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B.Tech (MECHANICAL ENGINEERING)
Programme Syllabus
Effective from the Academic Year 2018-19

DEPARTMENT OF MECHANICAL ENGINEERING
SRI VENKATESWARA UNIVERSITY COLLEGE OF ENGINEERING
(AUTONOMUS)
SRI VENKATESWARA UNIVERSITY
TIRUPATI-517502 (A.P), INDIA.

VISION AND MISSION OF MECHANICAL ENGINEERING DEPARTMENT

Vision:

To be a globally renowned center for quality education and innovative research in Mechanical Engineering

Mission:

M1	Prepare effective and responsible graduate engineers for global requirements.
M2	Continuously strive to improve pedagogical methods employed in delivering the academic programs.
M3	Respond dynamically to the changing requirements of the industry.
M4	Conduct basic and applied research to contribute to intellectual human capital.
M5	Inculcate the spirit of entrepreneurship and social responsibility.

PROGRAM OUTCOMES

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

FIRST SEMESTER

Course Code	Course Title	Scheme of Instruction (Hours/Week)			Credits	Evaluation		Total
						Sessional Marks	Semester End Examination Marks	
		L	Tut	P/D				
MABST101	**Mathematics–I**	3	1	0	4	40	60	100
CYBST102	**Engineering Chemistry**	3	1	0	4	40	60	100
ENHST103	**English**	2	0	0	2	40	60	100
EEEST104	**BasicElectrical& Electronics Engineering**	3	1	0	4	40	60	100
MEEST105	**EngineeringGraphics**	2	0	3	3.5	40	60	100
ENHSP106	**English Communications Lab**	0	0	3	1.5	40	60	100
	Total	13	3	6	**19**	**240**	**360**	**600**

L – Lecture hours; Tut. – Tutorials; P/D – Practicals or Drawing

SECOND SEMESTER

Course Code	Course Title	Scheme of Instruction (Hours/Week)			Credits	Evaluation		Total
		L	Tut	P/D		Sessional Marks	Semester End Examination Marks	
MABST201	Mathematics–II	3	1	0	4	40	60	100
PYBST202	Engineering Physics	3	1	0	4	40	60	100
CSEST203	Programs for problem solving	3	0	0	3	40	60	100
MEEST204	**Manufacturing Processes**	4	0	0	**4**	40	60	100
MEESP205	**Workshop/ Manufacturing Practice**	0	0	3	1.5	40	60	100
CSESP206	Programs for problem solving Lab	0	0	3	1.5	40	60	100
CEMCT207	**Environmental Science**	4	-	-	-	100	-	100
	TOTAL	**17**	**2**	**6**	**18**	**340**	**360**	**700**

L – Lecture hours; Tut. – Tutorials; P/D – Practicals or Drawing

THIRD SEMESTER

Course Code	Course Title	Scheme of Instruction (Hours/Week)			Credits	Evaluation		Total
		L	Tut	P/D		Sessional Marks	Semester End Examination Marks	
MEPCT301	**Thermodynamics**	3	1	0	**4**	40	60	100
MABST302	**Numerical Methods**	3	0	0	**3**	40	60	100
MEPCT303	**Industrial safety and measures**	3	0	0	**3**	40	60	100
CEEST304	**Engineering Mechanics**	3	1	0	**4**	40	60	100
MEPCT305	**Manufacturing Technology**	3	0	0	3	40	60	100
COHST306	**Finance and Accounting**	3	1	0	**4**	40	60	100
MEPCT308	**Advanced Engineering Graphics**	2	0	3	**3.5**	40	60	100
MEPCP309	**Manufacturing Process Lab**	0	0	3	**1.5**	40	60	100
	TOTAL	**20**	**4**	**6**	**26**	**320**	**480**	**800**

Note: Open Elective-I & II (MOOCS)	Period of study during 3rd /4th /5th /6th Sem. Performance will be reflected in VI Sem.
Open Elective-III & IV (MOOCS)	Period of study during 3rd /4th /5th /6th/7th Sem. Performance will be reflected in VIII Sem.

L – Lecture hours; Tut. – Tutorials; P/D – Practicals or Drawing

FOURTH SEMESTER

Course Code	Course Title	Scheme of Instruction (Hours/Week)			Credits	Evaluation		Total
						Sessional Marks	Semester End Examination Marks	
		L	Tut	P/D				
PAMCT401	**ConstitutionofIndia**	4	-	-	0	- -	-	-
MEPCT402	**Applied Thermodynamics**	3	1	0	4	40	60	100
CEPCT403	**FluidMechanics &FluidMachines**	3	1	0	4	40	60	100
CEPCT404	**Solid Mechanics**	2	1	0	3	40	60	100
MEPCT405	**MaterialsEngineering**	3	0	0	3	40	60	100
MEPCT406	**Instrumentation and Control**	3	0	0	3	40	60	100
MEPCT407	**Machine Drawing**	1	0	4	3	40	60	100
MEHST 408	**Operations Research**	3	1	0	3	40	60	100
MEPCP409	**Fuels and IC Engines Laboratory**	0	0	3	1.5	40	60	100
	Industry internship*	*Students carry out Industry internship (Marks will be shown in 7th Semester)						
	TOTAL	**22**	**4**	**7**	**24.5**	**320**	**480**	**800**

Note: Industry internship for not less than four weeks after 4Th /6th Semester during summer.

Note: Open Elective-I & II (MOOCS)	Period of study during 3rd /4th /5th /6th Sem. Performance will be reflected in VI Sem.
Open Elective-III & IV (MOOCS)	Period of study during 3rd /4th /5th /6th/7th Sem. Performance will be reflected in VIII Sem.

L – Lecture hours; Tut. – Tutorials; P/D – Practicals or Drawing

FIFTH SEMESTER

Course Code	Course Title	Scheme of Instruction (Hours/Week)			Credits	Evaluation		Total
						Sessional Marks	Semester End Examination Marks	
		L	Tut	P/D				
MEPCT501	**HeatTransfer**	3	1	0	4	40	60	100
MEPCT502	**DesignofMachine Elements**	3	1	0	4	40	60	100
MEPCT504	**KinematicsofMachinery**	3	1	0	4	40	60	100
MEPET505	**Elective-I**	3	0	0	3	40	60	100
MEPCP507	**Machine Tools and Automation Lab**	0	0	3	1.5	40	60	100
MEPCP508	**Metrology Lab**	0	0	3	1.5	40	60	100
	TOTAL	12	3	6	18	**240**	**360**	**600**

Note: Open Elective-I & II (MOOCS)	Period of study during 3^{rd} /4^{th} /5^{th} /6^{th} Sem. Performance will be reflected in VI Sem.
Open Elective-III & IV (MOOCS)	Period of study during 3^{rd} /4^{th} /5^{th} /6^{th}/7^{th} Sem. Performance will be reflected in VIII Sem.

SIXTH SEMESTER

Course Code	Course Title	Scheme of Instruction (Hours/Week)			Credits	Evaluation		Total
						Sessional Marks	Semester End Examination Marks	
		L	Tut	P/D				
EOHST601	**Economics**	3	0	0	3	40	60	100
MEPCT602	**Machine Design**	3	1	0	4	40	60	100
MEPCT603	**Dynamics of Machinery**	3	1	0	4	40	60	100
MEPET604	**Elective-II**	3	0	0	3	40	60	100
MEPCP605	**Strength of Materials & Fluid Mechanics Laboratory**	0	0	3	1.5	40	60	100
MEPCP606	**Heat Transfer Laboratory**	0	0	3	1.5	40	60	100
MEOET607	**Open Elective-I (MOOCS)**	0	0	0	3			100
MEOET608	**Open Elective-II (MOOCS)**	0	0	0	3			100
	Industry Internship*					*Students carry out summer internship (Marks will be shown in 7th Semester)		
	TOTAL	**12**	**2**	**6**	**23**	**240**	**360**	**800**

Note: Open Elective-I & II (MOOCS)	Period of study during 3rd /4th /5th /6th Sem. Performance will be reflected in VI Sem.
Open Elective-III & IV (MOOCS)	Period of study during 3rd /4th /5th /6th/7th Sem. Performance will be reflected in VIII Sem.

L – Lecture hours; Tut. – Tutorials; P/D – Practicals or Drawing

SEVENTH SEMESTER

Course Code	Course Title	Scheme of Instruction (Hours/Week)			Credits	Evaluation		Total
		L	Tut	P/D		Sessional Marks	Semester End Examination Marks	
MEPET701	**Automobile Engineering**	3	0	0	3	40	60	100
MEPET702	**Elective-III**	3	0	0	3	40	60	100
MEPEP703	**CAD / CAM Laboratory**	0	0	3	1.5	40	60	100
MEPCI704	**Internship***				3	100	-	100
MEPCX705	**Project Work –Phase-I**	0	0	6	3	100	-	100
	TOTAL	**6**	**0**	**9**	**13.5**	**320**	**180**	**500**

NOTE: Industry internship for not less than four weeks after 4^{Th} / 6^{th} Semester during summer.

Note: Open Elective-I & II (MOOCS)	Period of study during 3^{rd} /4^{th} /5^{th} /6^{th} Sem. Performance will be reflected in VI Sem.
Open Elective-III & IV (MOOCS)	Period of study during 3^{rd} /4^{th} /5^{th} /6^{th}/7^{th} Sem. Performance will be reflected in VIII Sem.

EIGTH SEMESTER

Course Code	Course Title	Scheme of Instruction (Hours/Week)			Credits	Evaluation		Total
						Sessional Marks	Semester End Examination Marks	
		L	Tut	P/D				
MEPET801	**Elective -IV**	3	0	0	3	40	60	100
MEPCP802	**Project Work Phase-II**	0	0	18	9	40	60	100
MEOET803	**Open Elective-III (MOOCS)**	0	0	0	3			100
MEPET 804	**Open Elective-IV (MOOCS)**	0	0	0	3			100
	TOTAL	**3**	**0**	**18**	**18**	**80**	**120**	**400**

Note: Open Elective-I & II (MOOCS)	Period of study during 3rd /4th /5th /6th Sem. Performance will be reflected in VI Sem.
Open Elective-III & IV (MOOCS)	Period of study during 3rd /4th /5th /6th/7th Sem. Performance will be reflected in VIII Sem.

L – Lecture hours; Tut. – Tutorials; P/D – Practicals or Drawing

CREDIT DISTRUBUTION CHART

S. No.	Category	SEMESTER								Total	Suggested BreakupofCredits (Total160)
		First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth		
1	HumanitiesandSocialSciencesincludingManagement courses	3.5		4	3		3			13.5	12*
2	BasicSciencecourses	8	8	3						19	25*
3	EngineeringSciencecoursesincludingworkshop , drawing, basicsofelectrical/mechanical/computeretc	7.5	6	7.5						21	24*
4	Professionalcorecourses		4	11.5	21.5	15	11	4.5	3	69.5	48*
5	ProfessionalElectivecoursesrelevanttochosen specialization/branch					3	3	3	3	12	18*
6	Opensubjects–Electivesfromothertechnicaland/or Emergingsubjects					3	3	3		9	18*
7	Projectwork,seminarandinternshipinindustryor elsewhere							6	9	15	15*
8	MandatoryCourses [Environmental Sciences, Induction Program, Indian Constitution,EssenceofIndianTraditionalKnowledge]		0		0		0			0	(non-credit)
	Total number of credits	19	18	26	24.5	21	20	16.5	15	160	160*
	Number of Hours per week	22	30	30	33	28	29	18	24	Odd Sem. – 98 Even – Sem. – 116	
	Total Number of marks	600	600	800	800	700	800	500	300	5100	

L – Lecture hours; Tut. – Tutorials; P/D – Practicals or Drawing

PROGRAM ELECTIVE COURSES

Sl. No	Course Code	Subject	Credits	SEMESTER	Elective
1	MEPET01	Advanced Manufacturing Process	3	V	I
2	MEPET02	Industrial Engineering &Management	3	V	I
3	MEPET03	Mechatronic Systems	3	V	I
4	MEPET04	Refrigeration & Air Conditioning	3	VI	II
5	MEPET05	Internal Combustion Engines	3	VI	II
6	MEPET06	Power Plant Engineering	3	VI	II
7	MEPET07	Non-Conventional Energy Sources	3	VI	II
8	MEPET08	CAD/CAM	3	VII	III
9	MEPET09	Robotics	3	VII	III
10	MEPET10	Nanotechnology and Surface Engineering	3	VII	III
11	MEPET11	Mechanical Vibrations	3	VII	III
12	MEPET12	Finite Element Analysis	3	VII	III
13	MEPET13	Tool Design	3	VIII	IV
14	MEPET14	Quality Control& Reliability Engineering	3	VIII	IV
15	MEPET15	Analysis and control of production systems	3	VIII	IV
16	MEPET16	Artificial Intelligence and expert systems	3	VIII	IV
17	MEPET17	Simulation and modeling	3	VIII	IV
18	MEPET18	Automation in Manufacturing	3	VIII	IV

L – Lecture hours; Tut. – Tutorials; P/D – Practicals or Drawing

OPENELECTIVECOURSES OFFERED FOR OTHER DEPARTMENTS

Sl. No	Course Code	Subject	Credits
1	MEOET01	Industrial Engineering &Management	3
2	MEOET02	Non-Conventional Energy Sources	3
3	MEOET03	Quality Control& Reliability Engineering	3
4	MEOET04	Analysis and control of production systems	3
5	MEOET05	Engineering system analysis and design	3
6	MEOET06	Simulation and modeling	3
7	MEOET07	Green Energy Systems	3

MABST101 MATHEMATICS – I

B.Tech I Semester

Effective from- 2018-19

Lectures / Week: 3 periods **credits:4**

Course Objectives:

- To enlighten the learners in the concept of differential equations and multivariable.
- To familiarize students with analytical methods of solving differential equations.
- The student develops the idea of using Laplace transforms.
- To enable the student to analyze and apply differentiation and integration for multivariable function.
- To introduce the evaluating of multiple integrals in two andthree dimensional spaces.

UNIT I

Differential Equations: Linear differential equations of second and higher order with constant coefficients-particular integrals-homogeneous differential equations with variable coefficients-method of parameters-simulation equations.

UNIT II

Laplace Transforms I: Laplace transforms of standard functions-inverse transforms-transforms of derivatives and integrals-derivatives of transforms-integrals of transforms.

UNIT III

Laplace Transforms II: Transforms of periodic functions-convolution theorem-applications to solution of ordinary differential equations.

UNIT IV

Calculus: Roll's and Mean value theorems - Taylor's and Maclaurins's series-maxima and minima for functions of two variables - Infinite series - Convergence Tests series of positive terms - comparison, Ratio tests - Alternating series - Leibnitz's rule - Absolute and conditional convergence.

UNIT V

Multiple Integrals: Curve tracing (both Cartesian and polar coordinate) - Evaluations of double and Triple integrals-change of order of integrations-change of variables of integrations-simple applications to areas and volumes.

Text/Reference Books

1. B S Grewal, Higher Engineering Mathematics, 40th Edition, Khanna Publications, 2007.
2. M K Venkataraman, Engineering Mathematics, National Publishing Company, Chennai.
3. B V Ramana, Higher Engineering Mathematics, 6th Reprint, Tata McGraw-Hill, 2008.
4. Bali and Iyengar, Engineering Mathematics, 6th Edition, Laxmi Publications, 2006.

COURSE OUTCOMES:

CO1	Applying various statistical models and methods for drawing conclusions and making decisions under uncertainty in engineering contexts
CO2	Apply statistical and numerical methods in various computer science related projects, seminars and research
CO3	Apply the knowledge of iterative methods to solve algebraic and transcendental equations, simultaneous linear equations, ODE (ordinary differential equations)
CO4	Acquire knowledge of finite differences, interpolation, numerical differentiation and numerical integration
CO5	Demonstrate a basic knowledge of the techniques for accurate and efficient solution of models based on linear and nonlinear systems of equations, ordinary differential equations and partial differential equations.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3										
CO2	2	3										
CO3	2	3										
CO4	2	3										
CO5	2	3										

CYBST102 ENGINEERING CHEMISTRY

B.Tech I Semester

Effective from- 2018-19

Lectures / Week: 3 periods **Credits:4**

COURSE OBJECTIVES:

- To be productive in applying life science concepts and biological engineering principles in engineering practice or for state –of –the –art study.
- To achieve knowledge, skills and resources for continued education of the chemical engineering course, over a life time.
- To develop the strength in processing and manufacturing and outline the scholarly accomplishments of its faculty to combine conventional chemical engineering subjects with specialized studies in the modern fields of biological engineering, Nano-materials engineering, nuclear engineering and paper engineering.
- To go after rewarding professional careers by skillfully leveraging chemical engineering principles.

UNIT I

Atomic and molecular structure (12 lectures) .

Postulates of quantum chemistry. Schrodinger equation. Particle in a box solutions Molecular orbitals of diatomic molecules and plots of the multicentre orbitals.Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene. Band structure of solids and the role of doping on band structures

UNIT II

Spectroscopic techniques and applications.

Principles of spectroscopy and selection rules.Electronic spectroscopy.Fluorescence and its applications in medicine.Vibrational and rotational spectroscopy of diatomic molecules.Applications.Nuclear magnetic resonance and magnetic resonance imaging, surface characterization techniques.

UNIT III

Chemical equilibrium, Intermolecular forces and potential energy surfaces.

Use of free energy in Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies.Free energy and emf.Cell potentials, the Nernst equation and applications.Use of free energy considerations in metallurgy through Ellingham diagram.Equations of state of real gases and critical phenomena.

UNIT IV

Periodic properties

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and

electro negativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular
geometries, Born- Haber cycle, The use of reduction potentials, Properties of ionic and covalent compounds.

UNIT V

Stereochemistry, Organic reactions and synthesis of a drug molecule

Representations of 3 dimensional structures, structural isomers and stereo isomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings.Synthesis of a commonly used drug molecule.

Reference/Text Books

1. University chemistry, by B. H. Mahan
2. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
3. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S Krishnan
5. Physical Chemistry, by P. W. Atkins
6. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition.
7. Principles of physical chemistry, Puri, Sharma and Pattania

COURSE OUTCOMES:

CO1	To predict the atomic structure, chemical bonding, and molecular geometry based on accepted models and characterize the bonding between atoms, molecules, interaction, energetics, hybridization, molecular orbitals and bond parameters.
CO2	Exposure of light on different chemicals produce color of chemicals and also able to carry out chemical conversion based on theoretical basis of photochemistry as well as different types of spectroscopy.
CO3	Understand the chemical equilibrium, Intermolecular forces and potential energy surfaces and able to apply them on thermodynamic functions.
CO4	Able to understand the physical and chemical characteristics of elements in various groups and periods according to ionic size, charge, etc. and position in periodic table.
CO5	Able to understand the stereochemistry of organic molecules – conformation and configuration, asymmetric molecules and nomenclature.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										
CO2		3	3									
CO3				3	3							
CO4							3	3				
CO5									3	3		

ENHST103 ENGLISH
B.Tech I Semester
Effective from- 2018-19

Lectures / Week: 2 periods **credits:2**

COURSE OBJECTIVES:

- To introduce students elements of grammar and composition of English Language.
- To familiarize students with literary texts such as Short stories and prose passages.
- To maintain linguistic competence through training in vocabulary, sentence structures and pronunciation.
- To develop communication skills by cultivating the habit of reading comprehension passages.
- To train the students to develop the language skills like listening, speaking, reading and writing.
- To initiate them into use of self instructed learner friendly modes of language learning through competence.
- To train them in soft skills to reach the needs of global job market

UNIT I
Vocabulary Building
The concept of Word Formation- Root words from foreign languages and their use in English- Acquaintance with prefixes and suffixes from foreign languages in English form derivatives- Synonyms, antonyms, and standard abbreviations.

UNIT II
Basic Writing Skills
Sentence Structures – Use of phrases and clauses in sentences – Importance of proper punctuation - Creating coherence – Organizing principles of paragraphs in documents -Techniques for writing precisely

UNIT III
Identifying Common Errors in Writing
Subject-verb agreement -Noun-pronoun agreement -Misplaced modifiers -Article -Prepositions -Redundancies -Clichés

UNIT IV
Nature and Style of sensible Writing
Describing - Defining - Classifying –Providing examples or evidence –Writing introduction and conclusion

UNIT V
Writing Practices
Comprehension - Précis Writing –Essay Writing

Reference/Text Books:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper Resource Book. 2001
4. Study Writing. LizHamp-Lyonsand Ben Heasly.Cambridge\UniversityPress. 2006.
5. Communication Skills. SanjayKumar and PushpLata.OxfordUniversityPress. 2011.
6.Exercises in Spoken English. Parts.I-III. CIEFL, Hyderabad. Oxford UniversityPress

COURSE OUTCOMES:

CO1	Participate in discussions with emphasis on narrating and describing situations to develop oral communication skills including fluency, idea sequencing, accuracy, vocabulary and pronunciation
CO2	Able to use prewriting techniques to develop ideas and produce multiple drafts of different types of paragraphs
CO3	Able to organize and write coherent sentences, paragraphs, and essays free of grammatical errors that impede comprehension
CO4	Able to create written texts in a variety of literary genres that demonstrate an ability to apply literary techniques and discriminate among aesthetic values
CO5	Strengthen their ability to write academic papers, essays and summaries using the process approach.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1										3		3
CO2					3							
CO3										3		3
CO4										3		
CO5					3					3		

EEEST104 Basic Electrical & Electronics Engineering

B.Tech I Semester

Effective from- 2018-19

Lectures / Week: 3 periods **credits:4**

COURSE OBJECTIVES:

- Students will gain knowledge regarding the various laws and principles associated network circuits.
- To Classify different electrical and electronics measuring equipment's and understanding their principles.
- To Explain operative principle of transformer with background of magnetic circuits..
- To classify and compare different types of electrical machines..
- Student will gain knowledge on electronic systems.

UNIT-I

DC Circuits

Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and Voltage laws, analysis of simple circuits with dc excitation. Superposition, The venin and Norton Theorems.Time-domain analysis of first-order RL and RC circuits.

UNIT II

AC Circuits

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits Consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT III

Transformers

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase Transformer connections.

UNIT IV

Electrical Machines

Ingle-phase induction motor.Construction, working torque-speed characteristic-Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Starting and speed control of induction motor - Construction, working, torque-speed characteristic-Construction and working of synchronous generators and speed control of separately excited dc motor.

UNIT V

Electrical Installations

Introduction to Converters and Inverters- Single phase and three phase voltage source Inverters- Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery Backup.

Text / References Books:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill,2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press,2011.
4. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
5. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

COURSE OUTCOMES:

CO1	Familiarity with basic electronic components and use them to design simple electronic circuits
CO2	Able to derive expression for impedance, current, power in series and parallel RLC circuit with AC supply along with phasor diagram.
CO3	Relate phase and line electrical quantities in polyphase networks, demonstrate the operation of single phase transformer and calculate efficiency and regulation at different loading conditions
CO4	Gain knowledge regarding electrical machines and apply them for solving practical problems
CO5	Evaluate work, power, energy relations and suggest various batteries for different applications, concept of charging and discharging and depth of charge

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1										3		3
CO2					3							
CO3										3		3
CO4										3		
CO5					3					3		

MEEST105 ENGINEERING GRAPHICS AND DESIGN

B.Tech I Semester

Effective from- 2018-19

Lectures / Week: 2periods **credits:3.5**

COURSE OBJECTIVES:

- To prepare you to design a system, component, or process to meet desired needs with in realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- To prepare you to communicate effectively.
- To prepare you to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Unit – I

Introduction to Engineering Drawing

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epi-cycloid, Hypo-cycloid and Involutes.

Unit – II

Scales

Scales– construction of Plain &Diagonal Scales.

Projections of points, lines

Projections of Points and lines inclined to both planes, including traces;

Unit – III

Projections of planes

Projections of planes (Regular surfaces only) inclined Planes-Auxiliary Planes;

Projections of Regular Solids (Simple solids - cylinder, cone, prism & pyramid) those inclined to both the Planes-Auxiliary Views;

Unit – IV

Isometric Projections& Orthographic projections

Principles of Orthographic Projections-Conventions Draw simple objects, dimensioning and scale.

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric

Views to Orthographic Views and Vice-versa, Conventions;

Unit – V

Introduction to CAD [Demonstrating]

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

Suggested Text/Reference Books:

(i) Bhatt N.D., Panchal V.M. &Ingle P.R., (2014), Engineering Drawing, CharotarPublishing House
(ii)Shah,M.B.&RanaB.C.(2008),EngineeringDrawingandComputerGraphics,PearsonEducation
(iii)Agrawal B.& A grawal C.M.(2012),Engineering Graphics, TMH Publication
(iv)Narayana, K.L. &P Kannaiah(2008),Text book on Engineering Drawing, ScitechPublishers
(v)(Corresponding set of) CAD Software Theory and User Manuals

COURSE OUTCOMES:

CO1	Able to Select, Construct and Interpret appropriate drawing scales, simple curves like ellipse, cycloid and spiral as per the situation.
CO2	Able to draw projections of points and lines in any direction of plane.
CO3	Able to draw projections of planes and solids in any direction of a plane.
CO4	Draw orthographic projection of solids like cylinders, cones, prisms and pyramids including sections.
CO5	Able to create basic drawings with drawing commands in Autocad.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3									3		
CO2	2		3									
CO3	2					2				3		
CO4	2											3
CO5	2							3				

ENHSP 106 ENGLISH COMMUNICATIONS LAB

B.Tech I Semester

Effective from- 2018-19

Lectures / Week: 1.5 periods **credits:1.5**

COURSE OBJECTIVE:

- To improve the students' fluency in English, through a well-developed vocabulary
- To enable them listening spoken English at normal conversational speed by educated English speakers
- To respond appropriately in different socio-cultural and professional contexts.
- To communicate effectively and appropriately in real life situation and develop drafting skills among the students.
- To develop and integrate use of the four language skills and enhance employability skills

Listening Comprehension -Pronunciation, Intonation, Stress and Rhythm -Common Everyday Situations: Conversations and Dialogues -Communication at Workplace -Interviews -Formal Presentations

Reference/Text Books:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper Resource Book. 2001
4. Study Writing. LizHamp-Lyonsand Ben Heasly.Cambridge\UniversityPress. 2006.
5. Communication Skills. SanjayKumar and Pushp Lata.Oxford UniversityPress. 2011.
6.Exercises in Spoken English. Parts.I-III. CIEFL, Hyderabad. Oxford UniversityPress

COURSE OUTCOMES:

CO1	Better pronunciation and accent
CO2	Ability to use functional English
CO3	Competency in analytical skills and problem solving skills
CO4	Increase possibilities of job prospects
CO5	Communicate confidently in formal and informal contexts

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										3		
CO2										3		3
CO3		2	2									
CO4												3
CO5										2		3

MABST201 MATHEMATICS-II

B.Tech IISemester

Effective from- 2018-19

Lectures / Week: 3 periods **credits:4**

COURSE OBJECTIVES:

- This course will illuminate the students in the concepts of liner algebra.
- To introduce the vector methods and vector calculus in evaluating multiple integrals in two and three dimensional spaces.
- To equip the students with standard concepts of fourier series and harmonic analysis and their applications.
- To familiarize the students with the techniques of evaluating improper integrals.
- To provide knowledge on Legendre's polynomials and properties of Bessel's functions.

Unit I

Matrices: rank of a matrix-solution of system of linear equations-Eigen values, vectors –Canley-Hamilton theorem-quadratic forms-diagonalization.

Unit II

Vector Calculus: Gradient, Divergence, Curl of a vector and related properties-line, surface, volume integrals- Green's, Stokes's and Gauss Divergence theorems and its applications.

Unit III

Fourier Series: Fourier series-even and odd functions, periodic functions-half range sine and cosine series-harmonic analysis.

Unit IV

Special Functions I: Gamma and Beta functions-series solutions of differential equations-ordinary points.

Unit V

Special Functions II: Bessel function-recurrence formulae-generating function for Jn(X)-Lengender polynomials-recurrence formulae-generating function for Pn(X) - Rodriguez's formula - orthogonality of Lengender polynomials.

Text/Reference Books

1. B S Grewal, Higher Engineering Mathematics, 40th Edition, Khanna Publications, 2007.
2. M K Venkataraman, Engineering Mathematics, National Publishing Company, Chennai.
3. B V Ramana, Higher Engineering Mathematics, 6th Reprint, Tata McGraw-Hill, 2008.
4. Bali and Iyengar, Engineering Mathematics, 6th Edition, Laxmi Publications, 2006.

COURSE OUTCOMES:

CO1	Use ranks of matrices to decide whether the system of linear equations is consistent or not and hence solve.
CO2	Acquire knowledge about the physical interpretation of the gradient, divergence and curl.
CO3	Able to know the basic results about the properties of Fourier transform and Fourier series and its convergence.
CO4	Acquire the knowledge of properties of special functions and to use this to solve differential equations.
CO5	Able to generate the functions of Lengender polynomials.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3										3
CO2	2	3										
CO3	3	3	3									
CO4	2	3										
CO5	2	3	2									

PYBST202 ENGINEERING PHYSICS

B.Tech II Semester

Effective from- 2018-19

Lectures / Week: 3 periods **credits:4**

COURSE OBJECTIVES

- Develop appropriate competence and working knowledge of laws of modern physics in understanding advanced technical engineering courses.
- Understand the quantum mechanics and ultimately the quantum behavior of charged particles when they are in motion.
- Identify and apply appropriate analytical and mathematical tools of physics in solving engineering problem.
- Apply the basic principles of mechanics of rigid body and continuous media and their applications understand the principles in electro statics and electromagnetic and magnetic properties of materials.

UNIT I

Wave Optics:

Interference: Huygen`s Principle-Principle of Superposition-Interference of Light-Young`s double slit experiment- -Newton's Rings.

Diffraction: Fraunhofer Diffraction at a Single Slit and a Circular Aperture-Plane Diffraction grating – Resolving Power-Rayleigh`s Criterion-Resolving power of Grating and Microscope.

Lasers : Introduction – Spontaneous and Stimulated Emission of Radiation – Population Inversion – Types of Lasers – Ruby Laser – He-Ne Laser – Semiconductor Laser – Applications of Lasers.

UNIT II

Mechanics of Rigid Body:

Rigid Body-Rotational Motion and Kinematics Relations-Kinetic Energy and Angular Momentum of a Rotating Body-Equation of Motion of a Rigid body (Torque of a Rigid Body)-Combined Translation and Rotational Motion of a Rigid Body- Body Rolling on an inclined Plane.

Mechanics of Continuous Media:

Elasticity, Stress and Strain- Hook`s Law and Behavior of Wire Under Load- Elastic Constants-Relation Between Elastic Modulii-Types of Supports, Beams and Loads-Different types of Bending-Cantilever with an End Load. Ultrasonic Waves - Sound Absorption and Reverberation -Sabine Formula - Acoustics of Buildings.

UNIT III

Electromagnetism and magnetic properties of Materials:

Laws of Electro statistics- Electric Current- Laws of Magnetism- Ampere`s, Faraday`s laws-Maxwell's Equations – Polarization - Permeability and dielectric constant- Polar and non-polar Dielectrics, Clausius-Mossotti equation, Applications of Dielectrics.

Magnetization - Permeability and Susceptibility- Classification of Magnetic Materials, Ferromagnetism-Magnetic Domains and Hesteresis, Applications of ferromagnetic materials**.**

UNIT IV

Quantum Mechanics : Wave – Particle duality – de Broglie Concept of Matter Waves – Properties of Matter Waves – Davison and Germer Experiment – G.P.Thomson Experiment – Heisenberg's Uncertainty Principle – Schrödinger's Time Independent and Time Dependent Wave equation – Significance of Wave Function – Electron in an Infinite Square Potential Well – Probability Densities and Energy Levels.

UNIT V

NanoPhysics and Nanotechnology : Introduction to Nanomaterials –Properties: Optical Properties – Quantum Confinement – Electrical properties. Synthesis of Nanomaterials: Ball milling, Arc deposition method – Chemical Vapour Deposition-Pulsed laser deposition. Characteristics of C60 (Zero dimensional), Carbon Nan tubes (One Dimensional) and Graphene (Two Dimensional). Applications of Nanomaterial.

Text Books/Reference Books:

1. R.K.Gaur and S.L.Gupta ``Engineering Physics" Sultan and Chand Pub., New Delhi

2. S.L.Gupta and Sanjeev Gupta`Unified Physics`Vol.I Jai Prakash Nath & Co., Meerut.

3. Hitendra K.Malik and A.K.Singh ``Engineering Physics" Tata MCGraw Hill Education PVt.Ltd., New Delhi

4. M.N.Avadhanulu and P.G.Kshirsagar ``A Text Book of Engineering Physics`` S.Chand and Company Pvt.Ltd., New Delhi

5. B.L Theraja, "Modern physics", S.Chand & Company.

6. V. Raghavan "Material Science", Tata Mc Graw Hill Publications.

7. M.S.Ramachandra Rao and Shubra Singh, ``Nanoscience and Nanotechnology``
Wiley India Pvt.Ltd, New Delhi

COURSE OUTCOMES:

CO1	Students demonstrate appropriate competence and working knowledge of laws of modern physics in understanding advanced technical engineering courses.
CO2	Able to demonstrate competency and understanding of the concepts found in Mechanics, Harmonic Oscillations, Waves in one dimension, wave Optics, Lasers, and a broad base of knowledge in physics
CO3	Able to know the significance of Maxwell's equations in the Engineering applications of electromagnetic and ferromagnetic materials.
CO4	Be able to understand the basic principles of Quantum mechanics and to apply these to the complex phenomenon of matter radiation interaction.
CO5	Be able to understand the basic principles of Quantum mechanics and to apply these to the complex phenomenon of matter radiation interaction.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3									2		
CO2	2									3		
CO3	1			3								
CO4		3								3		
CO5					2							3

CSEST203 PROGRAMMING AND PROBLEM SOLVING

B.Tech IISemester

Effective from- 2018-19

Lectures / Week: 3 periods **credits:3**

COURSE OBJECTIVES:

- To acquire problem solving skills.
- To be able to develop flowcharts and algorithms for the given problem.
- To learn how to write modular programs syntax and logical errors in C.
- To earn branching, iteration and recursion.
- To learn a problem into functions and synthesize a complete program using divide and conquer approach.

UNIT-I

Introduction to Programming

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)

Idea of Algorithm: steps to solve logical and numerical problems. Representation of

Algorithm: Flowchart/Pseudo code with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code- Arithmetic expressions and precedence.

UNIT-II

Conditional Branching and Loops

Writing and evaluation of conditionals and consequent branching, Iteration and loops , Arrays (1-D, 2-D), Character arrays and Strings.

UNIT-III

Basic Algorithms

Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

UNIT-IV

Functions Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference. Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

UNIT-V

Structures and Pointers: Defining structures and Array of Structures.Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation) File handling

Text Books&Reference Book:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

COURSE OUTCOMES:

CO1	Learn about fundamentals of computer and programming language, draw flow chart to solve given problem logically and develop algorithm to solve given program
CO2	Able to use the concept of branching and looping to design efficient C program and be able to apply the concepts of user defined function and recursion to support reusability
CO3	Able to discuss basic algorithmic analysis for simple algorithms; determine appropriate algorithmic approaches to a real world problems.
CO4	Apply fundamental programming concepts, using a functional programming language, to solve problems.
CO5	Design and develop a modular program in C for commercial billing activities using an array of structures and pointers.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1		3			2			2		2
CO2	2	3	2		3					2		
CO3		2	1								3	
CO4		3										
CO5			3									

MEEST204MANUFACTURINGPROCESSES

B.Tech IISemester

Effective from- 2018-19

Lectures / Week: 4 periods **credits:4**

COURSE OBJECTIVES:

- To understand and develop working knowledge of manufacturing process that are used in the industry.
- To learn how component can be manufactured in sustainable manner and learn about the environmental hazards of different manufacturing processes.
- Student should be able to design and analyze various manufacturing processes and tooling.
- Student will be able to joining processes as per the requirements of material being used to manufacture end product.
- Student should be able to understand the unconventional machine processes and its applications.

UNIT-I

Casting and moulding: Metal casting processes and equipment, Heat transfer and solidification, shrinkage ,riserdesign ,casting defectsand residual stresses.

UNIT-II

Metal Forming: Introduction to bulk and sheet metal forming, plastic deformation and yield criteria ;fundamentals of hot and cold working processes; load estimation for bulk forming (forging,rolling,extrusion,drawing)andsheetforming(shearing,deepdrawing,bending) principles of powder Metallurgy.

UNIT-lll

Metal cutting Single and multi-point cutting; Orthogonal cutting, various force Components :Chip formation, Tool wear and tool life, Surface finish and integrity, Machinability, ,Cutting toolmaterials,Cuttingfluids,Coating;Turning,Drilling,Millingandfinishingprocesses,
IntroductionctoCNCmachining. Additive manufacturing: Rapid proto typing and rapid tooling.

UNIT-IV

Joining/fastening processes Physics of welding,brazing and soldering; design considerations in welding,Solid and liquid state joining processes; Adhesive bonding.

UNIT-V

Unconventional Machining Processes:
AbrasiveJet machining,WaterJetMachining,AbrasiveWaterJetMachining,Ultrasonic Machining ,principles and process parameters, Electrical Discharge Machining, principle and processes parameters, MRR, surface finish, tool wear ,dielectric, power and control circuits, wire EDM;Electro chemicalmachining(ECM),etchant&mask ant,processparameters, MRR and surface finish.

Laser BeamMachining(LBM),PlasmaArcMachining(PAM)andElectronBeamMachining

Text Books

1. Kalpak jianand Schmid, Manufacturingprocesses forengineeringmaterials(5thEdition)-PearsonIndia,2014

2. MikellP.Groover, Fundamentals ofModern Manufacturing:Materials,Processes, andSystems

3. Degarmo, Black &Kohser, Materials and Processes inManufacturing

COURSE OUTCOMES:

CO1	Able to select materials, types and allowances of patterns and analyze the components of moulds, gating system in metal casting processes.
CO2	Develop process-maps for metal working processes using plasticity principles
CO3	Able to analyze Hot and Cold Working, Forging, Extrusion and Drawing Processes
CO4	Design and Analyze different sheet metal working processes
CO5	Understand different Welding and joining processes and its defects

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2		3		3							
CO2	1		2		3							
CO3		2			3							
CO4			3		3							
CO5			2		3							

MEESP205 WORKSHOP/MANUFACTURING PRACTICES

B.Tech IISemester

Effective from- 2018-19

Lectures / Week: 1.5 periods **credits:1.5**

COURSE OBJECTIVE:

- To understand the basic tools and operations in carpentry
- To understand the basic tools and operations in fitting & various types of joints.
- To understand the basic tools and operations in sheet metal trades.
- To understand the basic tools of house wiring & house wiring connections etc.
- To understand the basic tools and manufacturing processes in a foundry trade

1.Manufacturing Methods-casting, forming, machining, joining, advanced manufacturing methods
2. CNC machining, Additive manufacturing
3. Fitting operations & power tools
4. Electrical & Electronics
5. Carpentry
6. Plastic moulding, glass cutting
7. Metal casting
8. Welding(arc welding &gas welding), brazing

The above course content is learnt by online videos/ppt presentations**.**

Text/Reference Books:

(i) HajraChoudhury S.K.,Hajra ChoudhuryA.K.andNirjharRoyS.K.,"Elementsof Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and Publisher's private limited, Mumbai.

(ii)KalpakjianS.AndStevenS.Schmid,"ManufacturingEngineeringandTechnology",4thedition,PearsonEducationIndiaEdition,2002.

(iii) GowriP.HariharanandA. SureshBabu, "Manufacturing Technology–I" Pearson Education,2008.

(iv) RoyA. Lindberg, "Processes and Materials of Manufacture",4thedition, Prentice Hall India,1998.

(v) RaoP.N., "Manufacturing Technology", Vol.IandVol.II,TataMcGrawHillHouse 2017.

(ii)Workshop Practice:

1. Machine shop
2. Fitting shop
3. Carpentry
4. Electrical wiring
5. Weldingshop
6. Casting
7. Smithy
8. Plastic moulding & Glass Cutting

** choose any of the above Six for practice**

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

COURSE OUTCOMES:

CO1	Design and develop different types of wood joints based on the requirement
CO2	Design and develop different types of fittings as per requirement
CO3	Able to develop prototype models by using tin smithy tools.
CO4	Design and develop different moulds as per practical requirements.
CO5	Able to connect bulbs either series or parallel

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2		3									2
CO2	2		3									
CO3	2		3									
CO4	2		3									
CO5	2		3									

CSESP206 PROGRAMMING AND PROBLEM SOLVING LAB
B.Tech IISemester
Effective from- 2018-19

Lectures / Week: 1.5 periods **credits:1.5**

COURSE OBJECTIVES

- To make the student solve problems, implement algorithms using C language.
- To make the student solve problems, implement those using C & C++ programming languages.
- To strengthen the ability to identify and apply the suitable data structure for the given real world problem
- To organize the user's data for decision making and iterative processes.
- To apply structured programming approach to solve real time applications.

Assignments in C
Variable types and type conversions:

Simple computational problems using arithmetic expressions
Branching and logical expressions:

Problems involving if-then-else structures
Loops, while and for loops:

Iterative problems e.g., sum of series
1D Arrays: searching, sorting:

1D Array manipulation
2D arrays and Strings

Matrix problems, String operations
Functions, call by value

Simple functions
Numerical methods (Root finding, numerical differentiation, numericalintegration):

Programming for solving Numerical methods problems
Recursion, structure of recursive calls
Recursive functions
Pointers, structures and dynamic memory allocation
Pointers and structures
Assignments in C and JAVA
File handling
File operations

COURSE OUTCOMES:

CO1	Able to know concepts in problem solving
CO2	To do programming in C language
CO3	To write diversified solutions using C language
CO4	Implement Programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor.
CO5	Able to develop programs for real world applications using Java

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3										
CO2	2		3									
CO3	2	3	2									
CO4	2		3									
CO5	2	3										

CEMCT 207 ENVIRONMENTAL SCIENCE
B.Tech II Semester
Effective from- 2018-19

Lectures / Week: 3 periods **credits:4**

COURSE OBJECTIVES:

- Gain in –depth knowledge on natural processes that sustain life , and govern economy.
- Predict the consequences of human action on the web of life, global economy and quality of human life.
- Develop critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development.
- Acquire values and attitudes towards understanding complex environmental –economic- social challenges, and participating actively in solving current environmental problems and preventing the future ones.
- Adopt sustainability as a practice in life, society and industry.

Unit I: Environmental Studies and Natural Resources
Definition, Scope and importance of Environment, Environmental studies, Need for public awareness
Components of Environment- Atmosphere, Hydrosphere, Lithosphere.
Renewable and Non Renewable Resources and associated problems
•Water resources: Use and over utilization of surface and ground water, floods, drought, conflicts over water, dams benefits and problems.
•Forest resources: Use and over exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
• Land resources: Land as a resource, land degradation, Man induced landslides, soil erosion and desertification.
• Mineral resources: Use and overexploitation, Environmental effects of extracting and using mineral resources, case studies.
• Food resources: World food problems, changes caused agriculture and overgrazing, effects of modern agriculture, fertilizer – pesticide problems, water logging, salinity, Case studies.
• Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.
• Role of an individual in conservation of natural resources.
Unit II: Ecosystem and Biodiversity :
Ecosystem - Concept of an ecosystem.
- Structure and functions of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.

- Introduction, types, characteristic features, structure and function of the following ecosystem.
  (a) Forest ecosystem. (b) Grassland ecosystem

(c)Desert ecosystem. (d) Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its conservation:

- Definition, genetic species and ecosystem diversity.
- Biogeographically classification of India.
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation.
- Hot-spots of biodiversity.
- Threats to biodiversity: habitat loss, poaching of wildlife, man – wildlife conflicts.
- Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

Unit III Environmental pollution and Global Effects.

- Definition, Causes, Effects, and control measures of (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards
- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster management: Floods, earthquakes, cyclone, landslides, Tsunami.
- Climate change-Global warming, Acid rain, Ozone depletion,.

Unit IV

Environment Issues and Management

•Environment and Human health – Epidemic diseases, HIV/AIDS, Aviation Flue, Water Borne Diseases.

•Environmental Impact Assessment, Sustainable Development, Clean Production and Clean Development Mechanisms

•Environment Legislation: Environmental Protection Act, Water Act, Air Act, Wild Life Protection Act, Forest Conservation Act, Public Liability & Insurance Act, Issues involved in Enforcement of Environmental legislation.

Unit V

Social Issues and the Environment

- Population growth, Population Explosion, Population Control, Women and Child welfare.
- Urbanization, Industrialization, Development projects, Resettlement and Rehabilitation of people – Problems concerned, Case studies.
- Consumerism and Waste Products Conservation, Public Awareness, Water Conservation, Rain water harvesting, watershed management, Wasteland reclamation, Human Rights, Value education, Environmental ethics- Issues and possible solution.
- Role of information Technology in Environment and Human Health.

Text books :

1. Anubha Kaushik & C P Kaushik, Environmental studies, New age International Publishers, 2008
2. Benny Joseph, Environmental studies, Tata McGraw-Hill Publishers, 2005
3. M Chandra Sekhar, Environmental Science, Hi-Tech Publishers, 2004

4. Keerthinarayana and Daniel Yesudian, Principles of Environmental Sciences and Engineering , Hi-Tech Publishers, 2005
5. Amal K.Datta, Introduction to Environmental Science and Engineering, Oxford & IBH Publishing Co.Pvt.Ltd, 2000
6. Santhosh kumar Garg,Rajeshawri Garg and Rajni Garg, Ecological and Environmental studies, Khanna publishers, 2006

Reference books:

1. Gilbert M, Introduction to Environmental Engineering and Science, Masters Publication by Prentice –Hall of India Private Ltd., 1991
2. William P Cunningham and Mary Ann Cunningham, Principles of Environmental Science, Tata McGraw Hill Publishing Co.Ltd, 2002

COURSE OUTCOMES:

CO1	Able to understand the importance of the environment
CO2	Able to identify conservation concepts of natural resources
CO3	Able to identify problems due to human interactions in the environment
CO4	Able to understand the enforcement of environment acts in our constitution
CO5	Capable of managing social issues related to environment

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2						3					2
CO2	3						2					1
CO3	1						3					
CO4							3					
CO5	2						2					

MABST302NUMERICAL METHODS
B.Tech III Semester
Effective from- 2018-19

Lectures / Week: 3 periods **credits: 3**

COURSE OBJECTIVES:

- This course aims at providing the student with the knowledge on various numerical methods.
- Evaluation of finite differences and difference equations.
- To acquaint the student with different types of numerical methods to solve.
- To provide suitable and effective methods called numerical methods for differential equations.
- Evaluation of iterative methods and finite difference approximation to derivatives, solutions of Laplace, poisson equations by iterative methods.

Unit – I

Simple correlation and regression – Curve fitting – Fitting Linear, second degree and exponential curve by the method of least squares – Normal distribution

Unit – II

Determination of roots of non – linear equations: Bisection method – Falsi position method – Newton Raphson method – Iterative method. Solutions of system of linear equations: Gauss elimination with pivotal condensation – Gauss Jacobian, Gauss Seidel iteration methods.

Unit – III

Numerical interpolation: Newtons's forward and backward interpolation formulae – Lagrange's interpolation formulae, Finding first and second order differential coefficients using Newton's formulae. Numerical integration – Trapezoidal, Simpson's 1/3 and Simpson's 3/8 rules.

Unit – IV

Solutions of ordinary differential equations: Taylor's series – Euler method – Modified Euler's method – Runge Kutta methods (second and fourth order only) – Minlne's predictor corrector method.

Unit – V

Solutions of partial differential equations: Solutions of Laplace equation by Liebmann's iteration process – solution of Poisson's equations by using Gauss Seidel iteration method.

Text Books:

1. M. Ray & H.S. Sharma, *Mathematical Statistics*, Ram Prasad &Sons.
2. S. Armugam, *Numerical Methods*, Second Edition, Scitech Publications, Chennai.

References:

1. B.S. Grewel, *Higher Engineering Mathematics*, Thirty First Edition, Khanna Publications, 1995.

COURSE OUTCOMES:

CO1	Applying various statistical models and methods for drawing conclusions and making decisions under uncertainty in engineering contexts
CO2	Apply statistical and numerical methods in various computer science related projects, seminars and research
CO3	Apply the knowledge of iterative methods to solve algebraic and transcendental equations, simultaneous linear equations, ODE (ordinary differential equations)
CO4	Acquire knowledge of finite differences, interpolation, numerical differentiation and numerical integration
CO5	Demonstrate a basic knowledge of the techniques for accurate and efficient solution of models based on linear and nonlinear systems of equations, ordinary differential equations and partial differential equations

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1		3			2							
CO2		3			2							
CO3		3			2							
CO4		3			2							
CO5		3			2							

MEPCT301THERMODYNAMICS
B.Tech III Semester
Effective from- 2018-19

Lectures / Week: 3 periods **Tut / Week: 1 period** **credits:4**

COURSE OBJECTIVE:

- To learn about work and heat interactions, and balance of energy between system and its surroundings
- To learn about application of I law to various energy conversion devices
- To evaluate the changes in properties of substances in various processes
- To understand the difference between high grade and low grade energies and II law limitations on energy conversion.

UNIT - I

Fundamentals - System & Control volume; Property, State & Process; Exact & Inexact differentials; Work - Thermodynamic definition of work; examples; Displacement work; Path dependence of displacement work and illustrations for simple processes; electrical, magnetic, gravitational, spring and shaft work. Temperature, Definition of thermal equilibrium and Zeroth law; Temperature scales; Various Thermometers-Definition of heat; examples of heat/ work interaction in systems

UNIT – II

First Law for Cyclic & Non-cyclic processes; Concept of total energy E; Demonstration that E is a property; Various modes of energy, Internal energy and Enthalpy; First Law of Thermodynamics and Flow Processes - Derivation of general energy equation for a control volume; Steady state steady flow processes including throttling; Examples of steady flow devices; Unsteady processes; examples of steady unsteady Firs law applications for system & control volume

UNIT - III

Second law of Thermodynamics- Definitions of direct and reverse heat engines; Definitions of thermal efficiency and COP; Kelvin-Planck and Clausius statements; Definition of reversible process; Internal and external irreversibility; Carnot cycle; Absolute temperature scale. Clausius inequality; Definition of entropy S; Demonstration that entropy S is a property; Evaluation of S for solids, liquids, ideal gases and ideal gas mixtures undergoing various processes.

UNIT - IV

Irreversibility and Availability, Availability function for systems and Control volumes undergoing different processes, Lost work. Second law analysis for a control volume. Exergy balance equation and Exergy analysis. Definition of Pure substance, Ideal Gases and ideal gas mixtures, Real gases and real gas mixtures, Compressibility charts- Properties of two phase systems - Const. temperature and Const. pressure heating of water.

UNIT -V

Thermodynamic and Air standard cycles -; Basic Brayton cycle; Introduction to basic concepts of Gas Turbines; Sterling Engine, Otto, Diesel and Dual cycles; Air Standard Efficiency and comparison with Carnot Cycle Efficiency.

Text Books:

- Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., 2003, 6th Edition, *Fundamentals ofThermodynamics*, John Wiley and Sons.
- Jones, J. B. and Duggan, R. E., 1996, *Engineering Thermodynamics*, Prentice-Hall of India
- Moran, M. J. and Shapiro, H. N., 1999, *Fundamentals of Engineering Thermodynamics*, John Wiley and Sons.
- Nag, P.K, 1995, *Engineering Thermodynamics*, Tata McGraw-Hill Publishing Co. Ltd.
- Domakundwar and Kothandaraman, *A Course in Thermal Engineering;*
- Vasanadni, V.P. and Kumr, D.S., *Heat Engineering.*

COURSE OUTCOMES:

CO1	Understanding the concepts such as conservation of mass, conservation of energy, work interaction, heat transfer and first law of thermodynamics
CO2	Recognize and understand the different forms of energy and restrictions imposed by the first law of thermodynamics on conversion from one from to another.
CO3	Solve the practical thermodynamic problems by applying first law and steady flow energy equation
CO4	Able to explain the concept of entropy, including the Clausius Inequality, using thermodynamic tables, setting up entropy balances, and calculating isentropic efficiency of pumps, compressors, turbines, and heat exchangers.
CO5	Able to estimate performance of various Thermodynamic and air standard cycles.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO12
CO1	2			3			2					
CO2	1			2			3					
CO3			2	3								
CO4		3		2								
CO5		3		1								

MEPECT303INDUSRTRIAL SAFETY &MEASURES

B.Tech III Semester
Effective from- 2018-19

Lectures / Week: 3 periods **credits:3**

COURSE OBJECTIVES:

- It is needed to eliminate accidents causing work stoppage and production loss and to increase production means to higher standard of living..
- It is required to educate all members regarding the safety principles to avoid accidents in industry.
- Industrial safety is needed to check all the possible chances of accidents for preventing loss of life and permanent disability of any industrial employee, any damage to machine and material as it leads to the loss to the whole establishment.
- It is needed to prevent accidents in industry by reducing any hazard to minimum.
- To provide exposure to the students about safety of the plant and safety Inventory system.

UNIT-I

Introduction: Evolution of modern safety concept- Safety policy - Safety Organization - line and staff functions for safety- Safety Committee- budgeting for safety. Accident investigation: Concept of an accident, reportable and non reportable accidents, unsafe act and condition – principles of accident prevention, Supervisory role- Role of safety committee - Accident causation models. Techniques : Incident Recall Technique (IRT), disaster control, Job Safety Analysis (JSA), safety survey, safety inspection, safety sampling, Safety Audit.

UNIT-II

Safety performance monitoring: Permanent total disabilities, permanent partial disabilities, temporary total disabilities - Calculation of accident indices, frequency rate, severity rate, frequency severity incidence, incident rate, accident rate, safety “t” score, safety activity rate – problems

UNIT-III

Safety in engineering industry- Need of safety in engineering industry, general health hazards and control measures in engineering industry.

Safety measures for electric work, Overload and other protections, Energy conservation and safety. Electrical work in hazardous atmosphere, Static electricity

UNIT-IV

Hazard identification techniques: Hazard identification techniques with examples such as FMEA, CMA, Fault Tree Analysis, Preliminary Hazard Analysis (PHA), Hazard and operability (HAZOP) study, Safety Audit.

UNIT-V

Plant and Equipment Safety Appraisal & Control Techniques: Objectives, Plant safety observation, Plant Safety Inspections. Safety Sampling.Safety Surveys.Job Safety Analysis.Safety Inventory System.

REFERENCES:

1. Krishnan N.V. "Safety Management in Industry" Jaico Publishing House, Bombay, 1997.
2. . Accident Prevention Manual for Industrial Operations", N.S.C.Chicago, 1982
3. "Safety in Industry" N.V. Krishnan Jaico Publishery House, 1996.

COURSE OUTCOMES:

CO1	Understand the functions and activities of safety engineering and carry out a safety audit and able to submit a report for the audit.
CO2	To evaluate the safety performance of an organization from accident records
CO3	Able to understand the operation of various protection systems from electrical hazards and recognize different hazardous zones in Industries
CO4	Understand the methods of hazard identification and preventive measures.
CO5	Identify equipment requirements for a specific process and for various locations, working conditions and difficulties during the design and implementation of the plant layout.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1							3		2		3	
CO2							3		2			2
CO3									2			
CO4	1								3			
CO5	1								3			

CEEST304 ENGINEERING MECHANICS
B.Tech IIISemester
Effective from- 2018-19

Lectures / Week: 3 periods Tut / Week: 1 period credits:4

COURSE OBJECTIVES:

- To learn about forces and force systems and their applications.
- To learn how to find centroid and Moments of Inertia of different objects using mathematical formula.
- To learn about rectilinear and curvilinear motions of bodies and explain the resolution of a system of forces, compute their resultant and solve problems using equations of equilibrium
- To explain kinetics and kinematics of particles, projectiles, curvilinear motion, centroid motion and plane motion of rigid bodies.
- To explain the concepts of work-energy method and its applications to translation, rotation and plane motion and the concept of vibrations.

UNIT – I

Statics : Basic concepts – System of force, Concurrent and non – concurrent Coplanar and non – coplanar forces – Resultant – Moment of force and its applications – Couples and resultant of force systems – Equilibrium of systems of forces – free body diagrams (FBDs), Equations of equilibrium of coplanar systems and spatial systems.

UNIT-II

Center of gravity and moment of inertia – Theory of Pappus – Centroids of composite figures – Areas of gravity of bodies – Moment of inertia – Parallel and perpendicular axis theorems – Moments of inertia of composite of areas (rolled and built – up sections) – Radius of gyration of areas.

UNIT-III

Simple Stress and Strains – Elasticity and Plasticity – Types of stresses and strains – Hooke's law – Stress – Strain diagram for mild steel – Working stress – Factor of safety.
Lateral Strain and Poisson's ratio – Volumetric strain – Elastic module and relationship between elastic constants – Bars of varying section – Composite bars – Temperature stresses. Strain energy - principles of virtual work.

UNIT-IV

Kinematics: Rectilinear and Curvilinear motion – Velocity and Acceleration – Motion of A Rigid Body
– Types and their Analysis in Planar Motion.
Kinetics: Analysis as a particle and Analysis as a Rigid Body in Translation – Central Forces of motion– Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies – Work Energy Method – Equation for Translation – Work Energy application to Particle Motion, Connection System – Fixed axis Rotation and Plane Motion

UNIT-V

Analysis of Perfect Frames: Types of frames – cantilever frames and simply supported frames – Analysis of frames using method of joints and method of sections.

Mechanical Vibrations: Definitions, Concepts-Simple Harmonic motion-Free vibrations-Simple Compound and Torsional pendulum- Numerical problems.

Text Books:

1. Ghose, D.N., Applied Mechanics and Strength of Materials
2. Timoshenko and Young, Engineering Mechanics
3. Junarkar, S.B. Mechanics of Structures, Vol. 1.
4. Junarkar, S.B., Elements of Applied Mechanics

COURSE OUTCOMES:

CO1	Able to determine the resultant force and moment for a given force system
CO2	Able to determine the centroid and moment of inertia of composite sections
CO3	Able to understand the operation of various protection systems from electrical hazards and recognize different hazardous zones in Industries
CO4	Understand the methods of hazard identification and preventive measures.
CO5	Identify equipment requirements for a specific process and for various locations, working conditions and difficulties during the design and implementation of the plant layout.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1		3										
CO2		3										
CO3		3							2			1
CO4									3			1
CO5			3						1			

MEPCT305 Manufacturing Technology

B.Tech III Semester

Effective from- 2018-19

Lectures / Week: 3 periods **credits: 3**

COURSE OBJECTIVE:

- To provide knowledge on machines and related tools for manufacturing various components.
- To understand the relationship between process and system in manufacturing domain.
- To identify the techniques for the quality assurance of the products and the optimality of the process in terms of resources and time management.

Unit - I

Tooling for conventional and non-conventional machining processes: Mould and die design,Press tools, Cutting tools; Holding devices: Jigs and fixtures, principles, applications and design; press tools – configuration, design of die and punch; principles of forging die design. **(8)**

Unit - II

Metrology: Dimensions, forms and surface measurements, Limits, fits and tolerances; linear and angular measurements; comparators; gauge design; interferometry; Metrology in tool wear and part quality including surface integrity, alignment and testing methods. **(8)**

Unit - III

tolerance analysis in manufacturing and assembly. Process metrology for emerging machining processes such as micro-scale machining, Inspection and workpiece quality.Assembly practices: Manufacturing and assembly, process planning, selective assembly, Material handling and devices. Additive Manufacturing, Rapid Prototyping and Rapid Tooling. **(8)**

Unit - IV

Production planning & control: Forecasting models, Aggregate Production Planning, materials requirement planning. Inventory Models: Economic Order Quantity, quantity discount models, practical inventory control models, ABC,VED,FSN analyses, JIT. Simple queuing theory models.**(8)**

Unit – V

Competitive aspects in manufacturing. selection of materials, shapes and commercially available materials, manufacturing properties, cost of materials and processing, substitution of materials, selection of manufacturing process, dimensional tolerance and surface finish, production volume, manufacturing costs, value engineering concept . (8)

Text Books:

1. Kalpakjian and Schmid, Manufacturing processes for engineering materials (5th Edition)-Pearson India, 2014.
2. Taha H. A., Operations Research, 6th Edition, Prentice Hall of India, 2003.
3. Shenoy G.V. and Shrivastava U.K., Operations Research for Management, Wiley Eastern, 1994.
4. Panneerselvam, “Operations Research”, PHI Learning, 2006.

COURSE OUTCOMES:

CO1	Having knowledge on machines and related tools for manufacturing various components.
CO2	Able to understand the tooling needed for manufacturing, dimensional accuracy and tolerances of products, assembly of different Components in various manufacturing applications.
CO3	Able to identify the techniques for the quality assurance of the products and the optimality of the process in terms of resources and time management.
CO4	Have knowledge about different measurement methods and instruments, both traditional and modern that is used in the industry to measure product dimensions, shape and surface structure.
CO5	Able to select materials and manufacturing processes for producing low cost high quality products in the market.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	2		3									
CO2	1	2	3									
CO3	1		3									
CO4		2	3									
CO5	1		3									

MEPCT308Advanced Engineering Graphics
B.Tech III Semester
Effective from- 2018-19

Lectures / Week: 2 periods **(P/D) / Week: 3periods** **credits:3.5**

COURSE OBJECTIVES

- To know about different types of projection.
- To know projection of solids and section of solids.
- To know development of different types of surfaces.
- To know about isometric projection.

UNIT-I

Sections of solids of tetrahedron, cube, prism, pyramids and cone, section planes perpendicular to HP and inclined to VP, Section planes perpendicular to VP and inclined to HP sections plane Perpendicular to both HP and VP.

UNIT-II

Development of surfaces: Development of lateral surfaces of right regular solids as prisms, pyramids, cylinders and cones which are cut by plane inclined to HP only.

UNIT-III

Introduction to interpenetration of solids of intersection of two prisms, cylinders, cone and cylinder.

UNIT-IV

Isometric Projections: Isometric Projections and views such as prisms, Pyramids, cylinders and cones.

Solids placed one over the other.

UNIT-V

Introduction to AUTOCAD-Co-ordinate system, Object snap, Draw Tools -Line, Polyline, Rectangle, circle, spline, Ellipse, Point, Hatch, Text, Modify Tools - Erase, copy, Mirror, Offset, Array, Move Rotate, Trim, Fillet, Dimensions - Dimension Variables, Linear, Aligned, Radius and diameter, Angular Dimensions

Text Books:

1. Bhatt N.D. and V.M. Panchal, Engineering Drawing Revised Edition, Charotar Publications, 2010.
2. Dhananjaya A Jolhe, Engineering Drawing with an introduction to Auto CAD, Tata MeGrawhill - 2009.
3. Gautam Pohit, Gautam Gosh: Machine Drawing with auto cad-Pearson Publications
4. K.L.Narayana and P. Kannaih, A text Book of Engineering Drawing, SCITECH Publications – (1999)
5. K. Venugopal: Engineering Drawing & Graphics, New age International Publishers.

COURSE OUTCOMES:

CO1	Able to draw Projections of solids and Auxiliary projections of solids parallel to one plane perpendicular to both the planes
CO2	Able to analyze and draw section of solids inclined to both the planes
CO3	Able to develop surfaces of solids which are perpendicular to both the planes
CO4	Able to draw interpretation of solids in any angle
CO5	Able to draw isometric projections of simple objects

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1		1	3									1
CO2		1	3									1
CO3		1	3									1
CO4		1	3									1
CO5		1	3									1

MEPCP309 Manufacturing Process Lab
B.Tech III Semester
Effective from- 2018-19

(P/D) / Week: 3 periods **credits: 1.5**

COURSE OBJECTIVES:

- Understand practical orientation of manufacturing process.
- Knowledge on different kinds of production process and practice available for shaping or molding several daily used parts for industries.
- Prepare assembly drawing, sectional views and bill of materials for selection of equipment for various manufacturing process will be understand.

LIST OF EXPERIMENTS:

LATHE

Model 1: Step Turning

Model 2: Taper Turning with Knurling

Model 3: V Threading

SHAPER

Model 4: Making Square prism on Shaper

Model 5: Slot Cutting with Shaping Machine

MILLING MACHINE

Model 6: Rectangular Slot Cutting on Vertical Milling Machine

Model 7: Hexagonal Cutting on Horizontal Milling Machine

Model 8: Spur Gear cutting on Milling

THREADING

Model 9: Square Threading

Model 10: Double Start V Threading

Model 11: Drilling and Tapping

Model 12: Joining of Two Metal Work Pieces with Arc Welding or Gas Welding

Model 13: Pattern Making Related Moulding

COURSE OUTCOMES:

CO1	To impart knowledge of different types of machine tools and their constructional details like lathe, milling and shaping machines.
CO2	Able to develop knowledge about types of cutting tools, single point and multi point cutting tool and the manufacture of these tools, the speeds at which a specific type of tool will machine a particular type of material.
CO3	Acquire knowledge about coolants and lubrication, their use and purpose while machining.
CO4	Able to analyze different types of cutting tools, single point and multi point cutting tool and the manufacture of these tools, the speeds at which a specific type of tool will machine a particular type of material.
CO5	Able to perform different operations on lathe, milling and shaping by conducting experiments on these machine tools.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1			3						2			
CO2			3						2			
CO3			3						2			
CO4			3						2			
CO5			3						2			

MEPCT402 Applied Thermodynamics
B.Tech IV Semester
Effective from- 2018-19

Lectures / Week: 3 periods **Tut / Week: 1period** **credits:4**

Objectives:

- To learn about of I law for reacting systems and heating value of fuels
- To learn about gas and vapor cycles and their first law and second law efficiencies
- To understand about the properties of dry and wet air and the principles of psychrometry
- To learn about gas dynamics of air flow and steam through nozzles
- To analyze the performance of steam turbines

UNIT – I

Introduction to Fuels; Solid, liquid and gaseous fuels– Calorific Value of Fuels; Determination and Calculation of from Chemical Analysis, Combstion equations – Air required complete combustion. Stoichiometry, exhaust gas analysis- First law analysis of combustion reactions-Heat calculations. (8)

UNIT - II

Vapor power cycles- Basic Steam Power Cycles., Carnot and Rankine cycle, Modified Ranking Cycle; Binary Vapour Cycle- with superheat, reheat and regeneration, energy analysis. Super-critical and ultra super-critical Rankine cycle- Gas power cycles, - cycle, effect of reheat, regeneration & intercooling- Combined gas and vapor power cycles. Introduction to Psychrometry: Refrigeration and Air Conditioning- Use of Refrigerant Tables – R134a. **(8)**

UNIT -III

Steam Properties and Steam Generators: Properties of Steam, Definitions of saturated states; PV, TS, HS Diagrams, P-V-T surface; Use of steam tables; Determination of S from steam tables- Principle of increase of entropy; Saturation tables; Superheated tables; Steam Processes – Constant Volume, Constant pressure – Isothermal, Adiabatic and Hyperbolic Process, Throttling expansion.Identification of states & determination of properties, Mollier's chart **(8).**

UNIT – IV

Basics of compressible flow. Stagnation properties, Isentropic flow of a perfect gas through a nozzle, choked flow, subsonic and supersonic flows- normal shocks- use of ideal gas tables for isentropic flow and normal shock flow- Flow of steam and refrigerant through nozzle, supersaturation- compressible flow in diffusers, efficiency of nozzle and diffuser. **(8)**

UNIT -V

Analysis of steam turbines: Principles and operation – Classification - velocity and pressure compounding of steam turbines – Work done – Diagram Efficiency, Effect of Blade friction – stage efficiency, , Turbine reheat factor, Height of Turbine blade – Axial Thrust – losses in steam turbine ; Governing of turbines; Nozzles and classification - Definition of Isentropic efficiency for compressors, turbines and nozzles.
(8)

Total number of hours (40 lecture hours + 12 tutorials)

Text Books:

1) Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., 2003, 6th Edition, *Fundamentals ofThermodynamics*, John Wiley and Sons.

2) Jones, J. B. and Duggan, R. E., 1996, *Engineering Thermodynamics*, Prentice-Hall of India

3) Moran, M. J. and Shapiro, H. N., 1999, *Fundamentals of Engineering Thermodynamics*, John Wiley and Sons.

4) Nag, P.K, 1995, *Engineering Thermodynamics*, Tata McGraw-Hill Publishing Co. Ltd.

5) Eastop and McKaney, *Applied Termodynamics*

6) Domakundwar and Kothandaraman, *A Course in Thermal Engineering.*

COURSE OUTCOMES:

CO1	Able to analyze energy conversion in various thermal devices such as combustors, aircoolers, nozzles, diffusers, steam turbines and reciprocating compressors
CO2	Apply the second law of thermodynamics in evaluating the various properties of steam through steam tables and Mollier chart
CO3	Able to analyze, evaluate and draw conclusions regarding the performance of Rankine cycles, geothermal power cycles, and combined cycles.
CO4	Able to apply the fundamentals of compressible flow concepts and the use of gas tables for design of nozzles.
CO5	Evaluate the performance of steam turbines through velocity triangles, understand the need for governing and compounding of turbines.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**											
CO2		**2**			**2**							
CO3			**3**	**1**								
CO4			**1**									
CO5					**3**	**2**						

CEPCT403 Fluid Mechanics And Fluid Machines

B.Tech IV Semester

Effective from- 2018-19

Lectures / Week: 3 periods **Tut / Week: 1period** **credits:4**

COURSE OBJECTIVE:

- To learn about the application of mass and momentum conservation laws for fluid flows.
- To understand the importance of dimensional analysis.
- To obtain the velocity and pressure variation sin various types of simple flows
- To analyze the flow in water pumps and turbines.

UNIT-I

Definitionoffluid,Newton'slawofviscosity,Unitsanddimensions-Propertiesoffluids, mass density, specific volume, specific gravity, viscosity, compressibility and surfacetension, Control volume- application of continuity equation and momentum equation, Incompressible flow,Bernoulli'sequationandits applications.**(9)**

UNIT-II

Exact flow solutions in channels and ducts, Couette and Poisuielle flow, laminar flow throughcircularconduitsandcircularannuli-conceptofboundarylayer– measuresof boundarylayerthickness–Darcy Weisbachequation, frictionfactor,Moody'sdiagram.**(9)**

UNIT-III

Needfordimensional analysis–methodsof dimension analysis–Similitude–typesof similitudeDimensionlessparameters–applicationof dimensionlessparameters–Model analysis. **(6)**

UNIT-IV

Euler'sequation –theoryofRotodynamicmachines–variousefficiencies–velocity componentsatentryandexitoftherotor,velocitytriangles–Centrifugal pumps,working principle,workdonebytheimpeller,performancecurves –Cavitationinpumps- Reciprocatingpump– workingprinciple.**(8)**

UNIT-V

Classificationof water turbines,headsandefficiencies,velocitytriangles-Axial,radialand mixedflowturbines-Peltonwheel,FrancisturbineandKaplanturbines,workingprinciples– drafttube-Specificspeed,unitquantities,performancecurvesforturbines –governing of turbines. **(8)**

CourseOutcomes:

- Uponcompletionofthiscourse,studentswillbeabletomathematicallyanalyze simpleflowsituations
- Theywillbeabletoevaluatetheperformanceofpumpsand turbines.

TEXT BOOKS:

1. Fluid Mechanics - Frank M. White ll
2. Fox and Mcdonald's Introduction to Fluid Mechanics
3. Fluid Mechanics - Yunus Cengel and John Cimbala
4. Introduction To Fluid Mechanics And Fluid Machines - SK Som, G Biswas and S Chakraborty

5. A Text book of Fluid Mechanics and Hydraulic Machines- RK BANSAL

COURSE OUTCOMES:

CO1	Identify and obtain the values of fluid properties and relationship between them and understand the principles of continuity, momentum, and energy as applied to fluid motions.
CO2	Identify conditions under which flows are turbulent and derive equations that approximate its properties (time averages and fluctuations). Compare turbulent flow with those of laminar flow.
CO3	Identify the relevant parameters that govern a fluid system and use dimensional analysis to identify the fundamental variables that define flow
CO4	Apply Euler's Equation of motion and Bernoulli's equation for flow measuring devices and hydraulic machines.
CO5	Able to design and evaluate the performance of pumps and turbines.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**1**											
CO2		**2**			**2**							
CO3			**3**	**1**								
CO4			**1**									
CO5					**3**	**2**						

CEPCT404 Solid Mechanics
B.Tech IV Semester
Effective from- 2018-19

Lectures / Week: 2 periods **Tut / Week: 1period** **credits: 3**

COURSE OBJECTIVES:

- To establish an understanding of the fundamental concepts of mechanics of deformable solids; including static equilibrium, geometry of deformation, and material constitutive behavior.
- Mechanical behavior of the body by determining the stresses, strains and deflections produced by the loads up to the elastic limit.
- Fundamental concepts related to deformation, strain energy, moment of inertia, load carrying capacity, slope an deflection of beams, shear forces, bending moments, torsional moments, column and struts, principal stresses and strains and theories of failure.
- To provide students with exposure to the systematic methods for solving engineering problems in solid mechanics.

UNIT-I

IntroductiontoCartesiantensors,Strains:Conceptofstrain,derivationofsmallstraintensor andcompatibility,Stress:DerivationofCauchyrelationsandequilibriumandsymmetry equations,principalstressesanddirections

UNIT-II

Constitutive equations: Generalized Hooke's law, Linear elasticity, Material symmetry; BoundaryValueProblems:conceptsofuniquenessandsuperposition.

UNIT-III

Planestressand planestrain problems,introductiontogoverningequationsincylindricaland sphericalcoordinates, axisymmetric problems.

UNIT-IV

Applicationtothickcylinders,rotatingdiscs,torsionofnon-circularcross-sections,stress concentrationproblems,thermo-elasticity,2-d contactproblems.

UNIT-V

Solutionsusingpotentials.Energymethods.Introductiontoplasticity.

CourseOutcomes:

Uponcompletionofthiscourse, studentswillbe ableunderstandthedeformationbehaviorof solids under different types of loading and obtain mathematical solutions for simple geometries.

TextBooks:

[1]G.T.Mase,R.E.SmelserandG.E.Mase,ContinuumMechanicsforEngineers,Third Edition,CRCPress,2004.
[2]Y.C.Fung,FoundationsofSolidMechanics,Prentice HallInternational,1965.
[3]Lawrence. E.Malvern, IntroductiontoMechanicsofaContinuousMedium, PrenticeHall international,1969.

COURSE OUTCOMES:

CO1	Learn about the elastic and plastic behavior of material and evaluate stress invariants, principal stresses and their directions.
CO2	Determine strain invariants, principal strains and their directions.
CO3	Develop constitutive relationships between stress and strain for linearly elastic solid.
CO4	Analyze theories of failure and design components for safe operation.
CO5	Examine the properties of ideally plastic solid and apply the concepts of energy methods in solving structural problems.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**											
CO2		**2**			**2**							
CO3			**3**	**1**								
CO4			**1**									
CO5					**3**	**2**						

MEPCT405 Materials Engineering
B.Tech IV Semester
Effective from- 2018-19

Lectures / Week: 3 periods **credits: 3**

COURSE OBJECTIVES:

- To provide the students with basic knowledge of materials science, so that they would be able to understand and distinguish between variety of materials based on their structure and properties.

Unit - I

Crystal Structure: Unit cells, Metallic crystal structures, Ceramics. Imperfection in solids: Miller Indices, Point, line, interfacial and volume defects; dislocation strengthening mechanisms and slip systems, critically resolved shear stress. **(8)**

Unit - II

Mechanical Property measurement: Tensile, compression and torsion tests; Young's modulus, relations between true and engineering stress-strain curves, generalized Hooke's law, yielding and yield strength, ductility, resilience, toughness and elastic recovery; Hardness: Rockwell, Brinell and Vickers and their relation to strength. **(8)**

Unit - III

Alloys, substitutional and interstitial solid solutions- Phase diagrams: Interpretation of binary phase diagrams and microstructure development; eutectic, peritectic, peritectoid and monotectic reactions. Iron Iron-carbide phase diagram and microstrctural aspects of ledeburite, austenite, ferrite and cementite, cast iron. **(8)**

Unit - IV

Heat treatment of Steel: Annealing, tempering, normalising and spheroidising, isothermal transformation diagrams for Fe-C alloys and microstructure development. Hot Working and Cold Working, Continuous cooling curves and interpretation of final microstructures & properties- austempering, martempering, case hardening, carburizing, nitriding, cyaniding, carbo-nitriding, flame and induction hardening, vacuum & plasma hardening. **(8)**

Unit – V

Alloying of steel, properties of stainless steel and tool steels, maraging steels – TTT Cures- cast irons; grey, white, malleable and spheroidal cast irons- copper and copper alloys; brass, bronze and cupro-nickel; Aluminium and Al-Cu – Mg alloys- Nickel based superalloys and Titanium alloys Powder metallurgy Basic Concepts, introduction to Nano Materials. **(8)**

Text Books:

1. W. D. Callister, 2006, "Materials Science and Engineering-An Introduction", 6th Edition, Wiley India.

2. Kenneth G. Budinski and Michael K. Budinski, "Engineering Materials", Prentice Hall of India Private Limited, 4th Indian Reprint, 2002.
3. V. Raghavan, "Material Science and Engineering', Prentice Hall of India Private Limited, 1999.
4. U. C. Jindal, "Engineering Materials and Metallurgy", Pearson, 2011.
5. Sidney Avner. "Introduction to Physical Metallurgy", Tata McGraw-hill, New Delhi, 1997.

COURSE OUTCOME:

CO1	Analyze the Structure of materials at different levels, basic concepts of crystalline materials like unit cell, FCC, BCC, HCP, APF (Atomic Packing Factor), Co-ordination Number etc.
CO2	Understand concept of mechanical behavior of materials and calculations of same using appropriate equations
CO3	Able to explain the concept of phase & phase diagram & understand the basic terminologies associated with metallurgy. Construction and identification of phase diagrams and reactions
CO4	Able to produce materials by using different types of production processes and know the real life applications in practical cases.
CO5	Able to construct TTT diagrams and cooling curves and understand and suggest the heat treatment process & types. Significance of properties Vs microstructure. Surface hardening & its types.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**											
CO2		**2**			**2**							
CO3			**3**	**1**								
CO4			**1**									
CO5					**3**	**2**						

MEPCT406InstrumentationandControl

B.Tech IV Semester

Effective from- 2018-19

Lectures / Week: 3 periods **credits:3**

COURSE OBJECTIVES:

- To provide a basic knowledge about measurement systems and their components.
- To learn about various sensors used for measurement of mechanical quantities.
- To learn about system stability and control.
- To integrate the measurement systems with the process for process monitoring and control.

UNIT-I

Basic Concepts of Measurements: Introduction to measurement and measuring instruments, Methods of measurement, Modes of measurement, generalized measuring system and functional elements, instruments and its classifications, Sensors and Transducer and its classification, Static and dynamic performance characteristics of measurement devices, sources of error in measurement, classification and elimination of errors, uncertainty in measurements.

UNIT-II

Displacement Velocity/Speed, and Acceleration Measurement: Working principal of Resistive Potentiometer, Linear variable differential transducers, Electro Magnetic Transducers, Mechanical, Electrical and Photoelectric Tachometers, Piezoelectric Accelerometer, Seismic Accelerometer.

UNIT-III

Pressure Measurement: Pressure standards and methods of pressure measurement; Manometers; Elastic pressure transducers; Measurement of Vacuum; Force balance pressure gauges; Electrical pressure transducers; pressure switches; Calibration of pressure measuring instruments.

UNIT-IV

Temperature Measurement: Methods of temperature Measurement; Expansion thermometers: Bi-metallic, Liquid in glass; Filled System thermometers; Electrical temperature measuring instrument: Thermocouples, RTD, Thermistors; Pyrometers; Calibration of temperature measuring instruments.

UNIT-V

Measurement of Force, Torque, Power: Force measurement: Hydraulic force meter, Pneumatic force meter, Strain gauge load cell, cantilever beams, proving rings, and differential transformers. Measurement of torque and power: Prony brake dynamometer, Rope brake dynamometer, Hydraulic dynamometer, Eddy current dynamometer, Torsion bar dynamometer, Servo-controlled dynamometer.

TextBooks:

1. D.S. Kumar, “Mechanical Measurement & Control”, 4th Edition, Metropolitan Book Co, New Delhi, 2006.
2. B.C.Nakra and K.K.Choudhary, “Instrumentation measurement and analysis”, 3rd Edition, McGraw Hill Education (India) Private Limited, New Delhi, 2009.
3. A.K.Sawhney and Puneet Sawhney, “Mechanical Measurement and Instrumentation & Control”, 12th Edition, Dhanpat Rai & Co, 2009.

4. S. K. Singh, “Industrial Instrumentation and Control”, 3rd Edition, McGraw Hill Education (India) Private Limited, New Delhi, 2009.
5. R. K. Rajput, “Mechanical Measurements and Instrumentation”, 2nd Edition, S K Kataria & Sons, New Delhi, 2006.
6. Thomas G. Beckwith, Roy D. Marangoni, John H. and Lienhard V, “Mechanical Measurements”, 6th Edition, Addison Wesley

COURSE OUTCOMES:

CO1	Able to know the terms of the measurements, and understand the principle of operation of an instrument, Choose Suitable measuring instruments for a particular application and Apply ethical principles while measuring dimensions.
CO2	Apply the principles of instrumentation for transducers & measurement of non-electrical parameters like temperature, pressure, flow, speed, force and stress in mechanical engineering applications for sustainable development.
CO3	Selection and describe the functioning of force, torque, pressure, strain and temperature measuring devices.
CO4	Select appropriate device for the measurement of parameters like temperature, speed, stress, humidity, flow velocity etc., and justify its use through characteristics and performance.
CO5	Select and install the various measuring instruments in flow lines used for industrial purposes.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**											
CO2		**2**			**2**							
CO3			**3**	**1**								
CO4			**1**									
CO5					**3**	**2**						

MEPCT407 Machine Drawing
B.Tech IV Semester
Effective from- 2018-19

Lectures / Week: 1 periods **(P/D) / Week: 1period** **credits: 3**

COURSE OBJECTIVES:

- To understand and apply national and international standards while drawing machine component.
- To understand the concept of various tolerances and fits used for component design
- To familiarize in drawing assembly, orthographic and sectional views of various machine components.

Unit – I

Orthographic Views: Conversion of Pictorial views into Orthographic views with sectioning.

Unit - II

Machine Elements: Drawing views of the following machine elements: Thread profiles, Bolted joint, machine and cap screws, types of nuts, locking devices for nuts, Foundation Bolts.
Keys: Sunk Keys, Feather Keys, Spline Shaft, Wood – Ruff Key and round Key.

Unit – III

Shaft Couplings: Muff Coupling, Split muff Coupling, Flanged Coupling, protective type flanged coupling.
Riveted Joints: Different types of rivet heads, Different types of lap joints and butt joint.

Unit – IV

Assembly Drawing: Preparation of assembly drawing of Plumber Block, Foot Step Bearing, Swivel Bearing, Screw jack, Stuffing Box, Pipe Vice, Lathe tail Stock, Clapper box, Drill Jig, Cross head, Air cock.

Unit – V

Part Drawing: Preparation of part drawing of IC engine connecting rod, Revolving Centre, Square tool post, Eccentric, V- Belt drive, Drill jig, Cross head.

TEXT BOOKS:

1. Narayana K.L, Kannaiah P. and Venkata Reddy K.: Production Drawing, First Edition, New Age International, 2005.
2. Narayana K.L, Kannaiah P. and Venkata Reddy K.: Machine Drawing, Third Edition, New Age International, 2006.

REFERENCES:

1. Bhatt N.D.: Machine Drawing, Charotor Publishers, 2008
2. Dhawan R.K.: Machine Drawing, Second Edition, S. Chand & Company Limited, 1998

COURSE OUTCOMES:

CO1	Draw orthographic projections of lines, planes and solids
CO2	Identify and design different machine elements for joining purposes
CO3	Identify and draw the couplings and riveted joints
CO4	able to construct an assembly drawing using part drawings of machine components
CO5	Able to construct an part drawings using assembly drawing of machine components

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2	3									
CO2		**2**	3									
CO3		2	**3**									
CO4		2	**3**									
CO5		2	3									

MEHST408 Operations Research
B.Tech IV Semester
Effective from- 2018-19

Lectures / Week: 3 periods **Tut / Week: 1period** **credits: 3**

COURSE OBJECTIVES:

- To impart knowledge in concepts and tools of Operations Research
- To understand mathematical models used in Operations Research
- To apply these techniques constructively to make effective business decisions

UNIT-I

Introduction to general nature of operations research Models and their types
Introduction to LP Problems, examples, Graphical method of solution.Simplex Algorithm.
Duality.

UNIT-II

Transportation and Assignment problems, Transhipment models and Traveling Salesman Problems

UNIT-III

Replacement models – replacement of items that deteriorate with time and group replacement of items that fail suddenly.

Game theory models – two persons zero sum games.

UNIT-IV

Inventory models, costs used in inventory models, Basic inventory models – deterministic and static demand. Models with price breaks - Models with restrictions. Single period models with probabilistic demand and without set up cost.
Inventory control: ABC Analysis. Fixed order quantity, Fixed order interval systems and S-s policy.

UNIT-V

Waiting line models – Basic structure of queuing models, single server and multi server models-Stress is only on applications.
Simulation – simple models in inventory and queuing systems.

TEXT BOOKS:

1. Vohra N. D.: Quantitative Techniques in Management, 3rd Edition, Tata Mc Graw Hill, 2007.
2. Pannerselvam R.: Operations Research, 2nd Edition, PHI, 2006.

COURSE OUTCOMES:

CO1	Understand the concepts of operations research modelling approaches and solve LP engineering problems.
CO2	Formulate and solve engineering and managerial situations as Transportation and Assignment problems.
CO3	Able to solve replacement and game theory model problems.
CO4	Able to Solve inventory problems.
CO5	Able to simulate simple inventory and queuing models.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		3										
CO2		**3**										
CO3		3										
CO4		3										
CO5		3										

MEPCP409 Fuels and IC Engines Laboratory
B.Tech IV Semester
Effective from- 2018-19

(P/D) / Week: 3 periods **credits:1.5**

COURSE OBJETIVES:

- The main objective of this lab is to develop an idea of fuel properties and their variation with temperature, determination of kinematic viscosity and calorific value of fuels, understanding of basic internal combustion engine performance, determination of friction power and volumetric efficiency of I.C. engines and the use of multi-stage compression.

LIST OF EXPERIMENTS:

1. Measurements of Viscosity of Various Lubricating oils.
2. Test on Flash and Fire Point Apparatus.
3. Test on Distillation Apparatus.
4. Test on Aniline Point Apparatus.
5. Test on Bomb Calorimeter.
6. Performance Test On A Centrifugal Blower
7. Load Test and Smoke Test on I.C. Engines.
8. Heat balance sheet on I.C. Engines.
9. Valve Timing diagrams for Petrol & Diesel Engine cut models.
10. Port Timing diagrams for Petrol & Diesel Engine cut models
11. Performance Test on Air Compressor.
12. Performance Test on centrifugal blower.
13. Volumetric efficiency test on I.C engine.
14. Retardation Test on an I.C. Engine.
15. Air fuel ratio & volumetric efficiency test on I. C. Engine.
16. Test for optimum flow rate of cooling water for an I. C. Engine.

COURSE OUTCOMES:

CO1	Analyze important fuel and lubricant properties for the application in specific exploitation conditions
CO2	Measure flash & fire point of different fuels and measure performance of a centrifugal blower.
CO3	Conduct constant speed and variable speed tests on IC engines and interpret their performance.
CO4	Estimate energy distribution by conducting heat balance test on IC engines
CO5	Able to draw valve timing and port timing diagrams of Petrol & Diesel engines.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**			2					3			
CO2	1			3					3			
CO3	1			**2**					3			
CO4	1			2					3			
CO5	1			2					3			

MEPCT501 Heat Transfer
B.Tech V Semester
Effective from- 2018-19

Lectures / Week: 3 periods **Tut / Week: 1period** **credits:4**

COURSE OBJECTIVES:

- The aim of the course is to build a solid foundation in heat transfer exposing students to the three basic modes namely conduction, convection and radiation.
- Rigorous treatment of governing equations and solution procedures for the three modes will be provided, along with solution of practical problems using empirical correlations.
- The course will also briefly cover boiling and condensation heat transfer, and the analysis and design of heat exchangers.

UNIT-I

Introductiontothreemodesof heattransfer,Derivationofheatbalanceequation-Steadyone dimensionalsolutionforconductionheat transfer inCartesian,cylindricalandsphericalgeometry,conceptofconductionandfilmresistances,criticalinsulation thickness,lumped systemapproximationandBiotnumber,heattransferthroughpinfins-Twodimensionalconductionsolutionsforbothsteady andunsteadyheattransfer-approximatesolution to unsteadyconductionheattransferbytheuse ofHeisslercharts.**(12)**

UNIT-II

Heatconvection,basicequations,boundarylayers-Forcedconvection,external andinternal flows-Natural convectiveheattransfer-Dimensionlessparametersforforcedandfree convectionheattransfer-Correlationsforforcedandfreeconvection-Approximatesolutions tolaminarboundary layerequations (momentumandenergy)forbothinternalandexternal flow-Estimatingheattransferratesinlaminar and turbulentflow situations usingappropriate correlations forfree andforcedconvection. **(8)**

UNIT-III

Interactionofradiationwith materials,definitionsofradiative properties, StefanBoltzmann's law,blackandgraybody radiation,Calculationof radiationheattransferbetweensurfaces usingradiativeproperties, viewfactorsandtheradiositymethod.**(8)**

UNIT-IV

Typesofheat*exchangers,*Analysisanddesignofheatexchangersusingboth LMTDandε- NTU methods.**(6)**

UNIT-V

Boiling and Condensationheattransfer,Poolboilingcurve**(3)**

Introductionmasstransfer,Similarity betweenheatandmasstransfer**(3)**

TextBooks:

1.A.Bejan,HeatTransferJohnWiley,1993
2.J.P.Holman,HeatTransfer, EighthEdition,McGrawHill,1997.
3.F.P.Incropera,andD.P.Dewitt,FundamentalsofHeatandMassTransfer,JohnWiley, SixthEdition,2007.
4.MassoudKaviany,PrinciplesofHeatTransfer,JohnWiley,2002
5.YunusACengel,HeatTransfer:APracticalApproach, McGrawHill,2002
6. Heat Transfer by R.C. Sachdeva

COURSE OUTCOMES:

CO1	Understand principles of different modes of heat transfer processes.
CO2	Formulate and solve conduction and convective heat transfer problems.
CO3	Estimate and solve radiation problems of black, gray and opaque bodies.
CO4	Understand current challenges in the field of convective heat transfer.
CO5	Evaluate energy requirements for operating a flow system with heat exchanger.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	3	2									
CO2	1	**3**	2									
CO3	1	3	**2**									
CO4	1	3	**2**									
CO5	1	3	2									

MEPCT502 Design of Machine Elements

B.Tech V Semester

Effective from- 2018-19

Lectures / Week: 3 periods **Tut / Week: 1period** **credits:4**

COURSE OBJECTIVES:

- A strong background in mechanics of materials based failure criteria under pinning the safety-critical design of machine components.
- An understanding of the origins, nature and applicability of empirical design principles, based on safety considerations.
- An overview of codes, standards and design guidelines for different elements.
- An appreciation of parameter optimization and design iteration.
- An appreciation of the relationships between component level design and over all machine system design and performance.

UNIT-I

Engineering Design

What is designing? ; The process of Design; design by evolution; The Morphology of design; Identification and analysis of need; True need; Specifications ; Standards of performance ; use of checklists ; Morphological Analysis ; Brainstorming; measure of physical realizibility; Economic and financial feasibility ; Designing for shipping, handling and installation; Design for maintenance ; Detailed design

Unit-II

Designconsiderations-limits,fitsandstandardization, Modes of failure; factor of safety; Stress-strain relationships; shear stress and shear strain relationshipsReviewoffailuretheoriesforstatic anddynamicloading(includingfatiguefailure),Stress Concentration factors; Reduction of stress concentration effects ; Fluctuating stresses; fatigue Failure; Endurance limit; Notch sensitivity; Endurance limit; Soderberg and Goodman Diagrams; Modified Goodman's diagrams; Fatigue design under combined stresses. Design for finite and infinite life.

UNIT-III

Design of shafts and keys:

Designofshaftsunderstaticandfatigueloadings,; Axial, Bending, Torsional stresses; principles stresses; Theories of failure. Couplings:

Keys: Types of Keys; Design of shunk key. Effect of key way.Design of Splines.

UNIT-IV

Design of shaft couplings & pipe joints:

Introduction, Types of Shaft Couplings: Design of Sleeve or muff couplings, Clamp or Compression coupling, Flange Couplings. Design of Bushed pin type flexible coupling.

PIPE JOINTS: Introduction, Design of pipe joints, Hydraulic Pipe Joints, Design Of Flanged Pipe Joints

UNIT-V

Design of fasters Threaded joints-Thread joints; ISO metric screw threads, Bolted joint in tension; Torque requirement for bolt tightening; bolted joint under fluctuating load; eccentricity loaded bolted joints in shear; bolted joints with combined stresses; Bolt of uniform strength. Analysisand applicationsofpowerscrews

Welded joints-types of welded joints; stresses in butt and fillet welds; strength of welded joints; eccentricity welded joint; weld joint subject to bending moment and fluctuating forces; welding symbols; weld inspection

TextBooks:

[1] Shigley, J.E. and Mischke, C.R., Mechanical Engineering Design, Fifth Edition, McGraw-HillInternational;1989.

[2]Deutschman,D.,Michels,W.J.andWilson,C.E.,MachineDesignTheoryandPractice,Macmillan,1992.

[3] Juvinal,R.C.,FundamentalsofMachineComponentDesign,JohnWiley,1994.

[4] Spottes, M.F.,DesignofMachineelements,Prentice-HallIndia,1994.

[5]R.L.Norton,MechanicalDesign–AnIntegratedApproach,Prentice Hall,1998

COURSE OUTCOMES:

CO1	Understand the customers' need, formulate the problem and draw the design specifications
CO2	Able to select components as per standards and Understand component behavior subjected to loads and identify the failure criteria
CO3	able to design a machine component in fluctuating loads
CO4	able to design fasters for different mechanical purposes and identify welded joints and their failure
CO5	Able to design and analyze springs

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2	3									
CO2		**2**	3									
CO3	1	2	**3**									
CO4		2	**3**									
CO5	1	2	3									

MEPCT504Kinematics of machinery

B.Tech V Semester

Effective from- 2018-19

Lectures / Week: 3 periods **Tut / Week: 1period** **credits:4**

COURSE OBJECTIVES:

- To understand the kinematics and rigid-body dynamics of kinematical driven machine components.
- To understand the motion of linked mechanisms in terms of the displacement, velocity, and acceleration at any point in a rigid link
- To be able to design some linkage mechanisms and cam systems to generate specified output motion
- To understand the kinematics of gear trains.

Contents:

UNIT-I

Classificationofmechanisms-Basickinematicconceptsanddefinitions-Degreeoffreedom, mobility-Grashof'slaw,Kinematicinversionsoffourbarchainandslidercrankchains-Limitpositions-Mechanicaladvantage-Transmissionangle-Descriptionofsomecommon mechanisms-Quickreturn mechanism,straightlinegenerators-UniversalJoint-Rocker mechanisms

UNIT-II

Displacement,velocityandacceleration analysisofsimplemechanisms,graphicalvelocity analysisusinginstantaneouscenters,velocity andaccelerationanalysisusingloopclosure equations-kinematicanalysisofsimplemechanisms-slidercrankmechanismdynamics-Coincidentpoints-Corioliscomponentofacceleration-introductiontolinkagesynthesis- three positiongraphicalsynthesisformotionandpathgeneration

UNIT-III

Classificationof camsandfollowers-Terminologyanddefinitions-Displacementdiagrams- Uniform velocity,parabolic,simpleharmonicandcycloidalmotions-derivativesoffollower motions-specifiedcontour cams-circularand tangentcams-pressureangleand undercutting, sizingofcams,graphical andanalyticaldisccamprofilesynthesisforrollerandflatface followers

UNIT-IV

Involuteandcycloidalgearprofiles,gearparameters,fundamental lawofgearingand conjugateaction,spur gearcontactratioandinterference/undercutting- helical,bevel,worm, rack&piniongears,epicyclicand regular geartrainkinematics**(8)**

UNIT-V

Surface contacts- sliding and rolling friction- friction drives- bearings and lubrication- frictionclutches-beltandrope drives-frictioninbrakes**(8)**

CourseOutcomes:

- After completing this course, the students can design various types of linkage mechanismsforobtaining specificmotionand analysethemforoptimalfunctioning

TextBooks:

1.ThomasBevan, TheoryofMachines,3rd edition,CBSPublishers&Distributors,2005.
2.CleghornW.L.,MechanismsofMachines,OxfordUniversityPress,2005.
3.RobertL.Norton,Kinematicsand Dynamicsof Machinery,TataMcGrawHill,2009.
4.GhoshA.andMallickA.K.,TheoryofMechanismsandMachines,AffiliatedEast-WestPvt.Ltd,NewDelhi,1988.

COURSE OUTCOMES:

CO1	Understand the principles of kinematic pairs, chains and their classification, DOF, inversions, equivalent chains and planar mechanisms.
CO2	Acquire knowledge and develop straight line motion mechanisms and steering mechanisms.
CO3	Able to draw velocity and acceleration diagrams for different mechanisms
CO4	Able to design and develop gear and gear train depending on application.
CO5	Design cams and followers for specified motion profiles.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	2	3									
CO2		**2**	3									
CO3	1	2	**3**									
CO4		2	**3**									
CO5	1	2	3									

MEPET01 ADVANCED MANUFACTURING PROCESS

B.Tech V Semester

Effective from- 2018-19

Lectures / Week: 3 periods **credits:3**

COURSE OBJECTIVES:

- To acquire knowledge about nontraditional machining process
- To understand theory involved material removal mechanism
- To study the different process parameters
- To know the material addition processes

UNIT-I

MATERIAL REMOVAL PROCESSES: Introduction, history of machining, traditional machining processes, nontraditional machining processes, hybrid machining processes. need for non-traditional machining processes.

MECHANICAL PROCESSES: Ultrasonic machining - Introduction, the machining system, material removal process, factors affecting material removal rate, dimensional accuracy and surface quality, applications.

Water jet machining - Introduction, The machining system, Process parameters, Applications, Advantages and disadvantages of Abrasive jet machining - Introduction, Machining system, Material removal rate, Applications, Advantages and limitations of AJM.

UNIT-II

CHEMICAL PROCESSES: Chemical Milling - Introduction, Tooling for CHM, Process parameters, Material removal rate, Accuracy and surface finish, Advantages, Limitations, Applications Photochemical Milling - Introduction, Process description Applications, Advantages Electro Polishing - Introduction, Process parameters, Applications, Process limitations.

ELECTROCHEMICAL PROCESSES: Electro Chemical Machining: Introduction, Principles of electrolysis, Theory of ECM, ECM equipment, Basic working principles, Process characteristics, Process control, Applications Basics of Electrochemical Drilling, Electro-Chemical Deburring, and Electro stream drilling

UNIT-III

HYBRID ELECTROCHEMICAL PROCESSES: Electro Chemical Grinding - Introduction, Material removal rate, Accuracy and surface quality, Applications, Advantages and disadvantages Electrochemical Honing - Introduction, Process characteristics, Applications Electrochemical Super Finishing - Introduction, Material removal process, Process accuracy Electrochemical Buffing - Introduction, Material removal process

UNIT-IV

THERMAL PROCESSES: Introduction, Mechanism of material removal, The machining system, Material removal rates, Heat-affected zone, Applications. Wire EDM principle, Process parameters, surface finish and machining accuracy, applications.

Laser beam machining - Introduction, material removal mechanism, applications, advantages and limitations. electron beam machining - introduction, basic equipment and removal mechanism, applications, advantages and disadvantages. Plasma beam machining - introduction, machining systems, material removal rate, accuracy and surface quality, applications, advantages and disadvantages. Ion beam machining - introduction, material removal rate, accuracy and surface effects, applications

UNIT-V MATERIAL ADDITION PROCESSES: INTRODUCTION, CLASSIFICATION : Liquid-Based Techniques – stereo-lithography, holographic interference solidification, beam interference solidification, solid ground curing-liquid thermal polymerization, fused deposition, modeling, multi jet modeling, ballistic particles manufacturing, shape deposition manufacturing. Powder based processes - selective laser sintering, laser engineered net shaping, three-dimensional printing. Solid-Based techniques -solid foil polymerization, laminated object modeling.

TEXT BOOKS:

El-Hofy, Hassan Abdel-Gawad, "Advanced Machining Processes: Nontraditional And Hybrid Machining Processes", McGraw-Hill, 2005.

REFERENCES:

1. Pandey P.C. and Shah H.S, "Modern Machining Processes", 1st Edition, TMH, 2010.

2. Bhattacharya A, "New Technology, the Institution of Engineers", India 1984.

3. V. K. Jain, "Advanced machining processes", 1st Edition, Allied publishers, 2010.

COURSE OUTCOMES:

CO1	Analyze the different elements and characteristics of Abrasive jet machining and Ultrasonic Machining and its applications.
CO2	Able to decide on the process parameters to be adopted and applicability of various materials that are suitable for chemical and electro-chemical energy based machining processes
CO3	Understand the working of electric discharge machining and process of beam control techniques of EBM, plasma arc and Laser beam machining affecting the surface finish of work pieces in medical and engineering fields.
CO4	Describe product development, conceptual design and classify rapid prototyping systems; explain stereo lithography process and applications.
CO5	

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			3						2			
CO2			3						2			
CO3			**3**		2							1
CO4			**3**		2							
CO5			3		**2**							

MEPET02 INDUSTRIAL ENGINEERING AND MANAGEMENT

B.Tech V Semester

Effective from- 2018-19

Lectures / Week: 3 periods **credits:3**

UNIT – I

Administration, Management and Organization.Scientific Management. Functions of Management .Principles of Management.Types of Organization.Principles of Organization.Fayol's and Taylor's contributions to Management.
Personnel Management – A brief review of functions of personnel management.Concepts of job evaluation and merit rating.

UNIT – II

Plant Location – Location factors, concept of Weber theory. Choice of city, Suburban and country locations.

Plant Layout – Definition, Objectives, Salient features of product, process and fixed position layouts. Material Handling – Definition, Objectives, Classification of material handling equipment and factors influencing their selections

UNIT – III

Sales forecasting – need, Classification moving average exponential smoothing and linear regression technique.
Production Planning and Control – Objectives, Salient features of functions of PPC.

UNIT – IV

Work study – Definition, objectives and uses. Method study – definition.Objectives procedure and uses. Time study – Definition, needs, functions, and basic concepts of break down, preventive, predictive and total productive maintenance.

UNIT – V

Safety in industry – need safety programs, accident prevention, economic aspects, causes of accidents, accident prevention.Industrial disputes – Causes and methods of settling Labour participation in management concept. Types and advantages A brief outline of Factories Act, Industrial disputes Act and Workmen's Compensation Act.

TEXT BOOKS:

1. Khanna O P: Industrial Engineering And Management , 7th Edition, Dhanpat Rai & Sons, 2002
2. Panner Selvam R , Production and Operation Management
3. Ralph Barnes: Principles Of Motion And Time Study, Tata McGraw Hill, 1956
4. Joseph G Monks: Operation Management, 3rd Edition, McGraw-Hill, 1987

REFERENCES:

1. Adam & Edbert: Production/Operation Management, 5th Edition, Prentice Hall, 1992
2. Chary S.N.: Production and Operation Management,14th Reprint, Tata McGraw Hill, 2007
3. Buffa E S: Modern Production/Operation Management, 8th Edition, Wiley India, 2007
4. Clade S. George Jr : Management For Business Industry,1972

COURSE OUTCOMES:

CO1	Understand the evolutionary development of management thought and general principles of management.
CO2	Able to identify and design plant location, plant layout and material handling systems
CO3	Apply forecasting and PPC techniques to production systems
CO4	Able to reduce work duration in industries using work and time study
CO5	Able to suggest safety techniques for industries and know the concepts of factories ACTs.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						3					2	
CO2		**3**									2	
CO3			**3**								2	
CO4		3									2	
CO5									3		2	

MEPET03 Mechatronic Systems

B.Tech V Semester

Effective from- 2018-19

Lectures / Week: 3 periods **credits:3**

COURSE OBJECTIVE:

- To understand the structure of microprocessors and their applications in mechanical devices
- To understand the principle of automatic control and real time motion control systems, With the help of electrical drives and actuators
- To understand the use of micro-sensors and their applications in various fields

UNIT-I

Introduction:DefinitionofMechanicalSystems,Philosophyandapproach;Systemsand Design: Mechatronic approach, Integrated ProductDesign, Modeling, Analysis and Simulation,Man-MachineInterface.

UNIT-II

Sensors and transducers:classification,Developmentin Transducertechnology,Opto- electronics-Shaftencoders,CDSensors,VisionSystem,etc.;

UNIT-III

Drives andActuators:Hydraulic andPneumaticdrives,ElectricalActuatorssuchasservo motorandSteppermotor,Drivecircuits,openandclosedloopcontrol; Embedded Systems: HardwareStructure, SoftwareDesignandCommunication,ProgrammableLogicDevices, AutomaticControland RealTimeControlSystems;

UNIT-IV

Smartmaterials:ShapeMemory Alloy,PiezoelectricandMagneto-strictiveActuators: Materials,Static anddynamiccharacteristics,illustrativeexamplesforpositioning, vibration isolation, etc.;

UNIT-V

Micro mechatronicsystems:Microsensors,Microactuators;Micro-fabrication techniques LIGA Process:Lithography,etching,Micro-joiningetc.Application examples;Casestudies Examples ofMechatronic Systems fromRobotics Manufacturing, Machine Diagnostics, RoadvehiclesandMedicalTechnology.

CourseOutcomes:
Uponcompletionofthiscourse,studentswillgetanoverviewofmechatronicsapplications andtheuse of micro-sensorsandmicroprocessors.

TextBooks:
1) Mechatronics SystemDesign, Devdas Shetty &Richard A. Kolk, PWSPublishing Company(ThomsonLearning Inc.)
2) Mechatronics:AMultidisciplinaryApproach,WilliamBolton,PearsonEducation
3)ATextbookofMechatronics,R.K.Rajput, S.Chand&CompanyPrivateLimited
4)Mechatronics:ElectronicControlSystemsinMechanicalandElectricalEngineering, WilliamBolton,PrenticeHall.

COURSE OUTCOMES:

CO1	Able to know the need and importance of Electronics for Mechanical Engineer and Mechanical systems for Electronic Engineer.
CO2	Able to classify various sensors, transducer and actuators according to the applications.
CO3	Ability to design basic control systems using different actuators.
CO4	Able to know the concepts of smart materials and their usage in real world applications.
CO5	Design and develop Micro mechatronic systems for Machine Diagnostics, Road vehicles, Medical Technology, etc.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	2	3									
CO2		**2**	3									
CO3			**3**									
CO4	1			2								
CO5		2	3									

MEPCP507 Machine Tools & Automation Lab
B.Tech V Semester
Effective from- 2018-19

(P/D) / Week: 3 periods **credits:1.5**

COURSE OBJECTIVES:

- The course provides students with fundamental knowledge and principles in material removal processes.
- 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.
- To demonstrate the fundamentals of machining processes and machine tools.
- To develop knowledge and importance of metal cutting parameters.
- To develop fundamental knowledge on tool materials, cutting fluids and tool wear mechanisms.

List of Experiments:

1. Force Measurement on Lathe.
2. Power Measurement on Lathe.
3. Production of Single point cutting tool using and cutter grinder.
4. Differential Indexing.
5. Fit Exercise on Capstan Lathe.
6. Alignment Test on Lathe.
7. Alignment Test on Radial Drilling Machine.
8. Thrust and Torque Measurement in Drilling Operation.
9. Study of tool wear (flank wear)
10. Study of Weld Bead generator in Arc.
11. Measurement of Forces in Milling.
12. Study of Impact strength tests on Welding joints.

COURSE OUTCOMES:

CO1	Analyze forces, can control appropriateness for machine power according to working standards
CO2	Able to produce single point cutting tools as per standards
CO3	Able to conduct different machine alignment tests on lathe and drilling machines
CO4	Study and analyze the tool wear and indexing
CO5	Develop Programming skills and crate a component for required drawing, Simulate the prepared part programme using available simulation software's. And Prepare the parts on CNC

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2	3									
CO2			3	2								
CO3				**3**								
CO4				3								
CO5				3								

MEPCP508Metrology Lab
B.Tech V Semester
Effective from- 2018-19

(P/D)/ Week: 3 periods **credits:1.5**

COURSE OBJECTIVES:

- Learn the main principle on which different instruments operate and provide hands on experience on them.
- Generate knowledge and skill in use of precision instruments.
- Learn a basic understanding of various instruments used in linear and angular measurements.
- Get familiarize with usage of tool makers microscope.

List of Experiments:

1. Calibration of any two of the following instruments: (using slip gauges)
    i. Calibration of Micrometer.
    ii. Calibration of Mechanical Comparator.
    iii. Calibration of Vernier Caliper.
    iv. Calibration of Dial Gauge.
2. Measurement of taper angle using
    i. Bevel Protractor
    ii. Dial Gauge
    iii. Sine-Bar
    iv. Auto-Collimator.
3. Alignment tests:
    i. Parallelism of the spindle
    ii. Circularity & Concentricity of the spindle
    iii. Trueness of running of the spindle.
4. Gear testing: To find;
    i. diameter, pitch/module
    ii. pitch circle diameter
    iii. pressure angle
    iv. tooth thickness.
5. Check the straightness of a surface plate
    i. Using spirit level
        or
    ii. Using Auto-collimator
6. Check the flatness of a surface plate using one of the above methods.
7. Using light wave interference:
    i. Study of flatness of slip gauges
    ii. To find the height of a slip gauge.
8. Tool Maker's Microscope:

i. Establish the thread details
ii. To find the cutting tool angles.

COURSE OUTCOMES:

CO1	Prepare setups and measure dimensional and geometrical features of components.
CO2	Measure surface roughness of components.
CO3	Able to do alignment tests
CO4	Able to calibrate different mechanical instruments for general purposes
CO5	Gain knowledge on different setups for measuring thread profile

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		1	3									
CO2		**1**	3									
CO3		1	**3**									
CO4		1	**3**									
CO5		1	3									

EOHST601 ECONOMICS
B.Tech VI Semester
Effective from- 2018-19

Lectures / Week: 3 periods **credits:3**

COURSE OBJECTIVES:

- Students will use economic models in domestic and global contexts to analyze individual decision making, how prices and quantities are determined in product and factor markets, and macroeconomic outcomes
- Students will analyze the performance and functioning of government, markets and institutions in the context of social and economic problems.
- Students will think critically about economic models, evaluating their assumptions and implications.
- Students will use data to describe the relationships among variables in order to analyze economic issues.
- Students will communicate economic thought and analysis in both written and oral contexts to varied audiences.

UNIT – I

Introduction – Nature and Scope of Managerial Economics, Economic Theory and Managerial Economics.

UNIT – II

Demand Analysis and Forecasting – Demand Determinants, Demand Distinctions, Demand Forecasting: Methods of Demand Forecasting.Minimum average method and exponential method.

UNIT – III

Cost Analysis – Cost Concepts, Classifications and Determinants; Cost-output Relationship, Economies andDiseconomies of scale, Cost Control and Cost Reduction.

UNIT – IV

Price and output Decisions Under Different Markets Structures – Perfect Competition, Monopoly and Monopsony; price Discrimination, Monopolistic Competition, Oligopoly and Oligopsony.

UNIT – V

Pricing Policies and Practices – Pricing Policies, Pricing Methods, Specific Pricing Policies, Price Discountsand Differentials; Product-line Coverage and Pricing; Price Forecasting.

Text Books

1. Varshney R L and Maheswari K L : Managerial Economics, 19th Edition, Sultan Chand and Sons, 2009.

Reference Book

1. Froeb L M and McCann B T: Managerial Economics A Problem Solving Approach, Second Edition, Cengage Learning, 2008**.**

COURSE OUTCOMES:

CO1	Analyze the demand and supply conditions and assess the position of a company
CO2	Design competition strategies, including costing, pricing, product differentiation, and market environment according to the natures of products and the structures of the markets.
CO3	Assess the relationships between short-run and long-run costs.
CO4	Appraise some of the current and emerging issues in managerial economics at the national and international levels.
CO5	Explain four different pricing practices such as discrimination, two part pricing, block pricing, commodity bundling, transfer pricing, and peak load pricing

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1									2			1
CO2		3										1
CO3			3								1	
CO4	3											1
CO5		2	3						2			1

MEPCT602 Machine Design
B.Tech VI Semester
Effective from- 2018-19

Lectures / Week: 3 periods **Tut / Week: 1period** **credits:4**

COURSE OBJECTIVE:

- To teach students how to apply the concepts of stress analysis, theories of failure and material science to analyze, design and/or select commonly used machine components.
- To illustrate to students the variety of mechanical components available and emphasize the need to continue learning.
- To teach students how to apply mechanical engineering design theory to identify and quantify machine elements in the design of commonly used mechanical systems.
- To teach students how to apply computer based techniques in the analysis, design and/or selection of machine components.

UNIT-I

Mechanical springs

Helical springs-stress equation and deflection equation; spring materials; spring end formation; design against-static and fluctuating loads; Design of helical and Torsional springs; Compound springs ; equalized stress in spring leaves ; multi leaf springs; nipping and shot peening.

UNIT-II

Sliding Contact Bearings:

Classification of Bearings, Hydrodynamic lubricated bearings; Materials for sliding contact bearings; Lubricants – Properties and their selection Terminology used in Hydrodynamic journal bearings. Design procedure for journal bearings – Design of bearing caps and bolts. Heat in bearings.

Thrust Bearings: Design of footstep bearing and collar bearings.

UNIT-III

Rolling Contact Bearings:

Merits and demerits of rolling contact bearings over sliding contact bearings. Types of rolling contact bearings. Static and dynamic load capacities.Equivalent bearing load. Design for cyclic loads. Reliability of a bearing.Selection of radial ball bearings.Stribeck's equation.

UNIT-IV

Gears: Gears: Types of gears and their applications, gear materials allowable stresses. Law of gearing

Spur gears: Terminology, force analysis, Design of spur gears – Lewis equation. Check for dynamic load and wear load. Gear wheel proportion.

Helical Gears: Terminology, design of helical gears. Check for wear load. Force analysis.

UNIT-V

Engine parts:

Pistons, forces acting on pistons – Construction Design and proportions of Pistons.

Connecting rod: Thrust in Connecting rod – Stress due to whipping action on connecting rod ends – Cranks and Crank Shafts, Strength and proportions of overhang and centre cranks – Crank pins, Crank shafts.

TEXT BOOKS:

1. Lal G. K., Vijay Guptha, Venkata Reddy N.: Fundamental of Design and Manufacturing, Alpha Science International, 2005.

2. Bhandari V. B.: Design of Machine Element, Third Edition, Tata McGraw Hill, 2010.

3. Shigley J. E: Mechanical Engineering Design, Third Edition, Tata McGraw Hill, 2010.

REFERENCES:

1. Allen Strickland Hall, Alfred R. Holowenko, Herman G. Laughlin: Machine Design, Schaum Series, Tata McGraw Hill, 2010
2. Faires V.M: Design of Machine Elements, Fourth Edition, Macmillan, 1965.
3. Sharma P.C. & Aggarwal D.K.: Machine Design, S. K. Kataria & Sons, 1997.
4. Jain R.K.: Machine Design, Fifth Edition, Khanna, 1988.

COURSE OUTCOME:

CO1	Apply the design and development procedure for different types of springs by using Design Data Hand book.
CO2	To achieve an expertise in design of Sliding contact bearing in industrialapplications.
CO3	Capability to analyze Rolling contact bearing and its selection from manufacturer's Catalogue.
CO4	To understand and apply principles of gear design to spur gears and also become proficient in design of Helical and Bevel Gear.
CO5	Able to design and construct engine parts as per the automotive and industrial requirements.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2	3									
CO2		2	3									
CO3		2	3	1								
CO4		2	3									
CO5		2	3									

MEPCT603 Dynamics of Machinery

B.Tech VI Semester

Effective from- 2018-19

Lectures / Week: 3 periods **Tut / Week: 1period** **credits:4**

COURSE OBJECTIVE:

- To equip the student with fundamental knowledge of dynamics of machines so that student can appreciate problems of dynamic force balance, transmissibility of forces, isolation of systems, vibrations. Develop knowledge of analytical and graphical methods for calculating balancing of rotary and reciprocating masses.
- Develop understanding of vibrations and its significance on engineering design.
- Develop understanding of dynamic balancing, flywheel analysis, gyroscopic forces and moments.

UNIT-I

FRICTION: Inclined plane ,pivot and collar, uniform pressure, uniform wear.
Friction circle and friction axis, lubricated surfaces, boundary friction, film lubrication.
CLUTCHES: Friction clutches- Single Disc or plate clutch, Multiple Disc Clutch, Cone Clutch,

BRAKES AND DYNAMOMETERS: Simple block brakes, Band brake, internal expanding brake, braking of vehicle. Dynamometers – absorption and transmission types. General description and methods of operation.

UNIT-II

GYROSCOPIC COUPLE AND PRECESSIONAL MOTION: Gyroscopic Couple –effect of precession on stability of moving vehicles such as motor cars, motor cycles, aero-planes and ships-Gyroscopic stabilization.

TURNING MOMENT DIAGRAMS AND FLYWHEEL: Construction of crank effort and diagrams-Fluctuation of energy and speed in flywheels-flywheel of an I.C. engine. Flywheel of a punching press

UNIT-III

CENTRIFUGAL GOVERNORS: Sleeve loaded and spring loaded governors. Hartnell, Hartung governors and governors with auxiliary springs - sensitiveness, Isochronism and hunting in governors.Governors effort and power-controlling force diagrams-stability, Friction and insensitiveness.

UNIT-IV

BALANCING: Static and dynamic balance, balancing of rotating masses - analytical and graphical methods. Balancing of reciprocating masses – Partial balancing – locomotive balancing – variation of tractive effort. Swaying couple and Hammer blow. single and multi cylinder in line engines – firing order.

UNIT-V

VIBRATION: Free and forced vibration of single degree of freedom system, Role of damping, whirling of shafts and critical speeds. Simple problems on free, forced and damped vibrations. Vibration Isolation

& Transmissibility. Transverse vibrations of beams with concentrated and distributed loads. Dunkerly's method, Raleigh's method. Torsional vibrations - two and three rotor systems.

COURSE OUTCOME:

CO1	Able to analyze and design clutches, brakes and dynamometers.
CO2	Understand the gyroscopic effects in ships, aero planes, road vehicles and Characterize & design flywheels of an IC Engine.
CO3	Able to analyze and design centrifugal governors.
CO4	Analyze balancing problems in rotating and reciprocating machinery
CO5	Understand free and forced vibrations of single degree freedom systems.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2	3			2						
CO2	1			3		2						
CO3		2	3									
CO4		3										
CO5		3	2									

MEPET04 Refrigeration and Air Conditioning

B.Tech VI Semester

Effective from- 2018-19

Lectures / Week: 3 periods **credits:3**

COURSE OBJECTIVES:

- To familiarize with the terminology associated with refrigeration systems and air conditioning.
- To understand basic refrigeration processes
- To understand the basics of psychometric and practice of applied psychometrics
- To acquire the skills required to model, analyze and design different refrigeration as well as air conditioning processes and components

UNIT-I

Classificationofrefrigerationsystems
Advancedvapourcompression cycles,Refrigerantsandtheirmixtures:propertiesand characteristics-Ozonedepletionandglobalwarmingissues and solutions.

UNIT-II

Vapour compression System components: Compressors,Condensers,Expansion devicesandEvaporators – Selection-matchingof system components.

UNIT-III

Absorptionrefrigerationsystems, theircomponents-Numerical problems.

UNIT-IV

ReviewofPsychrometry andAir-conditioningprocesses-Comfortairconditioningand Coolingloadcalculations

UNIT-V

ApplicationsofACsystems-Conceptofenthalpypotential-Air washers,Coolingtowers,Evaporativecondensers,Coolingand dehumidifyingcoils.

TextBooks:

1.Gosney,W.B,PrinciplesofRefrigeration, Cambridge UniversityPress,1982.
2.Stoecker,W.F.andJones,J.W.,RefrigerationandAirconditioning,TataMcGrawHill, 1986.
3.Arora, C.P.,RefrigerationandAirconditioning,TataMcGrawHill,2ndEdition,2000.
4.Kuehn,T.H.,Ramsey,J.W.andThrelkeld,J.L.,ThermalEnvironmentalEngineering,3rd Edition,Prentice Hall,1998

COURSE OUTCOMES:

CO1	Interpret different heating sources of building and its calculations
CO2	Design and recommend low cost and high-performance air conditioning duct which find applications in modern industries, homes and offices
CO3	Determine the performance of refrigeration and air conditioning systems by conducting experiments.
CO4	Carry out psychometric calculations and air conditioning cooling load estimation.
CO5	Ability to estimate the energy requirements of cooling and heat equipment for simple air conditioning applications

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2		3								
CO2		2	3									
CO3			2	3								
CO4		3	2	1								
CO5		3	2									

MEPET05 Internal Combustion Engines

B.Tech VI Semester

Effective from- 2018-19

Lectures / Week: 3 periods **credits:3**

COURSE OBJECTIVES:

- To familiarize with the terminology associated with IC engines.
- To understand the basics of IC engines.
- To understand combustion, and various parameters and variables affecting it in various types of IC engines.
- To learn about various systems used in IC engines and the type of IC engine required for various applications.

UNIT-I

Reviewofidealcycles;Detailsoffuel-aircycles.

UNIT-II

CombustioninSIand CI engines, Combustionstages, Combustionchambers and abnormalcombustion.

UNIT-III

Fuel supply systemsinSIandCIengines,carburetors,Portfuelinjection,Directinjection and Commonrailinjection.Ignitionsystem.

UNIT-IV

Lubricationsystemandcoolingsystem.

UNIT-V

Testingof IC engines.Engine emissionsandcontrol.AdvancedIC Engineconcepts.

CourseOutcomes:

Studentswhohavedonethiscoursewillhaveagoodideaofthebasicsof ICenginesand howdifferentparametersinfluencetheoperationalcharacteristicsofIC Engines

TextBooks:

1.ObertE.F,"InternalCombustionEnginesandAirPollution",HarperandRowPublication Inc.NY,1973.
2.HeislerH,"AdvancedEngine Technology",Edward Arnold,1995.
3.HeywoodJ.B,"InternalCombustion EngineFundamentals",McGrawHillBookCo.NY, 1989
4.HeldtP.M,"HighSpeedCombustionEngines",Oxford&IBHpublishingCo.India, 1985.
5.Stockel MW,StockelTSandJohansonC,"AutoFundamentals",TheGoodheart,Wilcox Co.Inc.,Illinois, 1996.

COURSE OUTCOMES:

CO1	Ability to perform a thermodynamic analysis of ideal cycles and fuel-air cycles.
CO2	Ability to perform a combustion analysis of fuels in the basic cycles.
CO3	Analyze different electronic fuel injection system, supercharging and its effect on performance of SI and CI engine.
CO4	Able to understanding the role of lubrication and cooling systems in reducing friction and wear.
CO5	Able to specify and interpret data of alternative fuels and its emission which effect the environment.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2		3								
CO2	1		3	2								
CO3			3	2			2					
CO4		3	2									
CO5		2		3			2					

MEPET06 Power Plant Engineering

B.Tech VI Semester

Effective from- 2018-19

Lectures / Week: 3 periods **credits: 3**

COURSE OBJECTIVES:

- To provide an overview of power plants and the associated energy conversion issues.

UNIT-I

Coal based thermalpower plants, basic Rankine cycle and its modifications, layout of moderncoalpowerplant,supercriticalboilers,FBCboilers,turbines,condensers.Subsystemsofthermalpowerplants,fuelandashhandling,draughtsystem, feed watertreatment,binarycycles andcogenerationsystems

UNIT-II

Gasturbineandcombinedcyclepower plants,Brayton cycleanalysisandoptimization, componentsof gasturbinepowerplants,combinedcyclepowerplants,IntegratedGasifier based CombinedCycle(IGCC)systems.

UNIT-III

Basicsofnuclearenergyconversion,Layoutandsubsystemsofnuclearpowerplants,Boiling WaterReactor(BWR),PressurizedWaterReactor(PWR),CANDU Reactor, Pressurized HeavyWaterReactor(PHWR),FastBreederReactors (FBR),gascooledandliquidmetal cooled reactors,safetymeasuresfornuclearpowerplants

.

UNIT-IV

Hydroelectricpowerplants,classification,typicallayout andcomponents,principlesofwind, tidal,Photovoltaic solarandthermal,geothermal,biogasandfuelcellpowersystems

UNIT-V

Energy,economicandenvironmental issues,powertariffs,loaddistributionparameters,load curve,capitalandoperatingcostofdifferentpowerplants,pollutioncontrol technologies includingwastedisposaloptionsforcoalandnuclearplants.

TextBooks:

1.NagP.K.,PowerPlantEngineering,3rd ed.,TataMcGrawHill,2008.
2.ElWakilM.M.,PowerPlant Technology, TataMcGrawHill,2010.
3.ElliotT.C.,ChenKand Swanekamp R.C.,PowerPlantEngineering,2nd ed.,McGrawHill,1998.

COURSE OUTCOMES:

CO1	Describe the power generation scenario, the layout components of thermal power plant and analyze the improved Rankin cycle, Cogeneration cycle
CO2	Realize the details of gas power plant and analyze gas turbine power cycles.
CO3	Able to identify elements and their functions and operations of nuclear and gas turbine power plants

CO4	Able to recognize the layout, component details of hydroelectric power plant and nuclear power plant
CO5	Know the Social and Economic issues of power plants and describe the different power plant electrical instruments and basic principles of economics of power generation.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1		2	3								
CO2		2		3								
CO3			3	2								
CO4		2	3	1								
CO5		2		3			2					

MEPET07 Non-Conventional Energy Sources

B.Tech VI Semester

Effective from- 2018-19

Lectures / Week: 3 periods **credits:3**

COURSE OBJECTIVES:

- To provide a survey of the most important renewable energy resources and the technologies for harnessing these resources within the framework of a broad range of simple to state- of -the-art energy systems.

UNIT – I

Introduction: Role and potential of new and renewable sources – The solar energy option – Environmental impact of solar power.

Principles of Solar Radiation: Physics of the sun – The solar constant –Solar radiation on tilted surface – Instruments for measuring solar radiation and sun shine – Solar radiation data.

UNIT – II

Solar Energy Collection: Flat plate and concentrating collectors – Classification of concentrating collectors – Orientation and Thermal analysis – Advanced collectors.

Solar Energy Storage: Different methods – Sensible, Latent heat and Stratified storage – Solar Ponds

Solar Applications: Solar heating/cooling techniques – Solar distillation and drying - Photovoltaic energy conversion.

UNIT – III

Wind Energy: Sources and potentials – Horizontal and Vertical axis windmills – Performance characteristics.

Bio-Mass: Principles of Bio-conversion – Anaerobic/Aerobic digestion – Types of Bio-gas digesters – Gas yield – Combustion characteristics of bio-gas – Utilization for cooking, I.C. engine operation – Economic aspects.

UNIT – IV

Geothermal Energy: Resources – Types of wells – Methods of harnessing the energy – Potential in India.

OTEC: Principles – Utilization – Setting of OTEC plants - Thermodynamic cycles.

Tidal and Wave Energy: Potential and Conversion techniques – Mini-hydel power plants – Their economics

.

UNIT – V

Direct Energy Conversion: Need for DEC – Principles of DEC – Thermo-electric generators – Seebeck, Peltier and Joule Thompson effects – Figure of merit – Materials – Applications – MHD generators – Principles – Dissociation and Ionization – Hall effect – Magnetic flux – MHD accelerator – MHD engine – Power generation systems .

Fuel Cells: Principle – Faraday's laws – Thermodynamic aspects – Selection of fuels and Operating conditions.

TEXT BOOKS:

1. Rai G.D. : Non-conventionalEnergy Sources, Standard PublishersDistributors.
2. Ashok V Desai : Non-conventionalEnergy, New Age International.
3. K. Udayakumar, M. Anandakrishnan: Renewable Energy Technologies, Narosa, 1997.

REFERENCES:

1. Twidell and Weir: Renewable Energy Sources, 2nd Edition, Taylor & Francis, 2006.
2. Sukhatme: Solar Energy, 1st Edition, Tata McGraw-Hill Education, 2008
3. D. Yogi Goswami, Jan F. Kreider : Solar Power Engineering, 2nd Edition, Taylor & Francis, 2006.

COURSE OUTCOMES:

CO1	Able to study various non-conventional sources of energy like wind, biomass etc and its applications in remote areas of the country.
CO2	Able to understand the instruments for measuring solar radiation and analyze the solar radiation data.
CO3	Able to understand the principles and applications of solar energy, solar energy collection, solar heating, solar distillation and photo voltaic energy.
CO4	Understand the Geothermal, Wind & Tidal energy, its mechanism of production and its applications
CO5	Understand the concept of Biomass energy resources and their classification, types of biogas Plants- applications

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	3								
CO2	1	2	1	3								
CO3	1	2	2	3								
CO4	1	2		3								
CO5		2	1	3								

MEPCP605 Strength of Materials & Fluid Mechanics laboratory

B.Tech VI Semester

Effective from- 2018-19

(P/D) / Week: 3 periods **credits:1.5**

COURSE OBJECTIVES:

- The objective of the strength of materials lab is to demonstrate the basic principles in the area of strength and mechanics of materials and structural analysis to the undergraduate students through a series of experiments.
- In this lab the experiments are performed to measure the properties of the materials such as impact strength, tensile strength, compressive strength, hardness, ductility etc.
- Enrich the concept of fluid mechanics and hydraulic machines.
- Demonstrate the classical experiments in fluid mechanics and hydraulic machinery.
- Correlate various flow measuring devices such as Venturimeter, orifice meter and notches etc.
- Discuss the performance characteristics of turbines and pumps

List of Experiments:

1. Tension test on mild steel bar
2. Tension test on HYSD steel bar
3. Compression test on wood
4. Shear test on wood
5. Torsion test on steel
6. Test on close coiled helical spring
7. Bending test on rolled steel joist
8. Bending test carriage spring
9. Charpy impact test
10. Deflection test on a beam under Uniform Bending
11. Deflection test on simple supported beam
12. Deflection test on fixed beam

List of Experiments:

1. Discharge Measurements:
   (a) Small Orifice
   (b) Venturi Meter
   (c) Orifice Meter
   (d) Triangular Notch
2. Losses in Pipes:
   (a) Pipe Friction
   (b) Sudden Contraction
   (c) Gate Value

3. Determination of Efficiency in Pumps and Turbines:
   (a) 0.4 K.W Centrifugal Pump
   (b) 0.8 K.W Centrifugal Pump
   (c) 5.5 K.W Centrifugal Pump

COURSE OUTCOMES:

CO1	Analyze the behavior of the solid bodies subjected to various types of loading.
CO2	Apply knowledge of materials and structural elements to the analysis of simple structures.
CO3	Able to identify suitable pumps and turbines for different working conditions.
CO4	Able to conduct experiments (in teams) in pipe flows and open-channel flows and interpreting data from model studies to prototype cases, as well as documenting them in engineering reports
CO5	Analyze a variety of practical fluid-flow devices and utilize fluid mechanics principles in design

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2	3									
CO2	1	2		3								
CO3		2	3	3								
CO4		2		3								
CO5	1	2	2	3								

MEPCP606 Heat Transfer Laboratory
B.Tech VI Semester
Effective from- 2018-19

(P/D) / Week: 3 periods **credits:1.5**

COURSE OBJECTIVES:

- Understand the various forms of heat transfer and their applications in real life problems.
- Analyze different methods to calculate the heat transfer coefficient in various heat transfer problems.
- Analyze the theoretical knowledge and apply it in conducting experiments in the forms of heat transfer.

List of Experiments:

1. Test on Conduction in Composite Slab System.
2. Test on Thermal Conductivity of Solids.
3. Test on Emmissivity Measurement Apparatus.
4. Test on Lagged Pipe Apparatus.
5. Test on Steffan-Boltzman Apparatus.
6. Test on Concentric Tube Fin Type-Heat Exchanger.
7. Test on Natural Convection Apparatus.
8. Test on Forced Convection Apparatus.
9. Test on Drop-wise Condensation Apparatus.
10. Determination of COP of vapor compression refrigeration system

COURSE OUTCOMES:

CO1	Estimate heat transfer coefficient in forced convection.
CO2	Measure heat transfer coefficient in free convection and correlate with theoretical values.
CO3	Estimate the effective thermal resistance in composite slabs and efficiency in pin-fins.
CO4	Determine surface emissivity of a test plate.
CO5	Able to design refrigeration and control systems

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	2	2								
CO2	1	3		2								
CO3	1	3		2								
CO4	1	3		2								
CO5	1	2	3	2								

MEPET701Automobile Engineering
B.Tech VII Semester
Effective from- 2018-19

Lectures / Week: 3 periods **credits:3**

COURSE OBJECTIVES:

- To understand the construction and working principle of various parts of an automobile
- The anatomy of the automobile in general
- The location and importance of each part
- The functioning of the engine and its accessories, gear box, clutch, brakes, steering, axles and wheels
- Suspension, frame, springs and other connections
- Emissions, ignition, controls, electrical systems and ventilation

Unit-I

Introduction

Components of four wheeler automobile – chassis and body – power transmission – rear wheel drive, front wheel drive – types of engines, engine construction, turbo charging and super charging – engine lubrication, splash and pressure lubrication systems, Arrangement of cylinders, types valve arrangements, Liners- dry and Wet type, function and constructional details, combustion chambers for petrol and diesel engines.

Unit-II

Fuel Supply System:

S.I. Engine: Fuel supply systems, Mechanical and electrical fuel pump, carburetor: types, Air cleaners and types.

C.I. Engines: Requirements of diesel injection systems, types of injection systems, fuel pump.

Emission from Automobiles: Pollution standards - Emission norms (Euro & BS), Pollution Control, Techniques, Multipoint fuel injection system, Common rail diesel injection system, Gasoline direct injection system and Alternative energy sources,

UNIT III

Cooling System : Cooling Requirements, Air Cooling, Liquid Cooling, Thermo, water and Forced Circulation System, Radiators: Types, Cooling Fan, water pump, thermostat, antifreeze solutions.

Ignition System: Function of an ignition system, battery ignition system, constructional features of storage, battery, condenser and spark plug – Magneto coil ignition system, electronic ignition system using contact breaker

UNIT IV

Transmission Systems:

Clutch: Function of clutch, single plate and multiple plate, and centrifugal clutches and clutch materials, fluid coupling, torque converter.

Gear box: Need, sliding type, constant and synchromesh type. Automatic transmission. Propeller shaft; need and constructional details.

UNIT V

Suspension System: Objects of suspension systems – torsion bar, shock absorber.

Braking System: Mechanical brake system, Hydraulic brake system, Pneumatic brakes and antilock braking system (ABS).

Steering System: Steering mechanism, Ackerman steering mechanism, Davis steering mechanism. Power Steering System

TEXT BOOKS:

1. Automobile Engineering : Narang G.B.S.
2. Automobile Engineering Vol. I & II : Kirpal Singh.
3. Automobile Engineering : R.K. Rajput
4. Automobile Engineering : Dr. G. Devaradjane
5. Internal Combustion Engines : V. Ganesan

REFERENCES:

1. Automotive Mechanics : Heitner J.
2. I.C.Engines : Mathur M.L. & Singh R.P.

COURSE OUTCOMES:

CO1	Able to know the concepts of different types of engines and their parts
CO2	Able to select air cleaners and carburetors for petrol and diesel engines
CO3	Acquire knowledge on cooling systems, lubrication systems and ignition systems of SI and CI engines
CO4	Design clutches and gear boxes for small vehicles
CO5	Able to select different steering mechanisms and brakes for smooth moving of vehicle

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	3									
CO2	1	3		3								
CO3	1		2	3								
CO4	1	2	3									
CO5	1	2	3	3								

MEPET08 Computer Aided Design and Computer aided manufacturing (CAD / CAM)

B.Tech VII Semester

Effective from- 2018-19

Lectures / Week: 3 periods **credits:3**

COURSE OBJECTIVES:

- To provide an overview of how computers can be utilized in mechanical component design.

Unit – I

FundamentalsofComputerGraphics-Productcycle,sequentialandconcurrentengineering, ComputerAidedDesign,CAD system architecture,computergraphics,Coordinatesystems, work station, CADstandards-GraphicalKernelSystem(GKS),standardsforvexchangeimages,Open Graphics Library (OpenGL), Data exchange standards- IGES, STEP, CALS etc., Communicationstandards, DDA and Circle Algorithms.

Unit - II

2Dand3Dtransformations,viewing transformation, mathematical formulations, GeometricModeling-representationofcurves,Hermite curves,Beziercurves,B-spline curves,rationalcurves,Techniquesof surfacemodelling,surfacepatch,Coonsandbicubic patches,BezierandB-splinesurfaces,Solidmodellingtechniques,CSGandB-rep.

Unit – III

Computer aided manufacturing, manufacturing planning and manufacturing control, computer integrated manufacturing, CAPP, Retrieval type and Generative type, types production and planning and control activities, fundamentals of MRP, MRP-2, ERP, ERP-2, shop floor control, automatic identification systems, machine loading and sequencial problem, factory data collection system, AIM, barcodes, RFID, magnetic tape, OCR, machine vision.Adaptive control machining systems, Types of Adaptive Control.

UNIT – IV

Numerical Control – NC, NC Modes, NC Elements, NC machine tools and their structure, Machining centre, automatic tool changers, Turning and Milling machine centres, Controls in NC, CNC, and DNC systems. CNC Part Programming – Fundamentals, Open loop and closed loop, tape formats, Canned Cycles, cutter radius compensation, length compensation, manual part programming, Creating manufacturing database, Computer Assisted Part Programming using APT; Geometry statements, motion statements, PTP – Contour /Continuous interpolation methods, Post process statements, auxiliary statements, macro statement program for simple components on CNC Turning and Milling machines.

UNIT – V

Group Technology and FMS:, benefits. Machinability data systems, Computer generated time standards, Capacity planning, Shop Floor Control, CIM concepts, topology concepts. Automated Material Handling Systems: Robot configurations and robots in material handling, Part Family.Classification and Coding, advantages and limitations. Group technology machine cells – FMC, FMG, FMS, and Agile manufacturing.

TextBooks:

1.IbrahimZeid,MasteringCADCAM,TataMcGrawHillPublishingCo.2007.
2.C.McMohanandJ.Browne, CAD/CAMPrinciples,IIedition,PearsonEducation,1999.
3.W.M.Neumannand R.F.Sproul, PrinciplesofComputerGra[hics,McGrawHill,1989.
4.D.HearnandM.P. Baker,ComputerGraphics,Prentice HallInc.,1992.
5. Mikell P. Groover, Automation, Production Systems, and Computer-integrated Manufacturing,prentice Hall

COURSE OUTCOME:

CO1	Able to understand the role of CAD in mechanical component and system design by creating geometric models and engineering drawings.
CO2	To implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.
CO3	Acquire knowledge and understanding of modeling concepts and computer implementation of lines, curves, surfaces and transformations.
CO4	Able to know the usage of numerical control machines and its codes and also know how computer is useful in making the process planning.
CO5	Able to apply the concepts of production planning & control and group technology to the development of FMS.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1		3									
CO2	1	3	2									
CO3	1	3	2	2								
CO4	1		3									
CO5	1			3								

MEPET09 Robotics
B.Tech VII Semester
Effective from- 2018-19

Lectures / Week: 3 periods **credits:3**

UNIT –I

Fundamentals of robotics – Automation and robotics, Robot Anatomy, Four common robot configurations – Robot motions – Robot wrist – Robot work volumes – Robot characteristics – Spatial resolution, Accuracy, Repeatability.

UNIT-II

Control Systems and components – Basic control systems components and models –Mathematical models, transfer function – Block diagrams, Characteristic equations – Controllers– Proportional control , Integral control, Proportional and Derivative (PD) control, Proportional and Integral (PI) control and PID Control – Analysis of robot joint axis – Open loop and closed loop control systems

UNIT-III

Drive systems and sensors –Servo controlled and non-servo controlled robots. Direct drive and indirect drive Drives – Hydraulic, Pneumatic and Electric drives – Robot joint control design. Types of sensors – Contact and non – contact type sensors – Position sensors – velocity sensors – force sensors – torque sensors – Tactile sensor – proximity and range sensors – Use of sensors in robotics.

UNIT-IV

Robot end – effectors – grippers and tools – Mechanical grippers – types of gripper mechanisms – gripper force analysis – vacuum grippers – magnetic grippers – Tools as end – effectors – Robotic sensory gripper – Remote centre compliance device (RCC).

UNIT-V

Robot programming and applications – programming methods – Off – line programming and on – line programming – teach box or control box, Lead through programming – Use of robot programming languages – VAL. Applications of robot – Material handling, Machine loading/unloading, Assembly, Inspection etc., Work cell layout – Robot Work cells. Economic analysis.

TEXT BOOKS:

1. Mikell P. Groover, Mitchell Weiss, Roger N. Nagel and Nicholas G. Odrey, 'Industrial Robotics Technology, Programming and Applications', Mc Graw Hill Book company, 1986

2. R.K. Mittal and I.J. Nagrath, Robotics and Control, McGraw Hill Education (India) Private Ltd., 2014.
3. Deb S.K, Deb.S,"Robotics Technology and Flexible Automation", Tata McGraw-Hill Education Private Limited, 2009.
4. Ganesh S. Hegde, A text book on Industrial Robotics, Laxmi Publications (P) Ltd., 2007.

REFERENCES:

1. John J. Craig, Introduction to Robotics Mechanics and Control, Second Edition, Addison Wesly Longman Inc. International Student edition, 1999

2. Mark W. Sponge & Vidya Sagar M.,"Robot Dynamics and Control" ,Wiley; 1st edition (1989)

3. Tsuneo Yohikwa, Foundations of Robotics Analysis and Control, Prentice Hall of India Pvt. Ltd., 2001

COURSE OUTCOMES:

CO1	Able to demonstrate the basic functioning and identifying of various components of robots
CO2	Able to understand the different types of control systems, drive mechanisms and select appropriate drive system as per industry requirements and also apply various controls as per requirement.
CO3	Able to carry out kinematic analysis, workspace analysis and trajectory planning for a robot and also identify suitable sensors/actuators and grippers for robots
CO4	Able to select an appropriate robot for given industrial inspection and material handling systems.
CO5	Plan, design and implement robotic systems, algorithms and software capable of operating in complex and interactive environments.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2	1	2		3								
CO3	1	3		2								
CO4	1	2	3									
CO5	1	2	3									

MEPET10 Nanotechnology and Surface Engineering
B.Tech VII Semester
Effective from- 2018-19

Lectures / Week: 3 periods **credits:3**

UNIT-I

Introduction to Surfaces

Surfaces and Interfaces – Importance of Surfaces in Nano Regime – Thermodynamics of surfaces – surface energy – notation of surface structures – surface reconstruction – Surface and interfacial tension and measurement– contact angle and wetting –surfactants, and interfacial forces – Review of Surface Characterization Techniques – optical, topographic, chemical and mechanical properties (XPS, PIXE, RBS, SIMS, LEED, RHEED)

UNIT-II

Processes at Solid Surfaces

Adsorption – Physisorption and Chemisorption – Adsorption isotherms (Langmuir and BET) – Reaction Mechanism (Langmuir-Hinshelwood and Eley-Rideal) – Sticking Probability –Types of Catalyst – Homo vs Hetero - Properties and preparation of Catalyst – TON, TOF, E factor - Surface and electronic properties of metal and metal oxide catalyst and its principle behind catalysis – Sabatier Principle – Bronstedt –

Polanyi relation - Role of Surfaces, Interfaces, Morphology in Catalysis– Active sites incatalysis & determination – porous materials

UNIT-III

Role of Surfaces in Bio-nano interactions Adhesion and its importance – Adhesion vs cohesion – Work in adhesion and cohesion - Theories on adhesion (Bradley, Hertz, JKR) - Methods of adhesion measurement (Scotch Tape, Peel test, Scratch, Blister, Ultrasonic and acoustic micro cavitation methods) – Adhesion measurement in cell (observational, probing and counting techniques) - Surface modification and adhesion - Adhesion of nanoparticles, cells and between nanoparticle & cells - Cancer cell surface interaction.

UNIT-IV

Tribological Aspects of Surfaces

Tribological aspects of adhesion, friction and wear – Friction and Friction Types – Theories of Macro (Amontons, Coulomb) and Nanoscale friction (Tomlinson, FrenkelKontorova, Bowden and Tabor models)– Difference between macro and micro/nano tribology- Wear – Wear Mechanisms and types – identification of different mechanisms – Wear theory (Archard, Rabinowictz, Bassani and D'Acunto Theory)– Characterization techniques for friction and wear – Tribometer, Friction Force Microscopy,

Nanoindentation and Nanoscratching – Methods to reduce wear and Friction –Fracture –Lubrication –Surface Coatings.

UNIT-V

Surfaces in Multidisciplinary Applications

Colloids– Optical and Electrical properties – Colloids in Drug Delivery – Electrical and Electronic properties of Surfaces –zeta potential - Corrosion – Coatings for corrosion protection –High temperature issues - New

coating concepts in multilayer structures – thermal barrier coatings. Bioinspired materials – Tribology in Human Body, Artificial organs and Medical devices –Nanosurfaces in Energy, Environmental, Automobile and Industrial Applications.

TEXT BOOKS

1. Gabor A. Somorjai, Yimin Li, Introduction to Surface Chemistry and Catalysis, John Wiley & Sons, New Jersey, 2010.
2. HaraldIbach, Physics of Surfaces and Interfaces, Springer-Verlag, Berlin, 2006.
3. Pankaj Vadgama, Surfaces and interfaces for biomaterials, First Edition, CRC Press, Boca Raton, 2005.
4. Peter J. Blau, Friction Scienceand Technology- From concepts to applications, Second Edition, CRC Press, Boca Raton, 2009
5. B. Bhusan, Modern Tribology Handbook, CRC Press, Boca Raton, 2005.
6. N. Birks, G. H. Meier, F. S. Pettit, Introduction to the high temperature oxidation of metals, Second edition, Cambridge University Press, 2006.

REFERENCE BOOKS

1. I. Chorkendorff, J.W. Niemantsverdriet, Concepts of Modern Catalysis and Kinetics, First Edition, Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, 2003.
2. Didier Astruc, Nanopaticles and catalysis, Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, 2008.
3. Ryan Richards, Surface and Nanomoecular Catalysis, Taylor & Francis, Boca Raton, 2006.
4. Jeremy Ramsden, Biomedical Surfaces, Aptech House, Inc., Boston, 2008.
5. Renate Forch, HolgerSchonherr, and A. Tobias A. Jenkins, Surface Design: Applications in Bioscience and Nanotechnology, Wiley -VCH Verlag GmbH & Co.
KGaA, Weinheim, 2009.

COURSE OUTCOMES:

CO1	Integrate a deep and comprehensive understanding of nanoscale phenomena and material properties with core principles and concepts in chemistry, physics, engineering and mathematics.
CO2	Evaluate and analyze the mechanical properties of bulk nanostructured metals and alloys, nanocomposites and carbon nanotubes.
CO3	Exhibit integrated knowledge in the structure of matter at the nanoscale and the technological elements of the physical, chemical and bio-related properties of materials.
CO4	Able to discuss ethical issues relevant to nanobiotechnology and nanomedicine.
CO5	Build nanomaterials using nanofabrication techniques, including top-down and bottom-up approaches.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

MEPET11 Mechanical Vibrations

B.Tech VII Semester

Effective from- 2018-19

Lectures / Week: 3 periods **credits:3**

UNIT – I

Oscillatory motion – Harmonic motion and periodic motion – conservation of energy and Newton's second law.Theory of the single degree – of – freedom oscillator – Free vibrations – Forced vibrations – Harmonic excitation.The undamaped system – The damped system.

UNIT – II

Free vibration with viscous damping – Forced vibration with viscous damping – Logarithmic decrement – response to simple forcing functions – Steady – state response to sinusoidal forcing – Properties of the dynamic amplification factor (DAF).

UNIT – III

Vibration of two – degree – of – freedom system – free response of an undamped 2 – DOF system – Use of Rayleigh's method and fundamental natural frequency – Natural frequency and mode shape shapes of undamped spring – mass system.

UNIT – IV

Normal mode analysis of undamped multi – degree – of – freedom system – Orthogonality properties of an undamped multi – degree – of – freedom system – Orthonormal modes. Decoupling forced vibration equations – Modal damping forced vibrations.

UNIT – V

Vibration of continuous systems – Vibrating string – Longitudinal vibration of rods – Torsional vibration of rods.Approximation methods in vibration analysis.

Text Books

1. W.T. Thomson and M.D. Dahleh, Theory of vibration with applications, Pearson Education, Inc, 2007.
2. Max Irvine, Structural dynamics, Allen and Unwin, 1980

Reference books

1. Denhartog Mechanical Vibrations, John Wiley and Sons, 2008.
2. Benson H. Tongue, Principles of vibration, 1st Edition, ASME, 1993.

COURSE OUTCOMES:

CO1	Able to solve for the motion and the natural frequency of a freely vibrating single degree of freedom undamped motion and a freely vibrating single degree of freedom damped motion.
CO2	Ability to determine vibratory responses of SDOF, TDOF and MDOF systems to harmonic, periodic and non-periodic excitation.
CO3	Able to calculate natural frequency and period of simple vibrating mechanical systems.
CO4	Able to represent the vibration phenomena as a mathematical model and solve it to obtain the response.
CO5	Able to know the process of vibration measurements & control and vibration continue systems.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	2									
CO2	1	3	2									
CO3	1	3										
CO4	1	3		2								
CO5	1	3		2								

MEPET12 Finite Element Analysis

B.Tech VII Semester

Effective from- 2018-19

Lectures / Week: 3 periods **credits:3**

COURSE OBJECTIVES:

- To illustrate the principle of mathematical modeling of engineering problems
- To introduce the basics and application of Finite Element Method

UNIT –I

Historical Background, Mathematical modeling of field problems in engineering, governing equations, discrete and continuous models, boundary and initial value problems, Weighted Residual Methods, Variational formulation of boundary value problems, Ritz technique, Basic concept of Finite Element Method.

UNIT -II

One dimensional second order equation, discretization, linear and higher order elements, derivation of shape functions, Stiffness matrix and force vectors, assembly of elemental matrices, solution of problems from solid mechanics. Thermal Analysis: Heat transfer, longitudinal vibration and mode shapes, fourth order beam equation, transverse deflections and natural frequencies.

UNIT – III

Two dimensional equations, variational formulation, finite element formulation, triangular elements- shape functions, elemental matrices and RHS vectors; Application to thermal problems, torsion of non-circular shafts, quadrilateral and higher order elements. Plane stresses and plane strain problems, body forces and thermal loads, plate and shell elements.

UNIT -IV

Natural coordinate systems, isoparametric elements and shape functions, numerical integration and application to plane stress problems, matrix solution techniques, solution of dynamic problems, introduction to FE software.

UNIT -V

Computational Fluid Dynamics (CFD): Introduction – Benifts of CFD – Usage and Applications – CFD Analysis and related available Software – Elementary Treatment

Text Books:

1.Reddy J.N., An Introduction to Finite Element Method, 3rd ed., Tata McGraw Hill, 2005.
2. Seshu P., Text Book of Finite Element Analysis, Prentice Hall, New Delhi, 2007.
Rao S.S., The Finite Element Method in Engineering,3rded., Butterworth Heinemann,2004

3.Chandraputla& Belegundu, Introduction to Finite Elements in Engineering, 3rd ed., Prentice Hall, 1990.

4.Desai, Y.M., Eldho, T.I., and Shah, A.H., Finite Element Method with Applications, Pearson Publications, 2011.

5.Jiyuan, Tu., Guan, H. Yeoh and Liu, Ch., Computational Fluid Dynamics – A Practical Approach, Butterworth Heinemann, 2008.

COURSE OUTCOMES:

CO1	Interpret the philosophy behind principles, design and modelling considerations in using finite element analysis.
CO2	Able to apply suitable boundary conditions to a global equation for bars, trusses, beams, circular shafts, heat transfer, fluid flow, axi symmetric and dynamic problems and solve them displacements, stress and strains induced.
CO3	Implement the formulation techniques to solve two-dimensional problems using triangle and quadrilateral elements.
CO4	Identify the application and characteristics of FEA elements such as bars, beams, plane and iso-parametric elements.
CO5	Able to simulate simple CFD models and analyze its results.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	2									
CO2	1	3	2									
CO3	1	3	2									
CO4	1	3	2									
CO5	1	3	2									

MEPEP703 CAD/CAM Laboratory
B.Tech VII Semester
Effective from- 2018-19

(P/D) / Week: 3 periods **credits:1.5**

CAD Laboratory

The following drafting tools should learn by the student using any Drafting software and using these tools the student should be able to plot orthographic projections and 3D assembly drawing

Introduction to AUTOCAD-Co-ordinate system, Object snap, Draw Tools -Line, Polyline, Rectangle, circle, spline, Ellipse, Point, Hatch, Text, Modify Tools - Erase, copy, Mirror, Offset, Array, Move Rotate, Trim, Fillet, Dimensions - Dimension Variables, Linear, Aligned, Radius and diameter, Angular Dimensions

Exercise on the above commands limited to 2D plotting.

Using above drawing tools, drawing of machine components and Production drawing of mating components with limits and fits are given as exercises. Minimum of 5 components of detailed drawings should be drawn.

CAM Laboratory

Minimum of three exercises to be performed.

Part programming on turning and milling machines and execution on simulator.

Exercises on coordinate measuring machine CMM; Determination of dimensions of the given object; determination of angle between two surfaces;

Text Books:

1. . Bhatt N D and VM Panchal, Engineering Drawing Revised Edition, Chrotar Publications, 2010
2. Dhananjaya A Jolhe, Engineering Drawing with an introduction to AutoCAD, Tata Mc- Graw Hill – 2009.
3. Gautam Pohit, Gautam Gosh – Machine Drawing with Auto Cad- Pearson Publishers
4. Production drawing , K.L. Narayana, P. Kannaiah and K. Venkata Reddy, New age International Publishers.

COURSE OUTCOMES:

CO1	Draw complex geometries of machine components in sketcher mode.
CO2	Create complex engineering assemblies using appropriate assembly constraints.
CO3	Develop G and M codes for turning and milling components.
CO4	Generate automated tool paths for a given engineering component.
CO5	Generate automated tool paths for a given engineering component.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2	3									
CO2		2	3									
CO3		2	3									
CO4		2	3									
CO5		2	3									

MEPET13 Tool Design
B.Tech VIII Semester
Effective from- 2018-19

Lectures / Week: 3 periods **credits:3**

UNIT –I

Cutting Tools Classification – Nomenclature of single point cutting tool – Differences between orthogonal and oblique cutting – Mechanism of metal cutting – Types of chips – chip breakers – Forces acting on a tool – Merchant circle diagram – Velocity relations – specific energy in cutting.

UNIT-II

Tool Wear – Tool life – Factors affecting tool life – Taylor's Tool life Equation – Tool wear mechanisms – Types of tool wear – Heat distribution in metal cutting – Measurement of temperature in metal cutting – Lathe tool Dynamometer – Cutting fluids – Selection and applications.

UNIT-III

Cutting Tool Materials- Requirements of tool materials, advances in tool materials, HSS, Coated HSS, Carbides ,Coated Carbides, Ceramics, Cold pressed, Hot Pressed , Ceramic composites, CBN, Diamond-properties, Advantages and limitations; Specifications for Inserts and tool holders. Design of single point cutting tool and form tool for NC Lathe work- Design of profile milling cutter and broach tools

UNIT- IV

Press Working and Economics of Machining: Press working operations- Press selection and Tonnage-Centre of Pressure- Cutting forces and clearances for Die Design – Compound and Progressive Die, Strip layout. Costs associated with machining operations- Optimum cutting speed for minimum cost and maximum production, cutting speed for minimum cost in Turning.

UNIT-V

Jigs & Fixtures- Uses- Locating devices, 3-2-1 principle of location – pin location- Radial location- 'V' location- Diamond locators. Types of clamping devices- principles of clamping. Design principles to Jigs & Fixtures – Drill Jigs, types- Drill Bushes, types- Fixtures for Turning, Milling and Welding.

TEXT BOOKS:

1. Fundamental of Tool Design – ASTME, Prentice Hall, New Delhi, 1987
2. Donaldson, Lecain and Goold - "Tool Design", McGraw Hill, New York, 1976

REFERENCES:

1. BLJuneja and GSSekhan, "Fundamental of Metal Cutting and Machine Tools", 2nd Edition, New Age International Publishers, New Delhi,2003
2. Milton C.Shaw, "Metal Cutting Principles", 1st Edition,CBS Publishers & Distributors Pvt.Ltd,2002.
3. Kempster, "In Introduction to Jig and Tool Design", ELBS, 1974.
4. Herman W. Pollack ,"Tool Design", Prentice Hall, New Delhi.

MEPET14 QUALITY CONTROL AND RELIABILITY ENGINEERING

B.Tech VIII Semester

Effective from- 2018-19

Lectures / Week: 3 periods **credits:3**

COURSE OBJECTIVES:

- Demonstrate the approaches and techniques to assess and improve process and/or product quality and reliability.
- Introduce the principles and techniques of Statistical Quality Control and their practical uses in product and/or process design and monitoring
- Illustrate the basic concepts and techniques of modern reliability engineering tools.

Unit-I

Introduction to Inspection and Quality Control, Objectives of Statistical Quality Control, Chance and Assignable Causes of variation, Control chart basic principles, Choice of control limits, Sample frequency and rational subgroups.

Control charts for variables: X and R charts and σ charts, Interpretation of control charts.

Unit-II

Process Capability Analysis: Specification limits and Control limits, Natural tolerance limits, Specifications and Process Capability, Process Capability indices, setting tolerances on assemblies and components.

Control Charts for Attributes: P chart, C chart, U chart, Sensitivity analysis of P charts, Quality Rating System.

Unit-III

Acceptance Sampling Plans for Attributes: Types of Sampling Plans, Advantages and disadvantages of Sampling Plans, Evaluation of Sampling Plans – OC, Curve, Characteristics of OC Curve, Producer risk and Consumer risk, AOQ, AQL, ATI, ASN. Multiple and Sequential sampling plans. Brief introduction to Acceptance Sampling plans for continuous production and Acceptance sampling plan for variables.

Unit-IV

Reliability: Concepts of reliability, Scope, Importance of reliability, Reliability data collection-
Failure data analysis: MTTF, MTBF, Failure rate, Hazard rate, reliability, Failure rate curve,
Types of failures – Hazard models (Exponential and Weibull).
System Reliability: Series, Parallel and Mixed configurations.
Reliability Improvement: Active and Standby redundancies, Introduction to Fault Tree Analysis, Maintainability and Availability.

Unit-V

Quality Costs: Prevention, Appraisal, Internal failure and External failure costs, Quality and Productivity, Total Quality Management, Quality function deployment, Tools for continuous quality improvement. Quality Circles: Concepts, Objectives and advantages. Introduction to Six Sigma Concept.Features of ISO 9000 quality system- Classification, Need, advantages and limitations.

TEXT BOOKS:

1. Amitava Mitra, "Fundamentals of Quality Control and Improvement" Wiley publications, 3rd Edition, 2008.
2. Gupta, R.C., "Statistical Quality control", Khanna Publishers, 1997.

REFERENCES:

1. Besterfield D.H., "Quality Control– A Practical Approach", Prentice Hall, 1993.
2. Grant E.L. "Statistical Quality Control" McGraw-Hill Science/Engineering/Math; 7th - edition (1996):Srinath, L.S., "Reliability Engineering", Affiliated East west press, 1991.

COURSE OUTCOMES:

CO1	Acquire knowledge on basic concepts of quality control and different types of control charts
CO2	Graduates will be aware of process capabilities in assemblies and able to select control limits.
CO3	Gain insight knowledge on consumer risks and effectively generate sampling plans.
CO4	An ability to use the techniques, skills, and modern engineering tools necessary for Quality Control and Reliability Engineering.
CO5	Acquire knowledge on TQM, six sigma concepts and ISO standards

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3		2								
CO2	1	3		2								
CO3	1	3		2								
CO4	1	3		2								
CO5	1	3		2								

MEPET15 ANALYSIS AND CONTROL OF PRODUCTION SYSTEMS

B.Tech VIII Semester

Effective from- 2018-19

Lectures / Week: 3 periods **credits:3**

COURSE OBJECTIVES:

- To understand the problems and opportunities faced by the operations manager in manufacturing and service organizations.
- To develop an ability to apply PPC concepts in a various areas like marketing, accounting, finance, engineering, personnel management, logistics, etc.
- To integrate operations concepts with other functional areas of business
- To understand the PPC function in both manufacturing and service organizations.
- To examine several classic Operations Management planning topics including production planning and inventory control.

UNIT –I

The Production Paradigm – Production as a System – Types of Production Systems – Job type, Batch type, flow type and Project type – Group technology – Lean and Agile manufacturing

UNIT –II

Facility Location and Layout – Multi plant location – Locational dynamics – use of REL charts and Travel charts – Computer based layout technique viz. CRAFT, CORELAP etc.

UNIT –III

Planning – Manufacturing and Service Strategies – Aggregate Planning – Graphical Analysis - Forecasting – Moving Average, Exponential Smoothing. Assembly Line Balancing – Heuristics for Line Balancing.

UNIT –IV

Operations Scheduling – Job shops and flow shops: Sequencing n jobs – 2 machines, n jobs 3 machines, n jobs m machines – 2 jobs m machines. Priority Scheduling rules – Criteria and effectiveness – "Traveling salesman" Problem.

UNIT –V

Controlling – Project planning and Controlling with PERT / CPM – MRP, JIT, KANBAN systems – LOB technique – MRP-II

TEXT BOOKS:

1. Adam and Ebert : Production and Operations Management, 5th Edition, Prentice Hall, 1992

2. Buffa E S : Modern Production Management, 8th Edition, Wiley-India, 2010.

REFERENCES:

1. Groover M.P.: Automation, Production Systems and CIM, 3rd Edition, Prentice Hall, 2007.
2. Joseph Monks: Operations Management, 3rd Edition, McGraw-Hill, 1987.
3. Seetharama L. Narasimhan, Dennis W. McLeavey, Peter Billington: Production Planning and Inventory Control, 2nd Edition, Prentice Hall, 1995.
4. Elsayed A. Elsayed, Thomas O. Boucher:Analysis and Control of Production Systems, 2nd Edition, Prentice Hall, 1994.

COURSE OUTCOMES:

CO1	Understand production systems and their characteristics.
CO2	Able to identify and design facility location and layout
CO3	Analyze aggregate planning strategies.
CO4	Apply forecasting and scheduling techniques to production systems.
CO5	Develop network diagrams for planning and execution of a given project.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2	3	2								
CO2		2	3	2								
CO3		2	3	2								
CO4		2	3	2								
CO5		2	3	2								

MEPET16 ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS
B.Tech VIII Semester
Effective from- 2018-19

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Course objectives

i. To study the idea of intelligent agents , search methods, reasoning and decision making
ii. To construct plans and methods for generating knowledge.
iii. To study the concepts of expert systems.

UNIT-I

INTRODUCTION

Introduction to AI: Intelligent agents – Perception –
Natural language processing – Problem – Solving agents – Searching for solutions: Uniformed search strategies – Informed search strategies.

UNIT-II

KNOWLEDGE AND REASONING

Adversarial search – Optimal and imperfect decisions – Alpha, Beta pruning – Logical agents: Propositional logic – First order logic – Syntax and semantics – Using first order logic – Inference in first order logic.

UNIT-III

3. UNCERTAIN KNOWLEDGE AND REASONING

Uncertainty – Acting under uncertainty – Basic probability notation – Axioms of probability – Baye's rule – Probabilistic reasoning – Making simple decisions.

UNIT-IV

PLANNING AND LEARNING

Planning: Planning problem – Partial order planning – Planning and acting in non-deterministic domains – Learning: Learning decision trees – Knowledge in learning – Neural networks – Reinforcement learning – Passive and active.

UNIT-V

EXPERT SYSTEMS

Definition – Features of an expert system – Organization – Characteristics – Prospector – Knowledge Representation in expert systems – Expert system tools – MYCIN – EMYCIN.

TEXT BOOKS

1. Stuart Russel and Peter Norvig, 'Artificial Intelligence A Modern Approach', Second Edition, Pearson Education, 2003 / PHI.

2. Donald A.Waterman, 'A Guide to Expert Systems', Pearson Education.

REFERENCE BOOKS

1. George F.Luger, 'Artificial Intelligence – Structures and Strategies for Complex Problem Solving', Fourth Edition, Pearson Education, 2002.

2. Elain Rich and Kevin Knight, 'Artificial Intelligence', Second Edition Tata McGraw Hill, 1995.

3. Janakiraman, K.Sarukesi, 'Foundations of Artificial Intelligence and Expert Systems', Macmillan Series in Computer Science.

4. W. Patterson, 'Introduction to Artificial Intelligence and Expert Systems', Prentice Hall of India, 2003.

MEPET17 Simulation and modeling
B.Tech VIII Semester
Effective from- 2018-19

Lectures / Week: 3 periods **credits:3**

UNIT-I

Systems: Models types, principles used in modelling, system studies, interacting subsystems andexample, simulation definition, examples, steps in computer simulation, advantages and disadvantagesof simulation, simulation study, classification of simulation languages.

UNIT-II

System Simulation :

Techniques of simulation, monte carlo method, comparision of simulation andanalytical methods, numerical compution techniques for continuous and descrete models, distributedleg models, cobweb models.

UNIT-III

Continuous system simulation :

Continuous system models, differential equation, analog computeranalog methods, digital analog simulators, CSSLS, CSMPIII language.

System Dynamics

: Historical background, exponential, Growth and decay models, modifiedexponentical growth models, logistic curves and generalization of growth models, system dynamicsdiagrams, dynamo language.

UNIT-IV

Probability concepts in simulation :

Stochastic variables, discrete and continuous probability function,constinuous uniform distributed and computer generation of random numbers, uniform randomnumber generator, non uniform contineously distributed random numbers, rejection method.

Discrete system simulation : Discrete events, representation of time, generation of arrivel patterns,simulation of telephone system, delayed calls, simulation programming tasks, gathering statistics,discrete simulation languages.

UNIT-V

Object Oriented approach in simulation, simulation in C++, Introduction to GPSS, generaldescription, action times, choice of paths, simulation of a manufacturing shop, facilities andstorage, program control statements, priorities and parameters, numerical attributes, functions,simulation of a supermarket transfer models, GPSS model applied to any application, simulationprogramming techniques like entry types.

Text books

1. G.Gordan “System Simulation” , 2ndEd, 2002 PHI.

2 Law & Kelton “Simulation Modelling and Analysis” 3rdEd., 2000, McGraw Hill

References :

1 T.A. Payer “Introduction to Simulation”, McGraw Hill
2 W.A. Spriet “Computer Oriented Modeling and Simulation**”.**
3 Narsingh Deo “System Simulation with Digital Computers”, PHI.
4 V. Rajaraman “Analog Simulation”, PHI

MEPET18 Automation in manufacturing
B.Tech VIII Semester
Effective from- 2018-19

Lectures / Week: 3 periods **credits:3**

COURSE OBJECTIVES:

- To understand the importance of automation in the of field machine tool based manufacturing
- To get the knowledge of various elements of manufacturing automation–CAD/CAM, sensors, pneumatics ,hydraulics and CNC
- To understand the basics of product design and the role of manufacturing automation

Course Contents:

Unit – I

Introduction:automation, definition, types of automation, reasons for automation, types of production, functions of manufacturing, Currenttrends,CAD,CAM,CIM; Organisation and information processing of manufacturing, automation strategies, types of plant layout and break-even analysis

Unit – II

Low cost automation: Mechanical &Electromechanical Systems, Pneumatics and Hydraulics,IllustrativeExamplesandcasestudies
CNC-AdaptiveControl,Automated Material handling, automated flow line – methods of work path transportation, linear and rotatary transfer mechanisms, automation for machining processes – design and fabrication considerations.

Unit – III

NCandNCpartprogramming, basic concepts of NC – coordinate system and machine motions, types of NC machines, machine control unit, NC systems and machine tool applications, basic machining processes, CNC and adaptive control.
Rigidautomation:Part handling, Machine tools. Flexible automation: Computer controlofMachine Tools and MachiningCenters,

Unit - IV

FMS – What is FMS?, machine components of FMS, CNC, types of FMS, machine workstation, (machining center), FMC, FMG, FMS, agile manufacturing, automated material handling, types. AGV, Robots, ASRS. Communication and control, computer networking, introduction – general structure, basic elements in communication system, software and hardware components. Classification of computer networks, topology, LAN, MAN, WAN. Star, bus, ring and hybrid.

Unit - V

Introduction toModelingandSimulation:Productdesign,processroutemodeling, Optimizationtechniques,Casestudies&industrialapplications.

CourseOutcomes:
Upon completionof thiscourse,thestudentswillgetacomprehensivepictureof computer basedautomationofmanufacturingoperations

TextBooks:

(i)Mikell P. Groover, Automation, Production Systems, and Computer-integrated Manufacturing,prentice Hall

(ii)SeropeKalpakjianandStevenR.Schmid,Manufacturing–EngineeringandTechnology, 7thedition,Pearson

(iii)YoramKoren, Computer controlofmanufacturingsystem,1stedition

(iv)IbrahimZeid,CAD/CAM: Theory&Practice,2ndedition.

(v) P N Rao, CAD CAM fundamentals and applications, 2nd Edition.