

R19 COURSE STRUCTURE AND SYLLABUS

For

B. Tech.

MECHANICAL ENGINEERING

(Applicable for batches admitted from 2019-20)



PRAGATI ENGINEERING COLLEGE **(AUTONOMOUS)**

Permanently Affiliated to JNTUK, Kakinada, Accredited by NAAC with “A” Grade
Recognized by UGC 2(f) and 12(b) under UGC act, 1956
1-378, ADB Road, Surampalem – 533 437
Near Peddapuram, E.G.Dist, Andhra Pradesh



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

R19 B.TECH ME COURSE STRUCTURE

Semester – 0
3 weeks Induction Program to be conducted at the beginning of First year

Zero Semester

Induction program (mandatory)	3 weeks duration
Induction program for students to be offered right at the start of the first year.	<ul style="list-style-type: none"> • Physical activity • Creative Arts • Universal Human Values • Literary • Proficiency Modules • Lectures by Eminent People • Visits to local Areas • Familiarization to Dept./Branch and Innovations

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Precious little is done by most of the institutions, except for an orientation program lasting a couple of days. We propose a 3-week long induction program for the UG students entering the institution, right at the start. Normal classes start only after the induction program is over. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.² The time during the Induction Program is also used to rectify some critical lacunas, for example, English background, for those students who have deficiency in it. The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

I Year – I Semester

S. No.	Course Category	Course Code	Title of the Course	L	T	P	C
1	Humanities, Social Sciences including Management	19HE1T01	Professional Communicative English	3	--	--	3
2	Basic Sciences	19BM1T01	Linear Algebra and Differential Equations	3	--	--	3
3	Basic Sciences	19BC1T01	Engineering Chemistry	3	--	--	3
4	Engineering Sciences	19CS1T01	Programming for Problem Solving using C	3	--	--	3
5	Engineering Sciences	19ME1T01	Engineering Drawing	1	--	3	2.5
6	Basic Sciences	19BC1L01	Engineering Chemistry Laboratory	--	--	3	1.5
7	Humanities, Social Sciences including Management	19HE1L01	Professional Communicative English Laboratory-I	--	--	3	1.5
8	Engineering Sciences	19CS1L01	Programming for Problem Solving using C Laboratory	--	--	3	1.5
9	Mandatory Courses	19BE1T01	Environmental Science	2	--	--	0
Total Credits							19

I Year – II Semester

S. No.	Course Category	Course Code	Title of the Course	L	T	P	C
1	Basic Sciences	19BM2T02	Numerical Methods and Multi Variable Calculus	3	--	--	3
2	Basic Sciences	19BM2T03	Integral Transforms and Vector Calculus	3	--	--	3
3	Engineering Sciences	19ME2T02	Engineering Mechanics	3	--	--	3
4	Basic Sciences	19BP2T01	Engineering Physics	3	--	--	3
5	Engineering Sciences	19EE2T02	Basic Electrical and Electronics Engineering	3	--	--	3
6	Professional Core	19ME3T04	Materials Science and Metallurgy	3	--	--	3
7	Basic Sciences	19BP2L01	Engineering Physics Laboratory	--	--	3	1.5
8	Engineering Sciences	19ME2L02	Engineering Workshop	--	--	3	1.5



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

9	Mandatory Course	19HM2T05	Constitution of India	2	--	--	0
Total Credits							21

II Year – I Semester

S. No.	Course Category	Course Code	Title of the Course	L	T	P	C
1	Basic Sciences	19BM3T05	Complex Variables and Statistical Methods	3	--	--	3
2	Professional Core	19ME3T05	Mechanics of Solids	3	--	--	3
3	Professional Core	19ME3T06	Thermodynamics	3	--	--	3
4	Professional Core	19ME3T07	Fluid Mechanics and Hydraulic Machinery	3	--	--	3
5	Professional Core	19ME3T08	Production Technology	3	--	--	3
6	Lab Course	19ME2L03	Computer Aided Engineering Drawing Practice	--	--	3	1.5
7	Engineering Sciences	19EE3L02	Basic Electrical and Electronics Engineering Laboratory	--	--	3	1.5
8	Lab Course	19ME3L05	Metallurgy and Mechanics of Solids Laboratory	--	--	3	1.5
9	Project Work	19ME3P01	Socially Relevant Activity*	--	--	--	0.5
10	Mandatory Course	19HM3T07	Professional Ethics and Human Values	2	--	--	0
Total Credits							20

***15hrs per semester**

II Year – II Semester

S. No.	Course Category	Course Code	Title of the Course	L	T	P	C
1	Professional Core	19ME4T09	Kinematics of Machinery	3	--	--	3
2	Professional Core	19ME4T10	Applied Thermodynamics	3	--	--	3
3	Humanities , Social Sciences including Management	19HM4T01	Managerial Economics and Financial Analysis	3	--	--	3
4	Professional Core	19ME4T11	Design of Machine Members-I	3	--	--	3



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

5	Professional Core	19ME4T12	Metal Cutting and Machine Tools	3	--	--	3
6	Professional Core	19ME4T13	Machine Drawing	1	--	4	3
7	Lab Course	19ME4L06	Fluid Mechanics and Hydraulic Machinery Laboratory	--	--	3	1.5
8	Lab Course	19ME4L07	Production Technology Laboratory	--	--	3	1.5
9	Mandatory Course	19HM4T06	Essence of Indian Traditional Knowledge	2	--	--	0
Total Credits							21

III Year – I Semester

S. No.	Course Category	Course Code	Title of the Course	L	T	P	C
1	Professional Core	19ME5T14	Dynamics of Machinery	3	--	--	3
2	Professional Core	19ME5T15	Design of Machine Members-II	3	--	--	3
3	Professional Core	19ME5T16	Operations Research	3	--	--	3
4	Professional Core	19ME5T17	IC Engines and Turbo Machinery	3	--	--	3
5	Professional Elective		Professional Elective-I	3	--	--	3
6	Open Elective		Open Elective-I	3	--	--	3
7	Lab Course	19ME5L08	Machine Tools and Theory of Machines Laboratory	--	--	3	1.5
8	Lab Course	19ME5L09	Thermal Engineering Laboratory	--	--	3	1.5
9	Mandatory Course	19ME5T49	MOOCS/Industry Courses approved by Department**	--	--	--	0
Total Credits							21

**Student can select the course of any discipline under MOOCS. However the agency will be decided by the respective BOS

List of Approved MOOC providers

CSWAYAM	Iversity	Coursera	Udemy	EduKart
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PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

IV Year – II Semester

S. No.	Course Category	Course Code	Title of the Course	L	T	P	C
1	Professional Core	19ME8T40	Unconventional Machining Processes	3	--	--	3
2	Professional Elective		Professional Elective-V	3	--	--	3
3	Professional Elective		Professional Elective-VI	3	--	--	3
4	Project Work	19ME8P03	Project Work	--	--	18	9
Total Credits							18
Total Credits (19 + 21 + 20 + 21 + 21+ 22 + 18 + 18)							160

L- Lecture

T- Tutorial

P-Practical

C-Credits

Professional Elective-I

S. No.	Course Code	Title of the Course
1	19ME5T18	Automobile Engineering
2	19ME5T19	Nano Technology
3	19ME5T20	Automation in Manufacturing
4	19ME5T21	Total Quality Management

Professional Elective-II

S. No.	Course Code	Title of the Course
1	19ME6T26	Power Plant Engineering
2	19ME6T27	Mechatronics
3	19ME6T28	Industrial Robotics
4	19ME6T29	Supply Chain Management

Professional Elective III

S. No.	Course Code	Title of the Course
1	19ME7T32	Refrigeration & Air-conditioning
2	19ME7T33	MEMS
3	19ME7T34	Additive Manufacturing
4	19ME7T35	Optimization Techniques

Professional Elective IV

S. No.	Course Code	Title of the Course
1	19ME7T36	Gas Dynamics & Jet Propulsion
2	19ME7T37	Mechanical Vibrations
3	19ME7T38	Design for Manufacturing
4	19ME7T39	Management of Inventory Systems



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

Professional Elective V

S. No.	Course Code	Title of the Course
1	19ME8T41	Computational Fluid Dynamics
2	19ME8T42	Mechanical Behavior of Materials
3	19ME8T43	Joining Processes
4	19ME8T44	Production Planning and Control

Professional Elective VI

S. No.	Course Code	Title of the Course
1	19ME8T45	Thermal Equipment Design
2	19ME8T46	Advanced Mechanics of Solids
3	19ME8T47	Non Destructive Evaluation
4	19ME8T48	Facilities Layout and Design

Open Elective I

S. No.	Course Code	Title of the Course
1	19CE5T18	Environmental Impact Assessment & Management
2	19EE5T24	Energy Audit, Conservation and Management
3	19EC5T10	Internet of Things
4	19CS5T05	Object Oriented Programming through Java
5	19HM5T03	Entrepreneurship

Open Elective II

S. No.	Course Code	Title of the Course
1	19CE6T23	Building Materials and Construction
2	19EE6T36	Power Safety and Management
3	19EC6T20	Microprocessors and Microcontrollers
4	19CS6T17	Computer Graphics
5	19HE6T02	Soft Skills and Interpersonal Communication

Open Elective III

S. No.	Course Code	Title of the Course
1	19CE7T38	Remote Sensing and GIS Applications
2	19EE7T12	Power Electronics
3	19EC7T39	Electronic Measurement and Instruments
4	19CS7T03	Python Programming
5	19HM7T04	Marketing Management



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

I Year I Semester

Professional Communicative English
(Common to CE, EEE, MECH, ECE, CSE & IT)

Course Category	Basic Sciences	Course Code	19HE1T01
Course Type	Theory	L-T-P-C	3 – 0 – 0 – 3
Prerequisites	LSRW + Vocabulary Synonyms, antonyms, Grammar.	Internal Assessment Semester End Examination Total Marks	30 70 100

COURSE OBJECTIVES	
1	Schumacher describes the education system by saying that it was mere training, something more than mere knowledge of facts. To develop extensive reading skill and comprehension for pleasure and profit.
2	The lesson centers on the pros and cons of the development of science and technology. To develop extensive reading skill and comprehension for pleasure and profit.
3	Depicts the symptoms of Cultural Shock and the aftermath consequences. To develop extensive reading skill and comprehension for pleasure and profit.
4	Portrays the ways of living life in its true sense. To develop extensive reading skill and comprehension for pleasure and profit.
5	Supports the developments of technology for the betterment of human life. To develop extensive reading skill and comprehension for pleasure and profit.

COURSE OUTCOMES	
Upon successful completion of the course, the student will be able to:	
CO1	Emphasizes that the ultimate aim of education is to enhance wisdom and inspires the readers to serve their nation with their self-enrichment.
CO2	Enables the learners to promote peaceful co-existence and universal harmony in the society and empowers the learners to have initiation in innovation.
CO3	Imparts the students to manage different cultural shock due to globalization and to develop multiculturalism to appreciate diverse cultures and also motivates the learners to contribute to their nation.
CO4	Arouse the thought of life to lead in a well path by recognizing the importance of work besides enhancing their LSRW skills.
CO5	Inspires the learners at the advancement of software by the eminent personalities and motivates the readers to think and tap their innate talents.



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	2	1	-	-	1	-	3	-	-
CO2	2	1	-	-	-	1	3	1	-	1	-	1	-	-
CO3	-	-	-	-	-	1	2	-	-	1	-	-	-	-
CO4	-	-	-	-	-	1	-	1	2	-	-	-	-	-
CO5	-	-	1	2	1	-	-	-	-	1	-	-	-	-

COURSE CONTENT

UNIT I	1. 'The Greatest Resource- Education' from Professional Communicative English. 2. 'War' from 'Panorama: A Course on Reading'
UNIT II	1. 'A Dilemma' from Professional Communicative English. 2. 'The Verger' from 'Panorama: A Course on Reading'
UNIT III	1. 'Cultural Shock': Adjustments to new Cultural Environments from Professional Communicative English. 2. 'The Scarecrow' from Panorama: A Course on Reading
UNIT IV	1. 'The Secret of Work' from Professional Communicative English. 2. 'A Village Lost to the Nation' from Panorama: A Course on Reading
UNIT V	1. 'The Chief Software Architect' from Professional Communicative English. 2. 'Martin Luther King and Africa' from Panorama: A Course on Reading

TEXT BOOKS

1. PROFESSIONAL COMMUNICATIVE ENGLISH. Published by Maruthi Publishers.
2. PANORAMA: A COURSE ON READING, Published by Oxford University Press India

REFERENCE BOOKS

1. ENGLISH GRAMMAR AND COMPOSITION – WREN & MARTIN
2. LEARNER'S ENGLISH GRAMMAR AND COMPOSITION – N.D.V. Prasada Rao

WEB RESOURCES

- Online Dictionaries:**
1. <https://dictionary.cambridge.org/>
<https://www.oxfordlearnersdictionaries.com/>



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

2.	Grammar: https://www.oxfordlearnersdictionaries.com/grammar/ https://dictionary.cambridge.org/grammar/british-grammar/
3.	Synonyms and Antonyms: https://www.thesaurus.com/browse/search https://www.englishclub.com/vocabulary/synonyms-antonyms.htm



Linear Algebra and Differential Equations (Common to CE, EEE, ME, ECE, CSE & IT)

Course Category	Basic Sciences	Course Code	19BM1T01
Course Type	Theory	L-T-P-C	3-0-0-3
Prerequisites	Basics of matrices, Differentiation, Integration	Internal Assessment Semester End Examination Total Marks	30 70 100

1	The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2	The skills derived from the course will help the student form a necessary base to develop analytic and design concepts.

Upon successful completion of the course, the student will be able to:		Cognitive Level
CO1	Solve systems of linear equations, determine the rank, find the eigen values and eigenvectors, diagonalization of a matrix.	K3
CO2	Identify special properties of a matrix, such as positive definite, etc., and use this information to facilitate the calculation of matrix characteristics.	K2
CO3	Solve first order differential equations and its applications	K3
CO4	Solve the linear differential equations with constant coefficients by appropriate method	K3
CO5	Find partial derivatives of multivariable functions and apply them to find extreme values of a function.	K3

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PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

COURSE CONTENT	
UNIT I	Solving system of linear equations, Eigen Values and Eigen vectors Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non-homogeneous linear equations – Gauss elimination method for solving system of equations – Eigenvalues and Eigen vectors and their properties.
UNIT II	Cayley-Hamilton Theorem and Quadratic forms Cayley-Hamilton theorem (without proof) – Finding inverse and powers of a matrix by Cayley-Hamilton theorem – Reduction to diagonal form-Quadratic forms-nature of the quadratic form - reduction of quadratic form to canonical form by orthogonal transformation.
UNIT III	Differential equations of first order and first degree Linear – Bernoulli – Exact – Reducible to exact. Applications: Newton's Law of cooling – Law of natural growth and decay – Orthogonal trajectories.
UNIT IV	Linear differential equations of higher order Non-homogeneous equations of higher order with constant coefficients with RHS term of the type e^{ax} , $\sin ax$, $\cos ax$, polynomials in x^n , $e^{ax}V(x)$, $x^mV(x)$ - Method of Variation of parameters.
UNIT V	Partial differentiation Introduction – Homogeneous function – Euler's theorem – Total derivative – Chain rule – Generalized Mean value theorem for single variable (without proof) – Taylor's and Maclaurin's series expansion of functions of two variables – Jacobian – Functional dependence. Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

TEXT BOOKS	
1.	B.S.Grewal , Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2.	Erwin Kreyszig , Advanced Engineering Mathematics, 10th Edition, Wiley-India
REFERENCE BOOKS	
1.	Micheael Greenberg , Advanced Engineering Mathematics, 9th edition, Pearson edn
2.	Dean G. Duffy , Advanced engineering mathematics with MATLAB, CRC Press
3.	Peter O'neil , Advanced Engineering Mathematics, Cengage Learning.
4.	Srimanta Pal, Subodh C.Bhunia , Engineering Mathematics, Oxford University Press.
5.	T.K.V. Iyengar et. al. , Engineering Mathematics Volume I & III S Chand Publications.
WEB RESOURCES	
1.	UNIT I: Solving system of linear equations, Eigen Values and Eigen vectors https://en.wikipedia.org/wiki/System_of_linear_equations https://en.wikipedia.org/wiki/Eigenvalues_and_eigenvectors
2.	UNIT II: Cayley-Hamilton Theorem and Quadratic forms https://www.math.hmc.edu/calculus/tutorials/eigenstuff/



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

	https://en.wikipedia.org/wiki/Quadratic_form
3.	UNIT III: Differential equations of first order and first degree https://en.wikipedia.org/wiki/Differential_equation http://um.mendelu.cz/maw-html/index.php?lang=en&form=ode https://www.khanacademy.org/math/differential-equations/first-order-differential-equations
4.	UNIT IV: Linear differential equations of higher order https://en.wikipedia.org/wiki/Differential_equation http://um.mendelu.cz/maw-html/index.php?lang=en&form=ode https://nptel.ac.in/courses/122107037/20
5.	UNIT V: Partial Differentiation https://en.wikipedia.org/wiki/Partial_derivative https://www.whitman.edu/mathematics/calculus_online/section14.03.html



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

I Year I Semester

ENGINEERING CHEMISTRY
(Mechanical Engineering)

Course Category	Basic Sciences	Course Code	19BC1T01
Course Type	Theory	L-T-P-C	3-0-3-4.5
Prerequisites	Intermediate Chemistry	Internal Assessment Semester End Examination Total Marks	30 70 100

COURSE OBJECTIVES

1	To learn about the hardness of water, boiler troubles, Drinking water standards and methods of removal of hardness of water
2	To get knowledge on Electrochemical cells, Batteries and fuel cells and their applications
3	To study about the factors affecting corrosion, controlling methods and about organic coatings
4	To learn about Cement, its setting and hardness, methods of polymerization, Plastics and Elastomers
5	To study about Nano materials, their preparation and applications and to gain awareness on smart materials,

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Distinguish between temporary and permanent hardness of water.
CO2	Illustrate the principles and applications of Batteries and Fuel cells
CO3	Identify different types of corrosion and their controlling methods.
CO4	Illustrate the principles of setting and hardening of cement and explain about polymers and their engineering applications.
CO5	Analyze the importance of nano and smart materials and Illustrate the principle of BET & TEM.

Contribution of Course Outcomes towards achievement of Program : Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	2	1	2	-	3	3	-	-	-	3	1	1	-
CO2	2	1	-	-	2	-	1	-	-	-	2	2	-	-
CO3	1	-	2	-	2	-	1	-	-	-	1	-	-	1
CO4	3	-	1	2	-	1	1	-	-	-	2	-	1	-
CO5	2	-	3	-	-	2	2	-	-	-	1	1	-	1



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

COURSE CONTENT	
UNIT I	<p>WATER TECHNOLOGY 9 hrs</p> <p>Introduction –Hard and Soft water, Estimation of hardness by EDTA Method - Boiler troubles - scale and sludge-priming and foaming and Caustic Embrittlement; Specifications for drinking water, Bureau of Indian Standards (BIS) and World health organization (WHO) standards, Industrial water – Primary and secondary treatments, zeolite and ion-exchange processes- desalination of brackish water, reverse osmosis (RO) and electro dialysis.</p> <p>Learning outcomes: After the completion of the Unit I, the student will be able to</p> <ul style="list-style-type: none"> • Explain the principles of reverse osmosis and electro dialysis. (L-2) • Compare the quality of drinking water with BIS and WHO standards. (L-2) • Illustrate boiler troubles associated with hard water. (L-2) • Demonstrate the Industrial water treatment processes. (L-2)
UNIT II	<p>ENERGY SOURCES AND APPLICATIONS 9 hrs</p> <p>Electrode potential, determination of single electrode potential –Nernst’s equation, Reference electrodes: Hydrogen and calomel electrodes – electrochemical series and its applications Batteries: Primary cell- dry or Leclanche cell, Secondary cell- Nickel-Cadmium cell – lithium batteries (Lithium-MnO₂); Fuel cells- H₂-O₂ fuel cell Solar energy: Photovoltaic cell and its applications. Fuels- Classification and characteristics-Liquid fuels- Refining of petroleum; gaseous fuels-LPG and CNG applications</p> <p>Learning outcomes: After the completion of the Unit II, the student will be able to</p> <ul style="list-style-type: none"> • Define electrode potential. (L-1) • Derive Nernst’s equation. (L-2) • Outline the difference between primary and secondary cells. (L-2) • Identify the applications of photo voltaic cell. (L-2) • Discuss the applications of LPG and CNG (L-2)
UNIT III	<p>CORROSION ENGINEERING 6+6 hrs</p> <p>III-A: Corrosion: Definition – theories of corrosion-Dry corrosion: Metal oxide formation - pilling bed worth ratio; Electro chemical corrosion: Mechanism, Factors affecting corrosion (nature of the metal and nature of the environment).</p> <p>III-B: Corrosion controlling methods: Sacrificial and Impressed current cathodic protection. Metallic coatings – Galvanizing and Tinning- Electro plating and Electro less plating; Anodic inhibitors and Cathodic inhibitors. Organic coatings – Paints and Varnishes (constituents and their functions).</p> <p>Learning outcomes: After the completion of the Unit III, the student will be able to</p> <ul style="list-style-type: none"> • Explain theories of corrosion. (L-2) • Identify the various factors affecting corrosion. (L-3) • classify different inhibitors of corrosion (L-2) • Choose different organic coatings. (L-3) • Apply the principles of corrosion control. (L-3)
UNIT IV	<p>ENGINEERING MATERIALS AND POLYMERS 10 hrs</p> <p>Cement: Portland cement, constituents, Manufacture of Portland Cement, Chemistry of setting and hardening of Cement (hydration, hydrolysis, equations).</p> <p>Refractories-Classification, properties(refractoriness, refractoriness under load, porosity)</p>



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

	<p>Polymers: Introduction-Methods of Polymerization (Emulsion and Suspension), Conducting polymers – Mechanism of conduction in poly acetylene – applications, Bio – degradable polymers.</p> <p>Plastics: Thermoplastics and thermo setting resins; Moulding of plastics – Compression and Injection moulding - Preparation, properties and applications of Polystyrene and Bakelite.</p> <p>Elastomers: Natural Rubber, Vulcanization of rubber; Synthetic Rubbers -Preparation, properties and applications of Buna-S and Thiokol.</p> <p>Learning outcomes: After the completion of the Unit IV, the student will be able to</p> <ul style="list-style-type: none"> • Illustrate the chemical reactions involved in the manufacturing of cement and properties of refractories. (L-2) • Identify preparation and properties of different polymers. (L-3) • Distinguish between thermoplastic and thermo setting resins. (L-4) • Identify applications of conducting polymers (L-3)
UNIT V	<p>NANO AND SMART MATERIALS 8 hrs</p> <p>Nano Materials: Introduction to Nano materials, Preparation of Carbon Nano Tubes(CNTs) by Laser Ablation and Chemical Vapor Deposition Methods, Fullerenes -Preparation, Properties and Applications; Chemical synthesis of nano materials : Sol-gel method, Characterization of nano materials by BET & TEM (basic principles), Applications of nano materials in waste water treatment, lubricants, Medicine and sensors.</p> <p>Smart Materials: Introduction – Types of smart materials-Self healing materials, Shape memory alloys and uses of smart materials.</p> <p>Learning outcomes: After the completion of the Unit V, the student will be able to</p> <ul style="list-style-type: none"> • Classify nano materials. (L-2) • Explain the synthesis and characterization methods of nano materials. (L-2) • Explain principles of BET & TEM. (L-4) • Identify different types of smart materials. (L-2)

TEXT BOOKS	
1.	P.C. Jain and M. Jain, Engineering Chemistry, 15/e, Dhanapat Rai & Sons, Delhi (2014).
2.	Engineering Chemistry by Shikha Agarwal: Cambridge University Press,2019 edition .
REFERENCE BOOKS	
1.	Sashi Chawla, A Textbook of Engineering Chemistry, Dhanapath Rai and sons, (2003)
2.	S.S. Dara, A Textbook of Engineering Chemistry, S.Chand & Co, (2010)
3.	N. Krishna Murthy and Anuradha, A text book of Engineering Chemistry, Murthy Publications (2014)
WEB RESOURCES	
1.	Water Technology 1. https://www.scribd.com/document/.../Engineering-Chemistry-Unit-I-Water-Treatment 2. www.lenntech.com/applications/process/boiler/boiler-water-treatment.htm
2.	Energy Sources and Applications https://en.wikipedia.org/wiki/Electrochemical_cell
3.	Corrosion Engineering &Corrosion controlling methods https://en.wikipedia.org/wiki/Corrosion
4.	Engineering Materials and Polymers https://en.wikipedia.org/wiki/Polymer_chemistry
5.	Nano and Smart Materials https://en.wikipedia.org/wiki/Nanomaterials



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

CO3	3	3	3	2	1	-	-	-	-	-	-	-	2	1
CO4	2	3	3	3	1	-	-	-	-	-	-	-	2	2
CO5	3	3	3	3	1	-	-	-	-	-	-	-	2	2

COURSE CONTENT	
UNIT I	<p>Introduction to Programming–Introduction to Computer Software, Classification of Computer Software, Representation of Data – Bits and Bytes, Programming Languages – High and Low Level Languages, Generation of Programming Languages, Program Design Tools: Algorithms, Flowcharts, Pseudocode, Types of Errors, Testing & Debugging Approaches.</p> <p>Introduction to C – Structure of a C Program, Writing the First C Program, Header Files used in C Program, Compiling and Executing C Programs.</p>
UNIT II	<p>Tokens in C: Basic Data Types in C – Keywords, Identifiers, Variables, Constants, Input / Output statements in C, Operators in C, Precedence and Associativity Rules, Type Casting Types.</p> <p>Decision Control: Decision Control Statements: Conditional Branching Statements - if, if – else, nested if, if – else – if, and Switch – Case.</p> <p>Basic Loop Structures: Iterative Statements - for, while and do - while, Nested Loops, The ‘Break’, ‘Continue’, and ‘goto’ statements.</p>
UNIT III	<p>Arrays: Declaration and Initialization of Arrays, Accessing & Storing the elements of an Array, Operations on Arrays: Traversing, Inserting, Deleting, Searching, Two Dimensional Arrays: Declaring, Initializing, Accessing, Operations on Two Dimensional Arrays (Matrices), Applications of Arrays.</p> <p>Strings: String Fundamentals, String Input and Output, String Library Functions</p>
UNIT IV	<p>Functions: Function Declaration / Function Prototypes, Function Definition, Function Call (Call by Value), Passing Parameters to Functions, Return Statement, Storage Classes, Recursive Functions, Arrays as Function Arguments.</p> <p>Pointers: Declaring Pointer Variables, Pointer Arithmetic, Passing Arguments to Function using Pointers (Call by Reference), Pointers and Arrays, Pointer to Pointer, Dynamic Memory Allocation – Malloc, Calloc, Realloc, Free.</p>
UNIT V	<p>Structures: Introduction to Structures, Nested Structures, Array of Structures.</p> <p>Unions: Introduction, Array of Union Variables, Union inside Structure, Enumerated Data Types, Bit Fields.</p> <p>Files: Declaring, Opening, and Closing File, Reading from and Writing to Text Files.</p>

TEXT BOOKS	
1.	Programming in C, Reema Thareja, 2nd Edition, Oxford University Press.
2.	The C programming Language, Dennis Richie and Brian Kernighan, Pearson Education



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

REFERENCE BOOKS	
1.	Programming in C – Ashok N.Kamthane, Amit Ashok Kamthane, 3rd Edition, Pearson.
2.	C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage.
3.	Programming in C (A Practical Approach) – Ajay Mittal, First Edition, Pearson.
WEB RESOURCES	
1.	http://nptel.ac.in/courses/106104128/
2.	http://students.iitk.ac.in/programmingclub/course/#notes
3.	http://c-faq.com/~scs/cclass/cclass.html
4.	http://www.youtube.com/watch?v=b00HsZvg-V0&feature=relmfu
5.	http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-087-practical-programming-in-c-january-iap-2010/



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

I Year I Semester

ENGINEERING DRAWING
(Only for ME)

Course Category	Engineering Science	Course Code	19ME1T01
Course Type	Theory	L-T-P-C	1-0-3-2.5
Prerequisites		Internal Assessment	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
1	To introduce the students to use drawing instruments and to draw polygons, Engineering Curves and Scales.
2	To introduce the students to use orthographic projections, projections of points and lines.
3	To make the students draw the projections of the planes.
4	To make the students draw the projections of the various types of solids.
5	To represent the object in 3D view through isometric views.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		Cognitive Level*
CO1	Construct polygons, scales and engineering curves.	k3
CO2	Identify the position of points and lines with use of orthographic projections.	k3
CO3	Analyze the location and position of plane figures through orthographic projections.	k4
CO4	Analyze the location and position of solid bodies through orthographic projections.	k4
CO5	Develop 2D and 3D objects by converting their views.	k6

*k1- Remembering, k2- Understanding, k3- Applying, k4- Analyzing, k5- Evaluating, k6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	-	-	-	-	-	1	-	1	-
CO2	3	2	1	2	1	-	-	-	-	-	1	-	1	-
CO3	3	2	1	2	1	-	-	-	-	-	1	-	1	-



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

CO4	3	2	1	2	1	-	-	-	-	-	1	-	1	-
CO5	3	2	1	3	3	-	-	-	-	-	1	-	1	-

COURSE CONTENT

UNIT I	<p>Introduction to Engineering Drawing.</p> <p>Polygons: Constructing regular polygons by general method.</p> <p>Curves: Parabola, Ellipse and Hyperbola by general methods tangent & normal for the curves. Cycloid and Involute.</p> <p>Scales: Vernier and Diagonal scales.</p>
UNIT II	<p>Orthographic Projections: Introduction, importance of reference lines, projections of points in various quadrants. Projections of straight lines inclined to both the planes, determination of true lengths and angle of inclination.</p>
UNIT III	<p>Projections of planes: Regular planes perpendicular/parallel to one plane.</p> <p>Regular planes inclined to one plane and parallel to other, inclined to both the planes.</p>
UNIT IV	<p>Projections of Solids: Simple positions of Prisms, Pyramids, Cones and Cylinders. Solids inclined to both the planes.</p>
UNIT V	<p>Isometric Projections: Introduction, Conversion of isometric views to orthographic views, Conversion of orthographic views to isometric views.</p> <p>Introduction to AutoCAD (Demo only)</p>

TEXT BOOKS

- Engineering Drawing by N.D. Bhatt, Chariot Publications, 56th Edition.
- Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age International (P) Limited (2008).

REFERENCE BOOKS

- Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers, 3rd Edition.
- Engineering Graphics for Degree by K.C. John, PHI Publishers.
- Engineering Graphics by P. Varghese, Mc Graw Hill Publishers, 2013.
- Engineering Drawing by Basant Agarwal, Tata McGraw Hill Publishers, 2014.
- B.V.R. Gupta & M. Raja Roy, Engineering Drawing, I.K. International Publishing House Pvt. Ltd., 2009.

WEB RESOURCES

- <http://nptel.ac.in/courses/112103019/>
- <http://www.me.umn.edu/courses/me2011/handouts/drawing/blanco-tutorial.html>
- https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/env_health_science_students/engineeringdrawing.pdf



Engineering Chemistry Laboratory

Course Category:	Basic sciences	Course Code	19BC1LC01
Course Type:	Lab	L-T-P-C	0 -0 -3-1.5
Prerequisites:	Basic Chemistry	Internal Assessment Semester End Examination Total Marks	30 70 100

Upon successful completion of the course, the student will be able to:

CO1	Students will learn to estimate the given amount of dissolved compounds in water by using volumetric analysis and preparation of polymers and nano particles
CO2	Students will be able to learn complexometric titrations to determine the concentration of different metal ions present in water.
CO3	Students will be able to identify the accurate value of P^H and conductivity of given solutions. and to estimate the viscosity and surface tension of given solutions.

Contribution of Course Outcome towards achievement of Program Outcomes (1–Low, 2–Medium, 3–High)

[illegible]



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(Autonomous R19)
MECHANICAL ENGINEERING

COURSECONTENT

(Any 10 of the following listed 14 experiments)

LIST OF EXPERIMENTS:

Introduction to chemistry laboratory – Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations, Quantitative analysis

1. Estimation of HCl using standard Na_2CO_3 solutions
2. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH
3. Estimation of KMnO_4 using standard Oxalic acid solution.
4. Estimation of Ferrous iron using standard $\text{K}_2\text{Cr}_2\text{O}_7$ solution
5. Determination of Temporary and permanent Hardness water using standard EDTA solution.
6. Determination of pH of the given sample solution using pH meter
7. Determination of Iron (III) using Colorimetric method
8. Conductometric Titrations between strong acid and strong base
9. Conductometric Titrations between strong acid and weak base
10. Estimation of Vitamin – C
11. Preparation of Phenol - Formaldehyde Resin
12. Determination of viscosity of a liquid
13. Determination of surface tension of a liquid
14. Preparation of Nano particles.(Cu/Zn)

TEXTBOOKS

1. Mendham J, Denney RC, Barnes JD, Thosmas M and Sivasankar B Vogel's Quantitative Chemical Analysis 6/e, Pearson publishers (2000).
2. N.K Bhasin and Sudha Rani Laboratory Manual on Engineering Chemistry 3/e, Dhanpat Rai Publishing Company (2007).

REFERENCEBOOKS

Vogel's Textbook of Quantitative chemical analysis, J. Mendham et.al.

[1] College designed manual

WEB-RESOURCES

1. www.bsauniv.ac.in/UploadImages/Downloads/Estimation%20of%20Hardness
2. <https://pubs.acs.org/doi/abs/10.1021/i560133a023>
3. <https://pdfs.semanticscholar.org/33d4/3b264bad212a14d660667298f12944ea11d5>



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

I Year I Semester

Professional Communicative English Lab – I
(For CE, EEE, ME, CSE & IT)

Course Category	Basic Sciences	Course Code	19HE1L01
Course Type	Laboratory	L-T-P-C	0 – 0 – 3 – 1.5
Prerequisites		Internal Assessment	30
		Semester End Examination	70
		Total Marks	100

PRESCRIBED LAB MANUAL FOR SEMESTER I:

STRENGTHEN YOUR STEPS: A Multimodal Course in Communication Skills' Published by Maruthi Publications.

COURSE OBJECTIVE

To enable the students to learn the communication skills; listening, speaking, reading and writing.

COURSE OUTCOME

The course enables the learner to acquire communication skills which will help the students to become successful in the competitive world.

COURSE CONTENT

The course content along with the study material is divided into six units.

UNIT 1:

Hello, I'm

Consonant Sounds

UNIT 2:

I would love to But,

Vowel Sounds

UNIT 3:

With your Permission, I would like to

Syllable and Accent

UNIT 4:

Why don't we.....

Pronunciation and Rhythm

UNIT 5:

Could you please

Tones

UNIT-6: Dialogues



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

COURSE CONTENT																											
1.	Construct flowcharts using Raptor Tool to a) calculate the maximum, minimum and average of three numbers b) calculate area of a triangle given three sides using Heron’s formula.																										
2.	Construct flowcharts using Raptor Tool to a) calculate simple interest for various parameters specified by the user. b) swapping of two numbers with and without using the third variable.																										
3.	Write a C Program to Perform Addition, Subtraction, Multiplication and Division of two numbers.																										
4.	Write a C Program to find the Grade of a student by taking input of percentage using all Relational Operators (>, >=, <, <=, ==, !=) <table><tr><th>Theory (%)</th><th>Letter Grade</th><th>Level</th></tr><tr><td>≥ 90</td><td>O</td><td>Outstanding</td></tr><tr><td>≥ 80 to < 90</td><td>S</td><td>Excellent</td></tr><tr><td>≥ 70 to < 80</td><td>A</td><td>Very Good</td></tr><tr><td>≥ 60 to < 70</td><td>B</td><td>Good</td></tr><tr><td>≥ 50 to < 60</td><td>C</td><td>Fair</td></tr><tr><td>≥ 40 to < 50</td><td>D</td><td>Satisfactory</td></tr><tr><td><40</td><td>F</td><td>Fail</td></tr></table>			Theory (%)	Letter Grade	Level	≥ 90	O	Outstanding	≥ 80 to < 90	S	Excellent	≥ 70 to < 80	A	Very Good	≥ 60 to < 70	B	Good	≥ 50 to < 60	C	Fair	≥ 40 to < 50	D	Satisfactory	<40	F	Fail
Theory (%)	Letter Grade	Level																									
≥ 90	O	Outstanding																									
≥ 80 to < 90	S	Excellent																									
≥ 70 to < 80	A	Very Good																									
≥ 60 to < 70	B	Good																									
≥ 50 to < 60	C	Fair																									
≥ 40 to < 50	D	Satisfactory																									
<40	F	Fail																									
5.	Write a C Program to swap two given input numbers a) With using a temporary variable. b) Without using a temporary variable.																										
6.	Write a C Program to implement arithmetic operations using two operands and one operator using a) if – else – if condition.																										



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

9.	Write a C Program a) To check whether the given number is a Palindrome or not. b) To check whether the given number is an Armstrong or not
10.	Write a C Program using Functions to find both the largest and smallest number in an given array numbers.
11.	Write C programs to perform swapping of two numbers by passing a value and reference.
12.	Write a C Program for two Matrices by checking the compatibility a) Addition. b) Multiplication.
13.	Write a C program on Strings to implement the following operations without string handling functions a) Concatenation of two given input strings. b)Length of a string. c) Reverse of a given string.
14.	Write C programs that use both recursive and non-recursive functions for the following i) To find the factorial of a given integer. ii) To find the GCD (greatest common divisor) of two given integers. iii) To find Fibonacci sequence
15.	Write a C program using Pointers to work on a) Matrix Addition. b) Transpose of a Matrix.
16.	Write a C program to read and print the details of an Employee (Name, Date of the Birth, Designation, Salary) using Structures.
17.	Write a C program a) to read and print the student details (Name, Register number, Address, Intermediate %) using Union. b) to display the name of the colour using Enum data type
18.	Write a C Program to a) Copy one file to another. b)Count the number of characters, words and lines in a file.



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

I Year I Semester

Environmental Science
(Common to All Branches)

Course Category	Basic Sciences	Course Code	19BE1T01
Course Type	Theory	L-T-P-C	3 – 0 – 0 – 0
Prerequisites	Exposure Basic Knowledge in Environment and protection.	Internal Assessment Semester End Examination Total Marks	0 0 0

COURSE OBJECTIVE:

1	To make the students to get awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life to save earth from the inventions by the engineers.
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COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:		Cognitive Level
CO1	Recognize the interconnectedness of human dependence on the earth's ecosystems	K -II
CO2	Comprehend environmental problems from multiple perspectives with emphasis on human modern lifestyles and developmental activities	K -I
CO3	Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century	K -II
CO4	Gain a higher level of personal involvement and interest in understanding and solving environmental problems.	K -II
CO5	Learn the management of environmental hazards and to mitigate disasters and have a clear understanding of environmental concerns and follow sustainable development practices	K -III
CO6	Influence their society in proper utilization of goods and services.	K -I

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	1	-	-	1	2	-	-	-	1	-	-	-
CO2	-	1	-	-	-	-	1	-	-	-	-	-	-	-
CO3	-	-	-	-	2	-	1	-	-	-	-	-	-	-
CO4	-	-	-	-	1	1	3	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	3	1	-	-	-	-	-	-

COURSE CONTENT

UNIT – I

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance-Need for public awareness.

Natural Resources:



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(Autonomous R19)
MECHANICAL ENGINEERING

Forest resources: deforestation – Mining, dams and other effects on forest and tribal people.

Water resources: Use and over utilization of surface and groundwater.

Food resources: World food problems, effects of modern agriculture, fertilizer-pesticide problems.

Energy resources: renewable and nonrenewable energy sources.

Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT-II

Ecosystems, Biodiversity and its conservation: Definition of Ecosystem and its structure, Functions

Biodiversity Definition-Value of biodiversity, India as a mega-diversity nation, Threats to biodiversity,

Conservation of biodiversity

UNIT-III

Environmental Pollution: Definition, Cause, Effects of Air pollution, Water pollution, Noise pollution, Radioactive pollution, Role of an individual in prevention of pollution.

Solid Waste Management: Sources, effects and control measures of urban and industrial waste.

UNIT-IV

Social Issues and the Environment: Air (Prevention and Control of Pollution) Act 1981. –Water (Prevention and control of Pollution) Act 1974, EPA act 1986 ,Issues involved in enforcement of environmental legislation, Rain water harvesting, Global Environmental challenges climate change and mitigations and Adaptations (Engineering technologies)

UNIT-V

Human population and the Environment:

Population growth, Women and child welfare, Role of Information technology in environment and human health Awareness to Environmental Assessment& clearance ,Audit .Environmental Governance in India

E-Waste management Rules (Biomedical Waste, Solid Waste)

Field work: A mini project related to Environmental issues / To visit a local polluted site (Submission of project by every student)

TEXT BOOKS

- | | |
|----|---|
| 1. | Environmental Studies for undergraduate courses by ErachBharucha,UGC. |
| 2. | A Textbook of Environmental Studies by Dr.S.AzeemUnnisa,Academic publishing company. |
| 3. | Environmental Studies by P.N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai |
| 4. | A Textbook EIA Notification 2006(2019) |

REFERENCE BOOKS

- | | |
|----|--|
| 1. | Text Book of Environmental Studies by Deeshita Dave & P. UdayaBhaskar, Cengage learning. |
| 2. | Glimpses of Environment by K.V.S.G. Murali Krishna Published by Environmental Protection Society, Kakinada, A.P. |
| 3. | Environmental Studies by Benny Joseph, Tata McGraw Hill Co, New Delhi |

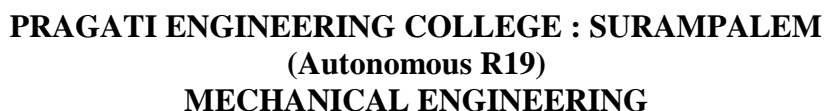
WEB RESOURCES

- | | |
|----|--|
| 1. | UNIT-1: MULTI DISPLINARY NATURE OF ENVIRONMENT and NATURAL RESOURCES
http://www.defra.gov.uk/environment/climatechange |
| 2. | UNIT-2:ECOSYSTEM, BIODIVERSITY AND ITS CONSERVATION
http://conbio.net/vl/ and www.biodiversitya-z.org/content/biodiversity |



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

3.	UNIT-3: ENVIRONMENTAL POLLUTION https://www.omicsonline.org/environment-pollution-climate-change.php and
4.	UNIT-4: Social Issues and the Environment http://www.publichealthnotes.com/solid-waste-management/
5.	UNIT-5: HUMAN POPULATION AND THE ENVIRONMENT http://IPCC.com



Numerical Methods and Multi-variable Calculus (Common to CE, ME, ECE, CSE, &IT)

Course Category	Basic Sciences	Course Code	19BM2T02
Course Type	Theory	L-T-P-C	3-0-0-3
Prerequisites	Differentiation, Integration	Internal Assessment Semester End Examination Total Marks	30 70 100

COURSE OBJECTIVES	
1	The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2	The skills derived from the course will help the student form a necessary base to develop analytic and design concepts.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		Cognitive Level
CO1	apply Newton, Gauss and Lagrange interpolation formulae to find interpolating polynomials for the given data.	K3
CO2	find the approximate roots of transcendental equations by using different numerical methods	K2
CO3	solve ordinary differential equations by using different numerical schemes	K3
CO4	Find areas and volumes using double and triple integrals	K2
CO5	apply a range of techniques to find solutions of standard PDEs	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

[illegible]



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

COURSE CONTENT	
UNIT I	Interpolation Introduction– Errors in polynomial interpolation – Finite differences – Forward differences– Backward differences –Central differences – Symbolic relations and separation of symbols – Differences of a polynomial-Newton’s formulae for interpolation –Gauss formulae for interpolation- Interpolation with unequal intervals – Lagrange’s interpolation formula.
UNIT II	Solution of Algebraic and Transcendental Equations Introduction- Bisection method – Method of false position – Secant method- Iteration method – Newton-Raphson method (One variable).
UNIT III	Numerical Integration and solution of Ordinary Differential equations Trapezoidal rule- Simpson’s 1/3rd and 3/8th rule-Solution of ordinary differential equations by Taylor’s series-Picard’s method of successive approximations-Euler’s method - Runge-Kutta method (second and fourth order).
UNIT IV	Multiple integrals Multiple integrals: Double and triple integrals – Change of variables – Change of order of integration. Applications: Finding Areas and Volumes.
UNIT V	Partial Differential Equations Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions –solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

TEXT BOOKS	
1.	B. S. Grewal , Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2.	Erwin Kreyszig , Advanced Engineering Mathematics, 10th Edition, Wiley-India
REFERENCE BOOKS	
1.	Micheael Greenberg , Advanced Engineering Mathematics, 9th edition, Pearson edn
2.	Dean G. Duffy , Advanced engineering mathematics with MATLAB, CRC Press
3.	Peter O’neil , Advanced Engineering Mathematics, Cengage Learning.
4.	Srimanta Pal, Subodh C. Bhunia , Engineering Mathematics, Oxford University Press.
5.	T.K.V. Iyengar et. al. , Engineering Mathematics Volume I & III S Chand Publications.
6.	T.Amarnath , An Elementary Course in Partial Differential Equations, Narosa Publications
WEB RESOURCES	
1.	UNIT I: Interpolation https://en.wikibooks.org/wiki/Introduction_to_Numerical_Methods/Interpolation
2.	UNIT II: Solution of Algebraic and Transcendental Equations https://en.wikibooks.org/wiki/Numerical_Methods/Equation_Solving



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

	https://www.slideshare.net/100005232690054/algebraic-and-transcendental-equations
3.	UNIT III: Numerical Integration and solution of Ordinary Differential Equations https://nptel.ac.in/courses/111107063/
4.	UNIT III: Multiple Integrals https://en.wikipedia.org/wiki/Multiple_integral http://tutorial.math.lamar.edu/Classes/CalcIII/MultipleIntegralsIntro.aspx
5.	UNIT V: Partial Differential Equations https://en.wikipedia.org/wiki/Partial_differential_equation



Integral Transforms and Vector Calculus

Course Category	Basic Sciences	Course Code	19BM2T03
Course Type	Theory	L-T-P-C	3-0-0-3
Prerequisites	NIL	Internal Assessment	30
		Semester End Examination	70
		Total Marks	100

1	The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2	The skills derived from the course will help the student form a necessary base to develop analytic and design concepts.

Upon successful completion of the course, the student will be able to:		Cognitive Level
CO1	examine the properties of Laplace transformation	K3
CO2	solve ordinary differential equations by using Laplace transformation technique	K2
CO3	expand a periodic function as a Fourier series and find Fourier transform of a given function.	K3
CO4	understand vector differential properties of scalar and vector point functions and their applications.	K2
CO5	apply Green's, Stokes and Divergence theorem to evaluate line, surface and volume integrals.	K3

[illegible]



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

COURSE CONTENT	
UNIT I	Laplace transforms: Laplace transforms of standard functions – Properties - Periodic functions - Unit step function – Dirac’s delta function.
UNIT II	Inverse Laplace transforms: Inverse Laplace transforms – Properties – Convolution theorem (without proof). Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.
UNIT III	Fourier Analysis: Introduction- Periodic functions – Dirichlet’s conditions - Fourier series of a function, even and odd functions –Change of interval – Half-range sine and cosine series. Fourier integral theorem (without proof) – Fourier sine and cosine integrals – sine and cosine transforms – Inverse transforms.
UNIT IV	Vector Differentiation: Gradient - Directional derivative - Divergence – Curl – Laplacian and second order operators – Vector identities.
UNIT V	Vector Integration: Line integral – Work done – Potential function – Area, Surface and volume integrals - Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof) and related problems.

TEXT BOOKS	
1.	B.S.Grewal , Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2.	Erwin Kreyszig , Advanced Engineering Mathematics, 10th Edition, Wiley-India
REFERENCE BOOKS	
1.	Micheael Greenberg , Advanced Engineering Mathematics, 9th edition, Pearson edn
2.	Dean G. Duffy , Advanced engineering mathematics with MATLAB, CRC Press
3.	Peter O’neil , Advanced Engineering Mathematics, Cengage Learning.
4.	Srimanta Pal, Subodh C.Bhunia , Engineering Mathematics, Oxford University Press.
5.	T.K.V. Iyengar et. al. , Engineering Mathematics Volume I & III S Chand Publications.
6.	Murray R Spiegel , Schaum's Outline of Vector Analysis, Schaum’s Outline.
7.	Shanti Narayan , Integral Calculus – Vol. 1 & II
WEB RESOURCES	
1.	UNIT I: Laplace transforms https://en.wikipedia.org/wiki/Laplace_transform https://web.stanford.edu/~boyd/ee102/laplace.pdf
2.	UNIT II: Inverse Laplace transforms https://www.intmath.com/laplace-transformation/7-inverse-laplace-transform.php



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

3.	Unit – III: Fourier Series https://www.mathsisfun.com/calculus/fourier-series.html https://lpsa.swarthmore.edu/Fourier/Xforms/FXformIntro.html
4.	UNIT IV: Vector Differentiation https://en.wikipedia.org/wiki/Vector_calculus
5.	UNIT V: Vector Integration https://en.wikipedia.org/wiki/Divergence_theorem http://tutorial.math.lamar.edu/Classes/CalcIII/StokesTheorem.aspx



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

I Year II Semester

ENGINEERING MECHANICS
(Common to CE & ME)

Course Category	Engineering Science	Course Code	19ME2T02
Course Type	Theory	L-T-P-C	3-0-0-3
Prerequisites	Exposure to Engineering Physics and Applied Mathematics	Internal Assessment Semester End Examination Total Marks	30 70 100

COURSE OBJECTIVES	
1	To study forces, free body diagrams & equations of equilibrium of coplanar systems and its applications.
2	To study Trusses, friction and its applications.
3	To learn about centroid and moments of Inertia of simple and composite figures.
4	To learn various paths of velocity and acceleration computation.
5	To study about work, energy and particle motion for engineering applications.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		Cognitive Level*
CO1	Analyze the Forces, Free Body Diagrams & Equations of Equilibrium of Coplanar Systems.	k4
CO2	Analyze the trusses, friction and its applications.	k4
CO3	Evaluate the centroid and moments of Inertia of Composite Figures.	k5
CO4	Determine the paths of velocity and acceleration computation.	k5
CO5	Adapt the concepts of work, energy and particle motion for engineering applications.	k6

*k1- Remembering, k2- Understanding, k3- Applying, k4- Analyzing, k5- Evaluating, k6- Creating



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1	-	-	-	-	-	-	-	-	-	2
CO2	3	3	3	2	-	1	-	-	-	-	-	-	-	2
CO3	3	3	3	2	-	-	-	-	-	-	-	-	-	3
CO4	3	3	3	2	-	-	-	-	-	-	-	-	-	3
CO5	2	1	1	2	-	-	-	-	-	-	-	-	-	2

COURSE CONTENT	
UNIT I	Introduction to Engineering Mechanics: Basic Concepts of mechanics, System of Forces. Resultant System of Forces: Resultant of Coplanar Concurrent Force System - Moment of a Force, Couple, Varignon's Theorem, Resultant of Coplanar Non-Concurrent Force System. Equilibrium System of Forces: Equations of Equilibrium of Coplanar Systems, Free Body Diagrams, Lami's Theorem, Equilibrium of Connected Bodies.
UNIT II	Friction: Introduction, types of friction, Coulomb's laws of dry friction, coefficient of friction, cone of friction. Trusses: Introduction, Assumptions and Equilibrium analysis of plane trusses by using method of joints.
UNIT III	Centroid: Introduction, Centroids of simple and composite sections. Centre of Gravity: Simple bodies and Composite bodies, Pappus Theorem. Moment of Inertia: Definition – Transfer Theorem, Perpendicular Theorem, Polar Moment of Inertia, Moment of Inertia of Simple and Composite Figures, mass moment of inertia of simple bodies.
UNIT IV	Kinematics: D'Alembert's Principle, Rectilinear Motion and curvilinear motion, Motion with Uniform Velocity, Motion with Uniform Acceleration. Kinetics: Analysis as a Particle and Analysis as a Rigid Body in Translation, Equations of Plane Motion – Fixed Axis Rotation.
UNIT V	Work – Energy Method: Equations for Translation, Motion of Connected Bodies Fixed Axis Rotation and Plane Motion. Impulse momentum method.



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

TEXT BOOKS

- | | |
|----------|---|
| 1 | Engineering Mechanics - S.Timoshenko, D.H.Young., 5 th Edition - , Mc Graw Hill. |
| 2 | Engineering Mechanics - S. S. Bhavikatti, K G Rajasekharappa, Revised Edition, New Age International. |

REFERENCE BOOKS

- | | |
|----------|--|
| 1 | Engineering Mechanics, N.H.Dubey, McGraw Hill, 2013. |
| 2 | Engineering Mechanics, A.K.Tayal, 14 th edition, 2 nd reprint, Umesh Publications, 2012. |
| 3 | Engineering Mechanics, R.K.Bansal, 3 rd edition, Laxmi Publications, 1996. |
| 4 | Engineering Mechanics: Statics & Dynamics, A. Nelson, Tata McGraw-Hill Education, 2009. |
| 5 | Engineering Mechanics, Ferdinand . L. Singer, Harper – Collins. |

WEB RESOURCES

- | | |
|----------|---|
| 1 | http://nptel.ac.in/courses/Webcourse-contents/IITKANPUR/engg_mechanics/ui/Course_home_3.htm |
| 2 | http://nptel.ac.in/courses/122104015/ |
| 3 | https://nptel.ac.in/courses/122104015/ |
| 4 | https://freevidelectures.com/course/2264/engineering-mechanics |
| 5 | https://nptel.ac.in/courses/112103108/3 |
| 6 | https://nptel.ac.in/courses/115104094/54 |



ENGINEERING PHYSICS
(Common to CE & ME branches)

Course Category	BASIC SCIENCES	Course Code	19BP2T01
Course Type	Theory	L-T-P-C	3 - 0 -0-3
Prerequisites	Intermediate Physics	Internal Assessment Semester End Examination Total Marks	30 70 100

COURSE OBJECTIVES	
1	Study the Crystal Structures, Properties and their relationship exhibited by Solid State materials for their utility.
2	Impart knowledge on magnetic materials with characteristic utility in appliances.
3	Simple harmonic motion and its adaptability for improved acoustic quality of concert halls- Impart concepts of flaw detection techniques using ultrasonic's.
4	Impart knowledge in basic concepts of LASERS along with its Engineering applications- Familiarize types of sensors for various engineering applications
5	Impart the knowledge of Nanomaterials, Properties, characterization Techniques and Applications

COURSE OUTCOMES		Cognitive Level
Upon successful completion of the course, the student will be able to:		
CO1	Apply the basics of crystal structures and X ray diffraction technique for material studies.	Application(K3)
CO2	Analyze the materials based on their magnetic properties and use them in possible applications.	Analysis(K3)
CO3	Analyze the factors behind acoustic defects and different ultrasonic testing techniques of materials using NDT	Analysis(K3)
CO4	Understand the basics principles of laser mechanism and Sensors for applications in engineering.	Understanding(K2)
CO5	Apply the knowledge of Nanomaterials and their properties for applications in engineering	Application(K3)

[illegible]



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

CO3	2	2	-	-	1	1	-	-	-	-	-	-	-	-
CO4	2	-	-	2	-	-	-	-	-	-	-	-	-	-
CO5	2	1	-	-	-	-	-	-	-	-	-	-	-	-

COURSE CONTENT	
UNIT I	CRYSTALLOGRAPHY & X-RAY DIFFRACTION (10 hrs) Introduction-Basis and lattice – Unit cell - Coordination number -Packing fraction -Bravais lattice-Crystal Systems – packing fractions of SC,BCC and FCC-Crystal directions and planes-Miller indices – Separation between successive (h k l) planes – Bragg’s law - Bragg’s X-ray spectrometer.
UNIT II	MAGNETIC PROPERTIES (8hrs) Introduction-Magnetic-dipole-moment-Magnetization-Magnetic susceptibility and permeability- Origin of permanent magnetic moment -Classification of Magnetic materials(Analytical) - Wiess theory – Domain theory -Hysteresis-eddy currents- soft and hard magnetic materials - applications
UNIT III	ACOUSTICS (11 hrs) Introduction – Reverberation - Reverberation time - Sabine’s formula (Jaggers’ Method using Eyrings approximation)–absorption coefficient and its determination- factors affecting acoustics of buildings and their remedies. ULTRASONICS Introduction-Production of ultrasonic’s by Magneto-striction and piezoelectric methods – Detection of ultrasonic’s- Non-Destructive Testing- pulse echo system through transmission and reflection modes - Applications.
UNIT IV	LASERS (11 hrs) Introduction-Characteristics–Spontaneous and Stimulated emission of radiation – population inversion - Pumping Mechanisms - Ruby laser – Helium Neon laser –Semiconductor laser– Applications SENSORS (Qualitative description only): Introduction-Strain and Pressure sensors-Piezoelectric-Magnetostriuctive sensors- Temperature sensor-smoke and fire detectors-Applications.
UNIT V	PHYSICS OF NANOMATERIALS (8hrs) Introduction to Basics of Nano materials, Properties - Preparation methods (Sol Gel Technique, Ball Milling) and characterization Methods Scanning tunneling Microscopy, Atomic Force Microscopy – CNTs Preparation (Arc Discharge method) and properties - Applications of NanoMaterials (CNTs).



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

TEXT BOOKS	
1	“A text book of Engineering Physics” by P G Kshirsagar& M N Avadhanulu, S Chand & Company Ltd
2	“Solid State Physics” by SO Pilai., - New age International Publishers
3	“Engineering Physics by P.K.Palanisamy, Scitech publications (New Edition 2019)
REFERENCE BOOKS	
1	“Sensor and Transducers” by Ian R Sinclair, Elsevier (Newnes) 3rd Eds
2	Kettles Introduction to Solid state Physics-Charles Kittel,Wiley India Edition
WEB RESOURCES	
1	http://youtu.be/OTDVov_kw6A https://slideplayer.com/slide/3866455/64/video/CHAPTER+3%3A+CRYSTAL+STRUCTURES+%26amp%3B+PROPERTIES.mp4 https://youtu.be/DYTcf01gdr0
2	https://nptel.ac.in/courses/113106032/15%20-%20Magnetic%20Properties.pdf
3	https://www.svce.ac.in/departments/physics/downloads/Notes/Unit-IV/UNIT%20IV%20Acoustics.pdf
4	https://youtu.be/UheTIVwukWg http://engineering.nyu.edu/gk12/amps-cbri/pdf/Intro%20to%20Sensors.pdf
5	https://nccr.iitm.ac.in/2011.pdf https://youtu.be/IFYs3XDufQ



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

CO2	3	2	2	2	-	-	-	-	-	-	-	1	1	-
CO3	3	2	2	2	-	-	-	-	-	-	-	1	1	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-	1	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-	1	-

COURSE CONTENT														
UNIT I	Electrical Circuits Basic definitions – types of network elements – Ohm’s Law – Kirchhoff’s Laws – inductive networks – capacitive networks – series – parallel circuits – star-delta and delta-star transformations.													
UNIT II	DC Machines & Transformers Constructional details and operating principle – EMF equation –DC motor – torque equation – applications - speed control methods of DC motor – Swinburne’s Test. Constructional details and operating principle of single phase transformers – EMF equation – equivalent circuit – Losses – OC & SC tests – efficiency.													
UNIT III	AC Machines Constructional details and operating principle of alternators – types –Regulation of alternator by synchronous impedance method. Principle of operation of 3-Phase squirrel cage induction motor – electromagnetic torque equation - power flow - brake test - efficiency calculation – applications.													
UNIT IV	Semiconductor Devices PN junction diodes – characteristics – half wave and full wave rectifiers - PNP and NPN junction transistor, transistor as an amplifier – transistor amplifier – frequency response of CE amplifier – concepts of feedback amplifier – SCR – MOSFET - IGBT.													
UNIT V	Operational Amplifiers Introduction to operation amplifiers (Ideal OP-AMP) – Characteristics – applications (inverting, non-inverting, integrator and differentiator).													

TEXT BOOKS	
1.	William Hayt and Jack E. Kemmerley, Engineering Circuit Analysis, Mc Graw Hill Company, 6 th Edition.
2.	Surinder Pal Bali, Electrical Technology, Vol-I, Vol-II, Pearson Publications, 1 st Edition.
3.	Basic Electrical and Electronics Engineering by M.S. Sukhija and T.K. Naga Sarkar, Oxford University Press..
4.	R.L. Boylestad and Louis Nashelsky, Electronic Devices and Circuits, PEI/PHI 2006, 9 th Edition.
REFERENCE BOOKS	
1.	John Bird, Electrical Circuit Theory and Technology, Routledge Taylor and Francis Group, 5 th Edition.
2.	M.S.Naidu and S.Kamakshiah, Basic Electrical Engineering, TMH Publications, 1 st Edition.
3.	Rajendra Prasad, Fundamentals of Electrical Engineering, PHI Publications, 2 nd edition.
4.	R. S. Sedha, A Text Book of Electronic Devices and Circuits, S.Chand & Co. 2 nd Edition
5.	David A. Bell, Electronic Devices and Circuits, Oxford University Press, 5 th Edition.



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

WEB RESOURCES (Suggested)	
1.	http://www.ncert.nic.in/html/learning_basket/electricity/electricity/machine/motor.html
2.	www.electriceasy.com
3.	www.nptel.ac.in/courses/108108076/
4.	https://nptel.ac.in/courses/122106025/



MATERIALS SCIENCE & METALLURGY
(only for ME)

Course Category	Professional Core	Course Code	19ME3T04
Course Type	Theory	L-T-P-C	3-0-0-3
Prerequisites	Exposure to Engineering Chemistry	Internal Assessment	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
1	To know the basic concepts of bonds in metals, alloys and understand the basic requirements for the formation of solid solutions and other compounds.
2	To understand the regions of stability of the phases that can occur in an alloy system in order to solve the problems in practical metallurgy.
3	To study the basic differences between cast irons, steels, non-ferrous metals and alloys, their properties and practical applications.
4	To study the affect of various alloying elements on iron-iron carbide system. To understand the various heat treatment and strengthening processes used in practical applications.
5	To study the basic concepts of composites and powder metallurgy so as to use them for practical applications.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		Cognitive Level*
CO1	Define various types of bonds and crystal structure of metals and its alloys.	k2
CO2	Construct equilibrium diagrams by studying various phases while drawing it.	k3
CO3	Make use of applications of Ferrous and Non-ferrous metals and its alloys.	k3
CO4	Analyze various heat treatment processes of alloys.	k4
CO5	Classify composites and explain powder metallurgy.	k5

*k1- Remembering, k2- Understanding, k3- Applying, k4- Analyzing, k5- Evaluating, k6- Creating

[illegible]



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

CO3	3	1	1	2	1	-	-	-	-	-	-	-	1	-
CO4	3	2	2	1	1	-	-	-	-	-	-	-	1	-
CO5	2	1	1	2	1	-	-	-	-	-	-	-	2	1

COURSE CONTENT	
UNIT I	Structure of Metals and Constitution of Alloys: Bonds in Solids – Metallic bond - crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys – determination of grain size. Types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.
UNIT II	Equilibrium Diagrams: Experimental methods of construction of equilibrium diagrams, Isomorphism alloy systems, equilibrium cooling and heating of alloys, Lever rule, eutectic systems, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule. Study of important binary phase diagrams of Cu-Ni-, Bi-Cd and Fe-Fe ₃ C.
UNIT III	Ferrous Metals and Alloys: Structure and properties of White Cast iron, Malleable Cast iron, Grey cast iron, Nodular cast iron, Alloy cast irons. Classification of steels, properties and applications of plain carbon steels. Non-ferrous Metals and Alloys: Structure and properties of copper and its alloys, Aluminum and its alloys, Titanium and its alloys.
UNIT IV	Heat treatment of Alloys: Annealing, normalizing, Hardening, TTT diagrams, tempering, Hardenability, surface - hardening methods, Age hardening treatment.
UNIT V	Powder Metallurgy: Introduction, Principle, manufacture of powders, steps involved, compaction and sintering, advantages and applications. Composite Materials: Classification of composites : particle – reinforced materials, fiber reinforced materials , metal – matrix composites and C – C composites, various methods of component manufacture of composites - Hand layup process, Filament winding process, Continuous pultrusion process.

TEXT BOOKS	
1	Introduction to Physical Metallurgy - Sidney H. Avner , McGrawHill, 2017.
2	<u>Material Science and Metallurgy for Engineers</u> by <u>V.D Kodgire and S.V Kodgire</u> 39 th Edition.
REFERENCE BOOKS	
1	Essential of Materials science and Engineering ,Pradeep P Fulay and Donald R.Askeland, Cengage publications, 2 nd Edition.
2	Materials Science and Engineering , Callister & Balasubramaniam, Wiley Publishers, 2 nd Edition.
3	Material Science for Engineering Students , Fischer , Elsevier Publishers, 1 st Edition.
4	Materials Science and Engineering V. Raghavan Prentice-Hall of India Pvt. Ltd., 5 th Edition 2004.



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

5	Material Science and Metallurgy , U. C. Jindal – Pearson Publications, 2011.
WEB RESOURCES	
1	http://nptel.ac.in/courses/113105024/7 .
2	http://nptel.ac.in/courses/112104122/12 .
3	http://nptel.ac.in/courses/113106031/17 .
4	http://nptel.ac.in/courses/113104068/36 .



ENGINEERING PHYSICS LABORATORY
(Common to CE & ME)

Course Category	BASIC SCIENCES	Course Code	19BP2T01
Course Type	Lab	L-T-P-C	0 - 0 - 3-1.5
Prerequisites	Intermediate Physics	Internal Assessment	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
1	The student will have exposure to various experimental skills which is essential for an Engineering student.
2	To gain practical knowledge by applying the experimental methods to correlate with the Theoretical Physics.
3	Apply the Analytical techniques and graphical analysis to the experimental data

COURSE OUTCOMES		Cognitive Level
Upon successful completion of the course, the student will be able to:		
CO1	Understand the basics of Mechanics, Elasticity, Diffraction using instruments like Fly wheel, Stewart Gee's, Grating	Understanding (K2)
CO2	Understand the basics of Waves and Oscillations in Physics using instruments like Volume Resonator, Sonometer.	Application(K3)
CO3	Determine the Magnetic and Dielectric constants of materials	Application(K3)

Outcomes (1 – Low, 2 - Medium, 3 – High)

[illegible]



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

COURSE CONTENT: (Any 10 of the following listed 12 experiments)	
1.	Determination of Rigidity modulus of a material- Torsional Pendulum.
2.	Determination of Young's modulus by method of single cantilever oscillations.
3.	Determination of Acceleration due to Gravity and Radius of Gyration - Compound Pendulum.
4.	Verification of laws of vibrations in stretched strings – Sonometer.
5.	Determination of ultrasonic velocity in liquid (Acoustic grating)
6.	Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus
7.	Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
8.	Determination of dielectric constant by charging and discharging method
9.	Determination of wavelength of Laser by diffraction grating
10.	Determination of particle size using Laser.
11.	Determination of Moment of Inertia of a Fly Wheel.
12.	Determination of Velocity of sound –Volume Resonator.

TEXT BOOKS	
1.	Laboratory Manual of Engineering Physics by Dr.Y.Aparna & Dr.K.Venkateswara Rao (V.G.S Publishers)
REFERENCE BOOKS	
1.	College customized manual
WEB RESOURCES	
1.	https://youtu.be/P-eJIXZimmQ
2.	https://youtu.be/iUhfstf10rk
3.	https://www.youtube.com/watch?v=BX4QPdP7fT8
4.	https://youtu.be/toggy3WVxV4
5.	https://www.youtube.com/watch?v=AYQLmFqFtlw
6.	https://www.youtube.com/watch?v=9MBE5t1Sv_w



ENGINEERING WORKSHOP (Only for ME)

Course Category	Engineering Science	Course Code	19ME2L02
Course Type	Laboratory	L-T-P-C	0-0-3-1.5
Prerequisites		Internal Assessment	30
		Semester End Examination	70
		Total Marks	100

1	To familiarize with the basic material removal/shaping processes.
2	To study the various tools and equipment used in different hands on sessions.
3	To develop a skill in dignity of labor, precision, safety at work place.

Upon successful completion of the course, the student will be able to:

CO1	Practice on manufacturing of components using workshop trades including fitting and carpentry.
CO2	Design different types of models by using workshop trades including black smithy and tin smithy.
CO3	Apply basic electrical engineering knowledge for house wiring practice.

[illegible]



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

LIST OF EXPERIMENTS	
A. Carpentry:	
1. T-Lap Joint	
2. Cross Lap Joint	
3. Dovetail Joint	
4. Mortise and Tenon Joint	
B. Fitting:	
1. V Fit	
2. Square Fit	
3. Half Round Fit	
4. Dovetail Fit	
C. Black Smithy:	
1. Round rod to Square	
2. S-Hook	
3. U- Hook	
4. Round Rod to Flat Ring	
D. House Wiring:	
1. Parallel Connection of three bulbs	
2. Series Connection of three bulbs	
3. Stair Case wiring	
4. Florescent Lamp Fitting	
E. Tin Smithy:	
1. Square Box without lid	
2. Open Scoop	
3. Taper Tray	
4. Funnel	

Note: At least two exercises to be done from each trade.



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

I Year II Semester

CONSTITUTION OF INDIA
(Common to all branches)

Course Category	Humanities including Management	Course Code	19HM2T05
Course Type	Theory	L-T-P-C	2 -0 -0-0
Prerequisites		Internal Assessment	0
		Semester End Examination	0
		Total Marks	0

Course Outcomes		Blooms Taxonomy Level
On successful completion of the course, the student will be able to		
CO 1	Understand the evolution of Constitution of India	Understanding
CO 2	Make use of their Fundamental rights.	Application
CO 3	Understand the functioning of the Union Government	Understanding
CO 4	Understand the functioning of the State and local self Government.	Understanding
CO 5	Understand the value of Indian Constitution in functioning of the country.	Understanding

Contribution of Course Outcomes towards achievement of Program														
Outcomes: 1 – Low, 2 - Medium, 3 – High														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	3	-	3	-	1	-	2	-	-
CO2	-	-	-	-	-	1	-	2	1	1	-	1	-	-
CO3	-	-	-	-	-	1	-	1	1	1	-	-	-	-
CO4	-	-	-	-	-	1	-	1	1	1	-	-	-	-
CO5	-	-	-	-	-	1	1	1	1	1	-	2	-	-

Course Content :

Unit – I

Introduction to Indian constitution: Meaning of the term constitution - History and development – Preamble of the Constitution – Constituent Assembly – The salient features of Indian Constitution.

Unit –II

Fundamental Rights and Directive principles of state policy: Individual and Collective Rights – Limitations of the fundamental Rights – Judicial Interpretation of Fundamental Rights.

Unit –III

Union Government: Union Legislature – Lok sabha and Rajya sabha (powers and functions) – President of India (powers and functions) – Prime minister of India (powers and functions) – Union Judiciary (supreme court powers and functions).

Unit – IV State and Local self Government:

State Government: State Legislature (Legislative Assembly / Vidhan Sabha, Legislative Council / Vidhan



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

Parishad) – Powers and functions of state legislature – The Chief Minister of the state (powers and functions)

Local Self Government: Election commission of India (Powers and Functions)- The Union Public Service Commission (Powers and Functions)

Unit – V Working of the Indian Constitution

The values of the Indian Constitution and Ushering of Social Revolution in India – Nature and Role of Higher Judiciary in India – Amendments (Recent)

Reference Books :

1. 'Indian Polity' by Laxmikanth
2. 'Indian Administration' by Subhash Kashyap
3. 'Indian Constitution' by D.D. Basu
4. 'Indian Administration' by Avasti and Avasti

Web Resources:

1. <https://www.clearias.com/historical-background-of-indian-constitution/>
2. <https://www.civilserviceindia.com/subject/General-Studies/notes/functions-and-responsibilities-of-the-union-and-the-states.html>
3. https://www.tutorialspoint.com/indian_polity/indian_polity_how_constitution_works



Complex Variables & Statistical Methods (For ME only)

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		Cognitive Level
CO1	Discuss the continuity, differentiability and analyticity	K3
CO2	Evaluate the integrals over a domain, Taylor and Laurent expansions of simple functions, determining the nature of the singularities and calculating residues	K2
CO3	Find the confidence intervals for a statistic from the given population	K3
CO4	Apply the concept of hypothesis testing to real world problems (large samples)	K2
CO5	Apply the concept of hypothesis testing to real world problems (small samples)	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

[illegible]



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

COURSE CONTENT	
UNIT I	Functions of a complex variable: Introduction – Continuity – Differentiability – Analyticity – Properties – Cauchy-Riemann equations in Cartesian and polar coordinates. Harmonic and conjugate harmonic functions – Milne – Thompson method.
UNIT II	Complex Integration and Power Series: Line integral – Cauchy’s integral theorem, Cauchy’s integral formula, Generalized integral formula (all without proofs)- Radius of convergence – Expansion in Taylor’s series, Maclaurin’s series and Laurent series – Residue theorem
UNIT III	Sampling Distributions: Review of Normal distribution – Population and samples – Sampling distribution of mean (with known and unknown variance), proportion, variances – Sampling distribution of sums and differences -Point and interval estimators for means, variances, proportions.
UNIT IV	Tests of Hypothesis (Large Samples): Type I and Type II errors -Maximum error- One tail, two-tail tests – Tests concerning one mean and proportion, two means- Proportions and their differences using Z-test.
UNIT V	Tests of Hypothesis (Small Samples): Tests concerning one mean and proportion, two means- Proportions and their differences using Student’s t-test – F-test and Chi -square test.

TEXT BOOKS	
1.	Probability and Statistics for Engineers: Miller and John E. Freund, Prentice Hall of India.
2.	Murugesan.K, Probability and Statistics & Random processes, Anuradha Publications
REFERENCE BOOKS	
1.	T.K.V. Iyengar et. al., Probability and Statistics, S Chand Publications.
2.	Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
3.	B.S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
4.	Jay L. Devore, Probability and Statistics for Engineering and Sciences, 8 th Edition, Cengage Learning. ISBN 13: 978-81-315-1839-7.
5.	Ronald E. Walpole, Sharon L. Mayers and Keying Ye, Probability and statistics for Engineers and Scientists, Pearson.
WEB RESOURCES	
1.	UNIT I: Functions of a complex variable https://en.wikipedia.org/wiki/Complex_analysis
2.	UNIT II: Integration and Series Expansions:



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

	https://en.wikipedia.org/wiki/Contour_integration http://mathonline.wikidot.com/complex-power-series
3.	UNIT III: Sampling Theory https://en.wikipedia.org/wiki/Normal_distribution https://en.wikipedia.org/wiki/Sampling_(statistics) https://nptel.ac.in/courses/111104073/
4.	UNIT IV: Tests of Hypothesis (Large Samples) https://en.wikipedia.org/wiki/Statistical_hypothesis_testing
5.	UNIT V: Tests of Hypothesis (Small Samples) https://machinelearningmastery.com/statistical-hypothesis-tests/



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

II Year I Semester

MECHANICS OF SOLIDS
(Only for ME)

Course Category	Professional Core	Course Code	19ME3T05
Course Type	Theory	L-T-P-C	3-0-0-3
Prerequisites	Exposure to Engineering Mechanics	Internal Assessment Semester End Examination Total Marks	30 70 100

COURSE OBJECTIVES	
1	To study the various types of stresses and strains subjected to axial loading and understand the strain energy concepts.
2	To study different beams, draw the shear force, bending moment diagrams and correlate the shear force, bending moment and rate of loading.
3	To study the bending and shear stresses on various cross sections of the beam.
4	To determine slope, deflection at any point on the determinate beams using various methods and stresses due to torsion.
5	To calculate stresses developed in thin and thick cylinders subjected to internal pressure.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		Cognitive Level*
CO1	Explain various types of stresses due to axial loading and the concept of strain energy.	k2
CO2	Develop shear force and bending moment diagrams for determinate beams subjected to different types of loads .	k3
CO3	Analyze the bending and shear stresses on different cross sections of the beams.	k4
CO4	Examine the slope and deflection of the beam by various methods subjected to point load, UDL, and uniformly varying loads and stresses due to torsion.	k4
CO5	Determine the stresses in thin and thick cylinders subjected to internal pressure.	k5

*k1- Remembering, k2- Understanding, k3- Applying, k4- Analyzing, k5- Evaluating, k6- Creating



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	1	1	-	-	-	-	-	-	1	1
CO2	3	3	2	2	1	1	-	-	-	-	-	-	1	1
CO3	3	3	2	2	1	1	-	-	-	-	-	-	1	1
CO4	3	3	2	2	1	1	-	-	-	-	-	-	1	1
CO5	3	3	2	2	1	1	-	-	-	-	-	-	1	1

COURSE CONTENT

UNIT I	Simple Stresses & Strains: Types of stresses & strains – Hooke’s law – stress – strain diagram for ductile and brittle materials – Factor of safety – Poisson’s ratio & volumetric strain – Relation between elastic constants - Bars of varying section – composite bars – Temperature stresses - Stresses on an inclined plane under different uniaxial and biaxial stress conditions - Principal planes and principal stresses (both analytical and graphical methods). Strain energy – Resilience – Gradual, sudden, impact and shock loadings.
UNIT II	Shear Force and Bending Moment: Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, U.D.L, uniformly varying loads and combination of these loads – Point of contraflexure – Relation between S.F., B.M and rate of loading at a section of a beam.
UNIT III	Flexural Stresses: Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$, Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections. Shear Stresses: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle sections.
UNIT IV	Deflection of Beams: Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay’s methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L uniformly varying load. Torsion: Introduction – Derivation of torsion equation - Torsion of Circular shafts - Stresses and strains in pure Shear.
UNIT V	Thin & Thick Cylinders: Thin cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in diameter, and volume of thin cylinders. Thick cylinders – Lamé’s equation – cylinders subjected to inside & outside pressures.



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

TEXT BOOKS	
1	Mechanics of Materials, Ferdinand P Beer, Johnston, Dewolf and Mazurek, 7 th Edition, Mc Graw Hill.
2	Strength of Materials, S. Ramamrutham, Dhanpat Rai and Co. Publications, 18 th Edition.
REFERENCE BOOKS	
1	Strength of Materials, U.C. Jindal, Umesh Publications, 1 st Edition.
2	Strength of Materials, D S Prakash Rao, Volume 1, University Press.
3	Strength of Materials, R.K.Bansal, Laxmi Publications, 4 th Edition.
4	Strength of Materials, Andrew Pytel and Ferdinond L. Singer Longman, 4 th Edition.
5	Mechanics of Materials, Gere & Timoshenko, CBS Publications, 2 nd Edition.
WEB RESOURCES	
1	http://nptel.ac.in/courses/112107147/1
2	http://nptel.ac.in/courses/112107147/7
3	http://nptel.ac.in/courses/112107147/23
4	http://nptel.ac.in/courses/105106116/
5	https://en.wikipedia.org/wiki/Strength_of_materials



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

II Year I Semester

THERMODYNAMICS
(Only for ME)

Course Category	Professional Core	Course Code	19ME3T06
Course Type	Theory	L-T-P-C	3-0-0-3
Prerequisites	Exposure to Engineering Physics	Internal Assessment Semester End Examination Total Marks	30 70 100

COURSE OBJECTIVES	
1	To understand the basic concepts like thermodynamic system, its boundary and related fundamental definitions.
2	To learn the first law for different thermodynamic systems and apply steady flow energy equation for various mechanical components.
3	To understand the second law statements and the associated terms to apply the principles to heat engines.
4	To understand the process of steam formation and its representation on property diagrams with various phase changes.
5	To understand the concept of air standard cycles and calculate the efficiency.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		Cognitive Level*
CO1	Illustrate basic concepts of thermodynamics and thermometry.	k2
CO2	Apply first law of thermodynamics for different thermodynamic systems.	k3
CO3	Analyze various concepts associated with second and third laws of thermodynamics.	k4
CO4	Analyze the mixture of perfect gases using property diagram with the use of steam tables and charts.	k4
CO5	Determine the efficiency of various air standard cycles.	k5

*k1- Remembering, k2- Understanding, k3- Applying, k4- Analyzing, k5- Evaluating, k6- Creating



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	-	1	1	-	-	-	-	-	2	-
CO2	2	2	2	2	-	1	1	-	-	-	-	-	2	-
CO3	2	2	2	2	-	-	-	-	-	-	1	1	2	-
CO4	1	2	2	1	-	-	-	-	-	-	-	1	2	-
CO5	2	2	2	2	-	-	-	1	-	-	-	2	2	-

COURSE CONTENT

UNIT I	Introduction: Basic Concepts: System, Boundary, Surrounding, Control Volume, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, reversibility and Irreversibility, Cycle –Quasi – static Process, Energy in State and in Transition, Types, Work and Heat, Point and Path function. Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry –Reference Points – Const. Volume gas thermometer.
UNIT II	First law of Thermodynamics: Joule’s Experiment – Corollaries – First law applied to a Process – applied to a flow system– PMM-I, Limitations of first law, Steady Flow Energy Equation. Throttling and free expansion processes –Ideal Gas Equations, deviations from perfect gas model – Vander Waals equation of state.
UNIT III	Thermal Reservoir, Heat Engine, Refrigeration and Heat pump, Parameters of performance. Second Law of Thermodynamics: Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM-II, Carnot’s principle, Carnot cycle and its specialties. Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Causes of irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations, Joule Thompson coefficient – Elementary Treatment of the Third Law of Thermodynamics.
UNIT IV	Pure Substances: P-V-T- surfaces, T-S and h-s diagrams, Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction – Mollier charts – Various Thermodynamic processes and energy Transfer- Mixtures of perfect Gases – Mole Fraction, Mass fraction Gravimetric and volumetric Analysis – Dalton’s Law of partial pressure, Avogadro’s Laws of additive volumes.
UNIT V	Power Cycles : Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericsson Cycle, Brayton Cycle, Lenoir Cycle – Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – comparison of Cycles.

Note: Use of steam tables and Mollier Chart is allowed



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

TEXT BOOKS	
1	Thermodynamics: An Engineering Approach, Yunus A Cengel, Michael A Boles, McGraw-Hill, 9 th Edition.
2	Engineering Thermodynamics by PK Nag, McGrawHill Publisher, 6 th Edition.
REFERENCE BOOKS	
1	Thermodynamics, J.P.Holman, McGrawHill, 4th Edition 1988.
2	Fundamentals of Thermodynamics, G.J.Van Wylen & Richard E Sonntag, Claus Borgnakke, Wiley Publications, 6 th Edition 2003.
3	An Introduction to Thermodynamics, Y.V.C.Rao – Universities press, 2004.
4	An Text Book of Engineering Thermodynamics, R K Rajput, Laxmi publications Ltd.,
5	Fundamentals of Engineering Thermodynamics, Volume 1, Michael - J.Moran, Howard N. Shapiro, Wiley Global Education, 7 th Edition 2010.
WEB RESOURCES	
1	http://nptel.ac.in/courses/112105123/1
2	http://nptel.ac.in/courses/Webcourse contents/IITKANPUR/Basic Thermodynamics/ui/TOC.html
3	http://www.nptelvideos.in/2012/12/basic-thermodynamics.html



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

II Year I Semester

FLUID MECHANICS & HYDRAULIC MACHINERY
(only for ME)

Course Category	Professional Core	Course Code	19ME3T07
Course Type	Theory	L-T-P-C	3-0-0-3
Prerequisites	Exposure to Engineering Mechanics & Basic Mathematics	Internal Assessment Semester End Examination Total Marks	30 70 100

COURSE OBJECTIVES	
1	To study different fluid properties and Manometers.
2	To learn about the different types of fluid flows, flow patterns, forces behind the flow, energy equation, Momentum equation and also to find the losses occurs in flow through the pipes.
3	To study the concept of boundary layer theory and hydrodynamic forces acting on vanes along with their performance evaluation.
4	To study different types of hydraulic turbines, draft tube theory, efficiency, governing and performance characteristics.
5	To study types of Pumps, work done, efficiency, performance of pumps & characteristic curves.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		Cognitive Level*
CO1	Define different fluid properties and also acquire knowledge on buoyancy and flotation.	k1
CO2	Classify the fluid flows, forces behind the flow and derive governing equations and losses in pipes.	k2
CO3	Make use of laminar and turbulent boundary layer concepts and analyze hydro dynamic forces on different vanes.	k3
CO4	Categorize various hydraulic turbines and evaluate their performance.	k4
CO5	Categorize various pumps and evaluate their performance.	k4

*k1- Remembering, k2- Understanding, k3- Applying, k4- Analyzing, k5- Evaluating, k6- Creating



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	-	-	-	-	-	-	-	-	-	1	1	-
CO2	3	3	3	3	-	-	-	-	-	-	-	1	-	1
CO3	3	3	1	-	-	2	2	-	-	-	-	3	1	-
CO4	3	3	1	-	-	2	2	-	-	-	-	3	-	2
CO5	3	3	1	-	-	2	2	-	-	-	-	3	-	2

COURSE CONTENT	
UNIT I	Fluid Statics: Physical properties of fluids- specific gravity, viscosity and surface tension - vapour pressure and their influence on fluid motion- gauge and vacuum pressure – measurement of pressure- Piezometer, U-tube and differential manometers.
UNIT II	Fluid Kinematics: Fluid flow patterns, Classification of Flows-Steady & Un-Steady, Uniform and Non- Uniform, Laminar, Turbulent, Rotational and Irrotational Flows-Equation of Continuity for One Dimensional Flows. Fluid Dynamics: Surface and Body Forces-Euler's Equation, Bernoulli's Equations for Flow along a Stream Line, Momentum Equation and Its Application on Force on Pipe Bend. Reynolds Experiment, Darcy's - Weisbach Equation-Minor Losses in Pipes, Pipes in Series, Parallel-Total Energy Line-Hydraulic Gradient Line, Measurement of Flow - Venturimeter, Orificemeter and Pitot Tube.
UNIT III	Boundary Layer Theory: Couette flow for one plate moving and another at rest - Laminar & Turbulent Boundary Layer, Boundary Layer Thickness, Displacement Thickness, Energy Thickness, Momentum Thickness, Separation of Boundary Layer, Buckingham π Theorem. Impact of Jets: Hydro dynamic forces of Jets on Stationary and moving flat, Inclined, Curved vanes, Jet striking centrally and a tip for Symmetrically and Un-symmetrically vanes, Velocity diagrams, work done and efficiency, Flow over radial vanes.
UNIT IV	Hydraulic Turbines: Classification of turbines, impulse and reaction turbines- Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies , hydraulic design –draft tube theory- functions and efficiency. Performance of Hydraulic Turbines: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer.
UNIT V	Centrifugal Pumps: Classification, working, work done – manometric head- losses and efficiencies specific speed- pumps in series and parallel - performance characteristic curves, NPSH. Reciprocating Pumps: Working, Discharge, slip, indicator diagrams.



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

TEXT BOOKS	
1	Fluid Mechanics- Fundamentals and Applications, Y.A.Cengel & J.M.Cimbala, Tata McGrawhill, 2008.
2	Fluid Mechanics and Hydraulic Machines, R. K. Bansal, Lakshmi Publications, 9 th Edition.
REFERENCE BOOKS	
1	Fluid Mechanics, F.M.White, Tata Mc Graw Hill, 3rd Edition.
2	Hydraulics and Fluid Mechanics including Hydraulics Machines, P. N. Modi, S. M. Seth, Standard Book House Publishers, 14 th Edition.
3	Fluid Mechanics and Fluid Power Engineering, D.S.Kumar, S.K. Kataria & Sons Publications.
4	Engineering Fluid Mechanics K L Kumar, Eurasia Publishing House.
5	Fluid Mechanics: Including Hydraulic Machines, A.K.Jain, Khanna Publications, 12 th Edition.
WEB RESOURCES	
1	http://nptel.iitm.ac.in/courses
2	http://nptel.iitm.ac.in/courses/105101082/;
3	http://nptel.iitm.ac.in/courses/105101082/;
4	http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv078Page1.htm
5	http://www.learnerstv.com/video/Free-video-Lecture-2630-Engineering.htm
6	http://www.learnerstv.com/video/Free-video-Lecture-2654-Engineering.htm
7	http://ga.water.usgs.gov/edu/hyhowworks.html



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

II Year I Semester

PRODUCTION TECHNOLOGY
(Only for ME)

Course Category	Professional Core	Course Code	19ME3T08
Course Type	Theory	L-T-P-C	3-0-0-3
Prerequisites	Exposure to Engineering Workshop Laboratory	Internal Assessment Semester End Examination Total Marks	30 70 100

COURSE OBJECTIVES	
1	To understand fundamentals of casting concepts.
2	To provide insight into sand casting and introduce other casting processes.
3	To impart knowledge on different welding processes.
4	To understand about the importance of rolling, forging and sheet metal operations.
5	To learn the basics of plastic and ceramics processing.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		Cognitive Level*
CO1	Explain the working principle of different metal casting processes and gating system.	k2
CO2	Illustrate preparation of moulds as per casting design considerations to minimize defects.	k2
CO3	Explain the different welding processes for joining the parts to fabricate the final product.	k2
CO4	Identify different metal forming processes and their application in real time.	k3
CO5	Distinguish the plastics, ceramics to produce the required parts.	k4

*k1- Remembering, k2- Understanding, k3- Applying, k4- Analyzing, k5- Evaluating, k6- Creating



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	1	-	1	-	-	-	-	-	-	1	2
CO2	2	2	1	1	1	-	-	-	-	-	-	-	2	-
CO3	3	2	1	1	1	1	-	-	-	-	-	-	1	-
CO4	3	2	2	2	2	1	-	-	-	-	-	-	1	-
CO5	2	1	2	2	2	1	-	-	-	-	-	-	2	1

COURSE CONTENT

UNIT I	<p>Introduction: Importance and Classification of manufacturing processes.</p> <p>Casting Processes: Steps involved in making a casting, Advantage of casting and its applications.</p> <p>Pattern: Types, materials used for pattern and allowance.</p> <p>Cores: Types of cores, core prints, principles and design of gating system, Gating ratio.</p>
UNIT II	<p>Melting and Casting Processes: Methods of melting and types of furnaces, Solidification of castings, Risers- Types, function and design, casting design considerations, basic principles and applications of Shell casting, investment casting, die casting, centrifugal casting, casting defects and remedies.</p>
UNIT III	<p>Welding Processes: Classification of welding processes, types of welds and welded joints, weld bead geometry.</p> <p>Fusion welding: Basic principles of Arc welding and It's Types, Gas welding, Types of flames, Oxy – Acetylene Gas cutting, Thermit welding, Electron Beam welding, Laser beam welding. -Applications, advantages and disadvantages.</p> <p>Pressure welding: Resistance welding- Spot welding, seam welding, butt welding, projection welding; Solid State welding- Forge welding, Friction welding, Friction stir welding, Explosive welding; Heat affected zones in welding; Welding defects: causes and remedies. Soldering and brazing.</p>
UNIT IV	<p>Sheet Metal Forming: Introduction, nature of plastic deformation, hot and cold working of metals; Sheet metal working operations: Blanking, piercing, bending, stamping. Spring back and its remedies. Coining, Spinning, types of presses and press tools.</p> <p>Rolling: Principle, types of rolling mill and products, roll passes, forces in rolling and power requirements.</p> <p>Extrusion: Basic extrusion process and its characteristics, hot extrusion and cold extrusion, wire drawing, tube drawing.</p> <p>Forging: Principles of forging, tools and dies. Types: Smith forging, drop forging, forging hammers, rotary forging and forging defects.</p>
UNIT V	<p>Plastics: Types, properties and their applications, processing of plastics, extrusion of plastics, transfer molding and compression molding, injection molding, thermoforming, rotational molding and blow molding.</p> <p>Ceramics: Classification of ceramic materials, properties and their application, ceramic powder preparation; Processing of ceramic parts: Pressing, casting, sintering; secondary processing of ceramics: Coatings, finishing.</p>



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

TEXT BOOKS	
1	Manufacturing Technology – Volume I, P.N.Rao 5 th Edition, McGraw-Hill Education.
2	Fundamentals of Modern Manufacturing: Materials, Processes and Systems, Mikell P. Groover, John Wiley and Sons Inc, 4 th Edition.
REFERENCE BOOKS	
1	Manufacturing Engineering and Technology, Kalpak Jain S and Schmid S.R. Pearson, 8 th Edition.
2	Manufacturing processes, Amitabha ghosh and Malik, East west press, 2 nd Edition.
3	Production Technology, P.C.Sharma ,S Chand Publishing, 8 th Edition.
4	Process and Material of Manufacture ,Roy A Lindberg , PHI, 4 th Edition.
5	Production Engineering-K.C. Jain, A.K. Chitale , PHI, 2 nd Edition.
WEB RESOURCES	
1	http://nptel.ac.in/courses/112107145/4
2	http://nptel.ac.in/courses/112107145/5
3	http://nptel.ac.in/courses/112107145/7
4	http://nptel.ac.in/courses/112107145/23#
5	https://onlinecourses.nptel.ac.in/noc19_me52
6	https://swayam.gov.in/nd1_noc19_mm19
7	https://onlinecourses.nptel.ac.in/noc19_me52/course



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

I Year II Semester

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB
(for ME only)

Course Category	Lab Course	Course Code	19EE3L02
Course Type	Laboratory	L-T-P-C	0-0-3-1.5
Prerequisites	Basic Electrical & Electronics Engineering	Internal Assessment	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES

1	To determine the voltage, current and power in star and delta connected loads.
2	To predetermine the efficiency of dc shunt machine using Swinburne's test.
3	To predetermine the efficiency and regulation of 1-phase transformer with O.C and S.C tests.
4	To obtain performance characteristics of DC shunt generator & 3-phase induction motor.
5	To find out regulation of an alternator with synchronous impedance method.
6	To control speed of dc shunt motor using Armature voltage and Field flux control methods.
7	To find out the characteristics of PN junction diode & transistor.
8	To determine the ripple factor of half wave & full wave rectifiers.
9	To find out the band width of transistor CE amplifier.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:		Cognitive Level
CO1	Determine the voltage, current and power in star and delta connected loads.	Evaluating
CO2	Compute the efficiency of DC shunt machine without actual loading of the machine.	Applying
CO3	Estimate the efficiency and regulation at different load conditions and power factors for single phase transformer with OC and SC tests.	Evaluating
CO4	Analyze the performance characteristics to determine critical speed and resistance of DC shunt generator & efficiency of 3-Phase induction motor.	Analyzing
CO5	Pre-determine the regulation of an alternator by synchronous impedance method.	Evaluating
CO6	Control the speed of dc shunt motor using Armature voltage and Field flux control methods.	Applying



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

CO7	Draw the characteristics of PN junction diode & transistor.	Understanding
CO8	Determine the ripple factor of half wave & full wave rectifiers.	Evaluating
CO9	Analyze the frequency response of to find the bandwidth of CE amplifier.	Analyzing

Contribution of Course Outcomes towards achievement of Program

Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	0	1	0	0	0	0	2	0	0	1	0	0
CO2	2	2	1	1	0	0	0	0	2	0	0	1	1	1
CO3	2	2	1	1	0	0	0	0	2	0	0	1	0	0
CO4	2	2	1	1	0	0	0	0	2	0	0	1	1	1
CO5	2	2	1	1	0	0	0	0	2	0	0	1	0	0
CO6	2	1	1	1	0	0	0	0	2	0	0	1	0	0
CO7	2	2	0	1	0	0	0	0	2	0	0	1	0	0
CO8	2	0	0	1	0	0	0	0	2	0	0	1	0	0
CO9	2	1	0	1	0	0	0	0	2	0	0	1	0	0

LIST OF EXPERIMENTS:

Section A: Electrical Engineering(Any 6 of the following experiments are to be conducted)

Experiment 1	Measurement of voltage, current and Power in Star and Delta Connected loads.
Experiment 2	Magnetization characteristics of DC Shunt Generator.
Experiment 3	Swinburne's test on D.C. Shunt machine (predetermination of efficiency of a given D.C. shunt machine working as motor and generator).
Experiment 4	Speed control of D.C. Shunt motor by a) Armature Voltage control b) Field control method.
Experiment 5	OC and SC tests on single phase transformer (predetermination of efficiency and regulation at given power factors).
Experiment 6	Load Test on Single Phase Transformer.
Experiment 7	Brake test on 3-phase Induction motor (determination of performance characteristics)
Experiment 8	Regulation of alternator by Synchronous impedance method.

Section B: Basic Electronics(Any 4 of the following experiments are to be conducted)

Experiment 1	PN junction diode characteristics a) Forward bias b) Reverse bias
Experiment 2	Transistor CE characteristics (input and output)
Experiment 3	Half wave rectifier with and without filters.
Experiment 4	Full wave rectifier with and without filters.



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

Experiment 5	CE amplifiers.
Experiment 6	OP- amp applications (integrator and differentiator).

References – Lab Manuals will be provided



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

II Year I Semester

COMPUTER AIDED ENGINEERING DRAWING PRACTICE
(only for ME)

Course Category	Professional Core	Course Code	19ME2L03
Course Type	Laboratory	L-T-P-C	1-0-4-3
Prerequisites	Exposure to Engineering Drawing	Internal Assessment	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
1	To enhance the skills in drawing of projections of solids.
2	To impart the knowledge of sectioning and development of surfaces of solids.
3	To learn the Interpenetration of solids and also methods of Perspective views.
4	To introduce various commands in AutoCAD and to create 2D wire frame models.
5	To create 3D wire frame models and geometrical model of simple solids and machine parts.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		Cognitive Level*
CO1	Draw the auxiliary projections of the various types of solids.	k3
CO2	Develop the sections of solids.	k6
CO3	Create perspective views of a given 3D object/part.	k6
CO4	Understand the AutoCAD commands.	k2
CO5	Create 3D views using AutoCAD.	k6

*k1- Remembering, k2- Understanding, k3- Applying, k4- Analyzing, k5- Evaluating, k6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	-	-	-	-	1	2	-	3	-	3
CO2	3	2	2	-	-	-	-	-	1	2	-	3	-	3
CO3	3	2	2	-	-	-	-	-	1	2	-	3	-	3



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

CO4	3	2	2	-	3	-	-	-	1	2	-	3	-	3
CO5	3	2	2	-	3	-	-	-	1	2	-	3	-	3

COURSE CONTENT	
UNIT I	Projections of Solids: Projections of Regular Solids - Auxiliary Views.
UNIT II	Sections of Solids: Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views. Development of Solids: Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid, Cone and their parts.
UNIT III	Interpenetration of Right Regular Solids: Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone, Prism Vs Cone. Perspective Projections: Perspective View: Points, Lines, Plane Figures and Simple Solids, Vanishing Point Methods (General Method only).
UNIT IV	Introduction to Computer Aided Drafting: Generation of points, lines, curves, polygons, dimensioning. Types of modelling: object selection commands – edit, zoom, hatching, layers, pattern filling, utility commands, 2D wire frame modelling and other commands like view points and view ports, examples to exercise different options like save, restore, delete, joint, single option.
UNIT V	Computer Aided Solid Modelling: Isometric projections, orthographic projections of isometric projections, perspective views, modelling of simple solids, 3D wire frame modelling, Boolean operations.

TEXT BOOKS	
1	Engineering Graphics, K.C. John, PHI Publications, 2009
2	Engineering Drawing by N.D Bhatt, Charotar Publications, 53 rd Edition.
REFERENCE BOOKS	
1	Engineering Graphics using AutoCad, T Jeyapoovan, Vikas Publications, 7 th Edition.
2	Engineering Drawing and Graphics+Auto CAD, K Venugopal, New age international publications, 4 th Edition.
3	Engineering Drawing, RK Dhawan, S.Chand Publications, Revised Edition.
4	Engineering Drawing ,KL Narayana,Scitech Publications, 2013
5	Engineering Drawing – Basant Agarwal and C.M. Agarwal, Mc Graw Hill Education, 2 nd Edition.



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

II Year I Semester

METALLURGY & MECHANICS OF SOLIDS LABORATORY
(Only for ME)

Course Category	Professional Core	Course Code	19ME3L05
Course Type	Laboratory	L-T-P-C	0-0-3-1.5
Prerequisites	Exposure to Metallurgy & Mechanics Of Solids	Internal Assessment Semester End Examination Total Marks	30 70 100

COURSE OBJECTIVES	
1	To impart practical exposure on the micro-structures of various materials and their hardness evaluation.
2	To study the behavior of materials under tension, compression, torsion, bending, shear and impact.
3	To study the behavior of springs under tension and compression.

COURSE OUTCOMES	
Upon successful completion of the course, the student will be able to:	
CO1	Understand and differentiate microstructures of ferrous & non-ferrous alloys.
CO2	Determine Young's modulus of elasticity of bars, beams and springs subjected to various loads.
CO3	Analyze deflection and strength of springs.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	3	-	-	-	-	-	-	-	-	3	-
CO2	3	3	-	2	-	-	-	-	-	-	-	-	3	-
CO3	2	-	-	-	2	-	-	-	3	-	2	3	3	-



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

LIST OF EXPERIMENTS

A. Metallurgy:

1. Preparation and study of the Microstructure of Al.
2. Preparation and study of the Microstructure of Cu.
3. Preparation and Study of the Microstructure of Gray Cast-iron.
4. Preparation and Study of the Microstructure of Stainless steel.
5. Preparation and Study of the Microstructure of Brass.
6. Preparation and Study of the Microstructure Malleable Cast Iron.
7. To find the hardness of ferrous/ Non-ferrous materials.

B. Mechanics of Solids:

1. Direct Tension test on Universal Testing Machine (UTM).
2. Compression Test on wood on Universal Testing Machine (UTM).
3. (a) Bending test on simply supported beam.
(i) Mild steel. (ii) Wood.
(b) Bending test on cantilever beam made of Mild Steel/Aluminum/Brass/Stainless steel.
4. Torsion test.
5. Hardness test.
(a) Brinell's hardness test.
(b) Rockwell hardness test.
6. Test on springs.
(a) Tension.
(b) Compression.
7. Impact test.
(a) Charpy.
(b) Izod.

Additional Experiments:

1. Double shear test on Universal testing machine.
2. Punch shear test.

Note: Any 6 experiments from each section A and B



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

II Year I Semester

PROFESSIONAL ETHICS AND HUMAN VALUES
(Common to all branches)

Course Category	Humanities including Management	Course Code	19HM3T07
Course Type	Theory	L-T-P-C	2 -0 -0-0
Prerequisites		Internal Assessment	0
		Semester End Examination	0
		Total Marks	0

Course Outcomes		Blooms Taxonomy Level
On successful completion of the course, the student will be able to		
CO 1	Understand different concepts in Professional Ethics and Human Values.	Understanding
CO 2	Apply ethical principles to resolve the problems that arise in work place.	Applying
CO 3	Make use of Engineers rights to fulfill their responsibilities.	Applying
CO 4	Understand the responsibility of an engineer in designing safety.	Understanding
CO 5	Analyze the social media accounts in order to create and maintain a positive digital footprint.	Analyzing

Contribution of Course Outcomes towards achievement of Program														
Outcomes: 1 – Low, 2 - Medium, 3 – High														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	2	-	-	3	2	3	-	2	-	1	-	-
CO2	-	-	2	-	-	2	2	3	-	1	-	2	-	-
CO3	-	-	2	-	-	3	2	3	-	2	-	1	-	-
CO4	-	-	2	-	-	3	2	3	-	2	-	1	-	-
CO5	-	-	2	-	-	2	2	3	-	1	-	1	-	-

Course Content:

UNIT - I

Professional Ethics and Human values:

Ethics -History of Ethics-Types of Ethics, Professional Ethics and its forms - Morals, Values – Integrity – Civic Virtue –Respect for others – Living Peacefully – Caring – Sharing – Honesty –Courage – Value time –Co-operation – Loyalty- Collegiality-Commitment – Empathy – Self-confidence – Spirituality- Character.



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

UNIT - II

Engineering & Organization Ethics:

Engineering Ethics-Meaning & Purpose of Engineering Ethics- Consensus and Controversy –Work Place Ethics and Business Ethics –Ethics in HRM, Finance & Marketing – Ethical Theories-Meaning & Uses of Ethical Theories-Theories of moral Development-Kohlberg's Theory – Gilligan's Argument –Heinz's Dilemma.

UNIT - III

Engineers Responsibilities and Rights:

Key Characteristics of Engineering Professionals – Professional Roles to be played by an Engineer - Ethical egoism-Collective bargaining-Confidentiality- Acceptance of Bribes/Gifts when is a Gift and a Bribe-examples of Gifts v/s Bribes-Whistle Blowing and its types-when should it be attempted-preventing whistle blowing.

UNIT - IV

Engineers' Responsibility for Safety and Risk:

Concept of Safety-Types of Safety, Risk-Types of Risks, Voluntary v/s Involuntary Risk- Short term v/s Long term Consequences- Expected Probability- Reversible Effects- Threshold Levels for Risk- Delayed v/s Immediate Risk- Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.

UNIT - V

Ethical issues in Social Media:

Social Media- Various Social Media Platforms: Google, Facebook, YouTube, Instagram -Social Media set-up and Uses-Ethical use of Social media-Effects of Social Media on Public- Social Media (vs) News-Social Media Fame and Reputation-Trolling, Harassing, and Hating on Social Media-Legal Aspects of Social Media.

REFERENCES :

1. "Engineering Ethics includes Human Values" by M.Govindarajan, S.Natarajan and V.S.SenthilKumar- PHI Learning Pvt. Ltd-2009.
2. "Professional Ethics and Morals" by Prof.A.R.Aryasri, DharanikotaSuyodhana- Maruthi Publications.
3. "Professional Ethics and Human Values" by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran- Laxmi Publications
4. "Professional Ethics and Human Values" by Prof.D.R.Kiran-
5. "Indian Culture, Values and Professional Ethics" by PSR Murthy-BS Publication
6. "Ethics in Engineering" by Mike W. Martin and Roland Schinzinger -Tata McGraw- Hill -2003
7. "Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.

Web Resources:

1. <https://study.com/academy/lesson/ethical-issues-in-internet-social-media-marketing.html>
2. https://www.tutorialspoint.com/engineering_ethics/engineering_ethics_rights_of_engineers
3. <https://link.springer.com/article/10.1007/s11948-997-0039-x>



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

II Year II Semester

KINEMATICS OF MACHINERY
(Only for ME)

Course Category	Professional Core	Course Code	19ME4T09
Course Type	Theory	L-T-P-C	3-0-0-3
Prerequisites	Exposure to Engineering Mechanics	Internal Assessment Semester End Examination Total Marks	30 70 100

COURSE OBJECTIVES

1	To understand different mechanisms and their motion constraints.
2	To study planar and spatial mechanisms.
3	To determine velocity and acceleration of different parts in a given mechanism by using graphical as well as analytical techniques.
4	To generate different cam profiles and study the transmission of power through belt drives.
5	To understand the concepts of gears and gears trains.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:		Cognitive Level*
CO1	Illustrate the concepts of different mechanisms their motion constraints.	k2
CO2	Develop straight line motion mechanisms and steering gear mechanisms.	k3
CO3	Determine the kinematic analysis of simple mechanisms.	k5
CO4	Design cam profiles based on the prescribed follower motion and perform kinematic analysis on cams with specified contours.	k6
CO5	Illustrate gear terminology, gear types and analyze gear trains.	k4

*k1- Remembering, k2- Understanding, k3- Applying, k4- Analyzing, k5- Evaluating, k6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	-	-	2	-	-	-	2	3	1	1
CO2	3	3	1	3	-	-	-	-	2	1	2	3	1	-
CO3	3	3	2	3	-	-	-	-	-	2	2	3	2	1



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

CO4	3	2	3	2	-	-	-	-	-	2	1	3	1	1
CO5	3	3	3	3	-	-	2	-	-	2	2	3	1	-

COURSE CONTENT	
UNIT I	<p>Mechanisms and Machines: Introduction: Mechanism and machine; Rigid and resistant bodies; Link; Kinematic pair; Degrees of freedom; Classification of kinematic pairs; Kinematic chain; Linkage, mechanism and structure; Mobility of mechanisms. Application of Kutzbach Criterion to Plane Mechanisms. Grubler's Criterion for Plane Mechanisms. Grashof's law.</p> <p>Inversions of Mechanisms: The four-bar chain; single and double slider crank chains.</p>
UNIT II	<p>Mechanism with Lower Pairs: Pantograph - straight line motion mechanisms - exact straight-line motion mechanisms- Peaucellier mechanism, Approximate straight-line motion mechanisms Watt mechanism. Condition for correct steering- Davis & Ackerman's steering gear mechanisms.</p> <p>Hooke's Joint: Ratio of shaft velocities - maximum and minimum speed of driven shaft - condition for equal speeds -Angular acceleration of driven shaft - Double Hooke's joint.</p>
UNIT III	<p>Velocity Analysis: Relative velocity method - velocity of point on a link- application of relative velocity method to simple mechanisms - rubbing velocity of a joint - Instantaneous center method - body centrode and space centrode - velocity of point on a link by Instantaneous center method, location of Instantaneous center - three centers in line theorem and its application for simple mechanisms.</p> <p>Acceleration Analysis: Acceleration diagrams of a link- acceleration diagrams for simple mechanisms- coriolis component of acceleration - acceleration diagram for slotted lever quick return mechanism.</p>
UNIT IV	<p>Cams: Classification of followers and cams -terms used in radial cams - displacement, velocity and acceleration diagrams when the follower moves with uniform velocity, uniform acceleration and retardation, simple harmonic motion -construction of cam profiles.</p> <p>Belt Drives: Introduction, Belt and rope drives, selection of belt drive- types of belt drives, V-belts, materials used for belt and rope drives, velocity ratio of belt drives, slip of belt, creep of belt, tensions for flat belt drive, angle of contact, centrifugal tension, maximum tension of belt.</p>
UNIT V	<p>Toothed Gearing: Classification of toothed wheels - terms used in gears - law of gearing - velocity of sliding of teeth - forms of teeth - Cycloidal and involute teeth- length of path of contact-arc of contact-contact ratio- interference in involute teeth - minimum number of teeth to avoid interference.</p> <p>Gear Trains: Simple, compound and reverted gear trains - epicyclic gear train - velocity ratio of epicyclic gear train - sun and planet wheels - torques in epicyclic gear train - Differential of an automobile.</p>

TEXT BOOKS	
1	Theory of Machines, S. S. Rattan, McGraw-Hill Publications, 3 rd Edition.
2	Theory of Machines, Thomas Bevan, CBS Publishers & Distributors, 3 rd Edition.



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

REFERENCE BOOKS

1	Theory of Machines and Mechanisms, Shigley J. E. and John Joseph Uicker, Oxford University Press, 3 rd Edition.
2	Theory of Machines, R.K. Bansal & J.S. Brar, Laxmi publications (P) LTD, 5 th Edition.
3	Theory of Machines, Sadhu Singh, Pearson, 3 rd Edition.
4	Mechanism and Machine Theory, J. S. Rao and R. V. Duddipati, New Age International, 2 nd Edition.
5	Theory of Mechanisms and Machines, A Ghosh & A K Malik, 3 rd Edition, East West Press.

WEB RESOURCES

1	www.mekanizmalar.com
2	www.museum.kyoto-u.ac.jp
3	Makezine.com
4	https://nptel.ac.in/courses/Webcourse-contents/IITDelhi/Kinematics%20of%20Machine/site/basic kinematics/ basickinematics08.htm
5	https://nptel.ac.in/courses/112105236/21
6	https://nptel.ac.in/courses/112105236/34
7	https://nptel.ac.in/courses/112104121/ 5. https://nptel.ac.in/courses/112106137/pdf/2_1.pdf .



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

II Year II Semester

APPLIED THERMODYNAMICS
(Only for ME)

Course Category	Professional Core	Course Code	19ME4T10
Course Type	Theory	L-T-P-C	3-0-0-3
Prerequisites	Exposure to Thermodynamics	Internal Assessment Semester End Examination Total Marks	30 70 100

COURSE OBJECTIVES	
1	To understand the fundamental components, performance evaluation and improve efficiency of steam power plant cycle.
2	To study the various types of boilers and their performance evaluation.
3	To study the performance of nozzle and condensers under various conditions.
4	To understand various types of steam turbines and their performance evaluation.
5	To study the various components of gas power plant cycle, performance evaluation and methods to improve the efficiency.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		Cognitive Level*
CO1	Explain steam power plant cycle to improve the performance by using different methods.	k5
CO2	Demonstrate the working of various boilers and their performance.	k2
CO3	Analyze steam nozzle for maximum discharge and condenser for better efficiency.	k4
CO4	Analyze the performance of steam turbines.	k4
CO5	Explain Gas turbine cycle to improve the performance by using different methods.	k5

*k1- Remembering, k2- Understanding, k3- Applying, k4- Analyzing, k5- Evaluating, k6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	-	2	2	-	-	-	-	2	3	-
CO2	3	3	2	-	-	2	2	-	-	-	-	2	3	-



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

CO3	3	3	3	-	-	2	2	-	-	-	-	2	3	-
CO4	3	3	3	-	-	2	2	-	-	-	-	2	3	-
CO5	3	3	2	-	-	2	2	-	-	-	-	2	3	-

COURSE CONTENT	
UNIT I	Basic Concepts: Rankine cycle - schematic layout, thermodynamic analysis, concept of mean temperature of heat addition, methods to improve cycle performance – regeneration & reheating.
UNIT II	Boilers: Classification – working principles of L.P & H.P boilers with sketches – mountings and accessories – working principles, boiler horse power, equivalent evaporation, efficiency and heat balance – draught, classification – height of chimney for given draught and discharge, condition for maximum discharge, efficiency of chimney – artificial draught, induced and forced.
UNIT III	Steam Nozzles: Function of a nozzle – applications - types, flow through nozzles, thermodynamic analysis – assumptions -velocity of fluid at nozzle exit-Ideal and actual expansion in a nozzle, velocity coefficient, condition for maximum discharge, critical pressure ratio, criteria to decide nozzle shape: Super saturated flow, its effects, degree of super saturation and degree of under cooling - Wilson line. Steam Condensers: Requirements of steam condensing plant – classification of condensers – working principle of different types – vacuum efficiency and condenser efficiency – air leakage, sources and its affects, air pump- cooling water requirement.
UNIT IV	Steam Turbines: Classification – impulse turbine; mechanical details – velocity diagram – effect of friction – power developed, axial thrust, blade or diagram efficiency – condition for maximum efficiency. De-laval turbine - methods to reduce rotor speed-velocity compounding, pressure compounding and velocity & pressure compounding, velocity and pressure variation along the flow – combined velocity diagram for a velocity compounded impulse turbine, condition for maximum efficiency. Reaction Turbine: Mechanical details – principle of operation, thermodynamic analysis of a stage, degree of reaction –velocity diagram – Parson's reaction turbine – condition for maximum efficiency – calculation of blade height.
UNIT V	Gas Turbines: Simple gas turbine plant – ideal cycle, essential components – parameters of performance – actual cycle – regeneration, inter cooling and reheating –closed and semi-closed cycles – merits and demerits, types of combustion chambers.

Note: Use of steam tables and Mollier Chart is allowed.

TEXT BOOKS	
1	Applied Thermodynamics by Eastop & McConkoy, Pearson Education, 5 th Edition.
2	Thermodynamics and Heat Engines, Volume 2 ,R.Yadav, Central book depot, 3 rd Edition.
REFERENCE BOOKS	
1	Thermal Engineering, M.L.Marthur & Mehta, Jain bros, 5 th Edition.



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

2	Heat Engineering, V.P Vasandani and D.S Kumar, Metropolitan Book Company, New Delhi, 3 rd Edition.
3	Applied Thermodynamics, R Yadav, International publishers, 6 th Edition.
4	Applied Thermodynamics, D.S.Kumar, S.K.Kotaria Publications, 2 nd Edition.
5	Gas Turbines, V.Ganesan , Tata Mcgraw-Hill, 3 rd Edition.
WEB RESOURCES	
1	http://nptel.ac.in/courses/112106133/
2	http://nptel.ac.in/courses/112106133/3
3	http://nptel.ac.in/courses/112106133/13
4	http://nptel.ac.in/courses/112106133/14
5	http://nptel.ac.in/courses/112106133/16



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

II Year II Semester

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS
(Common to all branches)

Course Category	Humanities including Management	Course Code	19HM4T01
Course Type	Theory	L-T-P-C	3 -0 -0-3
Prerequisites		Internal Assessment Semester End Examination Total Marks	30 70 100

Course Outcomes		Blooms Taxonomy Level
On successful completion of the course, the student will be able to		
CO 1	Make use of the concepts of managerial economics and demand in managerial decision making and predicting demand for goods and services	Applying
CO 2	Assess the functional relation among production, cost of production, cost concepts and Break-Even Analysis.	Evaluating
CO 3	Classify market structures as perfect and imperfect markets for price and output decisions	Understanding
CO 4	Appraise the forms of business organizations and trade cycles in economic growth.	Evaluating
CO 5	Apply accounting and capital budgeting techniques in financial decision making	Applying

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	1	-	-	-	-	-	-	-	-	3	-	-	-
CO3	-	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO5	-	3	-	-	-	-	-	-	-	-	1	-	-	-

Course Content :

Unit – I

Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics and Scope-Managerial Economics and its relation with other subjects-Basic Economic Tools used in Managerial Economics-Concepts of Demand-Types-Determinants-Law of Demand its Exceptions-Elasticity of Demand-Types and Measurement- Law of Supply -Demand forecasting and Methods of



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

demand forecasting.

Unit – II

Production and Cost Analysis: Production function- Law of Variable proportions- Iso-quants and Isocosts- Laws of Returns to Scale-Cobb-Douglas Production function-Economies of Scale-Cost Concepts- Fixed vs Variable Costs-Out of Pocket Costs vs Imputed Costs-Cost Volume Profit analysis-Determination of Break-Even Point (Simple Problems).

Unit – III

Introduction to Markets: Market Structures: Perfect Competition, Monopoly, Monopolistic and Oligopoly – Features – Price and Output Determination.

Theories of the Firm & Pricing Policies: Managerial Theories of firm: Marris and Williamson's models – Methods of Pricing: Limit Pricing, Market Skimming Pricing, Internet Pricing: Flat Rate Pricing, Usage sensitive, Transaction based pricing, Priority Pricing.

Unit – IV

Types of Business Organization and Business Cycles: Features and Evaluation of Sole Trader – Partnership – Joint Stock Company – State/Public Enterprises and their forms – Business Cycles – Meaning and Features – Phases of Business Cycles.

Unit – V

Introduction to Accounting and Capital Budgeting: Introduction to Double Entry Systems-Journal-Ledger- Trail Balance - Preparation of Financial Statements

Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Need for Capital Budgeting-Techniques of Capital Budgeting-Traditional and Modern Methods.

Textbooks:

1. Dr. B. Kuberudu and Dr. T. V. Ramana: Managerial Economics & Financial Analysis, Himalaya Publishing House 2011.
2. Dr. N. Appa Rao, Dr. P. Vijay Kumar: 'Managerial Economics and Financial Analysis', Cengage Publications, New Delhi – 2011
- 3.. Dr. A. R. Aryasri – Managerial Economics and Financial Analysis, TMH 2011

Reference Books :

1. V. Maheswari: Managerial Economics, Sultan Chand.
2. Suma Damodaran: Managerial Economics, Oxford 2011.
3. Prof. J.V.PrabhakaraRao, Prof. P. Venkatarao. 'Managerial Economics and Financial Analysis', Ravindra Publication.
4. Vanitha Agarwal: Managerial Economics, Pearson Publications 2011.
5. Sanjay Dhameja: Financial Accounting for Managers, Pearson.
6. Maheswari: Financial Accounting, Vikas Publications. 7. S. A. Siddiqui & A. S. Siddiqui: Managerial Economics and Financial Analysis, New Age International Publishers, 2012

Web Resources:

1. <https://economictimes.indiatimes.com/definition/law-of-supply>
2. <https://sites.google.com/site/economicsbasics/managerial-theories-of-the-firm>
3. <https://www.managementstudyguide.com/capitalization.htm>



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

II Year II Semester

DESIGN OF MACHINE MEMBERS –I
(Only for ME)

Course Category	Professional Core	Course Code	19ME4T11
Course Type	Theory	L-T-P-C	3-0-0-3
Prerequisites	Exposure to Engineering Mechanics, Mechanics of Solids, Material Science.	Internal Assessment Semester End Examination Total Marks	30 70 100

COURSE OBJECTIVES	
1	To understand the fundamental design concepts and apply the theories of failures to evaluate the strength of the machine elements.
2	To learn strength of the machine components subjected to static and variable loads by using different failure theories.
3	To study the basic principles for design of machine elements such as temporary and permanent joints.
4	To understand various joints subjected to combined loading for shaft design.
5	To study various shaft couplings subjected to torsion.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		Cognitive Level*
CO1	Explain the design procedure and find the stresses in machine components.	k2
CO2	Apply the loads on machine members and analyze the variable stresses to ensure safe design.	k3
CO3	Determine and analyze the stresses in temporary and permanent joints under various loading conditions.	k5
CO4	Determine and analyze the stresses in different shaft joints along with keys under various loading conditions.	k5
CO5	Design and analyze the shaft couplings for various engineering applications.	k6

*k1- Remembering, k2- Understanding, k3- Applying, k4- Analyzing, k5- Evaluating, k6- Creating



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	1	1	-	-	-	-	-	-	1	1
CO2	2	1	1	2	1	2	-	-	-	-	-	-	2	-
CO3	2	1	2	1	3	2	-	-	-	-	-	1	1	2
CO4	2	2	1	2	3	2	-	-	-	-	-	1	2	1
CO5	2	1	2	2	3	2	-	-	-	-	-	1	2	1

COURSE CONTENT	
UNIT I	INTRODUCTION: General considerations in the design of Engineering Materials and their properties – selection –Manufacturing consideration in design, tolerances and fits –BIS codes of steels. STRESSES IN MACHINE MEMBERS: Simple stresses – combined stresses – torsional and bending stresses – impact stresses – stress strain relation – various theories of failure – factor of safety – design for strength and rigidity – preferred numbers. The concept of stiffness in tension, bending, torsion and combined situations – static strength design based on fracture toughness.
UNIT II	STRENGTH OF MACHINE ELEMENTS: Stress concentration – theoretical stress concentration factor – fatigue stress concentration factor notch sensitivity – design for fluctuating stresses – endurance limit – estimation of endurance strength – goodman's line – soderberg's line – modified goodman's line.
UNIT III	RIVETED & WELDED JOINTS - Types of riveted heads and riveted joints- Lap Joint – Butt joint–Design of riveted joints with initial stresses - Strength of parallel fillet and Transverse fillet welded joints- Welded joint: Eccentric loading. BOLTED JOINTS – Design of bolts with pre-stresses – design of joints under eccentric loading – locking devices – both of uniform strength, different seals, Caulking and Fullering.
UNIT IV	KEYS, COTTERS AND KNUCKLE JOINTS: Design of keys-stresses in keys-cotter joints-spigot and socket, sleeve and cotter, jib and cotter joints- knuckle joints. SHAFTS: Design of solid and hollow shafts for strength and rigidity – design of shafts for combined bending and axial loads – shaft sizes – BIS code. Use of internal and external circlips, gaskets and seals (stationary & rotary).
UNIT V	SHAFT COUPLING: Types of shaft couplings-Rigid couplings – muff, split muff and flange couplings, flexible couplings – flange coupling (modified).

TEXT BOOKS	
1	Design of Machine Elements / V.M. Faires/McMillan publisher, 4 th edition.
2	Machine Design/V.Bandari/ TMH Publishers, 3 rd edition.
REFERENCE BOOKS	
1	Machine Design: An integrated Approach / R.L. Norton / Pearson Education, 2 nd Edition.



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

2	Mechanical Engineering Design by Shigley, Mc Graw Hill 10 th Edition.
3	Elements of Machine Design N.C.Pandya, C.S.Shaw, Charotar Publishing House Pvt Ltd, 15 th Edition.
4	Machine Design by Schaum's, Mc Graw Hill series, 1 st Edition.
5	Machine Design data book by B.B. Bandari, Mc Graw Hill, 1 st Edition.
WEB RESOURCES	
1	http://nptel.ac.in/courses/112105124/5
2	http://nptel.ac.in/courses/112105124/7
3	http://nptel.ac.in/courses/112105124/20
4	http://nptel.ac.in/courses/112105124/35
5	http://nptel.ac.in/courses/112105124/13



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

II Year II Semester

METAL CUTTING & MACHINE TOOLS
(Only for ME)

Course Category	Professional Core	Course Code	19ME4T12
Course Type	Theory	L-T-P-C	3-0-0-3
Prerequisites	Exposure to Metallurgy & Material Science, Production Technology.	Internal Assessment Semester End Examination Total Marks	30 70 100

COURSE OBJECTIVES

The students are to be exposed to the concepts of

1	Tool geometry and material removal processes.
2	Material removal process with different tools using Lathe Machines.
3	The knowledge in manufacturing applications through various machine tools.
4	Principles of metal cutting to practical applications through milling machines.
5	Finishing methods and holding devices.

COURSE OUTCOMES

The student will be able to:		Cognitive Level*
CO1	Analyze the fundamental knowledge on tool materials, cutting fluids and tool wear mechanisms.	k4
CO2	Understand the fundamentals and principles of metal cutting to practical applications through Lathe machine.	k2
CO3	Apply the The knowledge in manufacturing applications through various machine tools.	k3
CO4	Understand the Principles of metal cutting to practical applications through milling machines.	k2
CO5	Analyze Finishing methods and holding devices.	k4

*k1- Remembering, k2- Understanding, k3- Applying, k4- Analyzing, k5- Evaluating, k6- Creating



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1	3	2	-	-	3	1	1	3	3	1
CO2	3	3	3	1	3	3	-	-	3	1	3	3	3	2
CO3	3	3	3	1	3	3	-	-	3	1	3	3	3	2
CO4	3	3	3	1	3	3	-	-	3	1	3	3	3	2
CO5	3	3	3	1	3	3	-	-	3	1	3	3	3	2

COURSE CONTENT

UNIT I	FUNDAMENTALS OF MACHINING: Elementary treatment of metal cutting theory – element of cutting process – geometry of single point cutting tool, tool angles, chip formation and types of chips-built up edge and its effects chip breakers, mechanics of orthogonal cutting – Merchant's force diagram, cutting forces, cutting speeds, feed, depth of cut, tool life, tool wear, machinability, economics of machining, coolants, tool materials and properties.
UNIT II	LATHE: Engine lathe – principle of working, specification of lathe – types of lathe – work holders , tool holders – box tools taper turning, thread turning – for lathes and attachments, constructional features of speed gear box and feed gear box. Turret and capstan lathes – collet chucks – other work holders – tool holding devices – box and tool layout. Principal features of automatic lathes – classification – single spindle and multi-spindle automatic lathes.
UNIT III	SHAPING, SLOTTING AND PLANING MACHINES: Principles of working – principal parts – specifications, operations performed, quick return mechanisms and table feed mechanisms, Machining time calculations. MILLING MACHINES: Principles of working – specifications – classification of Milling Machines and Principle features, machining operations, types of cutters, geometry of milling cutters – methods of indexing, accessories to milling machines.
UNIT IV	DRILLING & BORING MACHINES: Principles of working, specifications, types, operations performed –types of drills – Boring Machines FINISHING PROCESSES: Theory of grinding – classification of grinding machines, cylindrical and surface grinding machines, tool and cutter grinding machines, different types of abrasives, bonds, specification and selection of a grinding wheel. Lapping, Honing & Broaching operations, comparison to grinding.
UNIT V	JIGS & FIXTURES: Principles of design of jigs and fixtures and uses, classification of jigs & fixtures, principles of location and clamping, types of clamping & work holding devices, typical examples of jigs and fixtures. CNC MACHINE TOOLS: CNC Machines, working principle, classification, constructional features of CNC machines.



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

TEXT BOOKS

1	Manufacturing Technology- Volume-II/P.N Rao/Tata McGraw Hill/4 th edition, 2018.
2	A course in Workshop Technology – B.S.RaghuVamshi – Volume II,Dhanapat Rai & Co.,10 th edition ,2009.

REFERENCE BOOKS

1	A Text book of Production Engineering(Manufacturing Proceeses)-P.C.Sharma, S.Chand & Company Ltd,8 th revised edition,2014.
2	Elements of workshop technology volume-II machine tools by S.K.Hajra choudary, S.K.Bose, A.K.Hajra choudary, Media promoters & publishers pvt ltd.,13 th edition, 2010.
3	A text book of Manufacturing Technology (manufacturing Processes) by R.K.Rajput Lakshmi Publications(p) Ltd.,1 st edition,2007.
4	Metal cutting Principles by Milton Clayton Shaw,3rd edition,1960.
5	Production Technology by H.M.T. (Hindustan Machine Tools), Tata McGraw-Hill private company limited, 28 th edition,2008.

WEB RESOURCES

1	https://nptel.ac.in/courses/112105126/1
2	https://nptel.ac.in/courses/112105126/2
3	https://nptel.ac.in/courses/112105126/11
4	https://nptel.ac.in/courses/112105126/23
5	https://nptel.ac.in/courses/112105127/
6	https://nptel.ac.in/courses/112105127/33
7	https://nptel.ac.in/courses/112105127/30



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

II Year II Semester

MACHINE DRAWING
(Only for ME)

Course Category	Professional Core	Course Code	19ME4T13
Course Type	Theory	L-T-P-C	1-0-4-3
Prerequisites	Exposure to Engineering Drawing	Internal Assessment Semester End Examination Total Marks	30 70 100

COURSE OBJECTIVES	
1	To provide basic understanding of Conventional representation, sections, joints, simple mechanical parts.
2	The student will be able to draw the assembly from the individual part drawing.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		Cognitive Level*
CO1	Illustrate different kinds of materials and mechanical components conventionally.	k2
CO2	Model the assembly drawing using part drawings.	k3

*k1- Remembering, k2- Understanding, k3- Applying, k4- Analyzing, k5- Evaluating, k6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	2	-	1	-	-	-	1	2	-	-	1	-
CO2	2	-	-	-	2	-	-	-	1	2	-	-	1	-

COURSE CONTENT	
PART A	Conventional representation of materials and components: <ul style="list-style-type: none"> • Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs, symbols for weldments. • Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned. • Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws. • Keys, Cotter joints and knuckle joint. • Riveted joints for plates.



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

	<ul style="list-style-type: none"> • Shaft coupling, spigot and socket pipe joint. • Journal, pivot and collar Pedestal Bearing (Plummer Block) and foot step bearings.
PART B	<p>Assembly Drawings: Drawings of assembled views for the part drawings of the following, using conventions and easy drawing proportions.</p> <p>Engine parts: Stuffing box, Cross head, Eccentric, Petrol Engine connecting rod and Piston.</p> <p>Other machine parts: Screws jack, Machine Vice, Plummer block and Tool post.</p> <p>Valves: Steam stop valve, Spring loaded safety valve, Feed check valve and air cock.</p>

Note: First angle projection to be adopted. The student should be able to provide working drawings of actual parts

TEXT BOOKS	
1	Machine Drawing –K.L. Narayana, P.Kannaiah & K. Venkata Reddy / New Age/ Publishers, 6 th Edition.
2	Machine Drawing: Includes Auto CAD – Ajeet Singh/McGraw Hill Education, 2 nd Edition.
REFERENCE BOOKS	
1	Machine Drawing by N.D.Bhatt, V.M. Panchal Charotar Publications, 50 th Edition.
2	Machine Drawing, O.P Jahkar, Amit Mathur, Khanna Publishing House, 1 st Edition.
3	Machine Drawing, S.Gill, Katson Books, 2017.
4	Machine Drawing, KC John, PHI, 2009.
5	Fundamentals of Machine Drawing, Sadhu Sign, PL Sah, PHI, 2 nd Edition.
WEB RESOURCES	
1	http://gt3.bme.hu/wp-content/uploads/2016/02/Narayana-Machine_Drawing.pdf



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

II Year II Semester

FLUID MECHANICS & HYDRAULIC MACHINERY LABORATORY
(Only for ME)

Course Category	Professional Core	Course Code	19ME4L06
Course Type	Laboratory	L-T-P-C	0-0-3-1.5
Prerequisites	Exposure to Fluid Mechanics and Hydraulic Machinery	Internal Assessment Semester End Examination Total Marks	30 70 100

COURSE OBJECTIVE

To impart practical exposure on the performance evaluation methods of various flow measuring equipment, hydraulic turbines and pumps.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Apply the fundamental principles of fluid mechanics, calculations involving basic flow measuring devices like venture meter, Orifice meter and major and minor losses of fluid flow through the pipes.
CO2	Estimate the optimum efficiency of a given pump under different load and (or) speed conditions and to analyze the trends depicted by characteristic curves obtained from the experiments.
CO3	Estimate the optimum efficiency of a given turbine under different load and (or) speed conditions and to analyze the trends depicted by characteristic curves obtained from the experiments.

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	3	-	-	3	3	-	-	-	-	-	3	-
CO2	3	-	-	2	-	-	-	-	-	-	-	-	3	-
CO3	-	3	3	-	-	3	2	-	-	-	-	-	3	-

LIST OF EXPERIMENTS

1. Calibration of Venturimeter.
2. Calibration of Orificemeter.
3. Determination of Friction factor for a given pipe line.
4. Losses in pipe fittings.
5. Impact of jet on vanes.
6. Performance test on Pelton wheel-constant head.
7. Performance test on Pelton wheel-constant speed.
8. Performance test on Francis turbine-constant head.



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

9. Performance test on Francis turbine-constant speed.
10. Performance test on Single stage centrifugal pump.
11. Performance test on Multi stage centrifugal pump.
12. Performance test on Reciprocating pump.

Note: Any 10 of the above 12 experiments are to be conducted.



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

II Year II Semester

PRODUCTION TECHNOLOGY LABORATORY
(only for ME)

Course Category	Professional Core	Course Code	19ME4L07
Course Type	Laboratory	L-T-P-C	0-0-3-1.5
Prerequisites	Exposure to Production Technology	Internal Assessment Semester End Examination Total Marks	30 70 100

COURSE OBJECTIVE

To impart hands-on practical exposure on manufacturing processes and equipment.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Make the pattern, mould and casting.
CO2	Do the arc welding, spot welding and brazing, injection and blow molding.
CO3	Do the metal forming and powder metallurgy test.

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	-	-	-	-	1	-	1	-	3	-
CO2	3	3	3	2	-	-	-	-	1	-	1	-	3	-
CO3	3	3	3	2	-	-	-	-	1	-	1	-	3	-

LIST OF EXPERIMENTS

A. Metal Casting Process:

1. Pattern making.
2. Sand testing - for strength and permeability.
3. Mould preparation.
4. Melting and Casting.
5. Sieve Analysis.

B. Welding:

1. Manual metal arc welding - Lap & Butt Joints.



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

- | |
|---|
| <ol style="list-style-type: none">2. Resistance Spot Welding.3. Brazing and soldering.4. Gas cutting.5. TIG/MIG Welding.6. Gas welding. |
|---|

<p>C. Metal Forming and Powder Metallurgy:</p>

- | |
|--|
| <ol style="list-style-type: none">1. Blanking & Piercing operations and study of simple, compound and progressive dies.2. Deep drawing and extrusion operations.3. Bending and other operations.4. Basic powder compaction and sintering. |
|--|

<p>D. Processing of Plastics:</p>
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- | |
|---|
| <ol style="list-style-type: none">1. Injection & Blow Moulding. |
|---|

Note: Total 10 experiments should be conducted from A, B, C & D.



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

II Year II Semester

ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE
(Common to all branches)

Course Category	Humanities including Management	Course Code	19HM4T06
Course Type	Theory	L-T-P-C	2 -0 -0-0
Prerequisites		Internal Assessment	0
		Semester End Examination	0
		Total Marks	0

Course Outcomes		Blooms Taxonomy Level
On successful completion of the course, the student will be able to		
CO 1	Understand the significance of Indian Traditional Knowledge.	Understanding
CO 2	Classify the Indian Traditional Knowledge	Analysis
CO 3	Compare Modern Science with Indian Traditional Knowledge system.	Evaluating
CO 4	Analyze the role of Government in protecting the Traditional Knowledge	Analysis
CO 5	Understand the impact of Philosophical tradition on Indian Knowledge System.	Understanding

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	1	2	-	-	3	-	1	-	2	-	-	-	-
CO2	-	-	2	-	-	2	-	2	-	-	-	-	-	-
CO3	-	-	2	-	-	3	-	1	1	2	2	1	-	-
CO4	-	-	2	-	-	2	-	2	-	-	-	-	-	-
CO5	-	-	1	-	-	3	-	1	-	3	-	1	-	-

COURSE CONTENT
Unit I Introduction to Traditional Knowledge: Define Traditional Knowledge- Nature and Characteristics- Scope and Importance- kinds of Traditional Knowledge- The historical impact of social change on Traditional Knowledge Systems- Value of Traditional knowledge in global economy. Unit II Basic structure of Indian Knowledge System: Astadash Vidya- 4 Ved - 4 Upaved



PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous R19)
MECHANICAL ENGINEERING

(Ayurved, Dhanurved, Gandharva Ved & Sthapthya Adi), 6 vedanga (Shisha, Kalppa, Nirukha, Vyakaran, Jyothisha & Chand), 4 upanga (Dharmashastra, Meemamsa, purana & Tharka Shastra).

Unit III

Modern Science and Indian Knowledge System-Indigenous Knowledge, Characteristics- Yoga and Holistic Health care-cases studies.

Unit IV

Protection of Traditional Knowledge: The need for protecting traditional knowledge -Significance of Traditional knowledge Protection-Role of government to harness Traditional Knowledge.

Unit V

Impact of Traditions: Philosophical Tradition (Sarvadarshan) Nyaya, Vyshepec, Sankhya, Yog, Meemamsa, Vedantha, Chavanka, Jain & Boudh - Indian Artistic Tradition - Chitra kala, Moorthi kala, Vasthu kala, Sthapthya, Sangeetha, Nruthya Yevam Sahithya

Reference Books :

1. Traditional Knowledge System in India, by Amit Jha, 2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.
3. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya Vidya
4. Swami Jitatmanand, Holistic Science and Vedant, Bharatiya Vidya Bhavan
5. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata.
6. Pramod Chandra, India Arts, Howard Univ. Press, 1983.
7. Krishna Chaitanya, Arts of India, Abhinav Publications, 1987.

Web Resources:

1. https://www.wipo.int/wipo_magazine/en/2017/01/article_0004.html
2. <http://iks.iitgn.ac.in/wp-content/uploads/2016/01/Indian-Knowledge-Systems-Kapil-Kapoor.pdf>
3. https://www.wipo.int/edocs/mdocs/tk/en/wipo_grtkf_ic_21/wipo_grtkf_ic_21_ref_facilitators_text.pdf