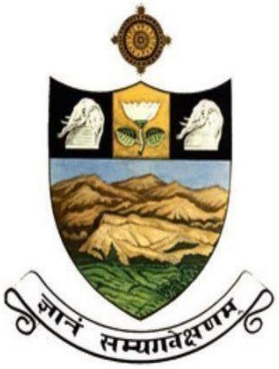
SRI VENKATESWARA UNIVERSITY :: TIRUPATI

Department of Mechanical Engineering

S.V. University College of Engineering:: Tirupati



R – 20 Scheme of Instruction and Syllabi of all Semesters B. Tech Programme

in

Mechanical Engineering

Effective from the batches admitted in

2020 – 21 onwards

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 engineeringproblems reaching substantiated conclusions using first principles of mathematics, natural sciences,andengineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and designsystem 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 theinformationto providevalid 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 anunderstandingofthelimitations.
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 theprofessionalengineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions insocietal 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 multi-disciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineeringcommunity 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 engineeringand management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary 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.

SRI VENKATESWARA UNIVERSITY
COLLEGE OF ENGINEERING: TIRUPATI 517 502

R-20 – Scheme of Instruction effective from the academic year 2020-2021

B.Tech. (Mechanical Engineering)

I Semester

Code	Category	Course Title	Scheme of Instruction (hr/Week) Lecture	Tutorial	Practical	Total Instruction	Credits
MA101	Basic Sci.	Mathematics – I	3	1	-	4	**4**
CY 101	Basic Sci	Engg Chemistry	3	1	-	4	**4**
EN103	Humanities	English	2	-	-	2	**2**
EE104	Basic Engg	Basic Electrical and Electronics Engineering	3	1	-	4	**4**
ME105	Basic Engg	Engineering Graphics and Design	2	-	3	5	**3.5**
EN 106	Humanities	English Communication Lab	-	-	3	3	**1.5**
		TOTAL	13	3	6	22	**19**

II Semester

Code	Category	Course Title	Scheme of Instruction (hr/Week) Lecture	Tutorial	Practical	Total Instruction	Credits
MA201	Basic Sci.	Mathematics – II	3	1	-	4	**4**
PY 202	Basic Sci	Engineering Physics	3	1	-	4	**4**
CS 203	Basic Engg	Programming for Problem Solving	2	1	-	3	**3**
CE 204	Basic Engg	Engineering Mechanics	3	1	-	4	**4**
ME 205	Basic Engg. Lab	Workshop / Manufacturing Practices	-	-	3	3	**1.5**
CS 206	Humanities Lab	Programming for Problem Solving Lab	-	-	3	3	**1.5**
CE 207	Audit	Environmental Science	4	-	-	4	**0**
		TOTAL	13	3	6	22	**18**

- All courses - 40 marks (Internal) + 60 marks (Univ. Semester End)
- Audit Course – 100 marks (Internal) -Zero Credits

Department of Mechanical Engineering

S. V. University College of Engineering:: TIRUPATI

Semester – III (Second year)

Sl. No	Course Code	Name of the Course	Category	Scheme of Instructions Hours per week				Credits
				Lecture	Tutorial	Practical	Drawing	
01	MA301B	Mathematics – III	BSC	03	01			03
02	ME302C	Strength of Materials	ESC	03	01			03
03	HS303C	Managerial Economics and Accountancy	HSMC	03				03
04	ME304C	Manufacturing Processes	PCC	03	01			03
05	ME305C	Basic Thermodynamics	PCC	03				03
06	ME306L	Strength of Materials Lab	ESC			03		1.5
07	ME307L	Manufacturing Process Lab	PCC			03		1.5
08	ME308L	Fuels Lab	PCC			03		1.5
09	ME309S	CAD Laboratory	SDC	01		02		02
10	MC310A	Constitution of India	MC	02				00
	Total			**18**	**03**	**11**		**21.5**

BSC – Basic Science Course: 03Credits;
SDC – Skill oriented course: 02 Credits
ESC – Engineering Science Course : 4.5 Credits
PCC – Professional Core Course: 09 Credits
HSMC – Humanities and Social Sciences :03 Credits
MC – Mandatory Course as prescribed by AICTE, New Delhi and it is a **non – credit** course

Note 1: Evaluation of SDC/SAC is similar to the evaluation process of regular laboratory work.

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

Semester – IV (Second year)

Sl. No	Course Code	Name of the Course	Category	Scheme of Instructions Hours per week				Credits
				Lecture	Tutorial	Practical	Drawing	
01	ME401C	Fluid Mechanics and Hydraulic Machinery	ESC	03	01			03
02	ME402C	Kinematics of Machinery	PCC	03	01			03
03	ME403C	Applied Thermodynamics	PCC	03	01			04
04	ME404C	Advanced Engineering Graphics	PCC	01			04	03
05	ME405C	Machine Tools and Metal Cutting	PCC	03				03
06	ME406L	Fluid Mechanics and Hydraulic Machinery Lab	ESC			03		1.5
07	ME407L	IC Engines Lab	PCC			03		1.5
08	ME408L	Electronics and Electrical Engineering Lab	ESC			03		1.5
09	ME409S	MATLAB	SDC	01		02		02
	Total			**14**	**03**	**11**	**04**	**22.5**

PCC – Professional Core Courses: 14.5 Credits;
ESC– Engineering Science Core: 06 Credits;
SDC – Skill Oriented Course: 02

Note 1: Evaluation of SDC/SAC is similar to the evaluation process of regular laboratory work.

Note 2: Summer Internship for two months after second year (to be evaluated during V semester)

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

Semester – V (Third year)

Sl. No	Course Code	Name of the Course	Category	Scheme of Instructions Hours per week				Credit
				Lecture	Tutorial	Practical	Drawing	
01	ME501C	Design of Machine Elements	PCC	3	01			03
02	ME502C	Heat Transfer	PCC	3	01			04
03	ME503C	Machine Drawing	PCC	3	01		04	03
04	ME504E	Professional Elective	PEC	3				03
05	ME505O	Open Elective ***(MOOCS)***	OEC	3				03
06	ME506L	Machine Tools Lab	PCC			3		1.5
07	ME507L	Heat Transfer Lab	PCC			3		1.5
08	ME508S	Finite Element Analysis	SAC	1		2		02
09	MC509A	Universal Human Values	MC	2				00
10		Summer Internship (2 Months) Mandatory*						1.5
		Total		**18**	**03**	**8**	**04**	**22.5**

SAC – Skill advanced course : 02 Credits -
PCC – Professional Core Course: 13 Credits
PEC – Professional Elective Course – 03
credits OEC – Open Elective Course – 03
credits Summer internship – 1.5 credits
MC – Mandatory Course as prescribed by AICTE, New Delhi and it is **a non – credit** course

Note 1: Evaluation of SDC/SAC is similar to the evaluation process of regular laboratory work.

Note: Summer Internship for two months after second year (to be evaluated during V semester)

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

Semester – VI (Third year)

Sl. No	Course Code	Name of the	Category	Scheme of Instructions				Credit
				Lecture	Tutorial	Practical		
01	ME601C	Machine Design	PCC					3
02	ME602C	Dynamics of Machinery	PCC	3				3
03	ME603C	Metrology and Instrumentation	PCC	3				3
04	ME604E	Professional	PEC	3				3
05	ME605O	Open Elective ***(MOOCS)***	OEC	3				3
06	ME606L	Simulation	PCC			3		1.5
07	ME607L	Lab Dynamics	PCC			3		1.5
08	ME608L	Lab Metrology	PCC					1.5
09	ME609S	Lab	SAC			3		2
10	MC 610A	Professional	MC	2				0
	Total			**1**	**0**	**0**		**21.**

SAC – Skill advanced course : 02 Credits
PCC – Professional Core Course: 13.5
Credits
PEC – Professional Elective Course – 03 credits
OEC – Open Elective Course – 03 credits
MC – Mandatory Course as prescribed by AICTE, New Delhi

Note: Research /Industrial Internship *after third year* to be evaluated during *VII semester*

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

Semester – VII (Fourth year)

Sl. No	Course Code	Name of the	Category	Scheme of Instructions				Credit
				Lecture	Tutoria	Practical		
01	ME701C	Industrial Engineering and	PCC					3
02	ME702C	Management	PCC	03				3
03	ME703C	Automobile Engineering	PCC	03				3
04	ME704E	Professional Elective	PEC	03				3
05	ME705E	Professional Elective	PEC	03				3
06	ME706O	Open Elective ***(MOOCS)***	OEC	03				3
07	ME707S	Robot Programming	SAC			3		2
08		Industrial Internship (2 Months)*						3
	Total			**1**		**3**		**2**

SAC – Skill advanced course : 02 Credits
PCC – Professional Core Course: 09 Credits
PEC – Professional Elective Course – 06 credits
OEC – Open Elective Course – 03 credits
Research/Industrial internship – 03 credits

***Research /Industrial Internship after third year to be evaluated during VII semester**

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

Semester – VIII (Fourth year)

Sl. No	Course Code	Name of the	Category	Scheme of Instructions				Credit
				Lectur	Tutorial	Practica	Drawin	
01		Major	PROJ		1			12
	Total							**1**

Total number of credits for B. Tech (Mechanical Engineering) Programme – Finalized

Year	Semeste		Credit
First	r	**19**	s
	1st	**18**	
Secon	**Semester**	**21.**	
	2nd	**5**	**4**
d	**Semester**	**22.**	**4**
	1st	**5**	
Fourt	**Semester**	**22.**	
h	**2nd**	**5**	**35**
	Eight		**16**

Division (breaking – up) of Core Subjects/Courses According to Stream (excluding electives and basic science courses):

Thermal	Manufacturing	Management	Design
04 (BTD,ATD,HT and AE)	03 (MP, MT& MC, Metrology)	02 (IE and M, OR)	04 (KoM, DoM, Machine Design, DoME)

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

Semester – wise Grouping of Professional Electives Courses (PECs)

Semester	Professional Elective Courses
V	1) Advanced Manufacturing Processes 2) Non – conventional Energy Sources
VI	3) Tool Design 1) Engineering Materials and Metallurgy 2) Robotic Engineering
VII	3) NC and CNC Systems 1) Additive Manufacturing 2) Quality control and Reliability
	3) Refrigeration and Air – conditioning 1) Finite Element Method 2) Nanotechnology

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

Semester – wise Grouping of Open Electives Courses (OECs)**

Semester	Open Elective Courses
	First OEC through SWAYAM platform (MOOCS)
VI	Second OEC through SWAYAM platform (MOOCS)
VII	Third OEC through SWAYAM platform (MOOCS)

**Open elective courses (OECs) are to be completed/done through MOOCS on SWAYAM platform (mostly NPTEL courses offered by premier institutes such as IITs and NITs).

Hence, the list of courses will vary depending upon the availability of slots pertaining to the courses offered by those premier institutes during a particular academic year.

1. PEC (Professional Elective Courses) and OEC (Open Elective Courses)

In REC – 20 (Revised Engineering Curriculum) draft provided by APSCHE the following points are highlighted with regard to MOOCs: **(page 10, point 09)**

There shall be **05** Professional Elective courses (PEC) and **04** Open Elective courses (OEC). All the Professional & Open Elective courses shall be offered for **03 credits**, wherever lab component is involved it shall be (2-0-2) and without lab component it shall be (3-0-0). If a course comes with a lab component, that component has to be cleared separately. The concerned BoS shall explore the possibility of introducing virtual labs for such courses with lab component.

All Open Electives are offered to students of all branches in general. However, a student shall choose an open Elective from the list in such a manner that he/she has not studied the same course in any form during the Programme.

But, we propose to offer 04 PEC and 03 OEC.

2. Courses under MOOCS

In REC – 20 (Revised Engineering Curriculum) draft provided by APSCHE the following points are highlighted with regard to MOOCs: **(page 10, point 11)**

A student shall be permitted to pursue up to a maximum of **two elective courses under MOOCs** during the Programme. Each of the courses must be of minimum 12 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to pursue and acquire a certificate for a MOOC course only from the organizations/agencies approved by the BoS in order to earn the 3 credits. The Head of the department shall notify the list of such courses at the beginning of the semester.

3. Summer Internship and its Evaluation

Evaluation of the summer internships shall be through the **departmental committee**. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee. The **report and the oral presentation** shall carry **40% and 60%** weightages respectively.

In the final semester, the student should mandatorily undergo internship and parallelly he/she should work on a **project with well-defined objectives**. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship. The project report shall be evaluated with an ***external examiner*** .

4. COMMUNITY SERVICE PROJECT

Community Service Project should be an integral part of the curriculum, as an ***alternative to the 2 months of Summer Internships*** / Apprenticeships / On the Job Training, whenever there is an exigency when students **cannot pursue their summer internships**.

The specific objectives are;

- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of the society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
    - Every student should put in a minimum of **180 hours** for the Community Service Project during the summer vacation.
    - Each class/section should be assigned with a mentor.

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

I Semester **MA 101MATHEMATICS –I**

(I Semester - Common for all branches)

Instruction: 3(L) +1(T) /week **Credits:4** **Assessment: 40 + 60**

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.

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

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

1. analyze differential equations and solve them
2. apply differential equations to engineering problems.
3. Use transformation to convert one type into another type presumably easier to solve.
4. use shift theorems to compute the Laplace transform, inverse Laplace transform and the solutions of second order, linear equations with constant coefficients.
5. solve an initial value problem for an n^{th} order ordinary differential equation using the Laplace transform.
6. expand functions as power series using Maclaurin's and Talor's series
7. optimize the problems related to OR, Computer science, Probability and Statistics
8. draw an approximate shape by the study of some of its important characteristics such as symmetry, tangents, regions enclosing curve tracing method to find length, area, volume.
9. use multiple integral in evaluating area and volume of any region bounded by the given curves.

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**						

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

I & II Semesters **CY 101/ CY 202 ENGINEERING CHEMISTRY**

(I Semester - CY 101 for Civil & Mechanical Engg) (II Semester -CY 202 for EEE, ECE & CSE)

Instruction: 3(L) +1(T) /week **Credits: 4** **Assessment: 40**

+ 60 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 multicenter 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. Nuclearmagnetic resonance and magnetic resonance imaging, surface characterization techniques.

UNIT III

Chemical equilibria, 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.Cellpotentials, 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 electronegativity, 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 stereoisomers, 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/Textbooks

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 Chemistryby P. W. Atkins
6. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Ed.
7. Principles of physical chemistry, Puri, Sharma and Pattania

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

1. analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. rationalize bulk properties and processes using thermodynamic considerations.
3. distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
4. rationalize periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
5. list major chemical reactions that are used in the synthesis of molecules.

Mapping of Course Outcomes with Program Outcomes:

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

& II Semesters **EN 103/ EN 203 ENGLISH**

(I Semester - EN 103 forChE,CE & ME)

(II Semester - EN 203 for EEE, ECE & CSE)

Instruction: 2(L) **Credits: 2** **Assessment: 40 + 60**

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 –Providingexamples or evidence –Writingintroductionand conclusion

UNIT V Writing Practices

Comprehension - Précis Writing –EssayWriting

Reference/Textbooks:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper ResourceBook. 2001
4. Study Writing. LizHamp- Lyonsand Ben Heasly. Cambridge University Press. 2006.
5. Communication Skills. Sanjay KumarandPushpalata. Oxford University Press. 2011.
6. Exercises in Spoken English. Parts.I-III. CIEFL, Hyderabad. Oxford University Press

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

1. learn the elements of grammar and composition of English Language.
2. Learn literary texts such as Short stories and prose passages.
3. maintain linguistic competence through training in vocabulary, sentence structures and pronunciation.
4. develop communication skills by cultivating the habit of reading comprehension passages.
5. develop the language skills like listening, speaking, reading and writing.

Make use of self-instructed learner friendly modes of language learning through competence

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

Mapping of Course Outcomes with Program Outcomes:

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

I Semester **EE104BASIC ELECTRICAL AND ELECTRONICS ENGG.**

(I Semester – for ChE, CE & ME)

Instruction: 3(L) +1(T) /week **Credits: 4** **Assessment: 40 + 60**

Unit-I

Electric DC Circuits: Kirchhoff's Voltage & Current laws, Superposition Theorem, Star – Delta Transformations.
AC Circuits: Complex representation of Impedance, Phasor diagrams, Power & Power Factor, Solution of Single Phase Series & Parallel Circuits. Solution of Three Phase circuits and Measurement of Power in Three Phase circuits.

Unit-II

Single Phase Transformers: Principle of Operation of a Single phase Transformer, EMF equation, regulation and Efficiency of a single phase transformer.
DC Machines: Principle of Operation, Classification, EMF and Torque equations, Characteristics of Generators and Motors

UNIT-III

Three Phase Induction Motor: Principle of Rotating Magnetic Field, Principle of Operation of 3- φ I.M., Torque-Speed Characteristics of 3-φ I.M.

UNIT-IV

p-n junction operation, diode applications, Zener diode as regulator.
Transistor and applications: Introduction to transistors, BJT Characteristics, biasing and applications

UNIT-V

Integrated Circuits: Operational amplifiers, Applications: adder, subtractor, Integrator and Differentiator.
Digital Circuits: logic gates, Combinational Logic circuits, Flip-Flops, counters and shift registers, Laboratory measuring instruments: digital multi-meters and Cathode Ray Oscilloscopes (CRO's).

Textbooks:

1. Electrical Technology by Edward Hughes
2. Basic Electrical Engineering by Nagrath and Kothari

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

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

1. understand the basic concepts of D.C. single phase and 3- phase supply and circuits and solve basic electrical circuit problems
2. understand the basic concepts of transformers and motors used as various industrial drives understand the concept of power factor improvement for industrial installations andconcepts of most economical power factor
3. understand the operation and characteristics of diodes, transistors, integrated circuits and digital circuits.

Mapping of Course Outcomes with Program Outcomes:

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

105 / ME 205ENGINEERING GRAPHICS AND DESIGN

(I Semester - ME105 for ChE, CE & ME)
(II Semester - ME205 for EEE,ECE & CSE)

I & II Semesters

Instruction: 2(L) +3 (Drg) /week Credits: 3.5 **Assessment: 40 + 60**

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;

Question Paper
Modular – 4 questions from
Units I t0 IV, 15 marks each

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
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.;

Text/Reference Books:

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

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

1. make a distinction between first angle projection and third angle projection of drawing.
2. draw hyperbola, parabola, Involutes and Cycloidal curves.
3. draw sections of solids including cylinders, cones, prisms and pyramids.
4. draw projections of lines, planes, solids and sections of solids.

draw orthographic projections of lines, planes, and solids.

Mapping of Course Outcomes with Program Outcomes:

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

I & II Semesters EN 106 / EN 206 ENGLISH COMMUNICATION LAB
(I Semester - EN 106 for ChE, CE & ME) (II Semester - EN206 for EEE, ECE & CSE)

Instruction: 0(L) +3(Lab) /week Credits: 1.5 Assessment: 40 + 60

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– Lyons and Ben Heasly. Cambridge Univ. Press. 2006
5. Communication Skills. Sanjay Kumar and Pushpalata. Oxford Univ. Press.2011
6. Exercises in Spoken English. PartsI-III.CIEFL, Hyderabad. Oxford Univ. Press

Course Outcomes:

The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

Mapping of Course Outcomes with Program Outcomes:

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

II Semester MA 201MATHEMATICS II

(II Semester - for all branches)

Instruction: 3(L) +1(T) /week Credits: 4 Assessment: 40 + 60

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 $J_n(X)$-Lengender polynomials-recurrence formulae-generating function for $P_n(X)$ - 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: At the end of the course, students will be able to

1. use ranks of matrices to decide whether the system of linear equations is consistent or not
2. use Cayley-Hamilton theorem to find inverses or powers of matrices.
3. use Eigen values and vectors to reduce Quadratic forms to normal form.
4. to analyze motion problems from real lines to curves and surfaces in 3-D and use tools such as divergence and curl of vector and gradient, directional derivatives that play significant roles in many applications.
5. use Green's theorem to evaluate line integrals along simple closed contours on the plane
6. use Stokes' theorem to give a physical interpretation of the curl of a vector field
7. use the divergence theorem to give a physical interpretation of the divergence of a vector field.

8. find the Fourier series of functions which are sums of constant times sine and cosine functions of different frequencies in order to observe periodic phenomenon.
9. Evaluate certain improper integrals to make them simple with introduction of Gamma and Beta functions.
10. study certain special functions that arise in solving certain ordinary differential equations to model many physical phenomena.

Mapping of Course Outcomes with Program Outcomes:

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

II Semester **PY 202ENGINEERING PHYSICS**
(II Semester - for ChE, CE& ME)

Instruction: 3(L) +1(T) /week **Credits: 4** **Assessment: 40 + 60**

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 Behaviour 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 Electrostatistics- Electric Current- Laws of Magnetism- Ampere`s, Faraday`s laws-Maxwells 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 C^{60} (Zero dimensional), Carbon Nanotubes (One Dimensional) and Graphene(Two Dimensional). Applications of Nanomaterials.

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 SanjeevGupta`UnifiedPhysics`Vol.I Jai PrakashNath& Co., Meerut.
3. HitendraK.Malik and A.K.Singh ``Engineering Physics" TataMCGraw Hill Education Pvt.Ltd., New Delhi
4. M.N.Avadhanulu and P.G.Kshirsagar ``A Textbook 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 McGraw Hill Publications.
7. M.S.RamachandraRao and Shubra Singh, ``Nanoscience and Nanotechnology`` Wiley India Pvt.Ltd, New Delhi

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

1. Develop appropriate competence and working knowledge of laws of modern Physics in understanding advanced technical engineering courses
2. understand the quantum mechanics and ultimately the quantum behavior of charged particles when they are in motion.
3. identify and apply appropriate analytical and mathematical tools of Physics in solving Engineering problems
4. apply the basic principles of Mechanics of rigid body and continuous media and their applicationsunderstand the principles in electrostatics and electromagnetics and magnetic properties of materials.
5. understand size depended properties of nano-dimensional materials and their effective utilization in making nano- and micro-devices for further microminiaturization of electronic devices.
6. think and participate deeply, creatively, and analytically in emerging areas of engineering technology.
7. Learnthe basics of instrumentation, design of laboratory techniques, measurement, data acquisition, interpretation, and analysis.
8. provide multidisciplinary experiences throughout the curriculum.

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

I & II Semesters CS 103 / CS203 PROGRAMMING FOR PROBLEM SOLVING
(I Semester –CS 103 for EEE, ECE & CSE)
(II Semester –CS 203 for ChE, CE & ME)

Instruction: 3(L) +1(T) /week **Credits: 4** **Assessment: 40 + 60**

Course Objectives:

1. To acquire problem solving skills
2. To be able to develop flowcharts and algorithms for the given problem
3. To learn how to write modular programs in C
4. To enable to use arrays, pointers, strings and structures in solving problems.
5. To explain the difference between object-oriented programming and procedural programming.
6. To understand principles of object-oriented programming.

UNIT-I

Problem Solving : Problem solving techniques, Computer as a problem solving tool, Programming Languages – Machine Language, Assembly Language, Low and High-Level Languages, Procedural and Object-Oriented Languages. Algorithm definition, Features, Criteria, Flowchart definition, Basic symbols, Sample flowcharts, Problem solving aspects, Efficiency of algorithms.

Basics of C: Structure of a C program, C tokens, Keywords, Identifiers, Basic data types and sizes, Constants, Variables, Operators in C, Operator Precedence and Associativity, Expressions, Type conversions, Basic input/output statement, Sample programs.

UNIT-II

Conditional Statements: Selection statements, Decision making within a program, Simple if statement, if-else statement, Nested if-else, if-else ladder and switch-case. Iterative statements: while-loop, do-while loop, for loop, Nested loops, Infinite loops, goto, break and continue statements, Sample programs.

Functions: Introduction to modular programming and functions, Basics, Standard Library of C functions, Prototype of a function, Parameter passing, User defined functions, Recursive functions, Passing arguments to a function: Call by reference, Call by value, Storage Classes in a single source file, Scope rules, Header files, C Pre-processor.

UNIT-III

Arrays: Introduction to arrays, Definition, Declaration, Storing elements, Accessing elements, One dimensional arrays: Array manipulation; Searching, Insertion, Deletion of an element from an array, Two dimensional arrays, Addition/Multiplication of two matrices, Transpose of a square matrix, Passing array to functions, String fundamentals, String manipulations, Standard library string functions.

Pointers: Definition of pointer, pointer type declaration, pointer assignment, pointer initialization, Pointer arithmetic, Functions and Pointers, Dangling memory, Character pointers and functions, Pointers to pointers, Arrays and Pointers, Pointer arrays, Pointers and structures, Dynamic memory management functions.

UNIT-IV

Structures: Structures declaration, Structure variables, Initialization of structures, Accessing structures, Nested structures, Arrays of structures, Structures containing arrays, Structures and functions, Pointers to structures, Self-referential structures, Unions, Typedef, Bit-fields.

File Processing: Concept of Files, Text files and binary files, File opening in various modes and closing of a file, Reading from a file, Writing onto a file.

UNIT V

Introduction to Object-Oriented Programming (OOP): Need for OOP, Principles of OOP, Basics of C++ Programming, Operator Overloading, Function Overloading, Inheritance: Derived classes, Protected access specifier, Derived class constructors, Overriding member functions, Class hierarchies, Public and Private inheritance, Multiple inheritance.

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

1. Develop and test programs in C and correct syntax and logical errors.
2. Implement conditional branching, iteration and recursion.
3. Decompose a problem into functions and synthesize a complete program.
4. Use arrays, pointers, strings and structures to formulate algorithms and programs
5. Use files to perform read and write operations.
6. Handle programming assignments based on class,abstraction, encapsulation, overloading and inheritance.

Text Books

1. Ashok N Kamthane, Amit Ashok Kamthane, Programming in C, 3rd Edition, Pearson Education, 2019.
2. Scheldt H, C: The Complete Reference, 4th Edition, Tata McGraw-Hill, 2002.
3. R.G. Dromey, How to solve it by Computer, Pearson Education, 2019.
4. Hanly J R &Koffman E.B, “Problem Solving and Program design in C”, Pearson Education, 2019.
5. Herbert Schildt,The Complete Reference C++, 4th Edition, Tata McGraw-Hill.

Reference Books

1. C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage.
2. Programming with C, Bichkar, Universities Press.
3. Programming in C, ReemaThareja, OXFORD.
4. C by Example, Noel Kalicharan, Cambridge.
5. The C++ Programming Language, Bjarne Stroustrup, 3rd Edition, Pearson Education.
6. Problem solving with C++: The Object of Programming, 9th Edition, Walter Savitch, Pearson Education.

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

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									

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

I & II Semesters CE 104 / CE 204 ENGINEERING MECHANICS

(I Semester –CE 104 for EEE)

(II Semester –CE 204 for CE & ME)

Instruction: 3(L) +1(T) /week Credits: 4 Assessment: 40 + 60

UNIT I

STATICS : Basic concepts – System of force, Concurrent and non-concurrent coplanar and non-coplanar forces – Resultant – Moment of force and its application – Couples and resultant of force systems – Equilibrium of systems of forces – Free body diagrams, Equations of equilibrium of coplanar systems and spatial systems.

UNIT II

Analysis of plane trusses: Types of supports – Types of trusses – Analysis of trusses using method of joints and method of sections.

UNIT III

CENTRE OF GRAVITY AND MOMENTS 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 areas (rolled and built up sections) – Radius of gyration of areas.

UNIT IV

SIMPLE STRESES 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 – Poisson's ratio and volumetric strain – Elastic moduli and relationship between elastic constants – Bars of varying section – Composite bars – Temperature stresses.

UNIT V

STRAIN ENERGY: Gradual, sudden and impact loading – Endurance limit principles of virtual work and its applications.

TEXTBOOKS:

1. Ghose D.N. – Applied Mechanics and Strength of Materials.
2. Timoshenko & Young – Engineering Mechanics.
3. Junarkar SB – Mechanics of Structures – Vol. I.
4. Junarkar SB – Elements of Applied Mechanics.

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

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

1. apply the basic knowledge of force system.
2. know the types of supports occur in civil engineering structures
3. know the geometrical properties of different cross sections.
4. understand different types of stresses and strains, elastic constants.
5. understand the behavior of different internal forces under different types of loading.

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			

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

I & II Semesters ME 105 / ME 205 WORKSHOP/MANUFACTURING PRACTICE

(ME 105 for EEE, ECE & CSE)

(ME 205 for ChE,CE & ME)

Instruction: 0(L) +3 (lab)/week Credits: 1.5 Assessment: 40 + 60

Workshop Practice: Five practices among

1. Machine shop 2.Fittingshop 3.Carpentry 4.Electrical wiring

5. Welding shop 6.Casting 7.Smithy 8.Plasticmoulding&GlassCutting

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

Detailed Contents

1. ManufacturingMethods-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/ReferenceBooks:

1. HajraChoudhury S.K., HajraChoudhury A.K.andNirjharRoy S. K., Elements of Workshop Technology", Vol. I 2008and Vol. II 2010, Media promoters and Publishers private limited, Mumbai.
2. Kalpakjian S. and Steven S. Schmid ManufacturingFngineeringand Technology", 4th edition, PearsonEducationIndiaEdition,2002.
3. GowriP.Hariharanand A. SureshBabu, Manufacturing Technology–I" Pearson Education,2008.
4. Roy A. Lindberg, Processes and Materials of Manufacture",4 th edition, Prentice Hall India,1998.
5. RaoP.N., "ManufacturingTechnology",Vol. I & II,TataMcGrawHillHouse, 2017

Laboratory Outcomes

- Upon completion of this laboratory course, students will be able to fabricate components with their own hands.

- They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
- By assembling different components, they will be able to produce small devices of their interest.

Course Outcomes : Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry to fabricatecomponents using different materials.

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									

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

I & II Sem CS 106/ CS206 PROGRAMMING FOR PROBLEM SOLVING LAB
(CS 106 for EEE, ECE & CSE)
(CS 206 for ChE, CE & ME)

Instruction: 0(L) +3 (Lab)) /week Credits: 1.5 Assessment: 40 + 60

Course Objectives:

1. To provide exposure to problem-solving through programming
2. To train the student on the concepts of the C- Programming language

The following programs shall be developed and executed in Programming Language C.

1. Programs on conditional control constructs.
2. Programs on iterative statements (while, do-while, for).
3. Programs on recursive procedures
4. Programs on arrays, matrices (single and multi-dimensional arrays).
5. Programs using user defined functions, demonstrating parameter passing methods viz. call by value and call by reference.
6. Programs using different library functions viz. ctype.h, math.h, stdio.h, stdlib.h, string.h, conio.h and pre-processor directives.
7. Programs using pointers (int pointers, char pointers) and pointer arrays.
8. Programs on structures and unions
9. Programs on File Processing.
10. Programs on Pointers to structures and Self-referential structures

Course Outcomes: After Completion of this course the student would be able to

1. Develop the C code for the given algorithm.
2. Understand, debug and trace the execution of programs written in C language.

Reference Books:

1. Scheldt H, C: The Complete Reference, 4th Edition, Tata McGraw-Hill, 2002.
2. Hanly J R &Koffman E.B, "Problem Solving and Program design in C", Pearson Education, 2019.
3. R.G. Dromey, How to solve it by Computer, Pearson Education, 2019.
4. Behrouz A. Forouzan& Richard F. Gilberg, Computer Science: A Structured Programming Approach Using C, Third Edition, Cengage Learning

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										

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

CE 107 / CE 207 **ENVIRONMENTAL SCIENCE** ***Audit Course***
(CE 107 for EEE, ECE &CSE) ***No Univ.Exam***
(CE 207 for ChE, CE & ME)

Instruction: 4(L) **Credits: 0(Zero)** **Assessment: 40 + 60**

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, dam 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 / Reference Books :

1. AnubhaKaushik& 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. AmalK.Datta, Introduction to Environmental Science and Engineering, Oxford & IBH Publishing Co.Pvt.Ltd, 2000
6. SanthoshkumarGarg,RajeshawriGarg and RajniGarg, Ecological and Environmental studies, Khanna publishers, 2006
7. Gilbert M, Introduction to Environmental Engineering and Science, Masters Publication by Prentice –Hall of India Private Ltd., 1991
8. William P Cunningham and Mary Ann Cunningham, Principles of Environmental Science, Tata McGraw Hill Publishing Co.Ltd, 2002

Course Outcomes:

At the end of the course, students will be able to

1. acquire knowledge in
   - diverse components of environment and natural resources
   - ecosystem and biodiversity & its conservation methods
   - population growth and human health
   - green technology
2. identify and resolve the issues related to sources of different types of pollutions
3. provide solutions to individuals, industries and government for sustainable development of natural resources
4. apply environmental ethics in protection of diversified ecosystems.

****

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					

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

MA301B MATHEMATICS - III

Instruction Hours/Week: 3(L) Credits: 3 Assessment : 40 + 60

Course Objectives:

1. This course aims at providing the student to acquire the knowledge on the calculus of functions of complex variables.
2. To understand power series and expansion of analytic function.
3. To understand Laurent Series, poles, singular points, Residue theorem and its applications.
4. The aim is to analyze the solutions of partial differential equations.
5. To discuss the boundary value problems, one dimensional wave equation, heat equation and Laplace Equation.

UNIT - I

Complex analysis - I: Analytical functions - Cauchy-Reimann equations – Construction of Analytic functions- Complex integration - Cauchy's theorem - Integral formula - Evaluation of integrals.

UNIT - II

Complex analysis - II**:** Taylor's and Laurents' series- Transformations- Conformal mapping - Bilinear transformations - Transformation of 1/z, z^2, sin z and cos z.

UNIT - III

Complex Analysis –III: Singularities - Poles - Residues - Residue theorem – Contour integration- Evaluation of real integrals

UNIT - IV

Partial differential equations - I : Formation of differential equations - Classification - First order linear partial differential equations – Legranges' linear equation - Method of multipliers - first order non-linear partial differential equations - Charpits method.

UNIT- V

Partial differential equations - II: Method of separation of variables - One dimensional wave equation - Heat equation – Laplace's equation.

Text Books:

1. Grewal B S, Higher Engineering Mathematics, 40th Edition, Khanna Publications, 2007.
2. Venkataraman M K, Engineering Mathematics, Vol. I & II, National Publishing Company, 1993.
3. Venkataraman M K, Engineering Mathematics, National Publishing Company, 1995.
4. Grewal B S, Engineering Mathematics, 13th Edition, Khanna Publications.
5. Kreyszig E, Advanced Engineering Mathematics, 8th edition, Wiley, 1998.

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

1. After the completion of course, students will be able to Understand the analyticity of complex functions and conformal mappings.
2. Apply Cauchy's integral formula and Cauchy's integral theorem to evaluate improper integrals along contours.
3. Describe basic properties of complex integration and having the ability to compute such integrals.
4. Describe conformal mappings between various plane regions.
5. Apply the concepts of Complex Analysis in many branches of Engineering, including the branches of hydrodynamics, thermodynamics, and particularly quantum mechanics.
6. Compute the residue of a function and use the Residue Theory to evaluate a contour integral or an integral over the real line.
7. Formulate/solve/classify the solutions of Partial differential equations.
8. Identify linear and nonlinear PDE and solve nonlinear PDE by Charpit's method.
9. Apply Variables separable methods to solve boundary value problems.
10. Find the solution of one dimensional wave equation, heat equation and Laplace equation.

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							

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME302C STRENGTH OF MATERIALS

Instruction Hours/Week: 3(L) Credits: 3 Assessment : 40 + 60

CO1	Analyze the statically determinate and indeterminate problems
CO2	Determine the stresses and strains in the members subjected to axial, bending and torsional loads
CO3	Evaluate the slope and deflection of beams subjected to loads
CO4	Determine the principal stresses and strains in structural members
CO5	Determine the torsional stress of structural beam

SYLLABUS

UNIT I

Stress And Strain: Concept of statically determinacy and indeterminacy- Determinate and Indeterminate problems in Tension and Compression - Thermal Stresses.

Elastic Constants and Impact Loading: Stress-strain diagrams for brittle and ductile materials -working stress - Strain energy in tension and compression - Impact loading - pure shear - Modulus of rigidity and Bulk modulus - Relation between E, G and K.

UNIT II

Shear Force And Bending Moment: Types of supports - Types of determinate beams - Simply supported, Cantilever, Overhanging and compound beams with articulations -Shear Force and Bending Moment diagrams.

Theory of Simple Bending: Assumptions - Theory of Simple Bending - Bending stresses in beams.

UNIT III

Principal stresses and strains: Principal planes and principal stresses, methods of determining stresses on oblique section, analytical and graphical method for determining stresses on oblique section, Mohr's circle.

Beams: Deflection of cantilever beam, simply supported beam, fixed beam.

UNIT IV

Thin Cylinders & Thick cylinders: Circumferential stresses, longitudinal stresses, Lame's equations and hoop stress.

Torsion Of Circular Shafts: Theory of Pure Torsion in Solid and Hollow circular shafts - Torsional Shear Stresses and angle of twist - transmission of Power.

UNIT V

Theories of failure: Introduction, maximum principal stress theory, maximum principal strain theory, maximum shear stress theory.

Columns and Struts: Introduction, Failure of long columns, Euler's theory, Euler's column theory, end conditions for long columns, crippling load expressions for different conditions.

TEXT BOOKS:

1. Timoshenko and Gere, Mechanics of Materials, CBS Publishers, New Delhi, 1996.
2. T.D.GunneswraRao and MudimbyAndal, Strength of Materials - Fundamentals and Applications, Cambridge University Press, 1st Edition, 2018.
3. Beer and Johnston, Mechanics of Materials, McGraw Hill International Edition, 1995.
4. E.P.Popov, Engineering Mechanics of Solids, Prentice Hall of India Pvt. Ltd., 1998.

REFERENCE BOOKS:

1. Beer, F.P, Johnston, E.R., Mechanics of Materials, McGraw-Hill Education -7th edition, ISBN: 9780073398235, 2015.
2. Hibbeler, R.C., Mechanics of Materials, Pearson Prentice Hall, ISBN- 978-0136022305, 2010.
3. Gere, M.J., Timoshenko, S.P., Mechanics of Materials, C.B.S., Publishers, 2004. ISBN: 9788123908946.
4. Popov, E.P., Engineering Mechanics of Solids, Pearson,2006. ISBN: 8177585789.
5. Ramamurtham, S., Strength of Materials, DhanpatRai Publications, ISBN: 978-9384378267, 2014.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

HS303C Managerial Economics and Accountancy

Course Code	Name of the Course	Category	L-T-P-C
HS303C	Managerial Economics and Accountancy	HSMC	3-0-0-3

Pre-requisites: Nil

Course Outcomes: After the completion of the course the student will be able to:

CO1	Understand Macro Economic environment of the business and its impact on enterprise.
CO2	Identify various cost elements of the product and its effect on decision making.
CO3	Understand the concepts of financial management and smart investment.
CO4	Prepare the Accounting records and interpret the data for Managerial Decisions.

Mapping of course outcomes with program outcomes:

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

Detailed Syllabus:

Unit -I

Introduction to Engineering Economics, Fundamental concepts, Time value of money, Cash flow and Time Diagrams, choosing between alternative investment proposals, Methods of Economic analysis (pay back, ARR, NPV, IRR and B/C ratio), The effect of borrowing on investment, Equity vs Debt Financing, concept of leverage, Income tax leverage.

Unit -II

Depreciation and methods of calculating depreciation (straight line, sum of the years digitmethod, Declining balance method, Annuity method, Sinking fund method), National income accounting Methods of estimation, Various concepts of National Income, Significance of National income Estimation and its limitations.

Unit -III

Inflation: Definition, Process and Theories of inflation and Measure of control. New Economic Policy 1991(Industrial Policy, Trade Policy, Fiscal Policy), Impact on Industry.

Unit -IV

Accounting Principles, procedure, Double entry system, Journal, ledger, Trial balance, Cashbook, preparation of Trading and Profit and Loss account, Balance sheet.

Unit -V

Cost Accounting: Introduction, Classification of costs, Methods of costing, Techniques ofcosting, Cost sheet and preparation of cost sheet, Break-even Analysis, Meaning and its application, Limitation.

Reading Text Books:

1. Henry Malcom Steiner, Engineering Economics Principles, 2nd Edition, McGraw Hill Education, 1996.
2. Dewett. K.K., Modern Economic Theory, Sultan Chand and Co., 2006.
3. A.N. Agarwal, Indian Economy, Wiley Eastern Limited, New Delhi.
4. Jain and Narang, Accounting Part-I, Kalyani Publishers, 2011.
5. Arora, M.N. Cost Accounting: Principles and Practice, 12th Edition, Vikas Publication, 2012.

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME304C MANUFACTURING PROCESSES

Lectures/week: 3 hours

Credits: 03

Sessionals: 20 +20

End Examination: 60

Course Outcomes (COs):

CO 1 Able to understand the basic concepts of manufacturing.
CO 2 Able to select suitable manufacturing process to produce products of desired size and shape.
CO3 Able to understand the basic manufacturing processes such as foundry and metal forming processes etc.
CO4 Ability to distinguish between gas welding and arc welding fabrication processes.

UNIT – I

Introduction – What is manufacturing? Basic history of manufacturing – Selecting materials – Basic properties of materials – Classification of Manufacturing Processes – Primary Shaping Processes – Secondary or Machining Processes – Selecting manufacturing processes – Mechanization and Automation – Computers in manufacturing industries.

UNIT – II

Metal – Casting Processes – Sand Casting – Sands – Types of sand moulds – Patterns – Cores – Core prints – Sand casting operation –Different types of casting processes – Melting furnaces – Foundry Automation – Inspection of Castings.

UNIT – III

Forming and Shaping Processes –Deformation of Metals – Elastic and Plastic Deformations – Force – Extension Curve – Metal working – Cold and Hot working processes.

Rolling – Flat rolling – Roll force and power requirement – Flat rolling practice – Cold rolling – Pack rolling – Thread rolling

Forging – Open die forging – Forging force – Impression die forging – Closed – die forging – Forgeability – Forging machines – Presses and Hammers.

UNIT – IV

Extrusion and Drawing – Introduction – Different Types of Extrusion Processes – Equipment – Defects in Extrusion – Drawing Processes – Drawing practice and Drawing defects – Drawing equipment.

UNIT – V

Sheet metal forming processes – Press tool operations – shearing action – Formability – Bending – Deep drawing – Spinning – Embossing and Coining.

Fabrication Processes – Classification – Joining processes – Fusion welding processes – Solid state welding processes – Soldering and Brazing.

TEXTBOOKS:

1. **SeropeKalpakjian:** Manufacturing Engineering and technology, 5th Edition, Pearson Prentice Hall, 2005.
2. **P.N. Rao:** Manufacturing Technology, 2nd Edition, TataMcGraw – Hill, 2007.
3. **P.C. Sharma**: A Textbook of Production Technology: Manufacturing Processes, 7th Edition, S. Chand and Company Ltd., 2007

REFERENCES:

1. **J.P. Kaushish**: Manufacturing Porcesses, 2nd Edition
2. **R.S. Khurmi and J.K. Gupta**: A Textbook of Workshop Technology: Manufacturing Processes, 7th Edition, S.Chand and Company Limited, 2008.
3. **HajraChoudury S.K**.: Elements of Workshop Technology, Volume – 1, Indian Book Distribuiton Co. Calcutta.

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							

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME305C - BASIC THERMODYNAMICS

B.Tech IIISemester Effective from 2021-2022

Lectures / Week: 3 periods Credits:03

Objectives:

- To learn about work and heat interactions, and balance of energy between system and itssurroundings.
- To learn about application of I law to various energy conversion devices.
- To learn about the II & III laws of thermodynamics with relations.
- To understand the difference between high grade and low grade energies and law limitationson energy conversion
- To learn about the air standard cycles

UNIT - I

Basic Concepts: System, boundary, Surrounding, Universe, control volume, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process – Reversible, Quasi static & Irreversible Processes, cycle, Causes of Irreversibility. Energy in State and in Transition – Types, Work and Heat, Point and Path function.Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry – Const. Volume gas Thermometer – Scales of Temperature.

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; Unsteady processes; examples of steady unsteady Firs law applications for system & control volume

UNIT – III

Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence, Corollaries, PMM of Second kind, Carnot cycle and its specialties, Carnot's theorem, Thermodynamic scale of Temperature. Clausius Inequality, Entropy, Principle of Entropy Increase, Availability and Irreversibility (Basic definitions) – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics.

UNIT-IV

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.

Course Outcomes:

- After completing this course, the students will be able to apply energy balance to systems and control volumes, in situations involving heat and work interactions
- Students can evaluate changes in thermodynamic properties of substances
- The students will be able to evaluate the performance of energy conversion devices
- The students will be able to differentiate between high grade and low grade energies.
- The students will be able to evaluate the performance of air standard cycles.

References:

- R.K. Rajput, 2007, 3rd Edition, EngineeringThermodynamics**,** Laxmi Publications (P) LTD.
- Nag, P.K, 1995, *Engineering Thermodynamics*, Tata McGraw-Hill Publishing Co. Ltd.
- Domakundwar and Kothandaraman, *A Course in Thermal Engineering* Moran, M. J. and Shapiro, H. N., 1999, *Fundamentals of Engineering Thermodynamics*, John Wiley and Sons.
- Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., 2003, 6th Edition, *Fundamentals of Thermodynamics*, John Wiley and Sons.
- Jones, J. B. and Duggan, R. E., 1996, *Engineering Thermodynamics*, Prentice-Hall of India

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME306L - STRENGTH OF MATERIALS LABORATORY

B.Tech III Semester Effective from- 2021-22

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

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME307L - MANUFACTURING PROCESS LAB

B.Tech IIISemester Effective from- 2021-22

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

LIST OF EXPERIMENTS:

I. LATHE

1:Step Turning

2:Taper Turning with Knurling

3:V Threading

II. SHAPER

4: Making Square prism on Shaper

5: Slot Cutting with Shaping Machine

III. MILLING MACHINE

6: Rectangular Slot Cutting on Vertical Milling Machine

7: Hexagonal Cutting on Horizontal Milling Machine

8: Spur Gear cutting on Milling

IV. THREADING

9: Square Threading

10: Double Start V Threading

11: Drilling ,Boring and Tapping

V. WELDING

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME308L - FUELS LABORATORY

B.Tech III Semester Effective from- 2021-22

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

LIST OF EXPERIMENTS:

1. Measurements of Viscosity using Redwood Viscometer
2. Measurements of Viscosity using Saybolt Viscometer
3. Test on Cleaveland flash point apparatus
4. Test on Cleaveland fire point apparatus
5. Test on Ables Flash Point Apparatus
6. Test on Distillation Apparatus
7. Test on Aniline Point Apparatus
8. Test of calorific value of fuels using Bomb Calorimeter
9. Determine the Pour point of given samples

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME309S – CAD Laboratory

B.Tech III Semester Effective from- 2021-22

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

Course objectives:

- Navigate through the drafting user interface.
- Create and maintain drawing sheets and views.
- Create and edit user-defined view boundaries.
- Create and edit associative section views.
- Create view dependent geometry.
- Create and edit symbols, dimensions and text.
- Generate an assembly parts list.

Introduction of 2-D and 3-D modeling:

Part Navigator, Master model drawings and drafting standards, drawing sheets, Drafting views Custom views, Move, copy, and align views, hiding geometry in drafting views, Updating drawings and drafting views, Centerline symbols, Dimensions, Notes and labels, Balloon, symbols, GD&T symbols, Surface finish, weld, and custom symbols, Section views, Editing section lines, Maintaining associativity, Detail views, View boundaries, Broken views, Break-out section views, View dependent edits, Part Attributes, Parts lists, Sectioning assembly views, Exploded views, ordinate dimensions, Hole Tables.

SYLLABUS:

Student will perform six exercises on the following,

2-D Modeling

1. Geometrical construction.
2. Orthographic projections.
3. Isometric projections.
4. Sectional views.

3-D Modeling

5. Machine components such as bolt & nuts, bearing brackets, vice bodies, etc.
6. Assembly drawing of any three simple components.

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

MC310A **Constitution of India**	
Instruction : Hours/Week : **2L:0T:0P**	**Credits: 0**
Sessional Marks : **100**	

Course Objectives: Students will be able to

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Unit-I

History of Making of the Indian Constitution: History
Drafting Committee, (Composition & Working)
Philosophy of the Indian Constitution: Preamble
Salient Features

Unit-II

- **Contours of Constitutional Rights & Duties:**
- Fundamental Rights
- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

Unit-III

- **Organs of Governance:**
- Parliament
- Composition
- Qualifications and Disqualifications
- Powers and Functions
- Executive
- President
- Governor
- Council of Ministers
- Judiciary, Appointment and Transfer of Judges, Qualifications
- Powers and Functions

Unit-IV

- **Local Administration:**
- District's Administration head: Role and Importance,
- Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation.

- Pachayati raj: Introduction, PRI: Zila Pachayat.
- Elected officials and their roles, CEO Zila Pachayat: Position and role.
- Block level: Organizational Hierarchy (Different departments),
- Village level: Role of Elected and Appointed officials,
- Importance of grass root democracy

Unit-V

- **Election Commission:**
- Election Commission: Role and Functioning.
- Chief Election Commissioner and Election Commissioners.
- State Election Commission: Role and Functioning.
- Institute and Bodies for the welfare of SC/ST/OBC and women.

Text Books/References:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Course Outcomes:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of 1956.

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

B.TECH IV SEMESTER, MECHANICAL ENGINEERING

ME401C- FLUID MECHANICS AND HYDRAULIC MACHINERY

EFFECTIVE FROM 2021-22 (R20- Regulations 2020)

Lectures/ Week :3 Hours Tutorials/ Week : 1 Hour Credits: 3

COURSE OBJECTIVES:

- To learn about the application of fluid flow concepts and fundamental equations.
- To apply the knowledge of flow through pipes and laminar flow in circular pipes.
- To understand the importance of dimensional analysis and Boundary layer concepts.
- To apply the knowledge of theory of rotodynamic machines and pumps.
- To design the different types of turbines and analyze their performance.

CONTENTS:

UNIT- I

Definition of fluid, Units and dimensions- properties of fluids, mass density, specific volume, specific gravity, viscosity, Newton's law of viscosity, compressibility, surface tension and capillarity – Fluid flow characteristics- Velocity, Acceleration, Types of flows – Stream lines, Path lines, Streak lines – Continuity Equation – Energy Equation - Momentum equation - Euler's equation of motion along a stream line- Bernoulli's equation and its applications.

UNIT –II

Flow through pipes – Laws of fluid Friction, Darcy-Weisbach equation and other formulae for Head loss due to friction in pipes, Minor losses in pipes, Pipes in Series and Pipes in Parallel, Moody's diagram - Laminar flow through circular pipes, Hagen-Poiseuille Equation.

UNIT-III

Boundary layer theory, thickness, measurement– Drag force on a flat plate due to boundary layer - Need for dimensional analysis – methods of dimension analysis – Similitude – type of similitude Dimensionless parameters – application of dimensionless parameters – Model analysis.

UNIT – IV

Theory of Rotodynamic machines - various efficiencies – velocity components at entry and exit of the rotor, velocity triangles – Centrifugal pumps, working principle, work done by the impeller, performance curves – Cavitations in pumps- Reciprocating pump – working principle.

UNIT- V

Classification of water turbines, heads and efficiencies, velocity triangles – Axial, radial and mixed flow turbines – Pelton wheel, Francis turbine, Kaplan turbine, working principles – Draft tube – Specific speed, Unit quantities, Performance curves.

Text Books:

1. Hydraulics and Fluid Mechanics by P.N. Modi and S.M. Seth.
2. Fluid Mechanics and Hydraulic Machines by R.K.Rajput.
3. Fluid Mechanics and Hydraulic Machines by R.K.Bansal.

References:

1. Fluid Mechanics by V.L. Streeter and E.Benzamine, Wylie.
2. Fluid Mechanics and Turbo machines by Madan Mohan Das.– PHI Learning Pvt.Ltd., New Delhi.

COURSE OUTCOMES: Upon completion of this course, students will be able to

DESCRIPTION OF THE COURSE OUTCOME	
CO1	Understand and analyze simple flow situations and solve fluid flow problems.
CO2	Classify flows and evaluate the flow through pipes and laminar flows.
CO3	Apply the knowledge of boundary layer theory and dimensional analysis.
CO4	Design and evaluate the performance of centrifugal and reciprocating pumps.
CO5	Design and analyze the characteristics of turbines.

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

B.TECH IV SEMESTER, MECHANICAL ENGINEERING
***ME402C* – KINEMATICS OF MACHINERY**
EFFECTIVE FROM 2021-22 (R20- Regulations 2020)

Lectures/ Week : 3 Hours Tutorials/ Week : 1 Hour Credits: 3

COURSE OBJECTIVES:

- The course under kinematics of Machinery has been designed to cover the basic concepts of kinematic aspects of machine elements which are useful for design of machines.
- This course provides the knowledge of mechanical engineers in Dynamic synthesis and analysis by providing significant skills and also experience in creating and modeling mechanisms and also provides the knowledge for doing position analysis of mechanisms of various machines.
- This course provides the understanding of the concepts of displacement on kinematics analysis.
- This course provides the kinematic analysis of gears and gear trains which are used in different machines.
- Ability to analyze the kinematics of cams, design of cams and followers. And also understanding of the concepts of displacement, velocity and acceleration of followers and how to determine them.

CONTENTS:

UNIT–I
BASICS OF MECHANISMS :

Elements or Links – Classification – Rigid Link, flexible and fluid link –Types of kinematic pairs – sliding, turning, rolling, screw and spherical pairs – lower and higherpairs– closedandopenpairs–constrainedmotion–completely,partially orsuccessfullyconstrainedand incompletelyconstrained – Degree of freedom, Mobility – Kutzbach criterion, Gruebler's criterion – Grashof's Law – Kinematic inversions of four-bar chain and slider crank chains – Limit positions – Mechanical advantage – Transmission Angle – Quick return mechanisms.

UNIT–II
STRAIGHT LINE MOTION MECHANISMS:
Exact and approximate, copied and generated types –Peaucellier - Hart - Scott Russel – Grasshopper – Watt- Tchebicheff - Robert Mechanisms and Pantograph.

STEERING MECHANISMS:
Conditions for correct steering – Davis Steering gear, Ackerman's steering gear.

UNIT–III

VELOCITY AND ACCELERATION ANALYSIS:

Instantaneous centers of rotation – Kennedy's theorem and its applications to planar mechanism for velocity analysis – Velocity analysis of various mechanisms using Relative velocity method, Velocity Images, Rubbing Velocity – Acceleration of simple mechanisms. Coriolis component of acceleration.

UNIT–IV

GEARS: Toothed gears – types – law of gearing, Forms of tooth- cycloidal and involute profiles. Velocity of sliding – phenomena of interference– Methods to avoid interference. Condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact.

GEAR TRAINS: Introduction –Types of gears trains – Simple, Compound, Reverted and Epicyclic gear trains. Train value and Velocity ratios of gear trains.

UNIT–V

CAMS:

Classification of cams and followers- Terminology and definitions- Displacement diagrams- Uniform velocity, parabolic, simple harmonic and cycloidal motions – Cam profiles for specified motions – disk cam withradial Knife edge follower, flat faced follower , roller follower – Oscillatory follower cams of specified contours.

Text Books:

1. Theory of Machines :S.S.Rathan / TMH
2. Theory of Machines :R.S.Khurmi. / S.Chand
3. Mechanisms and Machine theory :J.S.RaoandR.V.Dukkipati./NewAge
4. Theory of Machines &Mechanisms :PL. Ballaney / Khanna Publishers

References:

1. The theory of Machines : ShigleyJ.E/Oxford University Press
2. Mechanisms and Dynamics of Machinery: Hamilton Mabie H. and F. W. Ocvirk / Oxford University Press.

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

COURSE OUTCOMES: Upon completion of this course, students will be able to

DESCRIPTION OF THE COURSE OUTCOME	
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.

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

B.TECH IV SEMESTER, MECHANICAL ENGINEERING
***ME403C* – APPLIED THERMODYNAMICS**
EFFECTIVE FROM 2021-22 (R20- Regulations 2020)

Lectures/ Week : 3 Hours Tutorials/ Week : 1 Hour Credits: 4

COURSE OBJECTIVES:

- Able to learn about the Ist law analysis of combustion reactions.
- Able to learn about steam power cycles, boilers and draughts.
- Able to understand the steam generators and steam properties.
- Able to understand the compressible flows of nozzles.
- Able to analyse the performance of steam turbines.

CONTENTS:

UNIT–I

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

UNIT–II

Steam power cycles: Steam Power plant and its components, site selection, Carnot Vapour Power Cycle, Rankine cycle, Rankine Cycle with Reheat, Superheat, and Regeneration, Plant efficiency, Comparison of Carnot and Rankine cycles.

BOILERS: Classification Based on Working Principles & Pressures of Operation - L.P & H.P. Boilers – Mountings and Accessories. DRAUGHT: Classification – Height of Chimney for Given Draught and Discharge, Condition for Maximum Discharge, Efficiency of Chimney – Artificial Draught, Induced and Forced Draught.

UNIT–III

Steam Properties: Properties of Steam, Definitions of saturated states; PV, TS, HS Diagrams, P-V-T surface, Principle of increase of entropy; Steam Processes – Constant Volume, Constant pressure – Isothermal, Adiabatic and Hyperbolic Process, Throttling expansion.Identification of states & determination of properties.

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, super saturation- compressible flow in diffusers, efficiency of nozzle and diffuser.

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.

Text Books:

1. P. K. Nag, "Engineering Thermodynamics", 4thEdition, McGraw Hill, 2014.
2. Thermal Engineering, R.K. Rajput, 9/e, Lakshmi Publications, 2013.
3. Thermal Engineering, R.S Khurmi& JS Gupta, S.Chand, 2012.
4. Engineering Thermodynamics R.K. Rajputh, 3rdEdition, Lakshmi Publications, 2007.
5. Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., 2003, 6th Edition, Fundamentals of Thermodynamics, John Wiley andSons.

References:

1. Jones, J. B. and Duggan, R. E., 1996, Engineering Thermodynamics, Prentice-Hall of India
2. Moran, M. J. and Shapiro, H. N., 1999, Fundamentals of Engineering Thermodynamics, John Wiley and Sons.
3. Eastop and McKaney, Applied Termodynamics.
4. Domakundwar and Kothandaraman, A Course in Thermal Engineering.

COURSE OUTCOMES: Upon completion of this course, students will be able to

	DISCRIPTION OF THE COURSE OUTCOME
CO1	Understand the Ist law analysis of combustion reactions
CO2	Understanding of various steam power cycles, boilers and droughts.
CO3	Acquire the knowledge about the steam generators and steam properties
CO4	Acquire the knowledge on compressible flows of nozzles
CO5	Acquire the knowledge on the performance of steam turbines.

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								

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

B.TECH IV SEMESTER, MECHANICAL ENGINEERING

ME404C – Advanced Engineering Graphics

EFFECTIVE FROM 2021-22 (R20- Regulations 2020)

Lectures/ Week: 1 Hour | Drawing / Week: 4 Hours | Credits: 3

COURSE OBJECTIVES:

- To understand the basics of Projections of solids and Auxiliary projections of solids in different inclinations of the principle planes
- To provide the knowledge of section of solids and to provide sufficient knowledge to draw section planes perpendicular to HP and inclined to VP and also of solids inclined to both the planes.
- To provide knowledge of development of surfaces, and to know how to unwound an object / solid when it is being cut by an inclined plane.
- To impart the students, the ability to analyze the interpretation of solids intersections.
- To analyze the isometric projections of simple objects.

CONTENTS:

UNIT–I

Projections of Solids (Simple Solids - Cylinder, Cone, Cube, Prism, & pyramid, Octahedron and Tetrahedron) those inclined to both the planes by Auxiliary projections.

UNIT–II

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 true shape of the sections

UNIT-III

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-IV

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

UNIT-V

Isometric Projections: Isometric Projections and views such as prisms, Pyramids, cylinders and cones. Solids placed one over the other simple mechanical components.

Text Books:

1. Bhatt N.D. and V.M. Panchal, &Ingle P. R., (2014), Engineering Drawing, Charatar Publishing House.
2. Shah, M.B. &Rana B.C, (2008), Engineering Drawing and Computer Graphics, Pearson Education.
3. K.L.Narayana and P. Kannaih, A text Book of Engineering Drawing, SCITECH Publications – (2008)

References:

1. Agrawal B. &Agrawal C.M. (2012), Engineering Graphics, TMH Publishers.
2. K. Venugopal: Engineering Drawing & Graphics, New age International Publishers.

COURSE OUTCOMES: Upon completion of this course, students will be

	DISCRIPTION OF THE COURSE OUTCOME
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	PO10	PO11	PO12
CO1	**2**	1										
CO2	1	**2**				1						
CO3			**1**	**2**	2							
CO4				2	3	1						
CO5		1	1	2		**2**						

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI
(w.e.f. AY: 2020 – 2021)

ME405C MACHINE TOOLS AND METAL CUTTING

Lectures/week: 3 hours

Credits: 03

Sessionals: 20 +20

End Examination: 60

Course Outcomes (COs):

CO 1 Able to understand the basic concepts of metal cutting and basic machine tools of workshop practice.
CO 2 Able to make a distinction between machine tools employing single point cutting tool and multipoint cutting tool.
CO3 Prepared to cut gear teeth on a given job on a milling machine by adopting suitable indexing method.
CO4 Ability to understand the basic features of Capstan and Turret lathes and machining by abrasive grains.

UNIT – I

Cutting tools: Classification – Nomenclature/Signature of Single Point Cutting Tool – Differences between orthogonal cutting and oblique cutting – Mechanism of metal cutting – Types of Chips – Chip Breakers – Forces acting on a single point cutting tool – Merchant's Circle Force Diagram – Velocity relations – Specific energy in cutting – Tool life – Tool life equation.

UNIT – II

Lathe and Shaper: Types – operations done on Lathe. Work holding devices. Boring Machines – types and constructional details – Jig boring machine – Shaper, Slotting and Planer Machines – Constructional details – Quick return mechanisms – Estimation of machining time in lathe, shaper, and planer.

UNIT – III

Drilling and Milling Machines: Types of Drilling machines – Constructional details – Operations performed on them. Twist drill elements. Classification of milling machines – Constructional details of various types – Operations performed on them. Milling methods – Up – cut and Down – cut milling. Estimation of machining time in drilling and milling.

UNIT – IV

Gear cutting by Milling and Finishing Operations: Indexing head and types of indexing methods – Simple, Compound, Differential and Angle indexing. Spur and Helical gear cutting – Gear generating methods – Gear shaping and Gear hobbing. Finishing of gear by gear shaving, gear grinding, and gear lapping.

UNIT – V

Broaching and Grinding Machines : Types of broaches – broaching operations – types of broaching machines – Vertical, Horizontal, Continuous, and Rotary broaching machines. Grinding – Grinding wheels – Manufacturing, Specification – Wheel selection. Wheel dressing and truing. Different types of grinding machines. Use of magnetic chucks – Precision grinding processes – Lapping, Honing and Super finishing. Brief introduction to Capstan and Turret lathes.

TEXTBOOKS:

1. **Serope Kalpakjian**: Manufacturing Engineering and Technology, 5th Edition, Pearson Prentice Hall.
2. **Hazra Choudary and Bose S.K.:** Workshop Technology Volume II, 10th Edition, Media Promoters and Publishers , Pvt. Ltd. 2000
3. **B.S. Raghuvamshi** : Workshop Technology Volume II (Machine Tools), Dhanpat Rai and Co, Pvt. Ltd, 2009.
4. **Sharma P.C.**: Production Engineering, 10th Edition, S. Chand and Co, 2008
5. **Haslehurst M**.: Manufacturing Technology, 3rd Edition, Viva Books Pvt. Ltd. 1998
6. **Gupta S.C and Jain R.K.:** Production Technology, 9th Edition, Khanna Publishers, 2002.

References:

1. **HMT**: Production Technology, McGraw – Hill Education (India) Pvt. Ltd, 28th reprint, 2008.

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									

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

B.TECH IV SEMESTER, MECHANICAL ENGINEERING

ME406L- FLUID MECHANICS AND HYDRAULIC MACHINERY LAB

EFFECTIVE FROM 2021-22 (R20- Regulations 2020)

Practical/ Week : 3 Hours

Credits: 1.5

COURSE OBJECTIVES:

- To determine the coefficient of discharge in flow measuring devices.
- To determine the coefficient of different losses in pipe flow.
- To determine Specific Speed and draw the performances Characteristic curves of pumps.

CONTENTS:

FLOW MEASURMENT

1. Calibration of Small Orifice
2. Calibration of Venturi Meter
3. Calibration of Orifice Meter
4. Calibration of Triangular Notch

HEAD LOSSES IN PIPES

5. Determination of Friction factor of the pipe material
6. Determination of Head Loss coefficient due to sudden contraction
7. Determination of Head Loss coefficient due to Gate valve in a pipe line

HYDRAULIC MACHINES

8. Characteristic curves of 0.8 KW two stage centrifugal pump
9. Characteristic curves of 5.5 KW variable speed centrifugal pump

COURSE OUTCOMES: Upon completion of this course, students will be able to

	DISCRIPTION OF THE COURSE OUTCOME
CO1	Able to calibrate the flow measuring devices
CO2	Able to calculate loss coefficients for use in the pipe flow analysis.
CO3	Able to prepare the characteristic curves for the pumps.

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

B.TECH IV SEMESTER, MECHANICAL ENGINEERING

ME407L- IC ENGINES LAB

EFFECTIVE FROM 2021-22 (R20- Regulations 2020)

Practical/ Week : 3 Hours
Credits: 1.5

LIST OF EXPERIMENTS:

1. HeatbalancesheetonListerEngines.
2. PerformanceTeston2-stage Air Compressor.
3. Economical Speed Test on Kirloskar Engine.
4. Load Test on Kirloskar Engine by using Bio diesel.
5. Air fuel ratio& volumetric efficiency test on Kirloskar Engine.
6. Valve Timing diagrams for Cooper Engine.
7. Load Test on 4- stroke Kirloskar Diesel Engine
8. Smoke and Emission Test on four stroke diesel engine with 5-Gas Analyzer.

COURSE OUTCOMES: Upon completion of this course, students will be able to

	DISCRIPTION OF THE COURSE OUTCOME
CO1	Estimate energy distribution by conducting heat balance test on IC engines.
CO2	Conduct constant speed and variable speed tests on IC engines and interpret their performance.
CO3	Evaluate the performance of air compressor.

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

B.TECH IV SEMESTER, MECHANICAL ENGINEERING

ME408L- ELECTRONICS AND ELECTRICAL ENGINEERING LAB

EFFECTIVE FROM 2021-22 (R20- Regulations 2020)

Practical/ Week :3 Hours Credits: 1.5

COURSE OBJECTIVES:

- To study and analyze basic magnetic and electric circuits.
- To acquire knowledge on operating characteristics of Transformer and DC Machines.
- To study the characteristics of various electronic components.

LIST OF EXPERIMENTS:

1. Verification of KCL & KVL
2. Measurement of Inductance
3. Verification of Super position Theorem
4. Measurement of 3 phase power
5. OC & SC Test on 1 phase Transformer
6. Brake test on DC Shunt Motor
7. OCC on DC Shunt Generator
8. 1 Phase Half wave rectifier
9. 1 Phase full wave rectifier
10. PN Junction Diode Characteristics
11. V-I Characteristics of Zener Diode
12. Logic gates (NAND & NOR)

COURSE OUTCOMES: Upon completion of this course, students will be able to

	DISCRIPTION OF THE COURSE OUTCOME
CO1	Verify Network Theorem and analysis of Electrical Circuits
CO2	Understand the Significance and performance of DC Machines and Single phase Transformers
CO3	Design and analyze various Rectifiers & Logic Gates

Mapping of Course Outcomes with Program Outcomes:

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI
(w.e.f. AY: 2020 – 2021)

ME409S MATLAB

Lectures/week: 1 hours — Credits: 02

Laboratory/week: 2 hours* — Continuous Assessment: 40

End Examination: 60

***Evaluation is similar to regular Practical/Laboratory Class Model/Pattern**

Course Outcomes (COs):

CO 1 Able to understand the basic features of MATLAB platform
CO 2 Able to distinguish between Script file and Function file
CO3 Prepared to write simple programmes and to solve systems of linear algebraic equations – that is problem solving techniques.
CO4 Ability to make use of the numerical power of MATLAB in practical applications such as linear regression and interpreting and plotting of complex data with ease.

UNIT – I

Introduction: What is MATLAB? – MATLAB System – Starting MATLAB on Windows Platforms – MATLAB Environment – Basic commands and Syntax – Arrays and Matrices – Arithmetic and Array operations – Matrix operations and manipulations – Practice Exercises.

UNIT – II

Scripts and Functions: Script and Function files (M – files) – Control loops – Sample/simple Programmes – Basic Plotting – 2D and 3D plotting – Multiple plots – Additional plotting features – Practice Exercises.

UNIT – III

Matrix Algebra and Solutions to Systems of Linear Equations: Solving Linear algebraic equations by matrix methods – Polynomials – Symbolic mathematics – Preliminaries – Practice Exercises.

UNIT – IV

Solving Linear algebraic equations by Symbolic mathematics – Differentiation and Integration by Symbolic mathematics – Practice Exercises.

UNIT – V

Numerical Techniques: Numerical differentiation and Numerical integration – Fitting of data – Curve fitting – Interpolation of functions – Practice Exercises.

TEXTBOOKS:

1. **Tobin A. Driscoll**: Learning MATLAB, Siam, Cambridge University Press, India, 2005.
2. **Hanselman and Littlefield**: Mastering MATLAB 7, 1st Edition, PHI, 1997.
3. **Rudra Pratap**: Getting Started with MATLAB 7, Oxford University Press, 2006.
4. **Stevan C. Chapra**: Applied Numerical Methods with MATLAB for Engineers and Scientists, 3rdEdition, McGrawHill Companies, Inc, NY, 2012.

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME501C DESIGN OF MACHINE ELEMENTS

Effective from- 2020-21

Lectures / Week: 3 Periods + 1 Tutorial **credits:3**

Objectives

This course seeks to provide an introduction to the design of machine elements commonly encountered in mechanical engineering practice through

1. A strong background in mechanics of materials based failure criteria underpinning the safety – critical design of machine components
2. An understanding of the origins, nature and applicability of empirical design principles, based on safety considerations
3. An overview of codes, standards and design guidelines for different elements
4. An appreciation of parameter optimization and design iteration
5. An appreciation of the relationships between component level design and overall machine system design and performance

Course Contents

UNIT-I

Engineering Design
What is designing? ; The process of Design; design by evolution; Identification and analysis of need; True need; Specifications ; Standards of performance ; use of checklists ; Morphological Analysis ; Brainstorming; measure of physical realizibility; Designing for shipping, handling and installation; Design considerations; Design tools and resources; Design Engineer‟s Professional Responsibilities; Standards and Codes;

UNIT-II

Design Considerations – limits, fits and standardization, Modes of failure, factor of safety; Stress – strain relationships; Stress-strain relationships; shear stress and shear strain relationships; Review of failure theories for static and dynamic loading(including fatigue failure), Stress concentration factors; Reduction of stress concentration effects; Fluctuating stresses; fatigue failure; Endurance limit; Notch sensitivity; 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; Design of shafts under static and fatigue loadings; Axial, Bending, Torsional stresses; Principal stresses; theories of failure. Couplings.
Keys; types of keys; Design os hank key; Effect of keyway. Design of splines.

UNIT-IV

Design of shaft couplings and pipe joints; Introduction; Types of shaft couplings; Design of sleeve or muff couplings, Clamp or Compression coupling, Flange couplings. Design of bushed type flexible coupling. Pipe Joints: Introduction, Design of pipe joints, hydraulic pipe joints, Design of flanged pipe joints

UNIT-V

Design of fasteners Threaded joints – Thread joints; ISO metric screw threads. Bolted joint in tension; Torque requirements for bolt tightening; bolted joint under fluctuating load; eccentricity loaded bolted joints in shear; bolted joints with combined stresses; Bolt of uniform strength. Analysis and applications of power screws.
Welded joints – types of welded joints; stresses in butt and filler welds; strength of welded joints; Eccentric loaded welded joints; weld joint subject to bending moment and fluctuating forces; welding symbols; welded inspection.

TEXT BOOKS:

1. Shigley J. E and Mischke, C.R.: Mechanical Engineering Design, Fifth Edition, McGraw Hill International, 1989
2. Deutschman D. Michels, W.J. and Wilson, C.E, Machine Design Theory and Practice, MacMillan, 1992,
3. Juvinal, R.C., Fundamentals of Machine component esign, John Wiley, 1994
4. Spottes, M.F., Design of Machine Elements, Prentice – Hall India, 1994
5. R.L. Norton, Mechanical Design – An integrated Appoach, Prentice Hall, 1998

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									

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME502C HEAT TRANSFER

Lectures/Week: 4
periods Tutorial/Week
: 1 Hrs.

Credits: 4
Sessional marks: 20
+20 End Examination
Marks: 60

UNIT – I

General Modes of Heat Transfer: Basic modes of Heat Transfer, Basic laws of Heat Transfer, Applications of Heat Transfer, Fourier law of heat conduction, Newton‟s law of Cooling Basic equations, Coefficient of thermal conductivity convective, Heat transfer coefficient, Stephan Boltzmann constant, Overall heat transfer coefficient.

Conduction in steady state

Theory of heat conduction, Heat flow through plane wall and cylinder with Variable Thermal conductivity, Conduction through slabs, cylinders and spheres, Concept of thermal resistance, critical thickness insulation, logarithmic mean area, concept of shape factor, one dimensional steady state conduction with heat addition.

UNIT – II

Conduction : Conduction in unsteady state periodic and a periodic temperature variance, infinite semi and infinite solids general equations for conduction in unsteady state, lumped capacitance method, transfer heat flow in semi- infinite solid, convection boundary conditions – use of Grober / Heisler charts.

UNIT – III

Radiation: Introduction, Applications of Radiation, Nature of radiation, Emissive Power-Absorption, Reflection and Transmission, concept of black body, gray body, Planck‟s Law, Stephan Boltzmann law, Kirchhoff „s law, Radiation shape factor relations, Heat exchange between black bodies, Heat exchange between non-black bodies, introduction to radiation network analysis, Radiation shields.

UNIT – IV

Convection:

Heat transfer due to free convection: Introduction, Applications, Free convection heat transfer on a vertical flat plate, Empirical correlations for vertical plates and cylinders, horizontal plates and cylinders, Natural convection cooling in electronic equipment, heat pipe.

Heat transfer due to forced convection: Introduction, Applications, Principles of convection, The boundary layer concept-The velocity and Thermal boundary layer, Laminar boundary layer on a flat plate thermal boundary layer, empirical relations, laminar and turbulent flows, heat transfer in laminar flow over a flat plate, heat transfer in turbulent flows, relations between fluid friction and heat transfer, heat transfer in laminar tube flow, turbulent flow in pipes, flow across cylinders and spheres.

UNIT – V

Heat Exchangers: Introduction, Classification of heat exchangers**,** overall heat transfer coefficient, Fouling factors, LMTD method of Heat exchanger analysis, effectiveness of heat exchangers, NTU method, Compact heat exchangers, different considerations.

Heat transfer through extended surfaces: Theory of fins, fins of uniform cross-sectional area, Analysis of Long Fin and Short fin with insulated tip, heat transfer calculations, fin efficiency, fin effectiveness.

TEXT BOOKS:

1. Heat Transfer : Holman J P
2. Heat Transfer : Mahesh M. Rathore
3. Fundamentals of Engineering Heat and Mass Transfer : Sachdeva R C
4. Fundamentals of Heat and Mass Transfer : Kothandaraman
5. Heat Transfer : R.K. Rajput
6. Basic Heat and Mass Transfer : Mills. A
7. Heat Transfer : Y.A. Cengel

REFERENCES:

1. Introduction to Heat Transfer : Frank P Tancropera David P Dewitt
2. Heat Transfer : Ozisik
3. Principles of Heat Transfer : Frank Kreith
4. Heat and Mass Transfer : Yadav R.
5. Heat Transfer : Ballaney P L

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									

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME503C Machine Drawing

Effective from- 2020-21

Lectures / Week: 3 Periods + 1 Tutorial **credits:3**

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.: Machine Drawing, Third Edition, New Age International, 2006.
2. K.C. John: Text Book of Machine Drawing, PHI Learning Private Ltd, 2010.
3. Narayana K.L, Kannaiah P. and Venkata Reddy K.: Production Drawing, Second Edition, New Age International, 2010 reprint.

REFERENCES:

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

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									

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME504E ADVANCED MANUFACTURING PROCESSES

Lectures/Week: 3 periods

Credits: 3

Sessional marks: 20 +20

End Examination Marks: 60

UNIT-I

MATERIAL REMOVAL PROCESSES: Introduction, history of machining, traditional machining processes, non-traditional 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

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**							

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME504E NON – CONVENTIONAL ENERGY SOURCES

Lectures/Week: 3 periods

Credits: 3

Sessional marks: 20 +20

End Examination Marks: 60

UNIT – I

Introduction:

The solar energy option – Energy Scenario – Survey of Energy Resources – Classification – Need for Role and potential of new and renewable sources.

Principles of Solar Radiation:

Physics of the sun – The solar constant – Solar radiation on tilted surface – Instruments for measuring solar radiation and sunshine – 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.

Biogas and 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 – Carnot cycle – Limitations – 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 – Electron gas dynamic conversion – Economic aspects

Fuel Cells:

Principle – Faraday‟s laws – Thermodynamic aspects – Selection of fuels and Operating conditions.

TEXT BOOKS:

1. Rai G.D. : Non-conventional Energy Sources, Standard Publishers Distributors.
2. Ashok V Desai : Non-conventional Energy, 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.

Mapping of Course Outcomes with Program Outcomes:

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME504E TOOL DESIGN

Lectures/Week: 3 periods

Credits: 3

Sessional marks: 20 +20

End Examination Marks: 60

COURSE OBJECTIVES:

- To develop a solution oriented approach by in depth knowledge of Tool Design.
- To address the underlying concepts, methods and application of Tool Design.

CONTENTS:

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", 1stEdition,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.
5. Clade S. George Jr : Management For Business Industry,1972

COURSE OUTCOMES:

DISCRIPTION OF THE COURSE OUTCOME Upon completion of this course, students will be able to	
CO1	Design single point and multipoint cutting tools.
CO2	Find out the tool wear using different techniques and also select cutting fluids to reduce the heat.
CO3	Select cutting tool materials for different operations.
CO4	Select and design dies for press working operations.
CO5	Design jigs and fixtures and Understand principles of locating and clamping systems.

Mapping of Course Outcomes with Program Outcomes:

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME506L MACHINE TOOLS LABORATORY

Credits: 1.5

Laboratory/week: 3 hours

Internal Test: 40 Marks

End Examination: 60 Marks

(Any eight of the following experiments will be given)

List of Experiments:

1. Force Measurement on Lathe
2. Power Measurement on Lathe
3. Production of Single point cutting tool using tool and cutter grinder
4. Differential Indexing
5. Alignment Test on Lathe
6. Alignment Test on Radial Drilling Machine
7. Thrust and Toque Measurement in Drilling Operation
8. Measurement of Tool Wear
9. Study of weld Bead in Arc Welding
10. Measurement of Forces in Milling
11. Study of Impact strength tests on Welded joints

Mapping of Course Outcomes with Program Outcomes:

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME507L HEAT TRANSFER LABORATORY

Credits: 1.5

Laboratory/week: 3 hours

Internal Test: 40 Marks

End Examination: 60 Marks

(*Any nine of the following experiments will be given*)

List of Experiments:

1. Test on Thermal conductivity of metal rod.
2. Test on Thermal conductivity of slab.
3. Test on Emissivity Measurement Apparatus.
4. Test on Lagged Pipe Apparatus.
5. Test on Steffan-Boltzman Apparatus.
6. Test on Finned tube heat exchanger.
7. Test on Natural Convection Apparatus.
8. Test on Forced Convection Apparatus.
9. Test on Vapour compression test rig.
10. Test on parallel flow and counter flow heat exchanger
11. Test on thermal conductivity of liquids.

Mapping of Course Outcomes with Program Outcomes:

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME601C MACHINE DESIGN

Lectures/Week: 3 periods Tut/week: 1 period

Credits: 3
Sessional marks: 20 +20
End Examination Marks: 60

UNIT – I

Statistical Considerations in Design

Frequency distribution , characteristics of frequency curves, measures of central tendency and dispersion, probability – probability distribution – normal curve – population combinations – design and natural tolerances

UNIT – II

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 – III

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 – Heat in bearings. Design of collar bearings.

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. Selection of radial ball bearings.

UNIT – IV

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 center cranks – Crank pins, Crank shafts.

TEXTBOOKS:

1. Lal G.K., Vijay Gupta, Venkata Reddy N: Fundamentals of Design and Manufacturing , Alpha Science International, 2005
2. Bhandari V.B.: Design of Machine Elements, Third Edition, TataMcGrawHill, 2010.
3. Shigley J.E: Mechanical Engineering Design, Third Edition, Tata McGrawHill, 2010.

REFERENCES:

1. AllenStrickl and Hall, Alfred R. Holowenko, Herman G. Laughlin: Machine Design, Schaum Series, Tata McGrawHill, 2010.
2. Faires V.M.: Design of Machine Elements, Fourth Edition, Macmillan, 1965
3. Sharma P.C. and Aggarwal D.K.: Machine Design, S.K.Kataria and Sons, 1997
4. Jain R.K.: Machine Design , Fifth Ediiton, Kanna, 1988.

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									

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME602C DYNAMICS OF MACHINERY

Lectures/Week: 3 periods Tut/week:

Credits: 3

Sessional marks: 20 +20

End Examination Marks: 60

COURSE OBJECTIVES:

- To impart the knowledge on gyroscopic couple, friction applications to analyze the systems.
- To understand the concepts of flywheels and governors.
- To study the balancing of masses, vibration concepts for applying in different applications.

CONTENTS:

UNIT –I

Gyroscopic Couple and Force Analysis –effect ofprecession–motion on the stability of movingvehicles such as motorcycle – motorcar – aero planes and ships. Static and Dynamic Force Analysis of planar mechanisms.

UNIT–II

Friction:

Friction of screw and nuts - Pivots and collars – uniform pressure,uniform wear – friction circle and friction axis: lubricated surfaces – boundary friction – filmlubrication..

Applications: Simple block brake - Internal expanding brake- band brake of vehicle. Dynamometers – absorption and transmission types. General description and methods of operation. Clutches- Singleplate, multiplate, cone clutches.

UNIT–III

Turning Moment Diagram and Flywheels: Turning moment- Inertia torque-connecting rodangularvelocity andacceleration-crank effort andtorque diagrams-fluctuation of energy – flywheelsandtheir

Governors: Watt, Porter and Proell governors-Spring loaded governors–Hartnell and Hartung - Sensitiveness, iso-chronisms and hunting– effort and power ofthegovernors.

UNIT–IV

Balancing of masses: 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. Balancing of radial and V engines. Practical Methods of balancing of rotors.

UNIT –V

Vibrations: Free and forced vibration of single degree of freedom system, Role of damping, whirling of shafts and critical speeds. Free, forced and damped vibrations. Vibration Isolation and

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

TEXTBOOKS:

1. Theory of Machines : R.K.Bansal
2. Theory of Machines : S.S. Rattan
3. Mechanisms and Machine Theory : J.S. Rao and R.V. Dukkipati
4. Theory of Vibrations : Thomson

REFERENCEBOOKS:

1. Theory of Machines and Mechanisms : Joseph Edward Shigely
2. Theory of Machines : Thomas Bevan
3. Mechanical Vibrations : Dehhartog.

COURSE OUTCOMES: Upon completion of this course, students will be able to

	DISCRIPTION OF THE COURSE OUTCOME
CO1	Learn the concepts of gyroscopic effects on the stability of ships, aeroplanes and Automobiles. Learn the concepts of static and dynamic force analysis of planar mechanisms.
CO2	Understand the concepts of friction-clutches, brakes and dynamometers and its importance.
CO3	Understand the importance of turning moment diagrams, fly wheels, governors and its analysis.
CO4	Understand the balancing of rotary and reciprocating masses.
CO5	Understand the different types of vibrations.

Mapping of Course Outcomes with Program Outcomes:

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME603C Metrology and Instrumentation

Effective from- 2020-21

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

UNIT –I

Concept of measurement: - Introduction to Metrology; Need for high precision measurements; Terminologies in Measurement-Precision, accuracy, sensitivity, calibration. Errors in Measurement, types of errors, Abbe's Principle Basic standards of length- Line standard, End standards,Wavelength standard; Various Shop floor standards. Linear Measurement – Slip gauges, wringing, grades; Surface plate; Dial indicators; Height gauges and Vernier calipers. Comparators-mechanical, electrical, optical and pneumatic. Angular Measurement – Bevel protractor; Sine Bar, principle and use of sine bar, sine centre; Angle gauges. Sprit level; Angle Dekkor; Clinometers.

UNIT –II

Limits and Limit gauges – Making to suit, selective assembly, systems of limits and fits; Types of fits; Hole basis system and Shaft basis system. Standard systems of limits and fits; Shaft and Hole system; Tolerance, allowance and deviation (as per BIS). Simple problems on tolerance and allowance, shaft and hole system. Limit Gauges – GO and NO GO gauges; types of limit gauges. Gauge design - Taylor's principle of gauging; Gauge tolerance, disposition of gauge tolerance, wear allowance. Optical Measuring Instruments: - Benefits of using light waves as standards; Monochromatic light; Principle of Interference. Interference band using optical flat, application in surface measurement. Interferometers – NPL flatness interferometer, Pitter-NPL gauge interferometer.

UNIT –III

Screw thread measurement – Screw thread terminology; Measurement of major diameter; Measurement of minor or root diameter. Measurement of pitch; Measurement of effective diameter with two wire method and three wire method. Measurement of flank angle and form by profile projector and microscope. Measurement of surface texture – Meaning of surface texture, roughness and waviness; Analysis of surface traces, peak to valley height, R.M.S. value, Centre Line Average and R_a value, Rt, Rz etc. Methods of measuring surface roughness – Stylus probe, Tomlinson surface meter, Talysurf; Terms used in surface
roughness measurement – assessment length, roughness width cutoff, sampling length and evaluation length.
Interference method for measuring surface roughness – using optical flat and interferometers.
Autocollimator, principle and use of autocollimator.

UNIT –IV

Machine tool metrology – Alignment testing of machine tools like lathe, milling machine, drilling machine.
Advanced measuring devices – Laser interferometers. Coordinate Measuring Machine (CMM) – Introduction to CMM; Components and construction of CMM. Types of CMM; Advantages and application of CMM, CMM probes, types of probes – contact probes and non contact probes Machine Vision – Introduction to machine vision, functions, applications and advantages of machine vision. Steps in machine vision.

UNIT –V

Introduction to Mechanical Measurement – significance of mechanical measurement; Fundamental methods of measurement; Classification of measuring instrument. Stages in generalized measuring system – Sensor-Transducer stage, Signal-Conditioning stage, Readout-Recording stage; Types of input quantities; Active and Passive transducers. Performance characteristic of measuring devices – Static characteristics – Accuracy, Precision, Repeatability, Sensitivity, Reproducibility, Drift, Resolution, Threshold, Hysteresis, Static calibration. Dynamic characteristics- different order systems and their response-, Measuring lag, Fidelity, Dynamic error; Types of errors in measurement. Transducers – Working, Classification of transducers. Motion and Dimension measurement – LVDT – Principle, applications, advantages and limitations.

TEXT BOOKS:

1. Anand K Bewoor, Vinay A Kulkarni, Metrology & Measurement, McGraw-Hill, 2009
2. Ernest O. Doebelin, Dhanesh N. Manik, Measurement Systems Application and Design, McGraw-Hill, 2004
3. Galyer J.F.W., Schotbolt C.R., Metrology for Engineers, ELBS,1990
4. Thomas G. Beckwith, John H. L., Roy D. M., Mechanical Measurements, 6/E , Pearson Prentice Hall, 2007

REFERENCES:

1. ASME, Hand book of Industrial Metrology,1998
2. Hume K. J., Engineering Metrology, Macdonald &Co. Ltd.,1990
3. J.P.Holman, Experimental Methods for Engineers,Mcgraw-Hill, 2007
4. Sharp K.W.B., Practical Engineering Metrology, Sir Isaac Pitman & Sons Ltd.,1958

Mapping of Course Outcomes with Program Outcomes:

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME604E ENGINEERING MATERIALS AND METALLURGY

Lectures/Week: 3 periods

Credits: 3

Sessional marks: 20 +20

End Examination Marks: 60

UNIT -1

Space lattice and unit cells, Crystal structures of common metallic materials – bcc –fcc- hcp – Atomic packing factor – Miller indices –spacing of lattice planes –Relation between density and lattice constant. Crystal imperfections –point, line and surface defects. Edge and screw dislocations – Burger's vector. Plastic deformation by slip and twinning .Critical resolved shear stress for slip.

UNIT – II

Testing of Engineering materials –tensile, compressive, hardness and impact tests. Creep –creep test-creep curve- Mechanism of creep. Fatigue – fatigue stress cycles – fatigue test – S-N- curve –Mechanism of fatigue. Fracture – Ductile and brittle fracture –Griffith's criterion.

UNIT – III

Construction of cooling curves for a pure metal and a solid solution / alloy – Gibb's phase rule for a metal system
– Construction and interpretation of binary phase diagrams-Types of phase diagrams –Eutectic ,Eutectoid, Peritectic, Peritectoid.-Iron-Carbon system – cooling curve of pure iron. Iron – carbide equilibrium diagram – Effect of alloying elements on Iron-Iron carbide diagram.

UNIT – IV

Plain carbon steels – Uses and limitations of plain carbon steels. Alloy steels. Effect of alloying elements in steels. High speed tool steel, stainless steels, High nickel and High chromium steels. Cast irons-grey, white, malleable and SG irons. Non- Ferrous metals and alloys –Copper, Aluminum, Magnesium, Nickel and Zinc-Properties and applications.

UNIT –V

Transformation points – Construction of TTT diagram – TTT diagram and cooling curves. Heat treatment of steels
– Annealing, Normalizing, Hardening, Tempering, Austempering, Martempering. Surface hardening of steels – Carburizing, Nitriding, Cyaniding, Flame Hardening and induction hardening.
Powder Metallurgy –production of metal powders- Basic steps in powder metallurgy - advantages limitations and applications of powder metallurgy.

TEXT BOOKS:

1. Avner: Introduction to Physical Metallurgy, Second Edition, Tata McGraw-Hill, 2009.
2. William D. Callister, Jr.: Materials Science and Engineering, John Wiley & Sons Limited, 2008.
3. Daniel Yesudian C.D. & Harris Samuel D.G: Materials Science and Metallurgy.
4. Kodgire V.D.: Materials Science and Metallurgy, Second Edition, Tata McGraw-Hill, 2010.

REFERENCE BOOKS:

1. Raghavan V: Physical Metallurgy, Second Edition, PHI Learning Pvt. Ltd., 2006.
2. William F. Hosford: Physical Metallurgy, Second Edition, Taylor and Francis, 2009.
3. Reza Abbaschian, Lara Abbaschian, Robert E. Reed-Hill: Physical Metallurgy, Fourth Edition, Cengage Learning, 2010.

4 Krishan K Chawla Composite materials 2nd Edition, Springer, 2006

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME604E ROBOTIC ENGINEERING

Lectures/Week: 3 periods

Credits: 3

Sessional marks: 20 +20

End Examination Marks: 60

UNIT – I

Introduction: Overview - Classification of Robots – Classification by Coordinate System – Cartesian , Cylindrical, Spherical and Jointed Arm Robots – Classification by Control Method – Non – servo controlled , Servo Controlled

, Point – to – point and Continuous path controlled robots –Major Components of a Robot – Robot specifications and Performance parameters – Accuracy – repeatability - Precision and Workvolumes of different robot geometries

UNIT – II

Kinematics of Robotic Manipulators – Kinematic links and joints – General description of robot manipulators – Homogeneous transformation (HT) of objects – Forward and Inverse kinematics of two – degrees – of – freedom (DOF) Planar manipulators – Robot hand – Roll – Pitch – Yaw (RPY) Transformations – Denavit – Hartenberg (DH) Representations – Kinematic solutions by DH matrix

UNIT – III

Mathematical Modelling of a Robotic system – Robot control system – Different types of controllers – On – off , Proportional, Integral, Derivative and PD and PID controllers – Control Systems – Closed – loop and Open – loop control systems – Transfer functions – Applications of transfer functions in the context of robot controllers

UNIT – IV

Robot Drives, Sensors and Grippers – Powering the manipulator – Hydraulic, Pneumatic and Electric Drives – Robot Sensors – Types – Position, velocity, force and tactile range and proximity sensors – Robot vision – Robot grippers – Types of end – effectors/grippers – mechanical, pneumatic and magnetic grippers

UNIT – V

Industrial Applications of Robots and Robot Programming – Applications – Material handling, Machine loading and unloading, Assembly and Inspection – Programming by teach box (or pendent) – On – line and offline programming methods – Robot workcells

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. Bernard Hodges, 'Industrial Robotics', Second Edition, Jaico Publishing House, 1993
3. Deb S.K, Deb.S,"Robotics Technology and Flexible Automation", Tata McGraw-Hill Education Private Limited, 2009.
4. Gonzalez K.S.F.U.R.C. and Lee C.S.G., Robotics – Control – Sensing, Vision, and Intelligence , Mcgraw-Hill Book Company (July 1987)
5. Paul R.P," Robot Manipulators: Mathematics, Programming and Control "The MIT Press (November 2, 1981)

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME604E NC and CNC Systems

Lectures/Week: 3 periods

Credits: 3

Sessional marks: 20 +20

End Examination Marks: 60

UNIT-I

Introduction: Basic concepts of manufacturing systems, Fundamentals of machining Fundamentals of Numerical Control, Advantages of NC systems, Classification of NC systems, Features of NC machine tools and Design considerations of NC Machine Tools, Increasing productivity with NC Machines, Machine Control Unit Functions.

UNIT-II

NC Part Programming: Introduction, Manual programming- Basic concepts, Tape format, Contour Programming- Examples. Computer Aided Programming, APT Programming- General Description, Geometric Expressions, Motion Statements, Additional APT Statements-Examples, Other Programming Systems.

UNIT-III

System Devices: Drives-Hydraulic systems, Direct- Current Motors, stepping motors, Alternate-Current Motors. Feed Back Devices- Encoders, Resolvers, Inductosyn, Tachometers. Counting Devices-Flip- Flops, Counters, Decoders. Digital to Analog Converters.

Interpolators: Digital Differential Analyzer (DDA) – Principle of Operation, Exponential Deceleration, Linear Interpolator, Circular Interpolator, Complete interpolator, CNC Software Interpolators, Reference- word CNC Interpolators.

UNIT-IV

Control Loops: Introduction, Control of point to point systems- Incremental open-loop control, Incremental Closed loop control, Absolute closed loop circuit. Control loops in contouring systems-Principle of operation, position control, operation of a two-axis system.

CNC: Basic Concepts**,** Advantages of CNC, Digital Computer- principal structure, computer memory, Input and output, Reference-Pulse Technique, Microcomputers in CNC

UNIT-V

CNC Programming: – Steps in Programm planning, Part programming, preparatory commands, miscellaneous functions, input of dimensions, spindle and federate control, Tool functions and Reference points, Commands- register, position compensation, work offsets, tool length offset, rapid poisoning, machine zero, dwell.

CNC Turning, CNC Milling, and CNC Drilling- programme examples.

TEXT BOOKS:

Yoram Koren, “Computer Control of Manufacturing Systems”, TATA McGraw-Hill, 2005. Peter Smid, “CNC Programming Handbook”, second edition- Industrial Press Inc.

REFERENCES:

1. Steve F Krar, - Computer Numerical Control Simplified, Industrial Press,2001
2. Vishal S, “An introduction to NC/CNC machines”, India 2013.
3. Agarwal P.M and Patel V.J., “CNC fundamentals and programming”, Charotar Publishing House Pvt. Ltd.; 3nd Edition 2022
4. Radhakrishnan P., “Computer Numerical Control Machines”, New central book agency,1992

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME606L SIMULATION LABORATORY

Credits: 1.5

Laboratory/week: 3 hours

Internal Test: 40 Marks

End Examination: 60 Marks

---

*(Note: Students shall carry out Any **8 from PART-A and 2 from PART-B** of the following exercises)*

PART-A

Modelling and simulation of functions of basic mechanical elements/process/systems

1. Numerical simulations and modeling of different manufacturing systems and processes using commercial software's, like ABAQUS, DEFORM, MATLAB etc.
2. Modelling of simple processes, like hardness testing, deflection of beam etc.;
3. Generation and distribution of stress during sheet and bulk forming processes;
4. Modelling of machining process (turning) and chip formation;
5. Modelling of heat transfer and temperature distribution during various thermal processes (heat treatment, metal cutting, non-conventional machining processes);
6. Network problem and CAPP problem solutions using MATLAB
7. Thermal stress simulation of a 2D component
8. Conductive/conductive heat transfer simulation of a 2D component

10 Mode frequency analysis of beams (Cantilever, Simply supported & Fixed ends) 11 Harmonic analysis of a 2D component

12 Simulations of deformations and equivalent strains in various bending operations

13 Simulations of deformations, equivalent strains and drawing forces in deep drawing operations

14 Simulations of deformations, equivalent strains and roller forces in roll forming operations

PART-B Manufacturing process Simulation

(Students shall carry out the modeling and simulation for case studies of the following)

1. Casting processes - Study of Solidification, temperatures, Residual stresses, metallurgical phases etc.
2. Forging processes - Study of cold working and hot working processes for extrusion, drawing, rolling, etc.
3. Forming Processes – Study of blanking, bending, deep drawing, etc.
4. Welding Processes – Study of arc, spot, laser welding, etc.

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME607L DYNAMICS LABORATORY

Credits: 1.5

Laboratory/week: 3 hours

Internal Test: 40 Marks

End Examination: 60 Marks

---

*(Note: Any **Eight** of the following exercises are to be performed)*

LIST OF EXPERIMENTS

1. Determination of Natural Frequency of Free Transverse Vibration
2. Cam Analysis – Cam Profile and Jump-speed Characteristics
3. Free Vibration of Spring Mass System – Determination of Natural Frequency
4. Compound Pendulum – Determination of Radius of Gyration and Moment of Inertia
5. Bifilar Suspension – Determination of Radius of Gyration and Moment of Inertia
6. Trifilar Suspension – Determination of Radius of Gyration and Moment of Inertia
7. Whirling of Shaft – Determination of Critical Speed
8. Balancing of Rotating Masses
9. Determination of Gyroscopic Couple
10. Experiments on centrifugal governors
11. Studies on Gear trains
12. Kinematic analysis of various mechanisms
13. Moment of inertia of flywheel & connecting rod

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME608L METROLOGY LABORATORY

Credits: 1.5

Laboratory/week: 3 hours

Internal Test: 40 Marks

End Examination: 60 Marks

List of Experiments:

1. Measurement of Taper plug gauge using rollers, slip gauges and micrometer
2. Measurement of internal taper of a ring gauge using spheres and cylinders
3. Study of measuring instruments
4. Measurement of spur gear
5. Measurement of Taper ring gauge using spheres and depth micrometer
6. Sine Bar (Angle measurement of a Taper plug gauge)
7. Inspection of Drill Jig
8. Straightness testing – wedge Method
9. Measurement of Angle of V – Block
10. Measurement of Plug Screw by 3 – wire method
11. a) Measurement of effective diameter (Two – wire method) of a screw tap
    b) Radius measurement of a Partial cylinder

Mapping of Course Outcomes with Program Outcomes:

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME609S CNC Programming

Credits: 2

Laboratory/week: 3 hours

Internal Test: 40 Marks

End Examination: 60 Marks

List of Experiments

*(Note: Any **Eight** of the following exercises are to be performed)*

1. Introduction to CNC.
2. G-Codes and M-Codes.
3. Outer diameter plane turning and Step turning operation.
4. Inner diameter Profile Turning and Threading operation.
5. Outer diameter Profile Turning and Grooving operation.
6. Drilling & Inner diameter Profile operation.
7. Face milling operation.
8. Profile milling operation using G40 method.
9. Profile milling operation using G41 method.
10. Profile milling operation using G42 method.
11. Drilling & Tapping operation.

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

MC610A PROFESSIONAL ETHICS IN ENGINEERING

Instruction: Hours/Week: **2L:0T:0P** **Credits: 0**

Marks:100 Pre-requisites/co-requisites: None.

COURSE DESCRIPTION:

This course is designed to introduce engineering students to the concepts of engineering ethics. It will allow students to explore the relationship between ethics and engineering and apply classical moral theory and decision making to engineering issues encountered in academic and professional careers. It mainly focuses on improving the capacities of leadership /management through training in professional ethics. Codes of ethics have been invoked as a basis for professional engineering licensure. Violations of such ethical codes have led to many well-known tragic engineering failures that endangered human life and jeopardized public welfare. This discipline will doubtless take its place alongside such well- established fields as medical ethics, business ethics, and legal ethics.

COURSE OBJECTIVES: To enable the students

1. To create an awareness on Engineering Ethics and Human Values.
2. To instill Moral and Social Values and Loyalty and to appreciate the rights of others.
3. To study the moral issues and decisions confronting individuals and organizations engaged in engineering profession.
4. To study the related issues about the moral ideals, character, policies, and relationships of people and corporations involved in technological activity.

UNIT I Human Values: Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self-confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II Engineering Ethics: Senses of Engineering Ethics – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg''s theory – Gilligan's theory – Consensus and Controversy –Models of professional roles – Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT –III Engineering as Social Experimentation: Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT-IV Safety, Responsibilities and Rights: Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) Discrimination.

UNIT V Global Issues: Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct – Corporate Social Responsibility.

COURSE OUTCOMES: Upon completion of the course, the student should be able to:

1. Discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.
2. Learn the moral issues and problems in engineering; find the solution to those problems.
3. Learn the need for professional ethics, codes of ethics and roles, concept of safety, risk assessment.
4. Gain exposure to Environment Ethics & computer ethics; know their responsibilities and rights.

Grading /Assessment:

(i). Attendance: 20 marks

(ii). Group Activities/Assignments: 20 marks (iii). Semester End Examination: 60 marks

TEXTBOOKS:

1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

REFERENCES:

1. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases", Cengage Learning, 2009.
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.
5. Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for Personal Integrity and Social Responsibility" Mc Graw Hill education, India Pvt. Ltd.,New Delhi, 2013.

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME701C- INDUSTRIAL ENGINEERING AND MANAGEMENT

EFFECTIVE FROM 2023-24 (R20- Regulations 2020)

Lectures/ Week : 3 Hours Tutorials/ Week : -

Credits: 3

COURSE OBJECTIVES:

- TO understand the concepts related to principles of management, Industrial disputes.
- To apply the concepts related to sales forecasting, PPC & work study.
- To understand the emerging concepts of Industrial Engineering for different applications.

CONTENTS:

UNIT–I

Management concepts:

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.

Industrial disputes – Causes and methods of settling,Labour participation in management concept.A brief outline of Factories Act, Industrial disputes Act and Workmen's Compensation Act.

UNIT–II

Sales forecasting – need, Classification moving average exponential smoothing and linear regression technique.

Production Planning and Control – Objectives, Salient features and functions of PPC.

Personnel Management – A brief review of functions of personnel management. Concepts of job evaluation and merit rating

UNIT–III

Plant Location Layout – Location factors. 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–IV

Work study – Definition, objectives and uses. Method study – definition.Objectives procedure and uses. Time study – Definition, needs, functions.

Basic concepts of break down, preventive, predictive and total productive maintenance.

UNIT–V

Contemporary Practices:

Basic concepts of Just-In-Time (JIT) System, Total Quality Management (TQM), Six sigma, Manufacturing Resource Planning (MRP-II), Enterprise Resource Planning (ERP), Business Process Re-engineering, 5S Model, Deming's PDCA, Kaizen, Poka-Yoke, Benchmarking.

TEXT BOOKS:

1. Khanna O P: Industrial Engineering And Management , 7th Edition, DhanpatRai& Sons, 2002
2. PannerSelvam 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: Upon completion of this course, students will be able to

DISCRIPTION OF THE COURSE OUTCOME	
CO1	Understand the principles of management and Industrial disputes.
CO2	Identify and design plant location, plant layout and material handling systems.
CO3	Apply forecasting and PPC techniques to production systems.
CO4	Reduce work duration in industries using work study.
CO5	Understand the contemporary concepts of Industrial Engineering.

Mapping of Course Outcomes with Program Outcomes:

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME702C- OPERATIONS RESEARCH

EFFECTIVE FROM 2023-24 (R20- Regulations 2020)

Lectures/ Week : 3 Hours Tutorials/ Week : -

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 decisions.

CONTENTS:

UNIT–I

Development-definition-characteristics and phases-Types of models-Operations Research models-applications.

Allocation: Linear Programming Problem Formulation-Graphical solution- Simplex method-Artificial variable techniques: Two-phase method, Big-M method. Duality.

UNIT–II

Transportation problem: Formulation-Optimal solution, unbalanced transportation problem.

Assignment problem: Formulation- Optimal solution of Assignment problem- Travelling salesman problem.

UNIT–III

Sequencing: Introduction-Flow-Shop sequencing- n jobs through two machines – n jobs through three machines- Job shop sequencing-two jobs through 'm' machines

Replacement: Introduction- Replacement of items that deteriorate with time- when money value is not counted and counted- Replacement of items that fail completely- Group Replacement.

UNIT–IV

Theory of Games: Introduction- Terminology- Solution of games with saddle points and without saddle points. 2 x 2 games- dominance principle- m x 2 & 2 x n games- Graphical method.

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.

UNIT–V

Waiting lines: Introduction- Basic structure of queuing models, single server and multi server models.

PERT/CPM: Network Analysis, Program Evaluation and Review Technique (PERT), Critical Path Method (CPM).

TEXT BOOKS:

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

REFERENCES:

1. Hamdy A Taha: Introduction to Operations Research, 6th Edition, PHI, 1999.
2. Hiller and Lieberman: Introduction to Operations Research, 7th Edition, McGraw Hill, 2001.
3. Hira and Gupta: Introduction to Operations Research, 3rd Edition, S. Chand & Company Limited, 2008.

COURSE OUTCOMES: Upon completion of this course, students will be able to

	DISCRIPTION OF THE COURSE OUTCOME
CO1	Understand the concepts of operations research modelling approaches and solve LP engineering problems.
CO2	Formulate and solve Transportation and Assignment problems relevant to different applications.
CO3	Able to apply replacement and game theory models for practical problems.
CO4	Able to Solve inventory problems.
CO5	Able to solve waiting line and Network problems.

Mapping of Course Outcomes with Program Outcomes:

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME703C AUTOMOBILE ENGINEERING

Credits: 3

Lectures/week: 3 Hrs. Sessional Marks: 20+20

End Examination Marks: 60

Unit-I

Introduction

Layout of automobile, Chassis and body – power transmission –types of engines, engine construction, turbo charging and super charging – **Lubrication System:** engine lubrication, splash and pressure lubrication systems, **Liners**- dry and Wet type, function and constructional details, **Combustion chambers:** combustion chambers for petrol and diesel engines, Arrangement of cylinders, types of valve arrangements, **Mufflers and Types**: Baffle type muffler, Wave cancellation type muffler.

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 National and international – Pollution Control, Techniques, Multipoint fuel injection system, Common rail diesel injection system, Gasoline direct injection system

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.

Electrical System: Charging circuit, generator, starting system, lighting systems, Horn, wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.

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 and Vacuum brakes.

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

TEXTBOOKS:

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
6. Internal Combustion Engines : K.K. Ramalingam
7. Automobile Engineering : P.S. Gill

REFERENCES:

1. Automotive Mechanics : Heitner J.
2. I.C.Engines : Mathur M.L. & Singh R.P.
3. Fundamentals of Motor Vehicle Technology : Hillier & Pittuck
4. High Speed Combustion Engines : Heldt P.M.
5. Automotive Mechanics Services : Course W.H.
6. Motor Manuals Vol. I to VII : Judge A.W.
7. Advanced Engine Technology : Heisler

Mapping of Course Outcomes with Program Outcomes:

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME704E Additive Manufacturing

Lectures/Week: 3 periods

Credits: 3

Sessional marks: 20 +20

End Examination Marks: 60

UNIT-I

Introduction: Basic Principles of Additive Manufacturing (AM), AM Parts, Generic AM Process, Use of term AM, Benefits of AM, Distinction Between AM and Conventional Manufacturing Processes, Examples of AM Parts, Classification of AM Processes, Heat Sources- Lasers, Electron Beam, Electric Arc/Plasma Arc. Milestones in AM Development, AM around the World and AM Standards

UNIT-II

AM Systems: Photopolymer-Based Systems, Powder-Based Systems, Molten Material Systems, Solid Sheets. Metal Systems - Use of Substrates, Energy Density, Weight, Accuracy, Speed, Build Rate. Maintenance of Equipment, Materials Handling Issues, Design for AM.

UNIT-III

Additive Manufacturing Processes: Photopolymerization, Powder Bed Fusion Material Extrusion, Material Jetting, Sheet Lamination, Directed Energy Deposition Direct

- Write technologies, Hybrid Additive Manufacturing.

UNIT-IV

Materials for Additive Manufacturing: Introduction, Liquid-Based Material, Support Material, Powder-Based Materials-Polymer Powder Material, Metal Powder Material, Ceramic Powder Material, Composite Powder for AM Processes, Solid-Based Materials, Material issues in AM. Guidelines for Process Selection, Challenges of Selection, Pre-Processing, Part Build Time, Post- Processing to Improve Surface Quality, Dimensional Deviations, Improve Mechanical Properties, Rapid Tooling

UNIT-V

AM Software: AM Software for STL Editing, Slicing, STL Manipulation, Process Visualization and Collision, Modeling and Simulation, Manufacturing Execution System Software for AM.
Applications: Application Areas for AM-Enabled Product Development, Medical Modeling, Reverse Engineering Data, Architectural Modeling, Automotive, Aerospace.

TEXT BOOKS:

Gibson Ian, David W. Rosen, Brent Stucker, and Mahyar Khorasani, "Additive Manufacturing Technologies", Springer, 2021.

REFERENCES:

1. A Practical Guide to Design for Additive Manufacturing, Diegel, Olaf, Axel Nordin, and Damien Motte, Springer, 2020.
2. The 3D Printing Handbook: Technologies, Design and Applications, Redwood, Ben, Filemon Schoffer, and Brian Garret, 3D Hubs, 2017
3. Design for Advanced Manufacturing: Technologies and Process, Laroux K, Gillespie, McGrawHill, 2017

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME704E Quality Control and Reliability

Lectures/Week: 3 periods

Credits: 3

Sessional marks: 20 +20

End Examination Marks: 60

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME704E Refrigeration and Air – conditioning

Lectures/Week: 3 periods

Credits: 3

Sessional marks: 20 +20

End Examination Marks: 60

UNIT –I

Refrigeration: Cycles: Thermodynamic analysis of vapour compression, absorption, air cycle, steam jet and thermoelectric refrigeration systems. Comparison of COP and cost – Properties and selection of refrigerants – alternative refrigerants.

UNIT-II

Component parts: Reciprocating compressors – Condensers – Air cooled and Water cooled – Economical water rate – Evaporators – Defrosting – Design of towers and evaporative condensers.

UNIT-III

Refrigeration Control: Automatic and thermostatic expansion valve – Capillary tube – Compressor controls – miscellaneous controls. Testing and charging refrigeration units.

Cryogenics – liquification and purification of gases. Applications of refrigeration – dry ice, walk-in-Cooler, Water Coolers, Transportation, Food processing & Preservation, refrigerators, recent developments in refrigeration.

UNIT-IV

Air Conditioning: Basic Concepts : Fundamental functions of air conditioning – psychrometrics – air and humidity calculations – sensible heat factor – analysis of air conditioning process and cycles with psychrometric chart – Cooling load calculations.

UNIT-V

Comfort Air Conditioning: Physiological reactions to cooling – The effective temperature and its use in the determination of standards of comforts – comfort chart – comparison of domestic, industrial and commercial applications of air conditioning.

Ventilation system: Summer and winter ventilation – Ventilation of hot working spaces – industrial ventilation – air cleaning.

Controls: Automatic control of air conditioning systems – Duct work selection of fans.

TEXT BOOKS:

1. C. P. Arora: Refrigeration and Air Conditioning, 3rd Edition, McGraw-Hill, 2009
2. R. S. Agrarwal: Refrigeration and Air Conditioning, Allied Publishers, 2001.
3. Roy J. Dossat, "Principles of Refrigeration", 4th edition, Pearson Education Asia, 2009.
4. Stoecker, W.F. and Jones J. W., "Refrigeration and Air Conditioning", McGraw Hill, New Delhi, 1986.
5. Jones W.P., "Air conditioning engineering", 5th edition,Elsevier Butterworth-Heinemann, 2001

REFERENCES:

1. Hal Williams: Mechanical Refrigeration, 1st Edition, Whittaker & co., 1903.
2. Jordan & Priester: Refrigeration and Air Conditioning, 2nd Edition, Prentice-Hall, 1956.
3. Dossat: Principles of Refrigeration, 4th Edition, Pearson Education India, 2009.

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									

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME705E FINITE ELEMENT METHOD

Lectures/Week: 3 periods

Credits: 3

Sessional marks: 20 +20

End Examination Marks: 60

UNIT – I

Basic concepts of the Finite Element Method – Introduction, How does the FEM work – Comparison of Finite Element and Finite Difference Methods. A general procedure for Finite Element Analysis – Pre – processing, Solution and Post – processing. Brief History of Finite Element Method, Examples of Finite Element Analysis

UNIT – II

Stiffness Matrices – Spring and Bar Elements – Linear spring as a Finite Element – System Assembly in global coordinates, Elastic Bar, Spar/Link/Truss Element, Strain Energy, Castigliano's Theorem, Minimum Potential Energy

UNIT – III

Method of Weighted Residuals – Approximate Solution by Ritz, Galerkin Methods – Finite Element formulation of one – dimensional problems – Derivation of Element Stiffness and Element Force Matrices – Different Approaches in FEM**:** General Steps in FEM – Direct Approach- Variational Approach – Energy approach – Weighted Residual Approach. – Solving one – dimensional (1D) engineering problems and 1D heat transfer problems – fins

UNIT – IV

Flexural elements – Introduction, Elementary Beam theory, Flexural element, Flexural element stiffness matrix, Element load vector, Work equivalent for distributed loads, Hermite shape functions. 2D elements – liner triangular, bilinear rectangular and quadrilateral elements

UNIT – V

FEA of 2D structural and heat transfer problems, Constant strain triangle (CST), Jacobian, isoparameteric and serendipity elements – Numerical integration – Gauss Quadrature – Computer implementation in FEM

TEXTBOOKS

1. Fundamentals of Finite Element Analysis by David V. Hutton
2. A first course in the Finite Element Method by Daryl L. Logan
3. An Introduction to Finite Element Method by J.N. Reddy

REFERENCES

1. Introduction to Finite Elements in Engineering by Chandrupatla T.R. and Belegundu A.D
2. Finite element procedures by Klaus – Jurgen Bathe

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME705E NANOTECHNOLOGY

Lectures/Week: 3 periods

Credits: 3

Sessional marks: 20 +20

End Examination Marks: 60

UNIT –I

General Properties of Nano materials: Origin of nanotechnology, classification of nano materials, Fullerene, Carbon Nanotubes (CNT). Nanoparticles, Physical, Chemical, Electrical, Optical, Magnetic and mechanical properties of nanomaterials.

UNIT-II

Fullerenes and Carbon Nanotubes (CNT's): Introduction, Synthesis and Purification, Preparation of Fullerenes in the condensed phase, Transport, mechanical, physical properties of CNT's. Investigating and manipulating materials in the Nanoscale – Electron microscope, scanning probe microscopes, optical microscopes for Nanoscience and Technology, X – Ray Diffraction.

UNIT-III

Nanobiology – Interaction between Biomolecules and Nanoparticle surgaces. Different types of Inorganic materials used for the synthesis of Hybrid Nano – Bio assemblies. Nanoprobes for analytical applications.

UNIT-IV

Nanosensors: Nanosensors based on optical properties. Nanosensors based on quantum size effects. Nanobiosensors.

Nanomedicines – Developments of nanomedicines, Nanotechnology in diagnostic applications, materials for use in Diagnostic and therapeutic applications.

UNIT-V

Fabrication of nano materials – Top down approach grinding, Planeterory milling and comparison of particles and bottom up approach – Wet chemical synthesis methods, Microemulsion approach, Colloidal Nanopartciles production, Sol Gel methods, Sonochemical approach, Microwave and automization, Chemical vapour deposition methods.

TEXT BOOKS:

1. T. Pradeep, Nano: The essentials, Tata MaGraw – Hill, 2008.
2. Sulabha K Kulkarni, Nanotechnology: Principles and Practices, Capital Publishing Company, 2007.
3. W.R. Fahrner, Nanotechnology and Nanoelectronics, Springer , 2006
4. Rechard Booker and Earl Boyssen, Nanotechnology, Willey, 2006.

Reference Books

1. Gabor L. Hornyak, H.F. Tibbalas, Joydeep Datta, John J Moore Introduction to Nanoscience and Nanotechnology CRC Press.

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

***ME 705E* MECHANIACAL VIBRATIONS**

EFFECTIVE FROM 2022-23 (R20- Regulations 2020)

Lectures/ Week : 3 Hours Tutorials/ Week : - Credits: 3

COURSE OBJECTIVES:

- To study the basics of the vibrations of system.
- To deal with study and analysis of vibration phenomenon, control of vibration in machine parts, balancing.
- To deal with Introduction of basic terminology of noise engineering and noise control.

CONTENTS:

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: Upon completion of this course, students will be able to

	DISCRIPTION OF THE COURSE OUTCOME
CO1	Understand the different types of vibratory systems and solve for the natural frequency of a freely vibrating 1-DOF systems.
CO2	Analyze the responses of different vibratory systems
CO3	Analyze the vibration of 2-DOF systems.
CO4	Analyze the vibration of Multi-DOF systems.
CO5	Conduct the analysis of vibration of systems.

Mapping of Course Outcomes with Program Outcomes:

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME705E COMPOSITE MATERIALS

Lectures/Week: 3 periods

Credits: 3

Sessional marks: 20 +20

End Examination Marks: 60

UNIT – I

Basics of Composites

Introduction: Definition, Classification of Composite materials based on structure, based on matrix, Advantages of composites, Applications of composites, Functional requirements of reinforced and matrix.

UNIT – II

Manufacturing Methods

Open moulding methods Hand – lay up process, Spray – lay up process, Filament winding process Closed moulding methods: Compressive moulding, Vacuum bag moulding, pultrusion process and resin transfer moulding process.

UNIT – III

Types of reinforcements and their properties: Fibers: Carbon, Boron, Glass, Aramid, Al_2O_3 , SiC, Nature and Manufacture of glass, Carbon and aramid fibers, Comparison of fibers.

UNIT – IV

Fabrication of Polymeric Matrix Composites, Structure and Properties of Polymeric Matrix Composites Interface in Polymeric Matrix Composites, Applications.

Fabrication of Metal Matrix Composites: Solid state fabrication, Liquid state fabrication and In – situ fabrication techniques.

UNIT – V

Micromechanics of Composites: Density, Mechanical Properties: Prediction of Elastic constants, Micromechanical approach. Halpin – Tsai Equations, Transverse stresses

TEXTBOOKS

1. Composite Materials – Science and Engineering, K.K. Chawla, Springer – Verlag, NewYork, 1987
2. An introduction to Composite Materials, Hull, Cambridge, 2nd Edition, 1997
3. A textbook of Manufacturing Technology: Manufacturing Processes by R.K. Rajput, 2nd Edition
4. Fracture Mechanics by C.H. Wang , Airframes and Engines Division Aeronautical and Maritime Research Laboratory

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME707S ROBOT PROGRAMMING

Lectures/week: 1 hours — Credits: 02

Laboratory/week: 2 hours* — Continuous Assessment: 40

End Examination: 60

***Evaluation is similar to regular Practical/Laboratory Class Model/Pattern**

UNIT – I

Types of robots based on mode of control – PTP (point – to – point) and Control and Continuous path (CP) control robots.

Trajectory planning of a robot and its importance in execution of programming commands in accomplishing the given task in the world environment

UNIT – II

Robot Programming Methods – Broad classification – Online and Offline Programming

Types of programming – Manual setup – lead through programming – Computer like robot programming languages – Off line programming.

UNIT – III

Lead through programming – Powered lead through and Manual lead through – Use of Teach box or Control box in Manual programming of a robot – A robot simulator for lead through teaching

General information required or provided for teaching a robot

UNIT – IV

Robot Programming Languages – VAL, AL , and AML – Features and Applications

UNIT – V

Programming a robot in a work cell or robot cell and in Machine Vision environment

Sample Exercises/Experiments**

1. Program for PNP (Pick and Place) Activity
2. Teaching a robot to pick an object that is moving on a chute
3. Program for palletize the object
4. AL for bolt insertion task
5. Training a robot in accomplishing loading and unloading tasks in a robot or work cell
6. Programming a robot in a work cell aided by vision system
7. Programming to ensure safety of a robot in a work cell
8. Programming a robot to perform assembly and handling tasks in a robot cell

References

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. Bernard Hodges, 'Industrial Robotics', Second Edition, Jaico Publishing House, 1993
3. Deb S.K, Deb.S,"Robotics Technology and Flexible Automation", Tata McGraw-Hill Education Private Limited, 2009.

** ***Additions and deletions may be permitted in the above list of experiments depending on the availability of training or technical expert.***

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

ME508S FINITE ELEMENT ANALYSIS

Lectures/week: 1 hours — Credits: 02

Laboratory/week: 2 hours* — Continuous Assessment: 40

End Examination: 60

***Evaluation is similar to regular Practical/Laboratory Class Model/Pattern**

Course Outcomes (COs):

CO 1 Able to understand the basic concepts of FEA
CO 2 Able to understand spring , line, quadratic bar and plane truss elements
CO3 Prepared to model and formulate the given physical problem by suitable Finite Elements
CO4 Ability to make use of the numerical power of MATLAB in solving the FEA problems

UNIT – I

Introduction –Steps of the Finite Element Analysis (FEA) – MATLAB Functions for FEA – Overview of MATLAB – The spring Element Basic Equations – MATLAB Functions Used – Practice Exercises

UNIT – II

The Linear Bar Element – Basic Equations – MATLAB Functions Used – Practice Exercises

UNIT – III

The Quadratic Bar Element – Basic Equations – MATLAB Functions Used – Practice Exercises

UNIT – IV

The Plane Truss Element – Basic Equations – MATLAB Functions Used – Practice Exercises

UNIT – V

The Beam Element – Basic Equations – MATLAB Functions Used – Practice Exercises

TEXTBOOKS

1. Fundamentals of Finite Element Analysis by David V. Hutton
2. Concepts and Applications of Finite Element Analysis by Robert D. Cook, David S. Malkus and Michael

   E. Plesha

3. MATLAB Guide to Finite Elements – An interactive Approach by Peter I. Kattan
4. A first course in the Finite Element Method by Daryl L. Logan
5. An Introduction to Finite Element Method by J.N. Reddy

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

MC 509A Universal Human Values

Instruction: Hours/Week: **2L:0T:0P** **Credits: 0**
Marks:100 Pre-requisites/co-requisites: None.

COURSE DESCRIPTION:

The methodology of this course is universally adaptable, involving a systematic and rational study of the human being vis-à-vis the rest of existence. It is free from any dogma or value prescriptions. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with and within the student himself/herself finally.

COURSE OBJECTIVES:

1. To develop a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. To understand (or developing clarity) the harmony in the human being, family, society and nature/existence.
3. To strengthen self-reflection and to develop commitment and courage to act.
4. To understand social responsibility of an engineer.
5. To appreciate ethical dilemma while discharging duties in professional life.

COURSE CONTENT:

UNIT I: Introduction - Need, Basic Guidelines, Content and Process for Value Education: Purpose and motivation for the course, Self-Exploration–what is it? - Its content and process; „Natural Acceptance‟ and Experiential Validation- as the process for self-exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly - A critical appraisal of the current scenario. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

UNIT II: Understanding Harmony in The Human Being - Harmony in Myself! :

Understanding human being as a co-existence of the sentient „I‟ and the material „Body‟. Understanding the needs of Self („I‟) and „Body‟ - happiness and physical facility (Sukh and Suvidha). Understanding the Body as an instrument of „I‟ (I being the doer, seer and enjoyer). Understanding the characteristics and activities of „I‟ and harmony in „I‟. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Health.

UNIT III: Understanding Harmony in The Family and Society- Harmony in Human-Human Relationship: Understanding harmony in the Family - the basic unit of human interaction. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness (Ubhay-tripti); Trust **(Vishwas)** and Respect **(Samman)** as the foundational values of relationship. Understanding the meaning of Trust; Difference between intention and competence. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Resolution (Samadhan), Prosperity (Samridhi), fearlessness (**Abhay**) and co-existence as comprehensive Human Goals. Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha) - from family to world family.

UNIT IV: Understanding Harmony in The Nature and Existence - Whole Existence as Coexistence: Understanding the harmony in the Nature. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

UNIT V: Implications of The Above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics:
a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations.

COURSE OUTCOMES: On completion of this course, the students will be able to

1. To become more aware of themselves, and their surroundings (family, society, nature)
2. Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
3. Understand the role of a human being in ensuring harmony in society and nature.
4. To become sensitive to their commitment towards what they have understood (human values, human relationship and human society)
5. Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

TEXT BOOKS:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.
2. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

REFERENCE BOOKS:

1. E. F. Schumancher, 1973, Small is Beautiful: a study of economics as if people mattered. Blond & Briggs, Britain.
2. A. N. Tripathy, 2003, Human Values, New Age International Publishers.
3. Ivan IIIich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
4. A Nagraj, 1998 Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
5. Sussan George, 1976, How the Other Half Dies, Penguin Press, Reprinted 1986, 1991.
6. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
7. E G Seebauer & Robert L.Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.
8. M Govindrajan, S Natrajan & V. S Senthil kumar, Engineering Ethics (including Humna Values), Eastern Economy Edition, Prentice Hall of India Ltd.
9. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.
10. India Wins Freedom - Maulana Abdul Kalam Azad.

Relevant CDs, Movies, Documentaries & Other Literature:

1. value Education website, http://www.uptu.ac.in
2. Story of Stuff, http://www.storyofstuff.com
3. AI Gore, An Inconvenient Truth, Paramount Classics, USA
4. Charle Chaplin, Modern Times, United Artists, USA
5. IIT Delhi, Modern Technology - the Untold Story.