	2
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	50
END SEMESTER EXAM DURATION	2 hrs
LAST REVISION DATE	

INSTRUCTIONS: All questions are compulsory. Each question may have multiple options and will cover all units.

OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to analytical and business skills in Aptitude and to enhance skills as mentioned below:

- 1. To prepare students to develop basic understanding in Aptitude.
- 2. To acquire knowledge on various analytical tools.
- 3. To understand syntax and semantics of Aptitude in business.

LEARNING OUTCOMES:

- 1. Able to understand the basic fundamentals & concepts of Aptitude.
- 2. Exposure to various analytical tools used in business.
- 3. Ability to use different mathematical techniques.
- 4. Able to understand the importance of Aptitude.

MODULE CONTENTS

UNIT 1:- FUNDAMENTALS & USES OF ARITHMETIC-

Percentage, Ratio & Proportion: Percentage Meaning and Computations of Percentages, Definition of Ratio, Continued Ratio, Inverse Ratio, Definition of Proportion, Continued Proportion, Direct Proportion.

Profit And Loss :Terms and Formulae, Trade discount, Cash discount, Problems involving cost price, Selling Price, Trade discount and Cash Discount, Problems involving cost price, selling price, trade discount and cash discount.

Interest: Simple Interest, Compound Interest, Equated Monthly Instalments (EMI), Word Problems.

Sequence and Series: AP, GP (simple word problems only).

Average: Definition, meaning and simple problems on average.

UNIT 2: DATA ANALYSIS-

To understand different types of data format.

To acquire skills for analyzing different data format.

To understand scope and limitations of data uses in business.

Bar graph: Reading and interpretation of bar graph in vertical forms, reading scales, creating bar graph from given data, solving problems using information presented in bar graph.

Table: Creating table from given data, Reading and interpreting table, solving problems using information presented in table.

Line graph: Reading and interpreting line graph, solving problems using information presented in line graph.

Shares and Dividends: Concept of shares, stock exchange, Face value, Market value, Dividend, Equity shares, Preferential shares, Bonus share with examples.

Matrices and Determinants :Definition of Matrix ,Types of Matrix, Algebra of Matrix (Addition and Multiplication), Determinant, Adjoint of Matrix, Inverse of Matrix via Adjoint matrix, Solving simultaneous equations(Order3).

UNIT 3: ESSENTIALS OF LANGUAGE AND COMMUNICATION-

Speaking Skills: Formal and Informal Conversation, Conversation in the work place, Interviews, Public Speech, Lectures.

Listening Skills: Comprehending, Retaining, Responding, Tactics, Barriers to Listening, Overcoming listening barriers,

Misconception about listening.

Reading Skills: Acquiring Reading, Reading Development, Methods of Teaching, Reading difficulties.

Writing skills: Note-making, CV's, Report writing, Copy Writing, Agenda, Minutes, Circular, Essay writing on any current

issues, Paragraph, Essay Writing, Writing Research Papers, Dissertation.

<u>UNIT4:</u> Assignment 1, Assignment2, Project

	1. R S Agarwal quantitative aptitude book
TEXT BOOKS	2. Abhijit Guha quantitative aptitude book
	3. Minippally, Methukutty. M. 2001. Business Communication Strategies.
	11th Reprint. Tata McGraw – Hill. New Delhi.
	1. Aptitude books by Arihant publication
REFERENCE BOOKS	2. Swets, Paul. W. 1983. The Art of Talking So That People Will Listen:
	Getting Through to Family, Friends and Business Associates. Prentice Hall
	Press. New York.

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning Outcomes										1,2	3,4

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 75 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	1	10
2.	Sessional Test	2	15
3.	End Semester Written Exam	1	50

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4
Class Test	х	х	х	
Quiz	х	х	х	
Assignment			х	х

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

2 0 0

Professional Communication - I

SUBJECT CODE	VALU0123
CREDIT POINTS	2
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	50
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS : The question paper will consist of ten questions distributed over three sections A, B and C Section A comprise of one question carrying very short answer type questions and is compulsory, Section B comprise of two short answer type questions and Section C comprises of five long answer type questions These sections will also have internal choices of questions

OBJECTIVE

- 1. To learn the fundamentals of different structures of English grammar
- 2. To calculate the structures and patterns of English Language and to use them correctly in speaking
- 3. To learn about the creative literature writings
- 4. To improve speaking and writing
- 5. To inculcate professional skills of presenting and working
- 6. To understand different types of literatures and background with critical insights
- 7. To make students aware of the detailed exposition of English Language

LEARNING OUTCOMES

Following this course students will be able to :-

- 1. Identify the different structures and patterns of English Language
- 2. To make students a good Public Speaker
- 3. To make students aware about different literature of the World
- 4. To make students speak well in Professional English Speaking and writing highly professional in particular
- 5. Know the process of Communication and its ethics
- 6. To make students write in professional manner

MODULE CONTENT

UNIT : I GENERAL COMMUNICATION SKILLS

- Introduction to Communication
- Nature of Communication
- One-way versus two way Communication
- Characteristics of Communication and its objects
- Various stages of communication process
 - Downward/upward and Horizontal Communication
- Presentation Skills
- Introduction to the Novel
- Reading Comprehension and Group Discussion
- Tense-Formation
- Short Stories
 - o Joothan by Prem Chand
 - o Raja Rao (Kanthapura)
 - DH Lawrance (Sons and Lovers)

UNIT : II PATTERN AND STRUCTURE OF ENGLISH GRAMMAR AND EFFECTIVE SPEAKING

- Articles
- Quantifiers
- Usage of different comma's in writing
- Bio-data and resume writing
- Speech (Formation and public speaking)
- The Gift of Magi
- The lament, by Anton Chekov
- The Barber's trade union by Mulak Raj Anand
- Bertolt Brecht (The Good Woman of Setzuan)

UNIT : III LINGUISTICS AND PARALINGUISTIC FEATURES OF DELIVERY OF SPEECH

- What is Linguistics
- Passive Voice
- Adverbs
- Phrasal Verbs
- Modals
- Conjunctions
- Notice
- Reading Comprehension

• AS Prott (Virgin in the Carden)					
Caustava Elaubart Madama Boyary					
Caustave Flaubert Madalle Bovery Alice Wellver (Color Durple)					
• After watter (Color Furple)					
Artiala Writing					
Afficie witting The formation of words					
Formation of abstract Noung from Congrete Noung					
 Formation of abstract Nouns from Concrete Nouns Components of communication and their implementation 					
• Components of communication and their implementation					
• Formation of verbs from Noun					
LITEKAKI WORKS					
a. Joe Otton - what the Dutter Saw b. Leo Tolstow : Anakarenine					
c Ivan Turgeney :- Fathers and Son					
UNIT : V PROFESSIONAL SPEAKING SKILLS-I					
Professional Speaking (PUBLIC SPEAKING ART)					
Complaint and Job/Sales Letters					
 Noun and the number countable/uncountable/collective/abstract and material 					
• Syntax (Infinitive/General and different structures of Grammar					
 Past/Present and Future (Tense formation) 					
• Literary works					
• Tess of the d'urbervillers by Thomas hardy					
• The old man and the sea by Ernest Hemingway					
• Deliverane by Prem Chand					
• Jane Austen (Emma)					
UNIT : VI PROFESSIONAL SPEAKING SKILLS -II					
Derrida's views upon language					
Description of Tools of Communication					
One word Substitute					
Sentence Structure					
• Verb Patterns and their usage					
LITERARY WORKS					
a. GB Shaw :- Arms and the man					
b. JM Synge :- Playboy of the western world					
c. Jeanette winterson :- Oranges are not the only fruit					
d. SomerestMaugham :- Razor's edge					

Recommends Books

TEXT BOOK	Essential of Communication by BR Sharma
Reference	Derrida (Semiotics and Sign Structure)

MAPPING OF COURSE OBJECTIVES AGAINST STUDENTS LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e
Mapping of Course Objectives with	1,	1,	2,	2,	6,
Students Learning Outcomes	2,	2	3,	3,	7
	5		5	4,	
				5	

METHODS OF TEACHING AND STUDENT LEARNING

The subjects is delivered through lectures, on-line support, text book/course material reading and practical exercises Some videos will be shown to demonstrate certain concepts and research areas will be discussed Resources material is provided with the help of PDM Educational Directory Services (PEDS)

ASSESSMENT METHODOLOGIES

This subject will be evaluated for a total of 75 marks for theory

Assessment #	Type of Assessment	Per Semester	Maximum Mark
1	Class Text	4	05
2	Sessional Text	2	15
3	Group Discussion	4	05
4	End Semester Exam	1	50

EVALUATION

At the end of Semester Subject teacher will submit an evaluation report The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved The review report contains the following

- Approved refinement decisions due for implementation
- Actions taken based on previous subject review
- Problems encountered in the subject delivery
- Report discussed and analyzed action taken as a result of this process and are communicated to the main stakeholders

0 0 2

MODULE CODE	ENGL0109
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	
LAST REVISION DATE	

MODULE CONTENTS

<u>UNIT I:-</u> Writing Skills

- (A) Modes/Styles of Writing: Descriptive Writing, Narrative Writing, Expository Writing and Argumentative Writing.
- (B) Professional Writing: CV, Resume; Their Primary Focus, Special Features and Applications

UNIT II: PRESENTATION STRATEGIES & LISTENING SKILLS -

Reading and Understanding

- Close Reading
- Comprehension
- Summary Paraphrasing
- Analysis and Interpretation
- Translation (from Indian language to English and vice-versa) Literary/ Knowledge Texts

<u>UNIT III:</u> Introducing Verb Forms

Ordinary and Auxillary

- Be, have and do
- Action and State verbs
- Linking Verbs: be, appear, seem etc.
- Modals (functional and defective)

Non-Finite Verbs

• Verb+ Bare infinitive

- Verb + to-infinitive
- Gerund
- Verb+ to-infinitive or –ing
- Participles

<u>UNIT IV:</u> Communication

- Tips for Spoken English
- Conducting and Participating in Meetings
- Interviewing People: Guidelines for the Interviewer, Guidelines for the Interviewee

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark		
1	Internal Assessment	2	25		
2	External Assessment	1	25		

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning											
Outcomes											
At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

YOGA

L T P

2 0 0

MODULE CODE	VALU0118
CREDIT POINTS	1
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	25
END SEMESTER EXAM DURATION	1.5 hrs
LAST REVISION DATE	

INSTRUCTIONS: All questions are compulsory and each of the questions may have multiple options covering all units.

OBJECTIVES:

To develop understanding of moral values in different aspects of life for inculcating the skills as mentioned below:

- 1. To prepare students to develop basic understanding of Yoga.
- 2. To acquire knowledge on Yoga.
- 3. To understand the ethics, character building, leadership & goal setting.
- 4. To understand the success & personal growth.
- 5. To support the youth empowerment & health awareness.

LEARNING OUTCOMES:

- 1. Able to understand the Importance of Yoga in Life.
- 2. Able to understand principles, concepts, types, advantages and disadvantages of Yoga.
- 3. Ability to understand the life style management & self esteem.
- 4. Would behave morally in the society.

MODULE CONTENTS:

UNIT	1: INTRODUCTION OF YOGA
٠	Definition, Concept of Yoga
•	Path of Yoga
٠	Jnana Yoga
•	Bhakti Yoga

- Karma Yoga
- Raja Yoga

UNIT 2: PRINCIPLE OF YOGA

- Sthula Sharira
- Sukshma Sharira
- Karana Sharira

PANCH MAHABHUTA

- Akasha
- Vayu
- Agni
- Jal
- Prithvi

TANMATRAS (Five Elements)

- Sound (Shabda)
- Smell (Gandha)
- Taste (Rasa)
- Form (Rupa)
- Touch (Sparsha)

PANCHAKOSHA

- Annamya Kosha
- Pranamaya Kosha
- Manomaya Kosha
- Vignanamaya Kosha
- Anandamya Kosha

Panch Prana

- Prana
- <u>Apana</u>
- <u>Samana</u>
- <u>Udana</u>
- Vyana

SHAD CHAKRAS

Mooldhara Chakra

- <u>Svadisthan Chakra</u>
- Manipur Chakra
- Anahat Chakra
- Vishudhi Chakra
- <u>Ajna Chakra</u>
- Sahastra Chakra

UNIT 3: YOGA SUTRA OF MAHARSHI PATANJALI

Yoga sutra deals with the general nature of yoga and its technique. It is meant really to answer the question 'What is Yoga?' since Samadhi (self realization) is the essential technique of yoga.

UNIT 4: PRACTISE OF YOGA

- Shat Kriya
- Pranayama
- Asana (15 to 20 different asanas with their benefits and limitation)

RECOMMENDED BOOKS:

1. PATANJALI YOGA SUTRA BY SRI SRI RAVI SHANKER JI
2. BHAGWAT GITA
3. HATHA YOGA PRADIPIKA

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning Outcomes										1,2	3,4

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts, and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for theory.

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Sessional Test / Quiz	2	20
2.	Attendance	1	5
3.	End Semester Written Exam	1	25

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Assessments	1	2	3	4
Quiz & Assignment	х	х	х	
End Semester Written Exam			х	х
End Semester Oral Exam	х	х		х

EVALUATION

At the end of semester, the module incharge will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback on the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

MATERIAL SCIENCE

3 0 0

MODULE CODE	MECH2206
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. The student will be able to understand theory of structures of different elements.
- 2. To introduce students to the functional properties of materials and the roles of microstructure, defects and environment play in typical engineering applications.
- 3. The student will be able to understand binary phase diagram of different materials.
- 4. The student will be able to understand various heat treatment processes of the metals and alloys.
- 5. The student will be able to understand application of ceramic materials and advance material in daily life and effect on environment.

LEARNING OUTCOMES:

- 1. Learn to apply a knowledge of mathematics and advanced science and engineering principles to materials systems.
- 2. Exposure to design and conduct experiments and to analyze and interpret data.
- 3. Ability to learn to design a process, a microstructure, or a component to satisfy system needs
- 4. Be able to function on multidisciplinary teams.
- 5. Ability to identify, formulate, and solve engineering problems.
- 6. Able to understand professional and ethical responsibility.

COURSE CONTENT:

Unit I: Crystallography

Review of crystal structure, space lattice, crystal planes and crystal directions, co-ordination number, miller indices for directions and planes, voids in crystals, packing density in crystals. Number of atoms per unit cell, atomic packing factor, Numerical related to crystallography.

Unit II: Imperfection in metal crystals

Crystal imperfections and their classifications, point defects, line defects, edge & screw dislocations, surface defects, volume defects & effects of imperfections on metal properties. Characteristics of dislocations, generation of dislocations. Bonds in solids and characteristics of Metallic bonding, Deformation mechanisms and Strengthening mechanisms in structural materials.

Unit III : Solid solutions and phase diagram

Introduction to single and multiphase solid solutions and types of solid solutions, importance and objectives of phase diagram, cooling curves, unary & binary phase diagrams, Gibbs's phase rule, Lever rule, eutectic and eutectoid systems, peritectic and peritectoid systems, iron carbon equilibrium diagram and TTT diagram. Heat Treatment: Principles, purpose, classification of heat treatment processes, annealing, normalizing, stress relieving, hardening, tempering, hardenability, carburizing, nitriding, cyaniding, flame and induction hardening. Allotropic transformation of iron and steel, Properties of austenite, ferrite, pearlite, martensite.

Unit IV: Deformation of Metal

Elastic and plastic deformation, mechanism of plastic deformation, twinning, conventional and true stress strain curves for polycrystalline materials, yield point phenomena, strain ageing, work hardening, Bauschinger effect, season cracking. Recovery, re-crystallization and grain growth Failures of metals: process of fracture, types of fracture, fatigue failure, characteristics of fatigue, fatigue limit, mechanism of fatigue, factors affecting fatigue, failure analysis.

Unit V: Engineering alloys

Nano particles and Properties of Solid Surfaces and Thin Films, Mechanics of Biological Nanotechnology, Mechanical Properties of Nanostructure composites, ceramics, etc.

Heat resistant, corrosion resistant, super alloys, carbon and alloys tool steels and high-speed steels, ceramics: preparation and application

<u>Unit VI : Creep</u>

Definition and concept, creep curve, mechanism of creep, impact of time and temperature on creep, creep fracture, creep testing and prevention against creep. Corrosion: Mechanism, types of corrosion, effect of corrosion, prevention of corrosion.

RECOMMENDED BOOKS:

TEXT BOOK	 Material Science: V Ragvan Prentice Hall of India, New Delhi. Material science and Engineering: Dr. I P Singh Jain Brothers, New Delhi. Material science by O.P Khanna Material science by R.K Rajput
REFERENCE	 Material Science & Engineering: W D Callister Addition Wesly Publishing Co. New York. Material Science: G K Narula, K S Narula, V K Gupta Tata McGraw Hill, New Delhi. Science of Engineering Materials: C M Srivastava New Age International, New Delhi.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	05
2.	Sessional Test	2	15
3.	Group Discussion	4	05
4.	End Semester Exam	1	75

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6
Class Test	Х		Х		Х	
Quiz			Х		Х	Х
Assignment	Х	Х		Х		Х

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	с	d	e	f	G	h	i	j	k
Course Learning Outcomes	2,4	5		2,6	4	2		2		5,6	4

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review;
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

MATERIAL SCIENCE LAB

L T P

0 0 2

MODULE CODE	MECH2207
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

OBJECTIVES:

- 1. To get familiar with fundamental science and engineering principles relevant to materials.
- 2. To understand the relationship between Nano/microstructure, characterization, properties and processing and design of materials.
- 3. To have the experimental and computational skills for a professional career or graduate study in materials.
- 4. To acquire knowledge of the significance of research, the value of continued learning and environmental/social issues surrounding materials.
- 5. To communicate effectively, to work in teams and to assume positions as leaders.

LEARNING OUTCOMES:

- 1. Ability to apply a knowledge of mathematics and advanced science and engineering principles to materials systems.
- 2. Ability to design and conduct experiments and to analyse and interpret data.
- 3. Exposure to design a process, a microstructure, or a component to satisfy system needs.
- 4. Learn to function on multidisciplinary teams.
- 5. Learn to identify, formulate, and solve engineering problems.
- 6. Understand professional and ethical responsibility.

LIST OF EXPERIMENTS

1.	To study crystal structures of a given specimen.
2.	To study crystal imperfections in a given specimen.
3.	To study microstructures of metals/ alloys.
4.	To prepare solidification curve for a given specimen.
5.	To study heat treatment processes (hardening and tempering) of steel specimen.
6.	To study microstructure of heat-treated steel.
7.	To study thermo-setting of plastics.
9.	To study the creep behaviour of a given specimen.
10.	To study the mechanism of chemical corrosion and its protection.
11.	To study the properties of various types of plastics.
12.	To study Bravais lattices with the help of models.

RECOMMENDED BOOKS:

 Elements of Material Science and Engineering: VanVlack, Wesley Pub Comp Material Science - Narula, Narula and Gupta. New Age Publishers).
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REFERENCE	 Material Science & Engineering –V. Raghvan, Prentice Hall of India Pvt. Ltd, New Delhi Engineering Materials: Kenneth G. Budinski, Prentice Hall of India, New Delhi
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METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	G	h	i	j	k
Course Learning Outcomes	4	2	3,5	1,6	1,2	2	4,6		3,5		3

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

METAL CUTTING AND TOOL DESIGN

L T P

3 0 0

MODULE CODE	MECH2208
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. The course provides students with fundamental knowledge and principles in material removal processes.
- 2. In this course, the students apply the fundamentals and principles of metal cutting to practical applications through multiple labs using lathes, milling machines, grinding machines, and drill presses, Computer Numerical Control etc.
- 3. To demonstrate the fundamentals of machining processes and machine tools.
- 4. To develop knowledge and importance of metal cutting parameters.
- 5. To understand fundamental knowledge on tool materials, cutting fluids and tool wear mechanisms.
- 6. To apply knowledge of basic mathematics to calculate the machining parameters for different machining processes.

LEARNING OUTCOMES:

- 1. Apply cutting mechanics to metal machining based on cutting force and power consumption.
- 2. Exposure to operate lathe, milling machines, drill press, grinding machines, etc.
- 3. Ability to select cutting tool materials and tool geometries for different metals.
- 4. Exposure to appropriate machining processes and conditions for different metals.
- 5. Able to learn machine tool structures and machining economics.
- 6. Ability to write simple CNC programs and conduct CNC machining.

COURSE CONTENT:

Unit I: Introduction

Definition of feed, depth of cut and cutting speed. Concept of specific cutting energy in metal cutting and Numerical based on calculation of machining time on lathe, drilling machine, shaper, milling Machine and grinding machines considering specific cutting energy of materials.

Theory of Metal Cutting

Orthogonal and oblique cutting, tool geometry (ASA & ISO), types of chips, Factors affecting the chip formation, Cutting forces in orthogonal cutting and their measurement, Merchant circle and derivation of relationships between the cutting forces, chip thickness ratio, shear angle, stress and strain in the chip, work done and power required in metal cutting and 'size effect', apparent mean shear strength of work material.

Unit II: Ernst Merchant Theory

Ernst Merchant Theory, its assumptions and modifications. Relationship between cutting velocity, shear velocity and chip flow velocity. Mechanism of friction at chip-tool interface. Numerical Based on metal-cutting. Lee & Shafer Theory – slip line method, determination of shear angle by Mohr's circle.

Unit III : Machinability

Machinability and its criteria, forms of tool-wear in metal cutting, tool-life and its criteria, effect of different cutting parameters on tool-life. Economics of machining and numerical. Cutting fluids, their physical action and applications. Grinding: Specifications of grinding wheel, Mechanics of grinding, effect of grinding conditions and type of grinding on wheel behaviour, equivalent diameter of grinding wheel.

Unit IV: Cutting Tool Design

General considerations, study of angle for single point cutting and drill. Principles of different cutting tool materials and their important characteristics. Geometry of a drill. Basic principles of design of a single point and multiple point tools i.e. broaches and twist drill.

Unit V: Jigs & Fixtures

Important considerations in jigs and fixture design. Main principles of designing of jigs & fixtures, elements of Jigs and fixtures. Different devices and methods of locations. Different types of clamps used in jigs & fixtures.

Unit VI : Heat Generation in Metal Cutting

Heat generation and temperature distribution in metal cutting. Calculation of temperature in primary and secondary deformation zones and their measuring methods.

RECOMMENDED BOOKS:

TEXT BOOK	 B.L. Juneja, G. S. Sekhon, Nitin Seth" Fundamental of Metal Cutting and Machine Tools", New Age International 2ndedition, P. H. Joshi" Jigs and Fixtures", 2ndEdition TMH G.K. Lal "Introduction to Machining Science", New age International.
REFERENCE	 Geoffrey Boothroyd, "Fundamentals of Metal Machining & Machine Tools", TMH P.N. Rao, "Manufacturing Technology", Tata McGraw Hill Publication Ltd.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	05
2.	Sessional Test	2	15
3.	Group Discussion	4	05
4.	End Semester Exam	1	75

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6
Class Test	Х		Х		Х	Х
Quiz			Х		Х	
Assignment	Х	Х		Х		Х

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	с	d	e	f	G	h	i	j	k
Course Learning	4	5		6	4	2		3		5.6	1
Outcomes				0		-				2,0	1

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review;

• Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

METAL CUTTING AND TOOL DESIGN LAB	L	Т	Р
	0	0	2

MODULE CODE	MECH2209
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

OBJECTIVES:

- 1. The course provides students with fundamental knowledge and principles in material removal processes.
- 2. In this course, the students apply the fundamentals and principles of metal cutting to practical applications through multiple labs using lathes, milling machines, grinding machines, and drill presses, Computer Numerical Control etc.
- 3. To demonstrate the fundamentals of machining processes and machine tools.
- 4. To develop knowledge and importance of metal cutting parameters.
- 5. To develop fundamental knowledge on tool materials, cutting fluids and tool wear mechanisms.
- 6. To apply knowledge of basic mathematics to calculate the machining parameters for different machining processes.

LEARNING OUTCOMES:

- 1. Ability to apply cutting mechanics to metal machining based on cutting force and power consumption.
- 2. Able to operate lathe, milling machines, drill press, grinding machines, etc.
- 3. Ability to select cutting tool materials and tool geometries for different metals.
- 4. Exposure to select appropriate machining processes and conditions for different metals.
- 5. Able to learn machine tool structures and machining economics.
- 6. Enhance the skills to write simple CNC programs and conduct CNC machining.

LIST OF EXPERIMENTS

1.	Economic analysis of tooling.
2.	Step Turning and Taper Turning on Lathe.
3.	Design a Jig (CAD) and fabricate.
4.	Design a blanking (progressive) die (CAD).
5.	Thread Cutting and Knurling on Lathe.
6.	Lathe Tool and Drill Tool Dynamometers.
7.	Design a welding fixture (CAD).
8.	Making Internal Splines using Slotting Machine.
9.	Grinding of Single Point Cutting Tool.
10.	Planning Machine.

RECOMMENDED BOOKS:

TEXT BOOK	 B.L. Juneja, G. S. Sekhon, Nitin Seth" Fundamental of Metal Cutting and Machine Tools", New Age International 2ndedition, P. H. Joshi" Jigs and Fixtures", 2ndEdition TMH
REFERENCE	 Geoffrey Boothroyd, "Fundamentals of Metal Machining & Machine Tools", TMH P.N. Rao, "Manufacturing Technology", Tata McGraw Hill Publication Ltd.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	с	d	e	f	g	h	i	j	k
Course Learning Outcomes	6	2	5	1	2		2		4,5		3

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

ENERGY MANAGEMENT PRINCIPLES

LTP

3 1 0

MODULE CODE	MECH2210
CREDIT POINTS	3.5
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. To understand and apply the basics of calculations related to material and energy flow in the processes.
- 2. To study various types of conventional and non-conventional energy resources including solid, liquid and gaseous fuels.
- 3. To make student understand environmental regulatory legislations and standards and climate changes.

LEARNING OUTCOMES:

- 1. Ability to make material balances on unit operations and processes.
- 2. Exposure to perform simultaneous material and energy balances.
- 3. An understanding of the degrees of freedom analysis and its significance.
- 4. Able to understand the concept of humidity and usage of psychometric chart.

COURSE CONTENT:

<u>Unit I:</u> Introduction: Energy and the environment, energy and development, energy demand and supply, energy sources and production.

<u>Unit II:</u> Pattern of energy used in domestic, agricultural and industrial production, commercial and service sectors.

Unit III : Energy conservation and efficient use of energy, Green architecture and green city

Unit IV: Clean energy and alternatives source of energy, energy technology.

Unit V: Value engineering and management, energy inefficiency, energy economics.

Unit VI: Energy management and conservation: steps in energy management,

RECOMMENDED BOOKS:

TEXT BOOK	 O'Callaghan, Paul W. Energy management. London: McGraw- Hill.1993.
REFERENCE	1 Energy-environment linkages in the urban sector. Washington, D.C.:WorldBank.1991.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4
Class Test	Х		Х	
Quiz			Х	
Assignment	Х	Х		X

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	G	h	i	j	k
Course Learning	4	2		3	4	2.3		3		2	1
Outcomes	•	-		5	•	-,5		2		-	1

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review;
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

RAPID PROTOTYPING	L	Т	Р
	3	1	0
MODULE CODE	MECH2211		

CREDIT POINTS	3.5
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. To develop Understanding of the various rapid prototyping, rapid tooling, and reverse engineering technologies.
- 2. To select appropriate technologies for product development purposes.
- 3. To achieve knowledge of basic principles of rapid prototyping (RP), rapid tooling (RT), and reverse engineering (RE) technologies to product development.
- 4. Decipher the limitations of RP, RT, and RE technologies for product development.
- 5. Realize the application of RP, RT, and RE technologies for product development.

LEARNING OUTCOMES:

- 1. Able to describe the current available rapid prototyping systems, their fundamental operating principles, and their characteristics.
- 2. Able to describe complementary, secondary fabrication processes commonly used with the above rapid prototyping systems.
- 3. Ability to select the appropriate fabrication technology, or technologies, for a given prototyping task.
- 4. Ability to decipher the limitations of RP, RT, and RE technologies for product development.
- 5. Exposure to realize the application of RP, RT, and RE technologies for product development.

COURSE CONTENT:

<u>Unit I:</u>

Development – Benefits- Applications – Digital prototyping – Virtual Prototyping. Liquid Based and Solid Based Rapid Prototyping Systems Stereo lithography Apparatus, Fused deposition Modelling, Laminated object manufacturing, three dimensional printing: Working Principles, details of processes, products, materials, advantages, limitations and applications - Case studies.

<u>Unit II:</u>

Powder Based Rapid Prototyping Systems Selective Laser Sintering, Direct Metal Laser Sintering, Three Dimensional Printing, Laser Engineered Net Shaping, Selective Laser Melting, Electron Beam Melting: Processes, materials, products, advantages, applications and limitations – Case Studies.

Unit III :

Reverse Engineering and Cad Modelling Basic concept- Digitization techniques – Model Reconstruction – Data Processing for Rapid Prototyping: CAD model preparation, Data Requirements – geometric modelling techniques: Wire frame, surface and solid modelling – data formats - Data interfacing

Unit IV:

Rapid Tooling Classification: Soft tooling, Production tooling, Bridge tooling; direct and indirect – Fabrication processes, Applications. Case studies - automotive, aerospace and electronics industries.

<u>Unit VI :</u>

Part orientation and support generation, Support structure design, Model Slicing and contour data organization, direct and adaptive slicing, Tool path generation.

RECOMMENDED BOOKS:

TEXT BOOK	 Rapid prototyping: Principles and applications, second edition, Chua C.K., Leong K.F., and Lim C.S., World Scientific Publishers, 2003 Rapid Tooling: Technologies and Industrial Applications, Peter D. Hilton, Hilton/Jacobs, Paul F.Jacobs, CRC press, 2000.
REFERENCE	 Energy – resources, demand and conservation with reference to India – Chaman Kashkari, TMH. Integrated renewable energy for rural development– Proc. of natural solar energy convention, Calcutta

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark		
1.	Class Test	4	10		
2.	Sessional Test	2	30		
3.	Group Discussion	4	10		
4.	End Semester Exam	1	100		

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5
Class Test	Х		Х		Х
Quiz			Х		Х
Assignment	Х	Х		Х	

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning	4	5	3,4		4,5	2		3	2	5	
Outcomes											

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review;
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

MODULE CODE	CATEG	SUB- CATEGOR	MODULE		Т	Р	C	INTERN	EXTE	TOTAL
		Y						MARKS	L	
									MAR	
MECH2112	E	PC	FLUID MECHANICS	3	1	0	3.5	50	100	150
MECH2113	E	PC	FLUID MECHANICS LAB	0	0	2	1	25	25	50
MECH2114	E	PC	MANUFACTURING TECHNOLOGY	3	1	0	3.5	50	100	150
MECH2115	E	PC	MANUFACTURING TECHNOLOGY LAB	0	0	2	1	25	25	50
MECH2116	E	PC	STRENGTH OF MATERIALS-1	3	1	0	3.5	50	100	150
MECH2117	E	PC	STRENGTH OF MATERIALS-1 LAB	0	0	2	1	25	25	50
MECH2118	E	PC	KINEMATICS OF MACHINE	3	1	0	3.5	50	100	150
MECH2119	E	PC	KINEMATICS OF MACHINE LAB	0	0	2	1	25	25	50
MECH2120	E	PC	CREO	3	0	0	3	25	75	100
MECH2121	E	PC	CREO LAB	0	0	2	1	25	25	50
	E	PE	ELECTIVE- III	3	0	0	3	25	75	100
	E	PE	ELECTIVE- III LAB	0	0	2	1	25	25	50
	E	PE	ELECTIVE-IV	3	0	0	3	25	75	100
		TO.	TAL	21	4	12	29	425	775	1200

- L = Lecture
- T = Tutorial
- P = Practical
- C = Credit Point

ELECTIVES

MODULE COD	E ELECTIVE-III	MODULE CODE	ELECTIVE-IV	
MECH2222	STEAM & POWER GENERATION	MECH2228	QUALITY ENGINEERING	
		MECH2229	COMPUTER INTEGRATED MFG.	
	STEAM & POWER GENERATION			
MECH2223	LAB			
	RENEWABLE ENERGY			
MECH2224	RESOURCES			
	RENEWABLE ENERGY			
MECH2225	RESOURCES LAB			
	MANAGEMENT OF			
MECH2226	MANUFACTURING SYSTEM			
	MANAGEMENT OF			
MECH2227	MANJUFACTURING SYSTEM LAB			

FLUID MECHANICS

L T P

3 1 0

MODULE CODE	MECH2112
CREDIT POINTS	3.5
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. To understand the relation of fluid mechanics: viscosity, density, specific gravity, and surface tension.
- 2. To understand the concept of hydrostatic pressure at any depth in a fluid or fluid combination.
- 3. To determine the magnitude, direction and location of the resultant hydrostatic force acting on any submerged surface.
- 4. To impart the knowledge of Bernoulli Equation and to calculate pressure head, velocity head, or elevation head

LEARNING OUTCOMES:

- 1. Ability to understand basic principles of fluid mechanics.
- 2. Ability to analyze fluid flow problems with the application of the momentum and energy Equations.
- 3. Capability to analyze pipe flows as well as fluid machinery.
- 4. Able to apply fundamental concepts of thermodynamics to engineering applications.

COURSE CONTENT:

Unit I: Fluid Properties and Fluid Statics

Concept of fluid and flow, ideal and real fluids, continuum concept, and properties of fluids, Newtonian and non-Newtonian fluids. Pascal's law, hydrostatic equation, hydrostatic forces on plane and Curved surfaces ,stability of floating and submerged bodies, relative equilibrium, Problems, Introduction of CFD, Applications of CFD

Unit II: Fluid Kinematics

Eulerian and Lagrangian description of fluid flow; stream, streak and path lines; types of flows, flow rate and continuity equation, differential equation of continuity in cylindrical and polar coordinates, rotation, vorticity and circulation, stream and potential functions, flow net, Problems.

Unit III : Fluid Dynamics

Concept of system and control volume, Euler's equation, Bernoulli's equation, venturi meter, orifices, orifice meter, mouthpieces, kinetic and momentum correction factors, Impulse momentum relationship and its applications, Problems.

Unit IV: Compressible Fluid Flow

Introduction, continuity momentum and energy equation, sonic velocity, propagation of elastic waves due to compression of fluid, propagation of elastic waves due to disturbance in fluid, stagnation properties, isentropic flow, effect of area variation on flow properties, isentropic flow through nozzles, diffusers, injectors, Problem, Viscous Flow: Flow regimes and Reynolds's number, Relationship between shear stress and pressure gradient, uni-directional flow between stationary and moving parallel plates, movement of piston in a dashpot, power absorbed in bearings. Problems.

Unit V: Boundary Layer Flow

Boundary layer concept, displacement, momentum and energy thickness, von-Karman momentum integral equation, laminar and turbulent boundary layer flows, drag on a flat plate, boundary layer separation and control. Streamlined and bluff bodies lift and drag on a cylinder and an airfoil, Turbulent Flow: Shear stress in turbulent flow, Prandtl mixing length hypothesis, hydraulically smooth and rough pipes, velocity distribution in pipes

Unit VI : Flow Through Pipes

Major and minor losses in pipes, Hagen-Poiseuilli law, hydraulic gradient and total energy lines, series and parallel connection of pipes, branched pipes; equivalent pipe, power transmission through pipes, Problems.

RECOMMENDED BOOKS:

TEXT BOOK	 Fluid Mechanics-Streeter V L and Wylie E B, McGraw Hill Mechanics of Fluids- I H Shames, McGraw Hill
REFERENCE	 Introduction to Fluid Mechanics and Fluid Machines – S.K. Som and G.Biswas,TMH Fluid Mechanics and Fluid power Engineering – D.S. Kumar ,S.K. Kataria and Son Fluid Mechanics- RK Bansal

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark		
1.	Class Test	4	10		
2.	Sessional Test	2	30		
3.	Group Discussion	4	10		
4.	End Semester Exam	1	100		

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4
Class Test	Х		Х	
Quiz			Х	
Assignment	Х	Х		Х

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning Outcomes	4	3		2,4	3		1	2		2	4

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review;
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

FLUID MECHANICS LAB

L T P

0 0 2

MODULE CODE	MECH2113
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

OBJECTIVES:

- 1. To develop an appreciation for the properties of Newtonian fluids.
- 2. To get familiar with study analytical solutions to variety of implied problems.
- 3. To apply concepts of mass, momentum and energy conservation to flows.
- 4. To grasp the basic ideas of turbulence.

LEARNING OUTCOMES:

- 1. To achieve knowledge of basic principles of fluid mechanics.
- 2. Ability to analyze fluid flow problems with the application of the momentum and energy equations.
- 3. Able to analyze pipe flows as well as fluid machinery.
- 4. Exposure to understand the dynamics of fluid flows and the governing non-dimensional parameters.
LIST OF EXPERIMENTS

1.	To determine the coefficient of impact for vanes.
2.	To determine coefficient of discharge of an orifice meter.
3.	To determine the coefficient of discharge of Notch (V and Rectangular types).
4.	To determine the friction factor for the pipes.
5.	To determine the coefficient of discharge of venturimeter.
6.	To determine the coefficient of discharge, contraction & velocity of an orifice.
7.	To verify the Bernoulli's Theorem.
9.	To find critical Reynolds number for a pipe flow.
10.	To determine the meta-centric height of a floating body.
11.	To determine the minor losses due to sudden enlargement, sudden contraction and bends.
12.	To show the velocity and pressure variation with radius in a forced vertex flow.
13.	To verify the momentum equation.

RECOMMENDED BOOKS:

ТЕХТ ВООК	 Fluid Mechanics-Streeter V L and Wylie E B, McGraw Hill Mechanics of Fluids- I H Shames, McGraw Hill
REFERENCE	 Introduction to Fluid Mechanics and Fluid Machines – S.K. Som and G.Biswas,TMH Fluid Mechanics and Fluid power Engineering – D.S. Kumar ,S.K. Kataria and Son Fluid Mechanics- RK Bansal

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning	2	2	2		1.2		4		2	r	1
Outcomes	5	2	3		1,2		4		5	2	1

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

MANUFACTURING TECHNOLOGY

L T P

3 1 0

MODULE CODE	MECH2114
CREDIT POINTS	3.5
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. Students will be able to understand the machining processes and monitor tool wear.
- 2. The get familiar with concepts of the limits, fits, tolerance and allowance.
- 3. The demonstrate the use of forming processes like casting, injection molding, bending, stamping, forging, rolling, extruding, other working process and defects.
- 4. Student will able to understand the application and needs of fixture and mass production.
- 5. To achieve an understanding on concept of welding and allied process its application.

LEARNING OUTCOMES:

- 1. Ability to understand the principles and techniques of casting, forming, joining and finishing operations and be able to determine their suitability.
- 2. Ability to calculate and understand appropriate single-point machining relationships taking tool material and machine constraints into consideration.
- **3**. Enhance the knowledge of principles and appropriateness of non-traditional machining processes.
- 4. Select a suitable manufacturing process in order to achieve the specified product performance and design criterion while considering cost.

COURSE CONTENT:

Unit I: Moulding

Introduction to sand moulding, Pattern design, Pattern layout and construction, testing of moulding sand. moulding and core making machines, CO2 - Process, fluid sand process, shell moulding, cold curing process, hot-box method, flask less moulding, Design of metal moulds, Die Design for die Casting.

Unit II: Casting

Directional principles, Solidification, types of gating systems, Pouring time and temperature. Design criteria of pouring basin, sprue, runner, gate and riser, gating ratio- related numerical problems, Use of chaplet, chills and padding.

Unit III : Numeric controls of machine tools

Introduction, numerical control and its growth, NC machine tools, Axes of NC machines, Classification of NC system, CNC, DNC and machining centre, Machine control unit, NC tool and tool changer.

Unit IV: Mechanism of Metal Cutting

Deformation of metal during machining, nomenclature of lathe, milling tools, mechanics of chip formation, built-up edges, mechanics of orthogonal and oblique cutting, Merchant cutting force circle and shear angle relationship in orthogonal cutting, factors affecting tool forces. Cutting speed, feed and depth of cut, surface finish.

Unit V: Metal Forming

Introduction to Metal Forming, Elastic & plastic deformation, Hot working and cold working. Work required for forging, Hand, Power, Drop forging. Analysis of wire drawing and maximum reduction. Tube drawing, Extrusion, types and its application. Rolling process, rolling mills & rolled-sections. Defects in metal forming processes.

<u>Unit VI</u>: Temperature distribution at tool chip interface. Numerical on cutting forces and Merchant circle. Sheet metal processes, shearing, calculation of punch force, shearing dies, stretch forming, Deep drawing and its analysis.

TEXT BOOK	 Manufacturing Engineering Technology, K. Jain, Pearson Education. Manufacturing Technology: Foundry, Forming and Welding by
	P.N. Rao, TMH.
REFERENCE	 Production Engineering Sciences by P.C. Pandey and C.K. Singh, Standard Publishers Ltd. Manufacturing Science by A. Ghosh and A.K. Mallick, Wiley Eastern.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4
Class Test	Х		Х	
Quiz			Х	
Assignment	Х	Х		Х

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	2	1		3,4	2		2	3			4

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review;
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

MANUFACTURING TECHNOLOGY LAB

L T P

0 0 2

MODULE CODE	MECH2115
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

OBJECTIVES:

- 1. To impart knowledge to students in the latest technological topics on Production and Industrial engineering and to provide them with opportunities in taking up advanced topics in the field of study.
- 2. To create a congenial environment that promotes learning, growth and imparts ability to work with multi-disciplinary groups in professional, industry and research organizations.
- 3. To broaden and deepen their capabilities in analytical and experimental research methods, analysis of data and drawing relevant conclusions for scholarly writing and presentation.
- 4. To provide guidance to students for their choices in research and professional career outlook and to encourage students to take up research.

LEARNING OUTCOMES:

- 1. Able to achieve fundamental knowledge and understanding of Production and Industrial Engineering.
- 2. Exposure to acquire abilities and capabilities in the areas of advanced manufacturing methods, quality assurance and shop floor management.
- 3. Able to formulate relevant research problems, conduct experimental and/or analytical work and analyze results using modern mathematical and scientific methods.
- 4. Ability to review and document the knowledge developed by scholarly predecessors and critically assess the relevant technological issues.
- 5. Ability to design and validate technological solutions to defined problems and write clearly and effectively, for the practical utilization of their work.

LIST OF EXPERIMENTS

1.	Study and Practice of Orthogonal & Oblique Cutting on a Lathe
2.	Machining time calculation and comparison with actual machining time while cylindrical turning on a Lathe and finding out cutting efficiency.
3.	Study of Tool Life while Milling a component on the Milling Machine
4.	Study of tool Wear of a cutting tool while Drilling on a Drilling Machine.
5.	To determine the coefficient of discharge of venturimeter.
6.	Study of Speed, Feed, Tool, Preparatory (Geometric) and Miscellaneous functions for N. C part programming.
7.	Part Programming and proving on a NC lathe for: a. Outside Turning b. Facing and Step Turning c.Taper Turning d. Drilling e. Outside Threading
8.	Part Programming and Proving on a NC Milling Machine: a. Point to Point Programming b. Absolute Programming c. Incremental Programming

RECOMMENDED BOOKS:

TEXT BOOK	 Manufacturing Technology –Vol2, P.N. Rao, T.M.H, New Delhi Computer Aided Manufacturing: S Kumar & B Kant Khan, Satya Prakashan, New Delhi
REFERENCE	 Text Book of Production Engineering: P.C. Sharma, S.Chand & Sons. Production Engineering by KC Jain & AK Chilate, PHI, New Delhi

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning	5	1		2	1 2 5		5		1	r	2
Outcomes	5	4		Δ	1,2,3		5		4	7	5

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

3 1 0

MODULE CODE	MECH2116
CREDIT POINTS	3.5
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. To achieve knowledge of basic methodologies of deformable bodies under the action of forces and torques.
- 2. To learn about various loading applied on the beam.
- 3. To understand the empirical formula of Columns & Struts.
- 4. To enable learner to develop skills to find out Slope & Deflection in beam.

LEARNING OUTCOMES:

- 1. Ability to analyze and design structural members subjected to tension, compression, torsion, bending and combined stresses using the fundamental concepts of stress, strain and elastic behavior of materials.
- 2. Exposure to utilize appropriate materials in design considering engineering properties, sustainability, cost and weight.
- 3. Ability to perform engineering work in accordance with ethical and economic constraints related to the design of structures and machine parts
- 4. Able to develop skills for analysis of various bending and shear stress in different section of beam.

COURSE CONTENT:

Unit I: Simple Stresses & Strains

Concept & types of Stresses and strains, Poison's ratio, stresses and strain in simple and compound bars under axial loading, stress strain diagrams, Hooks law, elastic constants & their relationships, temperature stress & strain in simple & compound bars under axial loading, Numerical.

<u>Compound Stresses & Strains:</u> Concept of surface and volumetric strains, two dimensional stress system, conjugate shear stress at a point on a plane, Complementary shear stress, principle stresses & strains and principal- planes, Mohr's circle of stresses, Mohr's circle of Strain, Numerical.

Unit II: Shear Force & Bending Moments

Definitions, SF & BM diagrams for cantilevers, simply supported beams with or without over-hang and calculation of maximum BM & SF and the point of contra-flexure under (i) concentrated loads, (ii) uniformly distributed loads over whole span or a part of it, (iii) combination of concentrated loads and uniformly distributed loads, (iv) uniformly varying loads and (v) application of moments, relation between the rate of loading, the shear force and the bending moments, Problems.

Unit III : Torsion of Circular Members

Torsion of thin circular tube, Solid and hollow circular shafts, tapered shaft, stepped shaft & composite circular shafts, combined bending and torsion, Strain energy in torsion, Power Transmitted by circular shaft equivalent torque, effect of end thrust. Numerical.

Bending & Shear Stresses in Beams: Bending stresses in beams with derivation & application to beams of circular, rectangular, I,T and channel sections, composite beams, shear stresses in beams with combined bending, torsion & axial loading of beams. Numerical.

Unit IV: Columns & Struts

Column under axial load, concept of instability and buckling, slenderness ratio, derivation of Euler's formulae for the elastic buckling load, Eulers, Rankine, Gordon's formulae Johnson's empirical formula for axial loading columns and their applications, eccentric compression of a short strut of rectangular & circular sections, Numerical.

Unit V: Slope & Deflection

Relationship between bending moment, slope & deflection, Mohr's theorem, moment area method, method of integration, Macaulay's method, calculations for slope and deflection of (i) cantilevers and (ii) simply supported beams with or without overhang under concentrated load, Uniformly distributed loads or combination of concentrated and uniformly distributed loads, Numerical.

Unit VI: Fixed Beams

Deflections, reactions and fixing moments with SF & BM calculations & diagrams for fixed beams under (i) concentrated loads, (ii) uniformly distributed load and (iii) a combination of concentrated loads & uniformly distributed load. Continuous Beams: Bending moment diagram for continuous beams, Clapeyron's equation, Application of clapeyron's equation of three moments to continuous beams with (i) simply supported ends (ii) Fixed end supports

RECOMMENDED BOOKS:

TEXT BOOK	 Strength of Materials – G.H.Ryder - Macmillan, India Strength of Materials – Andrew Pytel and FredinandL.Singer, Addison – Wesley
REFERENCE	 Strength of Materials – Popov, PHI, New Delhi. Strength of Materials A Rudimentary Approach – M.A. Jayaram, Sapna Book House, Bangalore

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4
Class Test	Х		Х	
Quiz		Х	Х	
Assignment	Х	Х		Х

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	с	d	e	f	g	h	i	j	k
Course Learning Outcomes	3	1,4		3	2		1	3			4

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review;
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

STRENGTH OF MATERIALS -I LAB

L T P

0 0 2

MODULE CODE	MECH2117
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

OBJECTIVES:

- 1. To define direct normal stress and direct shear stress and compute their values
- 2. To describe ductile and brittle behavior of materials, emphasizing design implications.
- 3. To calculate shear stress distribution in solid and hollow round members under torsional loading conditions.
- 4. To design shafts for various conditions of power transmission and rotational speed
- 5. To determine shear and bending moment diagrams for variously loaded and supported beams, using graphical calculus.

LEARNING OUTCOMES:

- 1. Able to analyse and design structural members subjected to tension, compression, torsion, bending and combined stresses using the fundamental concepts of stress, strain and elastic behaviour of materials.
- 2. Ability to utilize appropriate materials in design considering engineering properties, sustainability, cost and weight.
- 3. Ability to perform engineering work in accordance with ethical and economic constraints related to the design of structures and machine parts.
- 4. Able to have understanding of analytic methods used in connection with the structural design of columns, long mechanical members under compression
- 5. Ability to design beams based on allowable normal and shear stresses and maximum allowable deflection

LIST OF EXPERIMENTS

1.	To study the Brinell hardness testing machine & perform the Brinell hardness test.
2.	To study the Rockwell hardness testing machine & perform the Rockwell hardness test.
3.	To study the Vickers hardness testing machine & perform the Vickers hardness test.
4.	Study of tool Wear of a cutting tool while Drilling on a Drilling Machine.
5.	To study the Ericson sheet metal testing machine & perform the Ericson sheet metal test.
6.	To study the Impact testing machine and perform the Impact tests (Izod & Charpy).
7.	To study the Universal testing machine and perform the tensile test.
8.	To perform compression & bending tests on UTM.
9.	To study the torsion testing machine and perform the torsion test.
10.	To draw shear Force, Bending Moment Diagrams for a simply Supported Beam under Point and Distributed Loads.
11.	To determine Mechanical Advantage and Efficiency of Single and Double Purchase Winch Crab.
12.	To determine Mechanical Advantage and Efficiency of Worm and Worm Gear of Single, Double and Triple start.
13.	To determine Mechanical Advantage, Efficiency of Simple and Compound Screw Jack.
14.	To find Moment of Inertia of a Fly Wheel.

RECOMMENDED BOOKS:

TEXT BOOK	 Strength of Materials – G.H.Ryder - Macmillan, India Strength of Materials– Andrew Pytel and Fredinand L.Singer, Addison – Wesley
REFERENCE	 Strength of Materials – Popov, PHI, New Delhi. Strength of Materials A Rudimentary Apprach – M.A.Jayaram, Sapna Book House, Bangalore

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark		
1	Internal Assessment	2	25		
2	External Assessment	1	25		

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	с	d	e	f	g	h	i	j	k
Course Learning	2	2		5	2.2		2		1	4	2
Outcomes	2	5		5	2,3		5		1	4	2

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

KINEMATICS OF MACHINE

L T P

3 1 0

MODULE CODE	MECH2118
CREDIT POINTS	3.5
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. To get familiar with mechanisms, linkages of machine and degree of freedom.
- 2. To understand the kinematic analysis of plane mechanism.
- 3. To study the cam and follower motion and synthesis of cam profile by graphical method.
- 4. To understand the classification of gears, gear trains and their terminology.

LEARNING OUTCOMES:

- 1. Able to build up critical thinking and problem solving capacity of various mechanical engineering problems related to kinematics of machines.
- 2. Ability to asses various concepts of mechanisms like straight line motion mechanisms, Steering gear mechanisms and working principles of power elements (Gears, gear trains, Cams, Belt and Chain drives) and design related problems effectively.
- 3. Ability to utilize analytical, mathematical and graphical aspects of kinematics of Machines for effective design
- 4. Exposure to comprehend the fundamentals of kinematics and to understand the concept of machines, mechanisms and related terminologies.

COURSE CONTENT:

Unit I: Introduction

Mechanism and machines, kinematics links, kinematics pairs, kinematics chains, degree of freedom, Grumbler's rule, kinematics inversion, equivalent linkages, four link planar mechanisms, straight line mechanisms, steering mechanisms, pantograph, problems.

Unit II: Cams

Classification of cams and followers, disc cam nomenclature, construction of displacement, velocity and acceleration diagrams for different types of follower motions, analysis of follower motions, determination of basic dimension, synthesis of cam profile by graphical methods, cams with specified contours, problems.

Unit III : Gears

Fundamental law of gearing, involute spur gears, characteristics of involute and cycloidal action, Interference and undercutting, center distance variation, path of contact, arc of contact, nonstandard gear teeth, helical, spiral bevel and worm gears, problems. Gear Trains: synthesis of simple, compound and reverted gear trains, analysis of epicylic gear trains, problems

Unit IV: Kinematics synthesis of Mechanisms

Function generation, path generation, Freudenstein's equation, two and three position synthesis of four bar and slider crank mechanisms by graphical and analytical methods, , precision positions, structural error; Chebychev spacing, transmission angle, problems.

Unit V: Vibrations

Vibration analysis of SDOF systems, natural, damped forced vibrations, based-excited vibrations and transmissibility ratio.

Unit VI: Belts and pulleys

Open and cross belt drive, velocity ratio, slip, material for belts, crowning of pulleys, law of belting, types of pulleys, length of belts, ratio of tension, centrifugal tension, power transmitted by belts and ropes, initial tension, creep, chain drives, chain length, classification of chains.

RECOMMENDED BOOKS:

TEXT BOOK	 THEORY OF MECHANISMS AND MACHINE by R.S. KHURMI. THEORY AND MACHINE: S.S. RATTAN , TATA MCGRAW HILL
REFERENCE	 THEORY OF MECHANISMS AND MACHINE: J.S RAO and R.V. dukkipati second edition new age international. THEORY OF MECHANISMS AND MACHINE: JOSEPH EDWARD SHIGLEY and JOHN JOSEPH UICKER, second edition mgh New York.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4
Class Test	Х		Х	
Quiz		Х	Х	
Assignment	Х	Х		Х

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	с	d	e	f	g	h	i	j	k
Course Learning	2	14		3	1		3	3		2	4
Outcomes	-	1,1		5	1		5	5		-	•

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review;
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

KINEMATICS OF MACHINE LAB

L T P

0 0 2

MODULE CODE	MECH2119
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

OBJECTIVES:

- 1. To understand the fundamentals of the theory of kinematics and dynamics of machines.
- 2. To learn techniques for studying motion of machines and their components.
- 3. To use computer software packages in modern design of machines.

LEARNING OUTCOMES:

- 1. able to distinguish kinematic and kinetic motion.
- 2. Ability to identify the basic relations between distance, time, velocity, and acceleration.
- 3. Exposure to apply vector mechanics as a tool for solving kinematic problems.
- 4. Ability to create a schematic drawing of a real-world mechanism.

LIST OF EXPERIMENTS

1.	To study various types of Kinematic links, pairs, chains and Mechanisms.
2.	To study inversions of 4 Bar Mechanisms, Single and double slider crank mechanisms.
3.	To plot slider displacement, velocity and acceleration against crank rotation for single slider crank mechanism.
4.	To find coefficient of friction between belt and pulley.
5.	To study various type of cam and follower arrangements.
6.	To plot follower displacement vs cam rotation for various Cam Follower systems
7.	To generate spur gear involute tooth profile using simulated gear shaping process
8.	To study various types of gears – Helical, cross helical worm, bevel gear.
9.	To study various types of gear trains – simple, compound, reverted, epicyclic and differential.
10.	To find co-efficient of friction between belt and pulley.
11.	To study the working of Screw Jack and determine its efficiency.
12.	Create various types of linkage mechanism in CAD and simulate for motion outputs and study the relevant effects.

RECOMMENDED BOOKS:

TEXT BOOK	 Theory of Mechanisms and Machines: Amitabha Ghosh and Ashok kumar Malik, Third Edition Affiliated East-West Press. Theory of Machines and Mechanisms: Joseph Edward Shigley and John Joseph Uicker, Jr. Second Edition, MGH, New York.
REFERENCE	1. Theory and Machines: S.S. Rattan, Tata McGraw Hill.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning	2	2		4		2	2		1 /		2
Outcomes	5	5		4		3	5		1,4		2

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

CREO

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3	0	0

MODULE CODE	MECH2120
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

This course aims to help product designers and engineers in developing a product design virtually. Creo is equipped with all the capabilities that are required for completing a product design. This course in Creo will help in sketching, modeling, validation of design, and visualize the product design.

- 1. To understand the basic Modeling Process.
- 2. To design, assemble, simulate and virtually manufacture any part of machine.
- 3. To know the Late stage change accommodation.
- 4. To know the Associative manufacturing generation and generation of service deliverables are automatic.
- 5. To understand Command finder features.
- 6. To get familiar with the Convenient means of adding references to sketches.

LEARNING OUTCOMES:

- 1. Able to understand and correctly use parametric feature solid modelling.
- 2. To define the concepts of, 3D direct modelling.
- 3. Finite Element Analysis and simulation.
- 4. Able to learn the schematic design.
- 5. Ability to learn technical illustrations,
- 6. Ability to understand viewing and visualization.

COURSE CONTENT

Unit 1: Basic Concepts

Introduction to the Creo Parametric Basic Modeling Process

Understanding Creo Parametric Concepts, Understanding Solid Modeling Concepts, Understanding Feature-Based Concepts, Understanding Parametric Concepts, Understanding Associative Concepts, Understanding Model-Centric Concepts, Recognizing File Extensions

Using the Creo Parametric Interface

Understanding the Main Interface, Understanding the Folder Browser, Understanding the Web Browser, UnderstZanding the Ribbon Interface, Setting the Working Directory and Opening and Saving Files, Managing Files in Creo Parametric

Creating Sketcher Geometry

Utilizing Constraints, Sketching with on the fly constraints, Sketching Lines, Sketching Centerlines, Sketching Rectangles, Sketching Circles, Sketching Arcs, Sketching Circular Fillets and Chamfers

Using Sketcher Tools

Understanding Construction Geometry Theory, Sketching Points, Dimensioning Entities within Sketcher, Modifying Dimensions within Sketcher, Sketcher Conflicts, Placing Sections into Sketcher Advanced Sketching

Sketching Ellipses, Sketching Elliptical Fillets, Sketching Splines, Modifying Splines (Basic & Advanced), Importing and Exporting Spline Points, Sketching Conics, Sketching Text, Analyzing Sketcher Convert Options, Analyzing Sketcher Dimension Options, Sketcher Diagnostic Tools

UNIT 2

Creating Extrudes, Revolves, and Ribs

Creating Solid Extrude Features, Adding Taper to Extrude Feature, Common Dashboard Options: Extrude Depth, Common Dashboard Options: Feature Direction, Common Dashboard Options: Thicken Sketch, Creating Solid Revolve Features, Common Dashboard Options: Revolve Angle, Automatically Adding and Removing Material, Creating Rib Features

Selecting and Editing

Understanding Creo Parametric Basic Controls, Using Drag Handles and Dimension Draggers, Using Keyboard Shortcuts, Understanding the Model Tree, Selecting Items using Direct Selection, Selecting Items using Query Selection, Selecting Multiple Components, Using the Search Tool, Understanding Selection Filters, Renaming Objects, Editing Features and Regenerating, Activating and Editing Models, Deleting and Suppressing Items

Creating Datum Features: Planes and Axes

Creating Datum Features Theory, Creating Datum Axes, Creating Datum Planes

Utilizing Internal Sketches and Embedded Datums

Creating Internal Sketches, Creating Embedded Datum Features

Creating Sweeps

Creating Sweeps with Open Trajectories, Creating Sweeps with Closed Trajectories, Analyzing Sweep Feature Attributes

Creating Blends

Creating a Parallel Blend Protrusion or Cut, Creating a Rotational Blend Protrusion or Cut

Creating Holes and Shells

Common Dashboard Options: Hole Depth, Creating Coaxial Holes, Creating Linear Holes, Creating Radial and Diameter Holes, Exploring Hole Profile Options, Creating Shell Features, Creating Standard Holes, Creating Creating Sketched Holes, Creating On Point Holes

Advanced Shells

Analyzing Shell References and Thickness Options, Excluding Surfaces from Shells, Extending Shell Surfaces, Analyzing Shell Corner Options

UNIT 3

Creating Rounds and Chamfers

Creating Rounds by Selecting Edges, Creating Rounds by Selecting a Surface and Edge, Creating Rounds by Selecting Two Surfaces, Creating Full Rounds, Creating Round Sets, Creating Chamfers by Selecting Edges, Creating Chamfer Sets

Advanced Rounds and Chamfers

Creating Rounds Through Curve, Creating Variable Radius Rounds, Auto Round, Creating Corner Chamfers, Creating Rounds and Chamfers by Reference, Using Intent Edges for Rounds and Chamfers, Using Chamfer Transitions, Using Round Transitions

Drafts

Creating Draft Features, Creating Basic Split Drafts, Analyzing Draft Hinges and Pull Direction, Drafting Intent Surfaces, Creating Drafts with Multiple Angles, Using the Extend Intersect Surfaces Draft Option, Creating Drafts Split at Sketch, Creating Drafts Split at Curve, Creating Drafts Split at Surface, Creating Drafts with Variable Pull Direction

Variable Section Sweeps

Creating Variable Section Sweeps using a Constant Section, Creating Variable Section Sweeps Normal to Trajectory, Creating Variable Section Sweeps using Constant Normal Direction, Creating Variable Section Sweeps Normal to Projection

UNIT 4

Helical Sweeps

Understanding Helical Sweeps Theory, Creating Helical Sweeps for Springs, Creating Helical Sweeps for Threads **Swept Blends**

Understanding Swept Blend Theory, Creating Swept Blends by Selecting Sections, Creating Swept Blends by Sketching Sections

Creating Patterns

Direction Patterning in the First Direction, Direction Patterning in the Second Direction, Axis Patterning in the First Direction, Axis Patterning in the Second Direction, Creating Reference Patterns of Features, Creating Reference Patterns of Components, Deleting Patterns or Pattern Members

Advanced Patterns

Creating Dimension Patterns in One Direction, Creating Dimension Patterns in Two Directions, Creating Rotational Dimension Patterns, Understanding Pattern Regeneration Options, Creating Fill Patterns, Specifying Fill Pattern Settings, Creating Curve Patterns, Creating Point Pattern

UNIT 5

Group, Copy, and Mirror Tools

Creating Local Groups, Copying and Pasting Features, Moving and Rotating Copied Features, Mirroring Selected Features, Mirroring All Features, Creating Mirrored Parts

Assembling with Constraints

Understanding Assembly Theory, Creating New Assembly Models, Understanding Constraint Theory, Understanding Assembly Constraint Status, Assembling Components using the Default Constraint, Constraining Components using Automatic, Constraining Components using Distance, Constraining Components using Angle Offset, Constraining Components using Parallel, Constraining Components using Coincident, Constraining Components using Normal, Constraining Components using Coplanar

Constraining Components using Centred, Constraining Components using Tangent

Constraining Components using Fix

Exploding Assemblies

Creating and Managing Explode States, Creating Offset Lines between Exploded Components

UNIT 6

Creating Drawing Views

Analyzing Drawing Concepts and Theory, Analyzing Basic 2-D Orientation, Creating New Drawings and Applying Formats, Creating and Orienting General Views, Adding Drawing Models and Sheets, Creating Projection Views

Creating Drawing Views

Creating Cross-Section Views, Creating Auxiliary Views, Creating 2D Cross Section Views, Creating New Drawings using Drawing Templates, Modifying Drawing Views, Creating Assembly and Exploded Views

Creating Drawing Details

Analyzing Detail Concepts and Types, Showing and Erasing Detail Items, Cleaning Up Dimensions, Manipulating Dimensions, Creating Driven Dimensions

Creating Drawing Details

Creating Notes, Showing a Bill of Materials, Analyzing Drawing Associativity

RECOMMENDED BOOKS:

TEXT BOOK

3. Cadd Centre Books.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark		
1.	Class Test	4	05		
2.	Sessional Test	2	15		
3.	Group Discussion	4	05		

4.	End Semester Exam	1	75

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6
Class Test	Х		Х		Х	
Quiz			Х		Х	х
Assignment	Х	Х		Х		

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	с	d	e	f	g	h	i	j	k
Course Learning Outcomes	2	5		2,4,6	4	3	6	2		3	4

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

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- Suggested remedies / corrective measures;
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- Actions taken based on previous course review;
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

CREO LAB

L T P 0 0 2

MODULE CODE	MECH2121
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

OBJECTIVES:

This course aims to help product designers and engineers in developing a product design virtually. Creo Lab is equipped with all the capabilities that are required for completing a product design. This course in Creo will help in sketching, modeling, validation of design, and visualize the product design.

- 1. To understand the basic Modeling Process.
- 2. To design, assemble, simulate and virtually manufacture any part of machine.
- 3. To know the late stage change accommodation.
- 4. To know the Associative manufacturing generation and generation of service deliverables are automatic.
- 5. To understand Command finder features.
- 6. To get familiar with the Convenient means of adding references to sketches.

LEARNING OUTCOMES:

- 1. Able to understand and correctly use parametric feature solid modelling.
- 2. To define the concepts of, 3D direct modelling.
- 3. Finite Element Analysis and simulation.
- 4. Able to learn the schematic design.
- 5. Ability to learn technical illustrations.
- 6. Ability to understand viewing and visualization.

LIST OF EXPERIMENTS

1.	Drawing a sketch of a Master Connecting Rod for Radial Engine in Creo with necessary details
2.	Drawing of a Flanged Hub layout in Creo with necessary details.
3.	To create a 3D model of a Disc Brake Rotor in Creo and create its necessary views.
4.	Make an Isometric dimensioned drawing of a connecting Rod using isometric grid and snap.
5.	To create a 3D model of a CPU cabinet (Sheet Metal) in Creo and create its necessary draft views.
6.	To create a 3D model of a Laptop Cooler Pad(Sheet Metal) in Creo and create its detail views.
7.	. To create a 3D model Assembly of a Screw Driver in Creo and create its necessary views.

RECOMMENDED BOOKS:

TEXT BOOK	1. Creo Books by CADD CENTRE.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning Outcomes	2	5		2,4,6	4	3	6	2		3	4

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

STEAM AND POWER GENERATION

L T P

3 0 0

MODULE CODE	MECH2222
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. To analyze the efficiency and output of modern Rankine cycle steam power plants with superheat, reheat, regeneration, and irreversibilities.
- 2. To calculate the performance of gas turbines with reheat and regeneration, and discuss the benefit of combined cycle power plants.
- 3. To get familiar with major types of solar energy power and wind turbine power and estimate power generation potential.
- 4. To learn about basic principles of nuclear power plants, such as pressurized-water, boiling-water, and heavywater reactors.
- 5. To understand power generation from renewables and alternative fuels and heat sources.
- 6. To understand and discuss the environmental impact of electric power production on air quality, climate change, water, and land.

LEARNING OUTCOMES:

- 1. Able to articulate power system concepts required to engineering problems.
- 2. Exposure to design power system components for a specified system and application
- 3. Ability to discuss various power sources for generation of power Merit/Demerits.
- 4. Ability to formulate A.C and D.C distribution networks for necessary variable calculation.
- 5. Ability to calculate usage of electrical power.
- 6. Ability to plot the power /Energy demand in the form of graph.

COURSE CONTENT:

<u>Unit I: Introduction:</u> Components of Steam Power System, Carnot Cycle, Rankine Cycle, Modified Rankine Cycle, p-v, h-s and T-s diagram for Rankine and Modified Rankine Cycle Problem.

<u>Unit II: Steam Generators:</u> Purpose, Classification of boilers, Fire tube and water tube boilers, Mountings and accessories, description of Cochran, Babcock -Wilcox boilers, efficiency of boiler and heat balance.

<u>Unit III: Steam Turbine:</u> Classification of steam turbine, impulse turbine, working principle, compounding of impulse turbine, velocity diagram, power output and efficiency of a single stage impulse turbine, reaction turbine, working principle, degree of reaction, velocity diagram, power output, efficiency, problem.

<u>Unit IV: Steam Condensers</u>: Classification of condensers, sources of air leakage in condensers, effect of air leakage in condenser, vacuum efficiency, condenser efficiency, air pumps, problem.

<u>Unit V: Improved and regenerative Feed heating cycle:</u> Regenerative feed heating cycle, binary vapour cycle, combined power and heating cycles back pressure turbine and pass out turbines.

<u>Unit VI: Fuel and Combustion:</u> Classification of fuels – solid, liquid and gaseous fuels, calorific values of fuels, stoichiometric air fuel ratio, excess air requirement, analysis of exhaust gases, problem.

RECOMMENDED BOOKS:

TEXT BOOK	 Thermodynamics and Heat Engines Vol II – R. Yadav, Central Publishing House Heat Engineering – V.P.Vasandani and D.S.Kumar, Metropolitan Book Co. Pvt. Ltd
REFERENCE	 I.C.Engines - M.L.Mathur and Sharma Dhanpat Rai & Sons Thermal Engineering - P.L.Balaney Khanna Publisher

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	05
2.	Sessional Test	2	15
3.	Group Discussion	4	05
4.	End Semester Exam	1	75

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6	7
Class Test	Х		Х		Х		Х
Quiz			Х		Х	Х	
Assignment	X	X		X			Х

MAPPING OF COURSE LEARNING OUTCOMES
Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning	2	5		236	14	3		24			4
Outcomes	2	5		2,5,0	1,1	5		2,1			

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review;
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

STEAM & POWER GENERATION LAB

L T P

0 0 2

MODULE CODE	MECH2223
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

OBJECTIVES:

- 1. To analyze the efficiency and output of modern Rankine cycle steam power plants with superheat, reheat, regeneration, and irreversibilities.
- 2. To calculate the performance of gas turbines with reheat and regeneration, and discuss the benefit of combined cycle power plants.
- 3. To explain the major types of solar energy power and wind turbine power and estimate power generation potential.
- 4. To explain the basic principles of nuclear power plants, such as pressurized-water, boiling-water, and heavy-water reactors.

- 1. Able to know the energy demand of world, nation and available resources to fulfill the demand.
- 2. Able to know about the conventional energy resources and their effective utilization.
- 3. Ability to acquire the knowledge of modern energy conversion technologies.
- 4. Exposure to understand and perform the various characterization techniques of fuels.
- 5. Ability to identify available nonconventional (renewable) energy resources and techniques to utilize them effectively.

LIST OF EXPERIMENTS

1	To study low pressure boilers and their accessories and mountings
1.	To study low pressure boners and their accessories and mountings.
2.	To study high pressure boilers and their accessories and mountings.
3.	To prepare heat balance sheet for given boiler.
4.	To study the working of impulse and reaction steam turbines.
5.	To find dryness fraction of steam by separating and throttling calorimeter.
6.	To study cooling tower and find its efficiency.
7.	To find the condenser efficiencies.
8.	To study and find volumetric efficiency of a reciprocating air compressor.
9.	Calibration of Thermometers and pressure gauges.
10.	To find calorific value of a sample of fuel using Bomb calorimeter.

RECOMMENDED BOOKS:

TEXT BOOK	 I.C.Engines - M.L.Mathur and Sharma Dhanpat Rai & Sons. Thermal Engineering - P.L.Balaney Khanna Publisher.
REFERENCE	 Thermodynamics and Heat Engines Vol II – R. Yadav, Central Publishing House.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	С	d	e	f	g	h	i	j	k
Course Learning	1	2.4		4		12	2		2.4		25
Outcomes	1	5,4		4		4,5	5		2,4		2,5

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

RENEWABLE ENERGY RESOURCES

L T P

3 0 0

MODULE CODE	MECH2224
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

1. To study various types of conventional and non-conventional energy resources including solid,

Liquid and gaseous fuels.

- 2. To acquire knowledge of solid, liquid and gaseous fuels.
- 3. To understand characterization techniques for fuels.
- 4. To acquire knowledge of alternate energy sources.

- 1. Able to design and conduct experiments, as well as to analyze and interpret data.
- 2. Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- 3. An ability to function on multi-disciplinary teams.
- 4. Exposure to identify, formulate, and solve engineering problems.
- 5. Able to acquire knowledge of professional and ethical responsibility.

COURSE CONTENT:

<u>Unit I: Solar Energy: radiation</u> – extra-terrestrial, spectral distribution, solar constant, solar radiation on earth, measurements; solar thermal system – solar thermal power and its conversion, solar collectors, flat plate, solar concentrating collectors, - types and applications.

<u>Unit II:</u> Wind and Small Hydropower Energy: wind data, properties, speed and power relation, power extracted, wind distribution and speed prediction, wind map of India; wind turbines and electric generators. fundamentals – types of machines and their characteristics, horizontal and vertical wind mills, elementary design principle, wind energy farms, off-shore plants; small, mini and micro hydro power plants and their resource assessment, plant layout with major components shown.

<u>Unit III</u>: Other Non-conventional Energy Sources: biomass – photosynthesis and origin of biomass energy, resources, cultivated resources, waste to biomass, terms and definitions – incineration, wood and wood waste, harvesting super tree, energy forest, phyrolysis, thermo-chemical biomass conversion to energy, gasification, anaerobic digester, fermentation, gaseous fuel; geothermal – resources, hot spring, steam system, principle of working, site selection, associated problems in development; ocean and tidal energy – principle of ocean thermal energy conversion, wave energy conversion machines, problems and limitations, fundamentals of tidal power, conversion systems and limitations.

<u>Unit IV</u>: Grid Connectivity: wind power interconnection requirement - low-voltage ride through (LVRT), ramp-rate limitations, supply of ancillary services for frequency and voltage control, load following, reserve requirement, impact of connection on stead-state and dynamic performance of power system; interfacing dispersed generation of solar energy with the grid, protective relaying, islanding, voltage flicker and other power quality issues; role of non-conventional energy system in smart grid.

<u>Unit V: Photovoltaic (PV) technology</u> - photovoltaic effect, efficiency of solar cells, semi-conductor materials, solar PV system, standards and applications, tracking.

<u>Unit VI</u>: Hydrogen energy– properties of hydrogen, sources, production and storage, transportation, problems for use as fuel; fuel cells – introduction with types, principle of operation and advantages

RECOMMENDED BOOKS:

TEXT BOOK	 Tiwari and Ghosal, "Renewable Energy Resources: Basic Principle & Application", Narosa Publication S N Bhadra ,D, Kastha, Wind Electrical Systems" Oxford Publication 2014 .
REFERENCE	 Ewald F. Fuchs, "Power Conversion of Renewable Energy Systems", Springer . B. H. Khan, "Non-Conventional Energy", Tata McGraw Hill.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	05
2.	Sessional Test	2	15
3.	Group Discussion	4	05
4.	End Semester Exam	1	75

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6
Class Test	Х		Х		Х	
Quiz			Х		Х	Х
Assignment	Х	Х		х		

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning Outcomes	5			4	4	1,4		2, 5			4,5

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review;
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

RENEWABLE ENERGY RESOURCES LAB

L T P

0 0 2

MODULE CODE	MECH2225
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

OBJECTIVES:

- 1. To list and generally explain the main sources of energy and their primary applications in the US, and the world.
- 2. To describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the environment.
- 3. To discuss remedies/potential solutions to the supply and environmental issues associated with fossil fuels and other energy resources.

- 1. Ability to describe the primary renewable energy resources and technologies.
- 2. Able to describe/illustrate basic electrical concepts and system components.
- 3. Ability to convert units of energy—to quantify energy demands and make comparisons among energy uses, resources, and technologies.
- 4. Exposure to collect and organize information on renewable energy technologies as a basis for further analysis and evaluation.

LIST OF EXPERIMENTS

1.	Study on greenhouse effect on solar flat plate collector
2.	Estimation of instantaneous efficiency of a solar liquid flat plate collector
3.	Study on solar flat plate collector in series and parallel combination
4.	Estimation of efficiency of solar air heaters
5.	Performance evaluation of concentrating solar collector
6.	Estimation of efficiency of solar photovoltaic panels
7.	Effect of Shadow & tilt angle on solar photo voltaic panel
8.	Study on solar photo voltaic panel in series and parallel combination
9.	Study on charging characteristics of a lead acid battery using solar photo voltaic panel.

BOOKS:

TEXT BOOK	 Energy Autonomy: The Economic, Social & Technological Case for Renewable Energy Non-Nuclear Futures: The Case for an Ethical Energy Strategy
REFERENCE	 Renewable Energy Sources and Climate Change Mitigation (2011) by the IPCC

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning	2 1	2		1		2	2		4		22
Outcomes	5,4	2		1		2	5		4		2,5

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

MANAGEMENT OF MANUFACTURING SYSTEM

L T P

3 0 0

MODULE CODE	MECH2226
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. To develop skills necessary to effectively analyze and synthesize the many inter-relationships inherent in complex socio-economic productive systems.
- 2. To reinforce analytical skills already learned, and build on these skills to further increase your "portfolio" of useful analytical tools for operations tasks.
- 3. To gain some ability to recognize situations in a production system environment that suggests the use of certain quantitative methods to assist in decision making on operations management and strategy.
- 4. To understand how Enterprise Resource Planning and MRPII systems are used in managing operations
- 5. To increase the knowledge, and broaden the perspective of the world in which you will contribute your talents and leadership in business operations.

- 1. Make management level decisions within a manufacturing environment including operations management, supply chain management and lean manufacturing.
- 2. Use effective human relations, leadership, interpersonal, and team skills in an organizational environment.
- 3. Analyze planning, professional and engineering decisions within a manufacturing environment.
- 4. Differentiate among general management decisions that are beyond strictly manufacturing, and includes skills to manage projects, energy, costs and budgets.

5. Generate written, oral, and graphic communications, including the use of current technology, persuasively and accurately in a professional manner.

COURSE CONTENT:

Unit I: Introduction

Production functions, Management systems, production and productivity. Plant Organization: Principles of organization, Organization structure-line and staff organization. Plant Location, Layout: Process layout, product layout and combination – methods of layout, economics of layout; group technology.

Unit II: Production Planning & Control

Types of products, demand, demand forecasting, marketing strategies, scheduling and control of scheduling production control.

Unit III: Industrial Maintenance

Types, organization for maintenance department, Breakdown and preventive maintenance and corrective maintenance. Inventory control and replacement analysis: Introduction replacement policy and method adopted, EOQ.

Unit IV: Management Concepts

Development of management principles, scientific management, human relation aspects. Production Cost Concepts: Introduction, cost of production, cost centre and unit, Classification and analysis of cost, break Even Analysis.

Unit V: Work Measurement

Definition, objectives & techniques, Time study equipment, performance rating, allowances, standard time, work sampling, PMTS.

Unit VI: Method Study

Definition and concepts, method study procedures, symbols, advantages, Operation process chart, Flow process charts, Two hand process chart, Motion study, micro motion, SIMO charts, Systems Concepts, Classification analysis techniques, Principle of motion economics.

RECOMMENDED BOOKS:

TEXT BOOK	 Ravi Shankar, "Industrial Engg. & Management", Galgotia Publications S.K. Sharma, "Industrial Engg. & Operation Management", S.K. Kataria & Sons.
REFERENCE	 Joseph S. Martinich, "Production & Operation Management", John Wiley & Sons. S. N. Chary," Production and operations management, TMH 4thedition

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	05
2.	Sessional Test	2	15
3.	Group Discussion	4	05
4.	End Semester Exam	1	75

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5
Class Test	Х		Х		Х
Quiz			Х		Х
Assignment	Х	Х		Х	

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	С	d	e	f	g	h	i	j	k
Course Learning	1	3		4	4	5	2.5	2		3	4
Outcomes							,-				

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review;
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

MANAGEMENT OF MANUFACTURING SYSTEM LAB

L T P 0 0 2

MODULE CODE	MECH2227
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

OBJECTIVES:

- 1. To gain an understanding and appreciation of the principles and applications relevant to the planning, design, and operations of Manufacturing/service firms.
- 2. To develop skills necessary to effectively analyze and synthesize the many inter-relationships inherent in complex socio-economic productive systems.
- 3. To reinforce analytical skills already learned, and build on these skills to further increase your "portfolio" of useful analytical tools for operations tasks
- 4. To understand how Enterprise Resource Planning and MRPII systems are used in managing operations.

- 1. Able to develop the ability to identify operational methodologies to assess and improve an organizations performance
- 2. Ability to assess the OPM function performance and capabilities in various organizations
- 3. Able to communicate effectively through discussion in seminars, teamwork and writing in discussion board, critiques and a project report.
- 4. Exposure to organize and deploy evidence, data and information to make decisions.
- 5. Able to plan and carry out work independently and to be self-disciplined and self-directed.
- 6. Ability to develop the skills of insight and critical evaluation.

LIST OF EXPERIMENTS

1.	To study the property changes of ferrous and nonferrous metals during cold and hot rolling
2.	Determine the physical changes of the given metals during Swaging.
3.	Micro-structural evaluation of MMAW, MAG & TIG welded steel.
4.	To study various characteristics of copper powder and evaluate green density as well as strength characteristics of cold compacted and sintered compact.
5.	To study the behaviour copper and ceramic powder during Conventional and Microwave Sintering of Particulate Compacts

RECOMMENDED BOOKS:

TEXT BOOK	 Ravi Shankar, "Industrial Engg. & Management", Galgotia Publications S.K. Sharma, "Industrial Engg. & Operation Management", S.K. Kataria & Sons.
REFERENCE	 Joseph S. Martinich, "Production & Operation Management", John Wiley & Sons. S. N. Chary," Production and operations management, TMH 4thedition

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning	2	26		15		15	26		1		2,3
Outcomes	C	2,0		1,5		4,5	3,0		1		,5

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

QUALITY ENGINEERING

L T P

3 0 0

MODULE CODE	MECH2228
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. To impart the knowledge of quality engineering concepts and tools.
- 2. To introduce the students about the knowledge of quality management, Cost quality and six-sigma concepts.
- 3. To achieve essential information about quality systems, auditing, product and process control and design, quality methods and tools.

- 1. Ability to apply knowledge of mathematics, science, and engineering.
- 2. Able to design and conduct experiments, as well as to analyze and interpret data.
- 3. Exposure to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- 4. Ability to function on multidisciplinary teams.
- 5. Ability to identify, formulate, and solve engineering problems.
- 6. Able to understanding professional and ethical responsibility.
- 7. An ability to communicate effectively.

COURSE CONTENT:

Unit I: Basic Concept Quality Costs

Fitness for Use, Quality Characteristics, Parameters of Fitness for use, Definition of quality and its meaning and importance in industry, Control and Quality control, Quality as Wining Strategy, Quality Tasks, Quality functions, The system Concept, Quality systems, quality assurance and ISO 9000 quality system standards, Quality costs concept, Quality cost categories, Examples of Quality cost studies, Securing the Cost figures, Pareto Analysis, Cost reduction Programs and economics of quality.

Unit II: Control charts

Statistical Tools in Quality control, The concept of variation, Tabular Summarization of Data, Frequency distribution, Graphical Summarization of Data: The Histogram, Quantitative methods of summarizing data: Numerical Indices, Probability distributions : General, The normal Probability distribution.

Unit III : Control charts curve

The normal curve and Histogram Analysis, The causes of variation, statistical aspect of control charting, concept of rational sub-grouping and detecting patterns on the control charts, for variables and attributes: X and R, X and S, p, np, c and u charts; specification and tolerances, natural tolerance limits, specification limits, process capability ratio analysis and narrow limit gauging.

Unit IV: Basic statistical concepts

Descriptions of Binomial, Poisson and Normal distribution with practical examples basics of sampling distribution. Acceptance Sampling: Principle of acceptance sampling, Acceptance sampling by attributes: single multiple and sequential sampling plans, lot quality protection and average outgoing quality protection, Acceptance sampling by variables sampling plans of process parameters, Six Sigma - Basic Concept.

Unit V: Total quality Management

Basic concepts of TQM, Fault Tree Analysis (FTA), historical review, leadership, concepts, role of senior management, quality statements, plans for process parameters, Modern Quality Management Techniques, Poka-Yoke, 7QC Tools, PDCA Cycle, 5 S Practice.

Unit VI : TQM tools

Benchmarking, QFD, Taguchi quality loss function TPM, FMEA. Lean Manufacturing continuous improvement techniques, JIT systems, KANBAN system, pareto diagrams, cause and effect diagrams, scatter diagram, run charts, affinity diagrams, inter-relationship diagram, process decision program charts.

RECOMMENDED BOOKS:

TEXT BOOK	 Quality Planning and Analysis, Juran and Gryna, TMH, New Delhi Quality Management, Kanishka Bed, Oxford University Press, New Delhi
REFERENCE	1. Fundamentals of Applied Statistics, Gupta and Kapoor, Sultan Chand and Sons, New Delhi

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	05
2.	Sessional Test	2	15
3.	Group Discussion	4	05
4.	End Semester Exam	1	75

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6	7
Class Test	X		Х		Х		Х
Quiz			X		X	X	

Assignment	X	Х	Х		Х

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	С	d	e	f	g	h	i	j	k
Course Learning	7	57		46	4	3		4,		3	4
Outcomes	,	0,1		.,0	•	5		6		5	

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
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COMPUTER INTEGRATED MANUFACTURING

L T P

0 0

3

MODULE CODE	MECH2229
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. Demonstrate knowledge of classical and state-of-the-art production systems, control systems, management technology, cost systems, and evaluation techniques.
- 2. Describe computer-integrated manufacturing (CIM) & its impact on productivity, product cost, and quality.
- 3. Describe computer technologies including computers, database and data collection, networks, machine control, etcetera, as they apply to factory management and factory floor operations.
- 4. Describe the integration of manufacturing activities into a complete system
- 5. Demonstrate sensitivity to human-factors related issues as they affect decision making in the factory environment.

- 1. Able to relate concepts and components of computer integrated manufacturing (CIM) and computer aided Manufacturing (CAM) to practical challenges.
- 2. Able to demonstrate the knowledge of computer numerical control (CNC) and CNC programming.
- 3. Ability to use commercial CAD/CAM software to process product models.
- 4. Able to demonstrate the knowledge of the operation of CNC machines.

COURSE CONTENT:

Unit I: Introduction

CAD/CAM Definition, Computer Technology-central processing unit (CPU), types of emory, input/output, the binary number system, computer programming languages. Automation-Types of Automation, CIM, reasons for automating, automation strategies. Conventional Numerical Control: Basic components of NC system, the NC procedure, NC coordinate systems, NC motion control system, applications of numerical control, advantages and disadvantages of NC, computer controls in NC, problems with conventional NC, NC controller technology, computer numerical control, functions of CNC, advantages of CNC, Direct numerical control, components of a DNC system, functions of DNC, advantages of DNC.

Unit II: NC Part Programming

Introduction, the punched tape in NC, tape coding and format, NC words, manual part programming, computer assisted part programming, the part programmer's job, the computer's job, NC part programming languages. The APT language: Geometry, statements, motion statements, post processor statements, auxiliary statements.

Unit III : Robotics Technology

Joints and links, common robot configurations, work volume, drive systems, types of robot control, accuracy and repeatability, end effectors, sensors in robotics, applications of robots. Automated Material Handling & FMS: The material handling function, types of material handling equipment, conveyor systems, types of conveyors, automated guided vehicle systems, applications. FMS-Components, types of systems, applying FMS technology, FMS workstation, planning.

Unit IV: Computer Aided Quality Control

Introduction, terminology in Quality Control, the computer in QC, contact and non-contact inspection methods-optical and non-optical, and computer aided testing.

Unit V: Computer Integrated Manufacturing Systems

Introduction, types, machine tools and related equipment's, material handling systems, computer control systems, function of the computer in a CIMS, CIMS benefits.

RECOMMENDED BOOKS:

TEXT BOOK	 Automation, Production Systems and Computer Integrated Manufacturing. Groover M.P, Prentice Hall of India. CAD/CAM – Groover M.P, Zimmers E.W, Prentice Hall of India.
REFERENCE	1. Approach to Computer Integrated Design and Manufacturing Nanua Singh, John Wiley.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	05
2.	Sessional Test	2	15
3.	Group Discussion	4	05
4.	End Semester Exam	1	75

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4
Class Test	Х		Х	
Quiz			Х	
Assignment	Х	Х		Х

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	с	d	e	f	g	h	i	j	k
Course Learning Outcomes	4	3		1	2	3				1	4

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review;
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SEMESTER V

MODULE CODE	CATEGORY	SUB- CATEGORY	MODULE	L	Т	Р	С	INTERNAL MARKS	EXTERNAL MARKS	TOTAL
MECH3101	E	PC	DYNAMICS OF MACHINES	3	1	0	3.5	50	100	150
MECH3102	E	PC	DYNAMICS OF MACHINES LAB	0	0	2	1	25	25	50
MECH3103	E	PC	FLUID MACHINE	3	1	0	3.5	50	100	150
MECH3104	E	PC	FLUID MACHINE LAB	0	0	2	1	25	25	50
MECH3105	E	PC	MECHANICAL MACHINE DESIGN-1	3	1	0	3.5	50	100	150
MECH3106	E	PD	SPECIALIZED MINOR PROJECT (GROUP) (ANSYS)LAB	0	0	4	2	50	50	100
MECH3107	E	PD	INDUSTRIAL TRAINING I (TO BE UNDERGONE AFTER IV SEMESTER)	0	0	0	1	50	0	50
VALU0136	Р	AE	APTITUDE II	2	0	0	2	25	50	75
VALU0140	Р	SE	PROFESSIONAL COMMUNICATION -II	2	0	0	2	25	50	75
	E	PE	ELECTIVE-V	3	0	0	3	25	75	100
	E	PE	ELECTIVE-VI	3	0	0	3	25	75	100
	E	PE	ELECTIVE-VI LAB	0	0	2	1	25	25	50
		TOTAL		19	3	10	26.5	400	650	1050

L = Lecture

T = Tutorial

P = Practical

C = Credit Point

ELECTIVES

MODULE	ELECTIVE-V	MODULE	ELECTIVE-VI
MECH3208	INDUSTRIAL ENGINEERING	MECH3210	MEASUREMENT & INSTRUMENTATION
MECH3209	FINITE ELEMENT METHODS	MECH3211	MEASUREMENT & INSTRUMENTATION LAB
		MECH3212	AUTOMOBILE ENGINEERING
			AUTOMOBILE ENGINEERING
		MECH3213	LAB

DYNAMICS OF MACHINES

L T P

3 1 0

MODULE CODE	MECH3101
CREDIT POINTS	3.5
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. To familiarity with common mechanisms used in machines and everyday life.
- 2. To use concepts of angular displacement, angular velocity and angular acceleration.
- 3. To understand forced motion due to rotating and reciprocating mass balance.
- 4. To draw a FBD for a system of rigid bodies.

- 1. Enhance the knowledge in dynamics of planar mechanism.
- 2. Able to analyze static and dynamic force analysis of mechanisms.
- 3. Ability to take notice of importance of the balancing and learn procedures of the basic balancing.
- 4. Able to understand the implication of computed results in dynamics to improve the design of a mechanism.

COURSE CONTENT:

Unit I: Static and Dynamic Force Analysis

Static force analysis of planer mechanisms, dynamic force analysis Including inertia and frictional forces of planer mechanisms.

Unit II: Dynamics of Reciprocating Engines

Engine types, indicator diagrams, gas forces, equivalent masses, Inertia forces, bearing loads in a single cylinder engine, crankshaft torque, engine shaking forces. Dynamics of Cam follower mechanism.

Unit III : Balancing of Rotating Components

Static balance, dynamic balance, balancing of rotating masses, two plane balancing, graphical and analytical methods, balancing of rotors, balancing machines, field balancing.

Unit IV: Mechanism for Control

Governors – Types – Centrifugal governors – Gravity controlled and spring controlled centrifugal governors – Characteristics – Effect of friction – Controlling force curves.

Unit V: Balancing of Reciprocating Parts

Balancing of single cylinder engine, balancing of multi cylinder; inline, radial and V type engines, firing order. Balancing of linkages –Balancing machines-Field balancing of discs and rotors.

Unit VI : Gyroscopes

Gyroscopic forces and torques – Gyroscopic stabilization – Gyroscopic effects in Automobiles, ships and airplanes. mechanical system and related vibration issues and can able to solve the problem

RECOMMENDED BOOKS:

	1. Rattan, S.S, "Theory of Machines",	3rd Edition, Tata McGraw-					
	Hill, 2009 Rao.J.S. and Dukkipa	ti.R.V. "Mechanisms and					
TEXT BOOK	Machine Theory", Wiley-Eastern Ltd., NewDelh1992.						
	2. John Hannah and Stephens R.C.,	"Mechanics of Machines",					
	Viva Low-Prices Student Edition, 1	999.					

REFERENCE 1. Thomas Bevan, "Theory of Machines", 3rd Edition, CBS Publishers and Distributors,2005.2. Cleghorn. W. L, "Mechanisms of Machines", Oxford University Press, 2005
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METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4
Class Test	Х		Х	
Quiz			Х	
Assignment	Х	Х		Х

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	3	4		2,5	4		3	2		2	1

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review;
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

DYNAMICS OF MACHINE LAB

L T P

0 0 2

MODULE CODE	MECH3102
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

OBJECTIVES:

- 1. To teach students concepts of generalized forces and the Principle of Virtual Work
- 2. To teach students concepts of static and dynamic mass balancing and flywheels
- 3. To introducing the approaches and mathematical models used dynamical analysis of machinery.

- 1. Ability to develop mastery of the knowledge in dynamics of planar mechanism.
- 2. Able to analyze static and dynamic force analysis of mechanisms.
- 3. Able to take notice of importance of the balancing and learn procedures of the basic balancing.
- 4. Ability to understand the implications of computed results in dynamics to improve the design of a mechanism.

LIST OF EXPERIMENTS

1.	To perform experiment on Watt and Porter Governors to prepare performance characteristic Curves, and to find stability & sensitivity
2.	To perform experiment on Proell Governor to prepare performance characteristic curves, and to find stability & sensitivity
3.	To perform experiment on Hartnell Governor to prepare performance characteristic Curves, and to find stability & sensitivity
4.	To study gyroscopic effects through models
5.	To determine gyroscopic couple on Motorized Gyroscope.
6.	To perform the experiment for static balancing on static balancing machine.
7.	To perform the experiment for dynamic balancing on dynamic balancing machine
9.	Determine the moment of inertial of connecting rod by compound pendulum method and tri-flair suspension pendulum

RECOMMENDED BOOKS:

техт воок	 Theory of Mechanisms and Machines: Amitabh Ghosh and Ashok Kumar Malik, Third Edition Affiliated East-West Press.
REFERENCE	1. Theory and Machine (S I units) S.S. Rattan, Tata McGraw-Hill

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	С	d	e	f	g	h	i	j	k
Course Learning Outcomes	2	2	3	1			3		3		4

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

FLUID MACHINE

L T P

3 1 0

MODULE CODE	MECH3103			
CREDIT POINTS	3.5			
FORMATIVE ASSESMENT MARKS	50			
SUMMATIVE ASSESMENT MARKS	100			
END SEMESTER EXAM DURATION	3 hrs.			
LAST REVISION DATE				

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. Students will learn about streamlines and streak lines for flows with given velocity fields
- 2. To know about the different types of hydraulic turbines, and pumps.
- 3. To know the concept of drag and lift force.
- 4. To understand the concepts of the hydrodynamic instability and transition to turbulence.

- 1. Ability to understand fluid particle systems and equipment.
- 2. Ability to select suitable size reduction equipment, solid-solid separation method and conveying system.
- 3. Ability to analyze mixing processes.
- 4. Able to develop understanding of fluid flow through packed and fluidized beds.

COURSE CONTENT:

Unit I: Impact of free jets

Impulse momentum principle, jet impingement - on a stationary flat plate, inclined plate and a hinged plate, at the center of a stationary vane, on a moving flat plate, inclined plate, a moving vane and a series of vanes, Jet striking tangentially at the tip of a stationary vane and moving vane(s), jet propulsion of Ships, problems.

Unit II: Impulse Turbines

Classification – impulse and reaction turbines, water wheels, component parts, construction, operation and governing mechanism of a Pelton wheel, work done, effective head, available head and efficiency of a Pelton wheel, design aspects, speed ratio, flow ratio, jet ratio, number of jets, number of buckets and working proportions, Performance Characteristics, governing of impulse turbines. Problems

Unit III : Dimensional Analysis and Model Similitude

Dimensional homogeneity, Rayleigh's method and Buckingham's π -theorem, model studies and similitude, dimensionless numbers and their significance. Unit quantities, specific speed and model relationships for turbines, scale effect, cavitation – its causes, harmful effects and prevention, Thomas cavitation factor, permissible installation height, Problems.

Unit IV: Centrifugal Pumps

Classification, velocity vector diagrams and work done, monomeric efficiency, vane shape, head capacity relationship and pump losses, pressure rise in impeller, minimum starting speed, design considerations, multi-stage pumps. Similarity relations and specific speed, net positive suction head, cavitation and maximum suction lift, performance characteristics. Brief introduction to axial flow, mixed flow and submersible pumps, Problems, Reciprocating Pumps: Construction and operational details, discharge coefficient, volumetric efficiency and slip, work and power input, effect of acceleration and friction on indicator diagram (pressure – stroke length plot), separation, air vessels and their utility, rate of flow into or from the air vessel, maximum speed of the rotating crank, characteristic curves, centrifugal vs. reciprocating pumps, brief introduction to screw, gear, vane and radial piston pumps, Problems.

Unit V: Francis Turbines

Component parts, construction and operation of a Francis turbine, governing mechanism, work done by the turbine runner, working proportions and design parameters, slow, medium and fast runners, degree of reaction, inward/outward flow reaction turbines, Performance Characteristics, Propeller and Kaplan turbines: Component parts, construction and operation of a Propeller, Kaplan turbine, differences between the Francis and Kaplan turbines, draft tube - its function and different forms, Performance Characteristics, Governing of reaction turbine, Introduction to new types of turbine, Deriaz, Bulb, Tubular turbines, Problems.

Unit VI : Hydraulic systems

Function, construction and operation of Hydraulic accumulator, hydraulic intensifier, hydraulic crane, hydraulic lift and hydraulic press, Fluid coupling and torque converter, Hydraulic ram, Problem.
RECOMMENDED BOOKS:

TEXT BOOK	 Hydraulic machines – Jagdish Lal Hydraulic and Fluid Mechanics-Modi and Seth
REFERENCE	 Introduction to Fluid Mechanics and Fluid Machines – S.K. Som and G.Biswas,TMH Fluid Mechanics and Fluid power Engineering – D.S. Kumar ,S.K. Kataria and Sons

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4
Class Test	Х		Х	
Quiz			Х	
Assignment	Х	X		X

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	с	d	e	f	g	h	i	j	k
Course Learning	1	2,4		2,3	1		1,3		2		1,4
Outcomes		,		,			,				,

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review;
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

FLUID MACHINE LAB

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0 0 2

MODULE CODE	MECH3104
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

OBJECTIVES:

- 1. To compare the results of analytical models introduced in lecture to the actual behaviour of Real fluid flows
- 2. To discuss and practice standard measurement techniques of fluid mechanics and their applications
- 3. To learn and practice writing technical reports
- 4. To work on small design projects.

LEARNING OUTCOMES:

- 1. Ability to identify, name, and characterize flow patterns and regimes.
- 2. Ability to understand basic units of measurement, convert units, and appreciate their magnitudes.
- 3. Exposure to utilize basic measurement techniques of fluid mechanics.
- 4. Able to discuss the differences among measurement techniques.
- 5. Exposure to measure fluid pressure and relate it to flow velocity.
- 6. Ability to demonstrate practical understanding of the various equations of Bernoulli.
- 7. Able to demonstrate practical understanding of friction losses in internal flows.

LIST OF EXPERIMENTS

1.	To study the constructional details of a Pelton turbine and draw its fluid flow circuit
2.	To draw the following performance characteristics of Pelton turbine-constant head, constant-speed and constant efficiency curves
3.	To study the constructional details of a Francis turbine and draw its fluid flow circuit
4.	To draw the constant head, constant speed and constant efficiency performance characteristics of Francis turbine.
5.	To study the construction details of a Kaplan turbine and draw its fluid flow circuit.
6.	To draw the constant head, speed and efficiency curves for a Kaplan turbine.
7.	To study the constructional details of a Centrifugal Pump and draw its characteristic curves
9.	To study the constructional details of a Reciprocating Pump and draw its characteristics curves.
10.	To study the construction details of a Gear oil pump and its performance curves.
11.	To study the model of Hydro power plant and draw its layout

RECOMMENDED BOOKS:

TEXT BOOK	 Fluid Mechanics and Hydraulic Machines – S S Rattan, Khanna Publishers Introduction to Fluid Mechanics and Fluid Machines – S K Som and G Biswas, Tata McGraw Hill
REFERENCE	 Fluid Mechanics and Fluid Power Engineering – D S Kumar, S K Kataria and Sons

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning	2	27	5	67	n		16		2.5		1
Outcomes	J	2,7	5	0,7	Δ		4,0		5,5		1

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

MECHANICAL MACHINE DESIGN-I

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3 1 0

MODULE CODE	MECH3105
CREDIT POINTS	3.5
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. To understand the design philosophy and Preliminary design.
- 2. To learn about the Selection of Fits and tolerances and analysis of dimensional chains.
- 3. To understand the classification of engineering material.
- 4. To analyse and design of mechanical Joints.
- 5. To design and analyse shafts with different geometrical features under various loading conditions.

LEARNING OUTCOMES:

- 1. Awareness of the influence of science and technology on civilizations and an ability to explain how science and technology have been applied to the betterment of humankind
- 2. Ability to evaluate ethical issues that may occur in professional practice
- 3. Understanding the role of engineering ethics in professional problem solving.
- 4. Familiarity with the NSPE Code of Ethics and its use in professional decision making
- 5. Ability to use mathematics, experimentation and computation in solving engineering problems
- 6. Fluency in both English and SI units and an ability to translate between them.
- 7. Learning about Design of Clutches and keys.

COURSE CONTENT:

Unit I: Design Philosophy

Problem identification- problem statement, specifications, constraints, Feasibility study technical feasibility, economic & financial feasibility, societal & environmental feasibility, Generation of solution field (solution variants), Brain storming, Preliminary design, Selection of best possible solution, Detailed design, Selection of Fits and tolerances and analysis of dimensional chains. What are the common profiles used for splines in machine elements. What are the rules that must be kept in mind while designing castings?

Unit II: Selection of Materials

Classification of Engg. Materials, Mechanical properties of the commonly used engg. Materials, hardness, strength parameters with reference to stress-strain diagram, Factor of safety. What types of threads are used for pressure tight joints and for power transmission.

Unit III : Mechanical Joints

ISO Metric Screw Threads, Bolted joints in tension, eccentrically loaded bolted joints in shear and under combined stresses, Design of power screws, Design of various types of welding joints under different static load conditions. Which ISO standard would be applicable if the product or the service involved design and development?

Unit IV: Riveted Joints, Cotter & Knuckle Joints

Design of various types of riveted joints under different static loading conditions, eccentrically loaded riveted joints, design of cotter and knuckle joints. What are ISO-9000 standards

Unit V: Belt rope and chain drives

Design of belt drives, Flat & V-belt drives, Condition for Transmission of max. Power, Selection of belt, design of Rope drives, and design of chain drives with sprockets. Keys, Couplings & Flywheel: Design of Keys – Flat, Kennedy Keys, Splines, Couplings design Rigid & Flexible coupling, turning Moment diagram, coefficient of fluctuation of energy and speed, design of flywheel – solid disk & rimmed flywheels.

Unit VI : Clutches & Brakes

Various types of clutches in use, Design of friction clutches – Disc. Multidisc, Cone & Centrifugal, Torque transmitting capacity. Various types of Brakes, Self-energizing condition of brakes, Design of shoe brakes – Internal & external Expanding, band brakes, Thermal Considerations in brake designing.

RECOMMENDED BOOKS:

техт воок	 Design of Machine Elements – V.B. Bhandari – Tata McGraw Hill, New Delhi. PSG Design Data Book
REFERENCE	 Engineering design – George Dieter, MGH, and New York. Machine Design: S.G. Kulkarini - Tata MacGraw Hill.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6	7
Class Test	Х		Х			х	
Quiz			Х		Х		
Assignment	Х	Х		X			x

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	с	d	e	f	g	h	i	j	k
Course Learning	16	47		235	1		13		6		14
Outcomes	1,0	','		2,5,5	1		1,5		Ū		1,1

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review;
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SPECIALIZED MINOR PROJECT (GROUP) (ANSYS LAB)LTP

0 0 4

MODULE CODE	MECH3106
CREDIT POINTS	2
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	50
END SEMESTER EXAM DURATION	
LAST REVISION DATE	

OBJECTIVES:

This course aims to help product designers and engineers in developing a product design and analysis. Ansys Lab is equipped with all the capabilities that are required for completing a product design and its validation suing simulations. This course in Ansys will help in sketching, modeling and validation of design of the product.

- 1. To understand the basic Modeling Process.
- 2. To design, assemble, simulate and virtually manufacture any part of machine.
- 3. To know the stages involved in any change in analysis.
- 4. To know the processes involved in design validation in Ansys..
- 5. To understand Command finder features.
- 6. To get familiar with pre-processing and post-processing in analysis..

LEARNING OUTCOMES:

- 1. Able to understand and correctly use parametric features in solid modelling.
- 2. To derive the concepts of 3D direct modelling with its analysis.
- 3. Finite Element Analysis and simulation.
- 4. Able to learn the schematic design with factors responsible.
- 5. Ability to learn analysis of any product.

LIST OF EXPERIMENTS

1.	Prepare a model of alloy wheel in solidworks with its technical details.
2.	Prepare a model of fabrication assembly using weldments in solidworks.
3.	To create a model of beams using surface model and line body.
4.	To refine meshing of plate containing hole at center.
5.	To create a report of structural analysis of different type of beams.
6.	To create a report of structural analysis of a clevis assembly.
7.	To create a report of modal analysis of a beam.
8.	To create a report of modal analysis of a connecting rod.
9.	To create a report of thermal analysis of a car disc brake rotor.
10.	To create a report of thermal stress analysis inside a cylinder.

RECOMMENDED BOOKS:

TEXT BOOK	1. Ansys Books by CADD CENTRE.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	2	5		2,4,6	4	3	6	2		3	4

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery and Suggested remedies / corrective measures,

INDUSTRIAL TRAINING I (TO BE UNDERGONE AFTER IV SEM) L T P

0 0 1

MODULE CODE	MECH3107
CREDIT POINTS	1
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	0
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

Assessment of Practical Training-I, undergone at the end of IV semester, will be based on seminar, viva-voce, report and certificate of practical training obtained by the student from the industry.

Professional Communication II

SUBJECT CODE	VALU0140
CREDIT POINTS	2
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	50
END SEMESTER EXAM DURATION	3hrs.
LAST REVISION DATE	

INSTRUCTIONS : The question paper will consist of ten questions distributed over three sections A, B and C Section A comprise of one question carrying very short answer type questions and is compulsory, Section B comprise of two short answer type questions and Section C comprises of five long answer type questions These sections will also have internal choices of questions

OBJECTIVE

- 1. To learn the fundamentals of different structures of English grammar
- 2. To calculate the structures and patterns of English Language and to use them correctly in speaking
- 3. To learn about the creative literature writings
- 4. To improve speaking and writing
- 5. To inculcate professional skills of presenting and working
- 6. To understand different types of literatures and background with critical insights
- 7. To make students aware of the detailed exposition of English Language

LEARNING OUTCOMES

Following this course students will be able to :-

- 1. Identify the different structures and patterns of English Language
- 2. To make students a good Public Speaker
- 3. To make students aware about different literature of the World
- 4. To make students speak well in Professional English Speaking and writing highly professional in particular
- 5. Know the process of Communication and its ethics
- 6. To make students write in professional manner

MODULE CONTENT

UNIT : I COMMUNICATION AND THEORIES

- Nature of Communication Pitfalls/One-way versus Two ways communication/efficient and effective communication
- Tenses-formation/efficient and effective communication
- Paragraph writing and usages of Comma's
- Presentation Skills
 - Literary Works
- The Bluest Eyes by (Toni Morission)
- Untouchable by Mulk Raj Anand
- BuchiEmecheta (In the Ditch)

UNIT : II INTRODUCTION TO THE NOVELS AND SHORTS STORIES (GRAMMAR ETHICS)

- Adverbs and Formal Words
- Using Different Commas
- Noun and the Numbers
- Nouns and (Count and Uncountable Collective and Abstract)
 - Interview Skills
- Short Stories
 - Deliverance by Prem Chand
 - Joothan by Prem Chand
 - Great Expectation by Charles Dickens
 - o DH Lawrence (Sons and Lovers)

UNIT : III BUSINESS COMMUNICATION

- Letter Writing Formal and Informal
- Letters of inquiry & Complaint
- Job Application and Resume
- Bio-Data
- Report Writing (Preparation/Planning/Structure/Matter Cover/Frontispiece/Title Page/Copyright-Notice/Forwarding Letter/Preface/Acknowledgements/Table of Contents/List of Contents/List of illustration/Abstract and Summary
- Adjective and their usage in a Language
- Gustave Flaubert (Madame Bovery)
- ShashiDespande (That long silence)

UNIT : IV DIFFERENT STRUCTURES OF ENGLISH LANGUAGE AND THEIR PATTERN

- Introduction to Semantics (Synonyms/Antonyms/Homophones Form and function of words
- Linguistic (various scientific theories of language)
- Passive voice and random topic writing and effective writing skills
- Syntax/Infinitive/Gerund
- Degrees (positive) (Comparative) (Superlative)
- Literary Works
 - Virginia Wolf (To the light house)
 - AS Byatt (Virgin in the Garden)
 - Zora Neale (Their eyes were watching God)
 - Lawrence Hill (The Book of Negros)

UNIT : V DIFFERENT ASPECT OF ENGLISH LANGUAGE AND ITS USE IN PROFESSIONAL COMMUNICATION

- Formation of adjectives from Noun
- Formation of adjectives from Verbs
- Some foreign words and their usage
- American and British Language
- Meanings of has/have
- Public Communication
- Communication, Papers reading and errors commissions

LITERARY WORKS

- a. Ian Mc Ewan :- Cement Garden
- b. Martin Amiss :- London Fields
- c. Murial Spark :- Prime of Mrs Jean Brodie
- d. Angela Carter :- Magic Toyshop

UNIT : VI LINGUISTIC AND ENGLISH COMMUNICATION

- Paronyms
- Linguistic and various stylistic theories in writing
- Synthesis
- Phonetics
- Reading Comprehensive and interpretation
- Note Taking/Making
- Summarizing

LITERACY WORKS

- a. Noel Coward :- Private Lives
- b. Arnold Wesker :- Chicken Soup with Barley

Recommended Books

TEXT BOOK	Essential of Communication by BR Sharma
Reference	Derrida (Semiotics and Sign Structure)

MAPPING OF COURSE OBJECTIVES AGAINST STUDENTS LEARNING OUTCOMES

Program Outcomes	a	b	с	d	e
Mapping of Course Objectives with	1,	1,	2,	2,	6,
Students Learning Outcomes	2,	2	3,	3,	7
	5		5	4,	
				5	

METHODS OF TEACHING AND STUDENT LEARNING

The subjects is delivered through lectures, on-line support, text book/course material reading and practical exercises Some videos will be shown to demonstrate certain concepts and research areas will be discussed Resources material is provided with the help of PDM Educational Directory Services (PEDS)

ASSESSMENT METHODOLOGIES

This subject will be evaluated for a total of 75 marks for theory

Assessment #	Type of Assessment	Per Semester	Maximum Mark
1	Class Text	4	05
2	Sessional Text	2	15
3	Group Discussion	4	05
4	End Semester Exam	1	75

EVALUATION

At the end of Semester Subject teacher will submit an evaluation report The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved The review report contains the following

- Approved refinement decisions due for implementation
- Actions taken based on previous subject review
- Problems encountered in the subject delivery
- Report discussed and analysed action taken as a result of this process and are communicated to the main stakeholders

FINITE ELEMENT METHODS

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3 0 0

MODULE CODE	MECH3209
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. To equip the students with the Finite Element Analysis fundamentals.
- 2. To enable the students to formulate the design problems into FEA.
- 3. To enable the students to perform engineering simulations using Finite Element Analysis software (ANSYS & ABAQUS).

LEARNING OUTCOMES:

- 1. Ability to identify mathematical model for solution of common engineering problems.
- 2. Able to formulate simple problems into finite elements.
- 3. Ability to solve structural, thermal, fluid flow problems.
- 4. Exposure to use professional-level finite element software to solve engineering problems in Solid mechanics, fluid mechanics and heat transfer.
- 5. Able to derive element matrix equation by different methods by applying basic laws in mechanics and integration by parts.

COURSE CONTENT

Unit I: Fundamental Concepts

Introduction; Historical Background, Stresses and Equilibrium, BoundaryConditions, Straindisplacement, Relations, Stress- strain Relations, Temperature Effects, Potential Energyand Equilibrium; The Rayleigh-Ritz Method, Galerkin's method. Saint Venant's Principle, Matrix Algebra.

Unit II: Gaussian Elimination. One-Dimensional Problems

Introduction; Finite Element Modeling, Coordinates and a Shape Functions, The Potential Energy Approach; The Galerkin Approach, Assembly of the Global Stiffness, Matrix and Load Vector. Properties of Stiffness Matrix, The Finite Element Equations; Treatment of Boundary Conditions, Quadratic Shape Functions; Temperature effects.

Unit III: Two-Dimensional Problems using Constant Strain Triangles

Introduction, Finite Element Modeling, Constant Strain Triangle, Problem Modeling and Boundary conditions; Axis Symmetric Solids subjected to Axis Symmetric Loading:- Introduction, Axis Symmetric Formulation, Finite Element Modeling; Triangular Element, Problem Modeling and Boundary conditions.

Unit IV: Two Dimensional Isoperimetric Elements and Numerical Integration

Introduction, The Four- Node quadrilateral, Numerical Integration Stress Calculations, High – Order Element; Nine-Node quadrilateral, Eight-Node Quadrilateral, Six-Node triangle, Comment on Mid side Node; Problems.

Unit V: Beams & Frames

Introduction, Finite Element formulation, Load Vector, Boundary considerations, Shear Force and Bending Moment, Beams on Elastic supports, Plane Frames, Simple Numerical. Three-Dimensional Problems in Stress Analysis: Introduction, Finite Element Formulation, Stress Calculations, Mesh Preparation, Hexahedral Elements and Higher order Elements, Problem Modeling.

<u>Unit VI : Transfer</u>

Introduction One-Dimensional Heat Conduction, Heat transfer in thin Fins, Two-dimensional steadystate Heat conduction, Potential Flow, Seepage, Fluid flow in Ducts. Dynamic Considerations: Introduction, Formulation, Element Mass Matrices: Evaluation of Eigen values and Eigenvectors, Interfacing with previous Finite Element Programs and a program for determining critical speeds of Shafts.

RECOMMENDED BOOKS:

TEXT BOOK	 Introduction to Finite Elements in Engineering Analysis by Tirupathi R. Chandruipatala and Ashok R.Belagundu. Prentice Hall. The Finite Element Method in Engineering by S.S.Rao, Peragamon Press, Oxford.
REFERENCE	 Finite Element Procedures, by Klaus Jurgen Bathi, Prentice Hall. Concepts and Applications of Finite Element Analysis, by Cook, Malkus and Plesha, John Wiley. The Finite Element Method by Zienkiewicz published by McGraw Hill. An Introduction to Finite Element Method by J.N. Reddy published by McGraw Hill.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30

3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5
Class Test	Х		Х		Х
Quiz			Х		Х
Assignment	Х	Х		Х	

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	4,5	4		2,3,5	1,3		1		3		4

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review;
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

MEASUREMENT AND INSTRUMENTATION

L T P

3 0 0

MODULE CODE	MECH3210
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. To introduce students to monitor, analyse and control any physical system.
- 2. To understand students how different types of meters work and their construction.
- 3. To introduce students a knowledge to use modern tools necessary for electrical projects.

LEARNING OUTCOMES:

- 1. Ability to measure various electrical parameters with accuracy, precision, resolution.
- 2. Able to use AC and DC bridges for relevant parameter measurement.
- 3. Ability to select appropriate passive or active transducers for measurement of physical phenomenon.
- 4. Able to use Signal Generator, frequency counter, CRO and digital IC tester for appropriate Measurement.
- 5. Able to test and troubleshoot electronic circuits using various measuring instruments.
- 6. Ability to maintain various types of test and measuring instruments.

COURSE CONTENT

Unit I: Instruments and Their Representation

Introduction, Typical Applications of Instrument Systems, and Functional Elements of a Measurement System, Classification of Instruments, Standards and Calibration.

Static and Dynamic characteristics of Instruments

Introduction, Accuracy, Precision, Resolution, Threshold, Sensitivity, Linearity, Hysteresis, Dead Band, Backlash, Drift, Formulation of Differential Equations for Dynamic Performance- Zero Order, First Order and Second order systems, Response of First and Second Order Systems to Step, Ramp, Impulse and Harmonic Functions.

Unit II: Transducer Elements

Introduction, Analog and Digital Transducers, Electromechanical; Potentiometric, Inductive Self Generating and Non-Self Generating Types, Electromagnetic, Electrodynamics, Eddy Current, Magnetostrictive, Variable Inductance, Linearly Variable Differential Transformer, Variable Capacitance, Piezo-Electric Transducer and Associated Circuits, Unbonded and Bonded Resistance Strain Gages. Strain Gage Bridge circuits, Single Double and Four Active Arm Bridge Arrangements, Temperature Compensation, Balancing and Calibration, Ionisation Transducers, Mechano Electronic Transducers, Opto-Electrical Transducers, Photo Conductive Transducers, Photo Volatic Transducers,

Unit III : Intermediate, Indicating and Recording Elements

Introduction Amplifiers, Mechanical, Hydraulic, Pneumatic, Optical, Electrical Amplifying elements, Compensators, Differentiating and Integrating Elements, Filters, Classification of Filters, A-D and D-A Converters, Digital Voltmeters (DVMs), Cathode Ray Oscillo scopes (CROs), Galvanometric Recorders, Magnetic Tape recorders, Data Acquisition Systems, Data Display and Storage.

Unit IV: Motion, Force and Torque Measurement

Introduction, Relative motion Measuring Devices, Electromechanical, Optical, Photo Electric, Moire-Fringe, Pneumatic, Absolute Motion Devices, Seismic Devices, Spring Mass & Force Balance Type, Calibration, Hydraulic Load Cell, Pneumatic Load Cell, Elastic Force Devices, Separation of Force Components, Electro Mechanical Methods, Strain Gage, Torque Transducer, and Toque Meter.

Unit V: Pressure and Flow Measurement

Pressure & Flow Measurement, Introduction : Moderate Pressure Measurement, Monometers, Elastic Transducer, Dynamic Effects of Connecting Tubing, High Pressure Transducer, Low Pressure Measurement, Calibration and Testing, Quantity Meters, Flow Rate Meters, Variable Head Meters, Variable Area Meters, Rota meters, Pitot-Static Tube Meter, Drag Force Flow Meter, Turbine Flow Meter, Electronic Flow Meter, Electronic Flow Meter, Electronic Flow Meter, Hot-Wire Anemometer

Unit VI: Basic Statistical Concepts

Types of Measured Quantities (Discrete and Continuous), Central Tendency of Data, Mode, Median, Arithmetic Mean, Best Estimate of true Value of Data, Measures of dispersion, Range, Mean Deviation, Variance, Standard Deviation, Normal Distribution, Central Limit Theorem, Significance Test, Method of Least Squares, Graphical Representation and Curve Fitting of Data.

RECOMMENDED BOOKS:

TEXT BOOK	 Measurement systems Application and Design. Ernest O.Doebelin, Tata McGraw Hill Edition (Fourth Edition) 2002. Measurement and Instrumentation in Engineering, FrancisS. Tse and Ivan E. Morse, Marcel Dekker
REFERENCE	 Principles of Measurement and Instrumentation – Alan S.Morris Prentice Hall of India. Mechanical Measurements : T.G. Beckwith, W.L. Buckand R.D. Marangoni Addison Wesley.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6
Class Test	Х		Х			Х
Quiz			Х		Х	
Assignment	Х	Х		X		

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	с	d	e	f	g	h	i	j	k
Course Learning Outcomes	4,6	4		2,5	2		1,3		4		

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review;
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

MEASUREMENT & INSTRUMENTATION LAB

L T P 0 0 2

MODULE CODE	MECH3211
CREDIT DOINTS	1
CREDIT FOINTS	
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

OBJECTIVES

- 1. To prepare students to perform the analysis of any electromechanical system.
- 2. To empower students to understand the working of electrical equipment used in everyday life.
- 3. To prepare the students for advanced courses in robotics.

LEARNING OUTCOMES

- 1. Ability to formulate and then analyze the working of any electrical machine using mathematical model under loaded and unloaded conditions.
- 2. Skill to analyze the response of any electrical machine.
- 3. Able to troubleshoot the operation of an electrical machine.
- 4. Ability to select a suitable measuring instrument for a given application.
- 5. Exposure to estimate and correct deviations in measurements due to the influence of the instrument and due to the accuracy of the instrument.

LIST OF EXPERIMENTS

1.	To study the working of Bourdon Pressure Gauge and to check the calibration of the gauge in a dead-weight pressure gauge calibration set up.
2.	To study a Linear Variable Differential Transformer (LVDT) and use it in a simple experimental set up to measure a small displacement.
3.	To study the characteristics of a pneumatic displacement gauge.
4.	To measure load (tensile/compressive) using load cell on a tutor.
5.	To measure torque of a rotating shaft using torsion meter/ strain gauge torque transducer.
6.	To measure the speed of a motor shaft with the help of non-contact type pick-ups (magnetic or photoelectric).

RECOMMENDED BOOKS:

TEXT BOOK	 Measurement systems Application and Design. Ernest O. Doebelin, Tata McGraw Hill Edition (Fourth Edition) 2002. Measurement and Instrumentation in Engineering, Francis S. Tse and Ivan E. Morse, Marcel Dekker.
REFERENCE	 Mechanical Measurements : T.G. Beckwith, W.L. Buck and R.D. Marangoni Addison Wesley

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning Outcomes	3	4,5		2		1		2,5		2	1

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

AUTOMOBILE ENGINEERING

L T P

3 0 0

MODULE CODE	MECH3212
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. To understand the working of various parts like engine, transmission, clutch, brakes.
- 2. To understand the environmental implications of automobile emissions.
- 3. To achieve an understanding of location and importance of each part.
- 4. To understand the functioning of the engine and its accessories, gear box, clutch, brakes, steering, axles and wheels.
- 5. The students will be made to learn Emissions, ignition, controls, electrical systems and ventilation.

LEARNING OUTCOMES:

- 1. Able to identify the different parts of the automobile.
- 2. Ability to explain the working of various parts like engine, transmission, clutch, brakes.
- 3. Exposure to describe how the steering and the suspension systems operate.
- 4. Able to understand the environmental implications of automobile emissions.
- 5. Ability to develop a strong base for understanding future developments in the automobile industry.

COURSE CONTENT:

Unit I: Introduction to Automobiles

Classification, Components, Requirements of Automobile Body; Vehicle Frame, Separate Body & Frame, Unitized Body, Car Body Styles, Bus Body & Commercial Vehicle Body Types; Front Engine Rear Drive & Front Engine Front Drive Vehicles, Four Wheel Drive Vehicles, Safety considerations; Safety features of latest vehicle-electronics stability control; Future trends in automobiles. Clutches : Requirement of Clutches – Principle of Friction Clutch – Wet Type & Dry Types; Cone Clutch, Single Plate Clutch, Diaphragm Spring Clutch, Multi plate Clutch, Centrifugal Clutches, Electromagnetic Clutch, Over Running Clutch; clutch components.

Unit II: Power Transmission

Requirements of transmission system; General Arrangement of Power Transmission system; Object of the Gear Box; Different types of Gear Boxes; Sliding Mesh, Constant Mesh, Synchro- mesh Gear Boxes; Epicyclic Gear Box, torque converter, continuously variable transmission, automatic transmission-dual clutch transmission, Freewheel Unit. Overdrive unit-Principle of Overdrive, Advantage of Overdrive, Transaxle, Transfer cases.

Unit III : Drive Lines, Universal Joint, Differential and Drive Axles

Effect of driving thrust and torque reactions; Hotchkiss Drive, Torque Tube Drive and radius Rods Propeller Shaft, Universal Joints, Slip Joint; Constant Velocity Universal Joints; Front Wheel Drive; Principle, Function, Construction & Operation of Differential; Rear Axles, Types of load coming on Rear Axles, Full Floating, Three quarter Floating and Semi Floating Rear Axles.

Unit IV: Suspension Systems

Need of Suspension System, Types of Suspension; factors influencing ride comfort, Suspension Spring; Constructional details and characteristics of leaf springs, dead axle and independent suspension, air suspension, shock absorbers Steering System : Front Wheel geometry & Wheel alignment viz. Caster, Camber, King pin Inclination, Toe-in/Toe-out; Conditions for true rolling motions of Wheels during steering; Different types of Steering Gear Boxes; Steering linkages and layout; Power steering–Rack & Pinion Power Steering Gear, Electronics steering.

Unit V: Automotive Brakes, Tyres & Wheels

Classification of Brakes; Principle and constructional details of Drum Brakes, Disc Brakes; Brake actuating systems; Mechanical, Hydraulic, Pneumatic Brakes; Factors affecting Brake performance, Power & Power Assisted Brakes, Concept of Anti-lock brakes, auto emergency braking; Tyres of Wheels; Types of Tyre& their constructional details, Wheel Balancing, Tyre Rotation; Types of Tyre wear& their causes.

Unit VI : Emission Control System & Automotive Electrical

Sources of Atmospheric Pollution from the automobile, Emission Control Systems – Construction and Operation of Positive Crank Case Ventilation (PVC) Systems, Evaporative Emission Control, Heated Air Intake System, Exhaust Gas Recirculation (ECR) Systems, Air Injection System and Catalytic Converters; Purpose construction & operation of lead acid Battery, Capacity Rating & Maintenance of Batteries; Purpose and Operation of Charging Systems, Purpose and Operations of the Starting System; Vehicle Lighting System.

RECOMMENDED BOOKS:

TEXT BOOK	 Automobile Engineering by Anil Chhikara, Satya Prakashan, New Delhi. Automobile Engineering by Dr. Kirpal Singh, standard Publishers Distributors.
REFERENCE	 Automotive Mechanics – Crouse / Anglin, TMH. Automotive Technology – H.M. Sethi, TMH, New Delhi. Automotive Mechanics – S. Srinivasan, TMH, New Delhi. Automotive Mechanics – Joseph Heitner, EWP.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5
Class Test	Х		Х		
Quiz			Х		Х
Assignment	Х	Х		Х	

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning		4		35	13		1		2		2.4
Outcomes		',		5,5	1,5		1		2		<i>2</i> , 1

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

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- Suggested remedies / corrective measures;
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AUTOMOBILE ENGINEERING LAB

L T P

0 0 2

MODULE CODE	MECH3213
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

OBJECTIVES:

- 1. To acquire knowledge of automobile anatomy in general.
- 2. The location and importance of each part.
- 3. The functioning of the engine and its accessories, gear box, clutch, brakes, steering, and wheels.
- 4. Suspension, frame, springs and other connections.
- 5. Emissions, ignition, controls, electrical systems and ventilation.

LEARNING OUTCOMES:

- 1. Able to identify the different parts of the automobile.
- 2. Ability to explain the working of various parts like engine, transmission, clutch, brakes.
- 3. Able to describe how the steering and the suspension systems operate.
- 4. Exposure to understand the environmental implications of automobile emissions.
- 5. Skills required to develop a strong base for understanding future developments in the automobile industry.

LIST OF EXPERIMENTS

	To study and prepare report on the constructional details, working principles and
	operation of the following Automotive Engine Systems & Sub Systems.
1.	(a) Multi-cylinder: Diesel and Petrol Engines.
	(b) Engine cooling & lubricating Systems.
	(c) Engine starting Systems.
	(d) Contact Point & Electronic Ignition Systems
	To study and prepare report on the constructional details, working principles and
	operation of the following
2.	Fuels supply systems:
	(a) Carburettors
	(b) Diesel Fuel Injection Systems
	(c) Gasoline Fuel Injection Systems.
	To study and prepare report on the constructional details, working principles and
2	operation of the following Automotive Clutches.
3.	(a) Coil-Spring Clutch
	(b) Diaphragm – Spring Clutch.
	(c) Double Disk Clutch.
	To study and prepare report on the constructional details, working principles and
	operation of the following Automotive Transmission systems.
4.	(a) Synchromesh –Four speed Range.
	(b) Transaxle with Dual Speed Range.
	(c) Four Wheel Drive and Transfer Case.
	(d)Steering Column and Floor –Shift levers.
	To study and prepare report on the constructional details, working principles and
	operation of the following Automotive Steering Systems.
5	(a) Manual Steering Systems, e.g. Pitman –arm steering, Rack & Pinion steering.
5.	(b) Power steering Systems, e.g. Rack and Pinion Power Steering System.
	(c) Steering Wheels and Columns e.g. Tilt & Telescopic steering Wheels, Collapsible
	Steering Columns.
	I o study and prepare report on the constructional details, working principles and
6	operation of the following Automotive Tyres & wheels.
0.	(a) Various Types of Bias & Radial Tyres.
	(b) Various Types of wheels.
1	

7.	To study and prepare report on the constructional details, working principles and operation of Automotive Emission / Pollution control systems.
8.	Modeling of any two automotive systems on 3D CAD using educational softwares (eg. 3D modeling package/Pro Engineering/I-Deas/ Solid edge etc.)
9.	Crash worthiness of the designed frame using Hyper mesh and LS-Dyna solver or other software.

RECOMMENDED BOOKS:

TEXT BOOK	1.	Automotive Mechanics – Crouse / Anglin, TMH.				
	2.	Automotive Technology -H.M. Sethi, TMH, New				
		Delhi.				
REFERENCE	1.	Motor Automotive Technology by Anthony E.				
		Schwaller – Delmer Publishers, Inc.				
	2.	The Motor Vehicle – Newton steeds Garrett				

METHODS OF TEACHING AND STUDENT LEARNING

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ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark		
1	Internal Assessment	2	25		
2	External Assessment	1	25		

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	с	d	e	f	g	h	i	j	k
Course Learning	4		3,4		5	2		2,3		4	1
Outcomes											

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.
SEMESTER VI

MODULE CODE	CAT EGO RY	SUB- CATEGORY	MODULE	L	Т	Р	С	INTERNAL MARKS	EXTERNA L MARKS	TOTAL
MECH3114	E	PC	INTERNAL COMBUSTION ENGINES & GAS TURBINES	3	0	0	3	25	75	100
MECH3115	E	PC	INTERNAL COMBUSTION ENGINES & GAS TURBINES LAB	0	0	2	1	25	25	50
MECH3116	E	PC	HEAT TRANSFER	3	0	0	3	25	75	100
MECH3117	E	PC	HEAT TRANSFER LAB	0	0	2	1	25	25	50
MECH3118	E	PC	MECHANICAL MACHINE DESIGN-2	3	1	0	3.5	50	100	150
MECH3119	E	PC	OPERATION RESEARCH	3	0	0	3	25	75	100
MECH3120	E	PD	SPECIALIZED MINOR PROJECT (INDIVIDUAL) (REVERSE ENGINEERING INCLUDING 3D SCANNING + 3D PRINTING	0	0	8	4	100	100	200
MECH3121	Р	CI	CREATIVITY AND INNOVATION			2	1	25	25	50
	E	PE	ELECTIVE-VII	3	0	0	3	25	75	100
	E	GE	ELECTIVE-A**	4	0	0	4	50	100	150
		TOTAL	-	19	2	12	26.5	375	675	1050

L = Lecture

Т	=	Tutorial ELECTIVES						
Р	=	Practical	MODULE CODE	ELECTIVE-VII				
				AUTOMATIC CONTROL				
С	=	Credit Point	MECH3222					
				STATISTICAL QUALITY CONTROL				
			MECH3223	& RELIABILITY				

MODULE CODE	GENERIC ELECTIVE - A
SAPM0321	SAP (MM) ^ψ
SAPS0322	SAP (SD)Ψ
SAPH0323	SAP (HCM)Ψ
	ONE / TWO MOOCS MODULE COMPRISING TOTAL OF 4 CREDIT POINTS.

 ψ Additional fee, if any, shall be borne by the student.

INTERNAL COMBUSTION ENGINE & GAS TURBINE

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3 0 0

MODULE CODE	MECH3114
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. To learn about types and configurations of spark ignition and diesel engines.
- 2. To find engines performance parameters such as BMEP, B.P, I.P, Torque, BSFC and their relationship to operating conditions.
- 3. To understand Ideal air standard cycles and fuel/air cycles.
- 4. To understand Combustion Processes in both spark and compression ignition engines: flame structure, cycle-to-cycle variation, knock, ignition, ignition delay.
- 5. To learn about Lubrication system, cooling system.
- 6. To study about Emissions, Smoke, and Catalytic converters.

- 1. Able to differentiate among different internal combustion engine designs
- 2. Ability to recognize and understand reasons for differences among operating characteristics of Different engine types and designs.
- 3. Able to give an engine design specification, predict performance and fuel economy trends with good Accuracy.

- 4. Based on an in-depth analysis of the combustion process, predict concentrations of primary Exhaust pollutants.
- 5. Exposure to the engineering systems needed to set-up and run engines in controlled Laboratory Environments.
- 6. Able to develop skills to run engine dynamometer experiments.

COURSE CONTENT:

Unit I: Air Standard Cycles

Internal and external combustion engines; classification of I.C. Engines, Cycles of operation in four stroke and two stroke I.C. Engines, Wankel Engines, Valve Timing Diagram, Assumptions made in air standard cycle; Otto cycle; diesel cycle, dual combustion cycle, comparison of Otto, diesel and dual combustion cycles; sterling and Ericsson cycles; air standard efficiency, specific work output, specific weight; work ratio; mean effective pressure; deviation of actual engine cycle from ideal cycle. Problems. Carburetion, Mixture requirements for various operating conditions in S.I. Engines; elementary carburettor, Calculation of A/F Ratio.

Unit II: Requirements of a diesel injection system fuel Injection and Ignition systems

Types of inject systems; petrol injection, Working principles of Governors, Gasoline Direct Injection, Variable Valve Technology, Nozzles and Fuel Injector, Fuel Feed pump, Injection Pumps, Requirements of ignition system; types of ignition systems ignition timing; spark plugs. Problems.

Unit III: Combustion in I.C. Engines

S.I. engines; Ignition limits; stages of combustion in S.I. Engines; Ignition lag; velocity of flame propagation; detonation; effects of engine variables on detonation; theories of detonation; pre-ignition; S.I. engine combustion chambers, Stages of combustion in C.I. Engines; delay period; variables affecting delay period; knock in C.I. engines; C.I engine combustion chambers. Lubrication and Cooling Systems: Functions of a lubricating system, Types of lubrication system; mist, wet sump and dry sump systems; properties of lubricating oil; SAE rating of lubricants, engine Performance and lubrication, Necessity of engine cooling; disadvantages of overcooling; cooling systems; air-cooling, water cooling; radiators.

Unit IV: Engine Testing and Performance

Performance parameters: BHP, IHP, mechanical efficiency, brake mean effective pressure and indicative mean effective pressure, torque, volumetric efficiency; specific fuel consumption (BSFC, ISFC), thermal efficiency; heat balance; Basic engine measurements; fuel and air consumption, brake power, indicated power and friction power, heat lost to coolant and exhaust gases; performance curves. Problems.

Unit V: Air pollution from I.C. Engine and Its remedies

Pollutants from S.I. and C.I. Engines, Methods of emission control: Exhaust Gas recirculation, Thermal convertor and catalytic convertor, Crankcase emission control (PCV System); Alternative fuels for I.C. Engines; the current scenario on the pollution front. Fuels: Fossil fuels, Chemical structure of Petroleum, Properties of SI and CI Engine Fuels, Fuel Ratings; Octane Number, Cetane Number.

Unit VI : Rotary Compressors

Root and vane blowers; Static and total head values; Centrifugal compressors- Velocity diagrams, slip factor, ratio of compression, pressure coefficient, pre-whirl; Axial flow compressor- Degree of reaction, polytrophic efficiency, surging, choking and stalling, performance characteristics, Problems.

Gas Turbines : Brayton cycle; Components of a gas turbine plant; open and closed types of gas turbine plants; Optimum pressure ratio; Improvements of the basic gas turbine cycle; multi stage compression with inter-cooling; multi stage expansion with reheating between stages; exhaust gas heat exchanger, Applications of gas turbines. Gas Turbine emissions. Problems.

RECOMMENDED BOOKS:

TEXT BOOK	 Internal Combustion Engines –V. Ganesan, PubTata McGraw- Hill. Gas Turbines - V.Ganesan, Pub Tata McGraw Hill.
REFERENCE	 Internal Combustion Engines & Air pollution- Obert E.F, Pub Hopper & Row Pub., New York Internal Combustion Engines Fundamentals- John B. Heywood, PubMcGraw Hill, New York

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	05
2.	Sessional Test	2	15
3.	Group Discussion	4	05
4.	End Semester Exam	1	75

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6
Class Test	Х		Х		Х	
Quiz			Х		Х	Х
Assignment	Х	Х		х		X

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	4		3,5	2	2		1,4		3		6

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review;
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

INTERNAL COMBUSTION ENGINE & GAS TURBINE LAB

L T P

0 0 2

MODULE CODE	MECH3115
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

OBJECTIVES:

- 1. To learn about types and configurations of spark ignition and diesel engines.
- 2. To find engines performance parameters such as BMEP, B.P, I.P, Torque, BSFC and their relationship to operating conditions.
- 3. To understand Ideal air standard cycles and fuel/air cycles.
- 4. To understand Combustion Processes in both spark and compression ignition engines: flame structure, cycle-to-cycle variation, knock, ignition, ignition delay.
- 5. To learn about Lubrication system, cooling system.
- 6. To study about Emissions, Smoke, and Catalytic converters.

- 1. Able to understand the thermodynamics of each component of a turbine engine which include inlets, fans, compressors, burners, turbines, afterburners and nozzles.
- 2. Exposure to know what the design variables for each component are.
- 3. Ability to understand the linked system performance of all components in the engine and performance trends for each component.
- 4. Able to understand the basis for off-design performance.

5. Able to understand how the engine integrates into an aircraft system and how to link the engine requirements to an aircraft's mission requirements.

LIST OF EXPERIMENTS

1.	To study the constructional details & working principles of two-stroke/ four stroke petrol engine.
2.	To study the constructional detail & working of two-stroke/four stroke diesel engine.
3.	Analysis of exhaust gases from single cylinder/multi cylinder diesel/petrol engine by Orsat Apparatus.
4.	To prepare heat balance sheet on multi-cylinder diesel engine/petrol engine.
5.	To find the indicated horse power (IHP) on multi-cylinder petrol engine/diesel engine by Morse Test.
6.	To prepare variable speed performance test of a multi-cylinder/single cylinder petrol engine/diesel engine and prepare the curves (i) bhp, ihp, fhp, vs speed (ii) volumetric efficiency & indicated specific specific fuel consumption vs speed.
7.	To find BHP of a multi-cylinder diesel engine/petrol engine by William's line method & by motoring method.
8.	To measure CO & Hydrocarbons in the exhaust of 2-stroke / 4-stroke petrol engine

RECOMMENDED BOOKS:

TEXT BOOK	 Internal Comb. Engines –V. Ganesan, PubTata McGraw- Hill. Gas Turbines - V.Ganesan, Pub Tata McGraw Hill.
REFERENCE	 Internal Combustion Engines Fundamentals- John B. Heywood, PubMcGraw Hill, New York Fundamentals of Internal Combustion Engines-H.N. Gupta, PHI, New Delhi

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning	1,4		3		2,4		5		4		3,4
Outcomes											

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

HEAT TRANSFER

L T P

3 0 0

MODULE CODE	MECH3116
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. To analyze heat conduction using Fourier's Law.
- 2. To understand the various type of thermal resistance in conduction.
- 3. To study different type of convection.
- 4. To understand transient heat transfer.
- 5. To understand the parallel and counter flow heat exchanger.
- 6. To study the effectiveness and efficiency of fin.

- 1. Ability to understand the basic laws of heat transfer.
- 2. Exposure to account for the consequence of heat transfer in thermal analyses of engineering systems.
- 3. Able to analyze problems involving steady state heat conduction in simple geometries.
- 4. Ability to develop solutions for transient heat conduction in simple geometries.
- 5. Able to obtain numerical solutions for conduction and radiation heat transfer problems.
- 6. Able to understand the fundamentals of convective heat transfer process.
- 7. Ability to evaluate heat transfer coefficients for natural convection.
- 8. Ability to find heat transfer coefficients for forced convection inside ducts.

COURSE CONTENT:

Unit I: Basic Concepts

Mechanism of Heat Transfer, Conduction, Convection and Radiation.

Unit II: Conduction

Fourier Law of Conduction, Thermal Resistance and its electrical Analogy, General Differential equation of Heat Conduction in Cartesian and Cylindrical Coordinates, One Dimensional Steady State Heat Conduction with and without heat generation through Plane Wall, Cylinders and Spherical systems. Composite Systems, Extended Surfaces, Methods for solving two-dimensional steady state conduction problems. Unsteady Heat Conduction, Lumped Analysis, Use of Heislers Chart. Critical Thickness of Insulation.

Unit III: Convection

Basic Concepts, Heat Transfer Coefficients, Boundary Layer Concept, Types of Convection. Forced Convection: Dimensional Analysis, External Flow, and Flow over Plates, Cylinders and Spheres. Internal Flow, Laminar and Turbulent Flow, Combined Laminar and Turbulent, Flow over Bank of tubes. Free Convection: Dimensional Analysis, Flow over Vertical Plate, Horizontal Plate, Inclined Plate, Cylinders and Spheres.

Unit IV: Condensation and Boiling

Film-wise condensation on vertical plate and horizontal tubes. Condensation inside tubes, Regimes of Pool boiling. Calculations on Nucleate boiling, Critical Heat flux and Film boiling, correlations in boiling and condensation.

Unit V: Heat Exchangers

Types of Heat Exchangers, Heat Exchanger Analysis, LMTD Method and NTU-Effectiveness method. Overall Heat Transfer Coefficient, Fouling Factors.

Unit VI: Heat Exchangers

Types of Heat Exchangers, Heat Exchanger Analysis, LMTD Method and NTU-Effectiveness method. Overall Heat Transfer Coefficient, Fouling Factors.

RECOMMENDED BOOKS:

TEXT BOOK	 Heat Transfer – J.P. Holman, John Wiley & Sons, NewYork. Fundamentals of Heat & Mass Transfer–Incropera, F.P. & Dewill, D.P –John Willey New York.
REFERENCE	 Conduction of Heat in Solids – Carslow, H.S. and J.C. Jaeger – Oxford Univ. Press. Conduction Heat Transfer – Arpasi, V.S. – Addison –Wesley.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark		
1.	Class Test	4	05		
2.	Sessional Test	2	15		
3.	Group Discussion	4	05		
4.	End Semester Exam	1	75		

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6	7	8
Class Test	Х		Х		х			X
Quiz			Х		Х	Х		
Assignment	Х	х		X			X	x

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	1		3,5		4,6		7		2		6,8

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review;
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

HEAT TRANSFER LAB

L T P

MODULE CODE	MECH3117
CREDIT POINTS	1
FORMATIVE ASSESSMENT MARKS	25
SUMMATIVE ASSESSMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

OBJECTIVES:

- 1. To analyze heat conduction using Fourier's Law.
- 2. To understand the various type of thermal resistance in conduction.
- 3. To study different type of convection.
- 4. To understand transient heat transfer.
- 5. To understand the parallel and counter flow heat exchanger.
- 6. To study the effectiveness and efficiency of fin.

- 1. Able to understand the basic laws of heat transfer.
- 2. Account for the consequence of heat transfer in thermal analyses of engineering systems.
- 3. Analyze problems involving steady state heat conduction in simple geometries.
- 4. Develop solutions for transient heat conduction in simple geometries.
- 5. Obtain numerical solutions for conduction and radiation heat transfer problems.
- 6. Understand the fundamentals of convective heat transfer process.
- 7. Ability to evaluate heat transfer coefficients for natural convection.
- 8. Evaluate heat transfer coefficients for forced convection inside ducts.

LIST OF EXPERIMENTS

1.	To determine the thermal conductivity of a metallic rod.
2.	To determine the thermal conductivity of an insulating power.
3.	To determine the thermal conductivity of a solid by the guarded hot plate method.
4.	To find the effectiveness of a pin fin in a rectangular duct natural convective condition and plot temperature distribution along its length.
5.	To find the effectiveness of a pin fin in a rectangular duct under forced convective and plot temperature distribution along its length.
6.	To determine average heat transfer coefficient for a externally heated horizontal pipe under forced convection & plot Reynolds and Nusselt numbers along the length of pipe. Also compare the results with those of the correlations.
7.	To measure the emissivity of the gray body (plate) at different temperature and plot the variation of emissivity with surface temperature.
9.	To verify the Stefen-Boltzmann constant for thermal radiation.
10.	To study the two phases heat transfer unit.
11.	To determine the water side overall heat transfer coefficient on a cross-flow heat exchanger.
12.	Design of Heat exchanger using CAD and verification using thermal analysis package eg. I-Deas etc

RECOMMENDED BOOKS:

ТЕХТ ВООК	 Heat Transfer – J.P. Holman, John Wiley & Sons, New York Fundamentals of Heat & Mass Transfer–Incropera, F.P. & Dewill, D.P –John Willey New York
REFERENCE	 Conduction of Heat in Solids – Carslow, H.S. and J.C. Jaeger – Oxford Univ. Press. Conduction Heat Transfer – Arpasi, V.S. – Addison –Wesley

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning Outcomes	5,7		4,6		3	5	2	1,7		4	5,8

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

MECHANICAL MACHINE DESIGN-II

L T P

3 1 0

MODULE CODE	MECH3118
CREDIT POINTS	3.5
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. To understand the design philosophy and Preliminary design.
- 2. To learn about the Selection of Fits and tolerances and analysis of dimensional chains.
- 3. To understand the classification of engineering material.
- 4. To analyse and design of mechanical Joints.
- 5. To design and analyse shafts with different geometrical features under various loading conditions.

- 1. Awareness of the influence of science and technology on civilizations and an ability to explain how science and technology have been applied to the betterment of humankind
- 2. Ability to evaluate ethical issues that may occur in professional practice
- 3. Understanding the role of engineering ethics in professional problem solving.
- 4. Familiarity with the NSPE Code of Ethics and its use in professional decision making
- 5. Ability to use mathematics, experimentation and computation in solving engineering problems
- 6. Fluency in both English and SI units and an ability to translate between them.
- 7. Learning about Design of Clutches and keys.

COURSE CONTENT:

Unit I: Design Philosophy

Problem identification- problem statement, specifications, constraints, Feasibility study technical feasibility, economic & financial feasibility, societal & environmental feasibility, Generation of solution field (solution variants), Brain storming, Preliminary design, Selection of best possible solution, Detailed design, Selection of Fits and tolerances and analysis of dimensional chains. What are the common profiles used for splines in machine elements. What are the rules that must be kept in mind while designing castings?

Unit II: Selection of Materials

Classification of Engg. Materials, Mechanical properties of the commonly used engg. Materials, hardness, strength parameters with reference to stress-strain diagram, Factor of safety. What types of threads are used for pressure tight joints and for power transmission.

<u> Unit III : Mechanical Joints</u>

ISO Metric Screw Threads, Bolted joints in tension, eccentrically loaded bolted joints in shear and under combined stresses, Design of power screws, Design of various types of welding joints under different static load conditions. Which ISO standard would be applicable if the product or the service involved design and development?

Unit IV: Riveted Joints, Cotter & Knuckle Joints

Design of various types of riveted joints under different static loading conditions, eccentrically loaded riveted joints, design of cotter and knuckle joints. What are ISO-9000 standards

Unit V: Belt rope and chain drives

Design of belt drives, Flat & V-belt drives, Condition for Transmission of max. Power, Selection of belt, design of Rope drives, and design of chain drives with sprockets. Keys, Couplings & Flywheel: Design of Keys – Flat, Kennedy Keys, Splines, Couplings design Rigid & Flexible coupling, turning Moment diagram, coefficient of fluctuation of energy and speed, design of flywheel – solid disk & rimmed flywheels.

Unit VI : Clutches & Brakes

Various types of clutches in use, Design of friction clutches – Disc. Multidisc, Cone & Centrifugal, Torque transmitting capacity. Various types of Brakes, Self-energizing condition of brakes, Design of shoe brakes – Internal & external Expanding, band brakes, Thermal Considerations in brake designing.

RECOMMENDED BOOKS:

техт воок	 Design of Machine Elements – V.B. Bhandari – Tata McGraw Hill, New Delhi. PSG Design Data Book
REFERENCE	 Engineering design – George Dieter, MGH, and New York. Machine Design: S.G. Kulkarini - Tata MacGraw Hill.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6	7
Class Test	Х		Х			Х	
Quiz			Х		Х		
Assignment	Х	Х		X			X

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	с	d	e	f	g	h	i	j	k
Course Learning	16	47		235	1		13		6		14
Outcomes	1,0	1,7		2,5,5	1		1,5		U		1,1

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review;
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

OPERATION RESEARCH

L	Т	Р
3	0	0

MODULE CODE	MECH3119
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

This course aims at familiarizing the students with quantitative tools and techniques, which are frequently applied to business decision-making & to provide a formal quantitative approach to problem solving and an intuition about situations where such an approach is appropriate.

- 1. Identify and develop operational research models from the verbal description of the real system.
- 2. Understand the mathematical tools that are needed to solve optimisation problems.
- 3. Use mathematical software to solve the proposed models.
- 4. Develop a report that describes the model and the solving technique, analyse the results and propose recommendations in language understandable to the decision-making processes in Management Engineering.

COURSE CONTENT

<u>Unit I:</u> Introduction: Definition, role of operations research in decision-making, applications in industry. Concept on O.R. model building –Types & methods.

Linear Programming (LP): Programming definition, formulation, solution- graphical, simplex Gauss-Jordan reduction process in simplex methods, BIG-M methods computational, and problems.

<u>Unit II:</u> Deterministic Model: Transportation model-balanced & unbalanced, north west rule, Vogel's Method, least cost or matrix minimal, Stepperg stone method, MODI methods, degeneracy, assignment, traveling salesman, Problems.

<u>Unit III:</u> Advanced Topic Of LP: Duality, PRIMAL-DUAL relations-its solution, shadow price, economic interpretation, and dual-simplex, and post-optimality & sensitivity analysis, problems.

<u>Unit IV:</u> Waiting Line Models: Introduction, queue parameters, M/M/1 queue, performance of queuing systems, applications in industries, problems.

<u>Unit V</u>: Project Line Models: Network diagram, event, activity, defects in network, PERT & CPM, float in network, variance and probability of completion time, project cost- direct, indirect, total, optimal project cost by crashing of network, resources levelling in project, problems.

<u>Unit VI:</u> Simulation: Introduction, design of simulation, models & experiments, model validation, process generation, time flow mechanism, Monte Carlo methods- its applications in industries, problems. Decision Theory: Decision process, SIMON model types of decision making environment- certainty, risk, uncertainty, decision making with utilities, problems.

RECOMMENDED BOOKS:

TEXT BOOK	 Operation Research – TAHA, PHI, New Delhi. Principle of Operations Research – Ackoff, Churchaman, arnoff, Oxford IBH, Delhi.
REFERENCE	1. Operation Research- Gupta & Sharma, National Publishers, New Delhi.
	2. Quantitative rechniques- vonfa, 1 MH, New Denni

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS)

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	05
2.	Sessional Test	2	15
3.	Group Discussion	4	05
4.	End Semester Exam	1	75

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5
Class Test	Х		Х		Х
Quiz			Х		Х
Assignment	Х	Х		х	

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	с	d	e	f	g	h	i	j	k
Course Learning Outcomes	4,5	4		2,3,5	1,3		1		3		4

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review;
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

SPECIALIZED MINOR PROJECT (INDIVIDUAL) (REVERSE ENGINEERING INCLUDING 3D SCANNING + 3D PRINTING)

L T P

MODULE CODE	MECH3120
CREDIT POINTS	4
FORMATIVE ASSESSMENT MARKS	100
SUMMATIVE ASSESSMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

OBJECTIVES:

- 1. To understand the basic Modeling Process.
- 2. To design, assemble, simulate and virtually manufacture any part of machine.
- 3. To know the late stage change accommodation.
- 4. To know the Associative manufacturing generation and generation of service deliverables are automatic.
- 5. To understand Command finder features.
- 6. To get familiar with the Convenient means of adding references to sketches.

- 1. Able to understand and correctly use parametric feature solid modelling.
- 2. To define the concepts of 3D Printing.
- 3. Finite Element Analysis and simulation.
- 4. Able to learn the schematic design.
- 5. Ability to learn technical illustrations.
- 6. Ability to understand viewing and visualization.

LIST OF EXPERIMENTS

1.	To study rapid prototyping and tooling on 3D printer.
2.	To study various types of 3D Printer process.
3.	Print setting and demonstration of 3D printing.
4.	To study and experiment on fused deposition modelling process.
5.	Creating the conversion of CSD to STL file and print project.
6.	Reverse engineering hardware and software.
7.	Relationship between reverse engineering & additive manufacturing.
8.	Working with CATIA .Getting started with sketcher and part design work bench.
9.	Creating GUI of DSE .Importing cloud data, Cloud Addition, Mesh processing.
10.	Creating scans and editing Scans in CATIAV5.

RECOMMENDED BOOKS:

ТЕХТ ВООК	3D Printer book by CADD Centre.
REFERENCE	3D Printer book by Imran Zaid.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 200 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	100
2	External Assessment	1	100

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	5,3		4,6		3	5	2	1,6		4	5,

EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

AUTOMATIC CONTROL

L T P

MODULE CODE	MECH3222
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. The mathematical modelling and simulation of basic engineering processes, components and a variety of physical systems, leading to the nomination of Transfer Functions and time responses to standard inputs for dynamic control systems
- 2. Rapidly predicting a system's Frequency Response to an incoming frequency spectrum and modifying system parameters to meet basic performance specifications. Subsequent System Identification from Frequency response analysis
- 3. Improving system performance by using PID controllers and focusing on tuning PID coefficients

- 1. Model and simulate linear and non-linear physical systems using basic laws using MATLAB.
- 2. Rapidly predict a system's frequency response.
- 3. Improve an existing system's performance by using controller actions such as PID controller.
- 4. Express and solve system equation in state variable form.

COURSE CONTENT:

Unit I: Introduction And Applications

Types of control systems ; Typical Block Diagram : Performance Analysis, Applications – Machine Tool Control, Boiler Control, Engine Governing, Aerospace Control, Active Vibration Control; Representation of Processes & Control Elements – Mathematical Modeling. Block Diagram, feed forward path, adaptive control system.

Unit II: Types of Controllers:

Introduction: Types of Control Action; Hydraulic Controllers; Electronic Controllers; Pneumatic Controllers and their advantage and disadvantage Problems. Representation, Representation of Systems or Processes, Comparison Elements; Representation of Feedback Control systems – Block Diagram & Transfer Function Representation, Representation of a Temperature, Control System, Signal Flow Graphs, Mason gain formula. Problems.

Unit III: Transient And Steady State Response

Time Domain Representation; Laplace Transform Representation; System with Proportional Control; Proportional – cum – Derivative control; Proportional – cum – Integral Control; Error Constants; Problems.

Unit IV: Frequency Response Analysis

Introduction; Closed and Open Loop Transfer Function; Polar Plots; Rectangular Plots; Nichols Plots: Equivalent Unity Feed Back Systems; Problems.

Stability Of Control Systems: Introduction; Characteristic Equation; Routh's Criterion; advantage of Routh criterion Nyquists Criterion, Gain & Phase Margins, Bandwidth, cut off rate, cut of frequency Problem

Unit V: Root Locus Method

Introduction; Root Loci of a Second Order System; General Case; Rules for Drawing forms of Root Loci; Relation between Root Locus Locations and Transient Response; Parametric Variation; Problems

Unit VI: State Space Analysis Of Control Systems

Introduction; Generalized State Equation; Techniques for Deriving System State – Space Equations; Transfer Function from State Equations; Solution of State Vector Differential Equations; Discrete Systems; Problems.

RECOMMENDED BOOKS:

TEXT BOOK	 Modern Control Engg. By Ugata, Prentice Hall of India, New Delhi. Control system engineering by Dhananjay K. Theckedath
REFERENCE	 Automatic Control Systems by Kuo' Published by Prentice Hall of India, New Delhi. Control System Engineering, I. J. Nagrath and M. Gopal, New Age, New Delhi.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	05
2.	Sessional Test	2	15
3.	Group Discussion	4	05
4.	End Semester Exam	1	75

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4
Class Test	Х		Х	Х
Quiz			Х	
Assignment	Х	Х		Х

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning	1		34		2		13		4		2
Outcomes	1		5,1		2		1,5		•		2

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review;
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

STATISTICAL QUALITY CONTROL & RELIABILITY

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MODULE CODE	MECH3223
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

- 1. To diagnose problems in the quality improvement process.
- 2. To identify ethical and unethical behavior in Quality Management.
- 3. To apply various quality improvement techniques.
- 4. To describe and apply the development and nature of quality control charts.
- 5. To apply the basic concepts of statistics and probability to quality management and control.

- 1. Ability to understand the philosophy and basic concepts of quality improvement.
- 2. Able to describe the DMAIC process (define, measure, analyse, improve, and control).
- 3. Able to demonstrate the ability to use the methods of statistical process control.
- 4. Able to demonstrate the ability to design, use, and interpret control charts for variables.
- 5. Exposure to demonstrate the ability to design, use, and interpret control charts for attributes.
- 6. Ability to perform analysis of process capability and measurement system capability.

COURSE CONTENT:

Unit I: Introduction

Definition and Need of quality, Aspects of quality, Quality characteristic, Quality specification, Quality function, Economics of quality. Inspection, Its objectives and types, Inspection versus Quality Control, Statistical Quality Control, its Tools, Advantages, Limitations and Applications.

Unit II: Control Charts

Concept of variability, Assignable and chance causes, Concept of specifications and tolerances, Definition and objectives of control charts, Control charts for variables and attributes and related problems, Variable charts vs attribute charts, Patterns on control charts, Type–I & Type-II Errors, Process capability and its methods of determination

Unit III: Acceptance Sampling

Definition, Advantages over 100% inspection, Methods of taking samples, Operating characteristics curve & its characteristics. Single, Double and Multiple, Sequential Sampling Plan & Related problems.

Unit IV: Quality Assurance

Need, Principles, Essentials & Advantages of Quality Assurance System, Quality Manual, Field complaints, Quality Audit & its types, Quality Assurance Methods, Quality Control vs Quality Assurance

Unit V: Probability & Statistics

Definition, Laws, Probability Distributions (Normal Binomial, Poisson, Exponential) & related problems. Measures of Central tendency & Dispersion, Concept of Variation, Variable and attribute data, Frequency distribution.

Unit VI : QUALITY FUNCTION DEPLOYMENT

QFD, Benefits of QFD, Stages of QFD, TQM, Implementation of TQM, House of quality,

RECOMMENDED BOOKS:

TEXT BOOK	 M. Mahajan, "Statistical Quality Control", Dhanpat Rai & Co. Amitav Mitra, "Fundamentals of Quality Control", Pearson Education
REFERENCE	 EL Grant & RS Leavenworth, "Statistical Quality Control", McGraw Hill & Co. Feigenbaum, "Total Quality Control", McGraw Hill & Co.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for theory.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	05
2.	Sessional Test	2	15
3.	Group Discussion	4	05
4.	End Semester Exam	1	75

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6
Class Test	Х		Х		Х	Х
Quiz			Х		Х	
Assignment	Х	х		Х		Х

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	а	b	с	d	e	f	g	h	i	j	k
Course Learning	1		15		3		2.6		5	Δ	2
Outcomes	1		т,5		5		2,0		5	-	2

EVALUATION

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