



## SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JNTUK, Kakinada), (Recognized by AICTE, New Delhi)

UG Programmes CE,CSE,ECE,EEE,IT & ME are Accredited by NBA

CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204

Regulation: R20		III / IV - B.Tech. I - Semester							
MECHANICAL ENGINEERING									
SCHEME OF INSTRUCTION & EXAMINATION (With effect from 2020-21 admitted Batch onwards)									
Course Code	Course Name	Category	Cr	L	T	P	Int. Marks	Ext. Marks	Total Marks
B20ME3101	Dynamics of Machinery	PC	3	3	0	0	30	70	100
B20ME3102	Design of Machine Elements	PC	3	3	0	0	30	70	100
B20ME3103	Mechanical Measurements and Metrology	PC	3	3	0	0	30	70	100
#PE-I	Professional Elective -I	PE	3	3	0	0	30	70	100
#OE-I	Open Elective-I	OE	3	3	0	0	30	70	100
B20ME3108	IC Engines and KOM Lab	PC	1.5	0	0	3	15	35	50
B20ME3109	Metrology Lab	PC	1.5	0	0	3	15	35	50
B20ME3110	Python Programming Lab (Skill Oriented Course)	SOC	2	1	0	2	--	50	50
B20MC3101	Employability Skills	MC	0	3	0	0	--	--	--
B20ME3111	Summer Internship	PR	1.5	--	--	--	--	50	50
<b>TOTAL</b>			<b>21.5</b>	<b>19</b>	<b>0</b>	<b>8</b>	<b>180</b>	<b>520</b>	<b>700</b>

	Course Code	Course
#PE-I	B20ME3104	Composite Materials
	B20ME3105	Mechatronics
	B20ME3106	Advanced Strength of Materials
	B20ME3107	MOOCs -I
#OE-I	Student has to study one Open Elective offered by AIDS or CE or CSBS or CSE or ECE or EEE or IT or S&H from the list enclosed.	

Code	Category	L	T	P	C	I.M	E.M	Exam
B20ME3101	PC	3	--	--	3	30	70	3 Hrs.

### DYNAMICS OF MACHINERY

(For ME)

#### Course Objectives:

1.	To gain the knowledge of analytical and graphical methods for calculating balancing of rotary and reciprocating masses.
2.	To learn the effect of gyroscopic couple on stabilization of sea vehicles, aircrafts and automobile vehicles
3.	To acquire the knowledge on the concept of vibrations, bearings, clutches, brakes and effect of friction in motion transmission and its significance on engineering design.
4.	To learn the concept of turning moment diagrams, flywheel, and speed control systems such as governors.

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

S.No	Outcome	Knowledge Level
1.	Illustrate the principles of balancing to rotating and reciprocating members	K3
2.	Apply the principles of gyroscopic couple on stabilization of sea vehicles, aircrafts and automobile vehicles	K3
3.	Analyze the vibrations of single degree of freedom of mechanical systems.	K4
4.	Compute the frictional losses and transmission torque in clutches, brakes mechanical components and bearing surfaces.	K3
5.	Apply the basic principles of mechanisms to governors, flywheel & forces on engine components and Turning moment diagrams	K3

### SYLLABUS

<b>UNIT-I (10Hrs)</b>	<p><b>Balancing of Rotating and Reciprocating Masses:</b> Balancing of a single rotating mass in the same plane and by two masses in different planes, balancing of several masses revolving in the same plane- Balancing of several masses revolving in different planes.</p> <p>Primary and secondary unbalanced forces of reciprocating masses, Partial balancing of unbalanced primary forces in a reciprocating engine, Partial balancing of locomotives- Effect of partial balancing of reciprocating parts of two-cylinder locomotives Variation of tractive force, Swaying couple and hammer blow- Balancing of primary and secondary forces in multi cylinder in-line engines- Direct and reverse cranks- Balancing of V- Engines</p>
<b>UNIT-II (10 Hrs)</b>	<p><b>Gyroscopic Couple and Precessional Motion:</b></p> <p>Precessional and angular motion- gyroscopic couple- effect of gyroscopic couple on an aero plane and on an avar ship, stability of a four-wheel vehicle moving in a curved path, stability of a two-wheel vehicle taking a turn.</p>

<b>UNIT-III (10 Hrs)</b>	<p><b>Vibrations:</b> Definitions- Types of vibrations- Natural frequencies of free longitudinal vibrations of systems having single degree of freedom- Equilibrium method- Energy method and Rayleigh's method. Frequency of damped vibration and forced vibration with damping, Simple problems on forced damped vibration, Magnification factor. Natural frequency of free transverse vibrations due to point load and uniformly distributed load acting over a simply supported shaft- Transverse vibrations for a shaft subjected to number of point loads- Dunkerley's method, Critical speed of a shaft. Natural frequency of free torsional vibrations- Free torsional vibrations of single and two rotor systems.</p>
<b>UNIT-IV (10 Hrs)</b>	<p><b>Friction:</b> Introduction; Kinds of friction; Laws of friction; Coefficient of friction; Screw jack; screw friction, Pivots and collars. <b>Clutches &amp; Brakes:</b> Friction clutches- single disc or plate clutch, multiple disc clutch, cone clutch, centrifugal clutch, Self-locking and self-energizing conditions of a block brake.</p>
<b>UNIT-V (10 Hrs)</b>	<p><b>Turning Moment Diagrams:</b> Analytical method for velocity and acceleration of piston, angular velocity and acceleration of connecting rod, Engine force analysis, crank effort and turning moment diagrams – fluctuation of energy – fly wheels. <b>Governors:</b> Watt, porter and proell governors, spring loaded governors – Hartnell, sensitiveness, isochronism, and hunting Stability;</p>
<b>Textbooks:</b>	
1.	Theory of machines / R. S Khurmi & J K Gupta / S. Chand & Company
2.	Theory of Machines / S.S Ratan/ Mc. Graw Hill Publ
3.	Theory of Mechanisms and Machines /Dr.JagadishLal / Metropolitan Pvt.Ltd.
<b>Reference Books:</b>	
1.	Theory of Machines / Thomas Bevan / CBS Publishers
2.	Mechanism and Machine Theory / JS Rao and RV Dukupati / New Age.
3.	Theory of Machines / Shiegly / MGH
4.	Mechanism and machine theory /Ashok G. Ambedkar / PHI Publications
5.	Theory of Machines & Mechanisms / P.L.Ballaney/Khanna Publishers
<b>e-Resources:</b>	
1.	<a href="https://nptel.ac.in/courses/112104114">https://nptel.ac.in/courses/112104114</a>
2.	<a href="https://nptel.ac.in/courses/112101096">https://nptel.ac.in/courses/112101096</a>

Code	Category	L	T	P	C	I.M	E.M	Exam
B20ME3102	PC	3	--	--	3	30	70	3 Hrs.
<b>DESIGN OF MACHINE ELEMENTS</b>								
(For ME)								
<b>Course Objectives:</b>								
1.	Introduce the concepts of design philosophy at basic level, types of loading and different failure criteria.							
2.	Acquaint with the design of temporary and permanent joints.							
3.	Understand, formulate, and analyze stresses and strains in various machine elements							
<b>Course Outcomes:</b> At the end of the course, students will be able to								
S.No	Outcome							Knowledge Level
1.	Identify the need for design process & Design various machine elements against static loads.							K4
2.	Design various machine elements against fluctuating loads							K4
3.	Design temporary joints required to assemble the machine elements							K4
4.	Design permanent joints required to assemble the machine elements							K4
5.	Design the energy absorbing mechanical components such as springs for the specified loading conditions							K4
<b>SYLLABUS</b>								
<b>UNIT-I (10Hrs)</b>	<b>Introduction:</b> Machine Design, basic procedure of machine design, BIS system of designation of steels, manufacturing considerations in design. <b>Design against static loads:</b> Modes of failure, Factor of safety, stress strain relationship, shear stress and shear strain, stresses due to bending moment, stresses due to torsional moment, eccentric axial loading, static failure theories.							
<b>UNIT-II (10 Hrs)</b>	<b>Design Against Fluctuating Load:</b> Stress concentration, stress concentration factors, reduction of stress concentration, fluctuating stresses, fatigue failure, endurance limit, notch sensitivity, Soderberg, Goodman and modified Goodman diagrams, Gerber equation, fatigue design under combined stresses							
<b>UNIT-III (10 Hrs)</b>	<b>Threaded Joints:</b> Forms of threads, basic types of screw fastenings, ISO metric screw threads, design of eccentrically loaded bolted joints subjected to simple stresses and shear loads Design of Socket & Spigot Cotter joint & Knuckle joint.							

<b>UNIT-IV</b> <b>(10 Hrs)</b>	<p><b>Welded joints:</b> Different types welded joints and their design aspects, Types and strength of weld joints, design axially loaded unsymmetrical welded joints and design of weld joints subjected to bending and eccentric loads</p> <p><b>Riveted joints:</b> Introduction, types of riveted joints, terminology and design of general riveted joints based on strength and efficiency (simple problems).</p>
<b>UNIT-V</b> <b>(8Hrs)</b>	<p><b>Spring Design:</b> classification and spring materials, Design of helical compression and tension springs subjected to static and fluctuating loads.</p> <p><b>Design of laminated springs,</b> Equalized stress in spring leaves, Surge in springs, Nipping and shot Peening.</p>
<b>Textbooks:</b>	
1.	Design of Machine Elements by V.B.Bhandari, TMH Publishing Co. Ltd., New Delhi.
2.	A Text Book of Machine Design by R.S.Khurmi, Eurasia Publishing House Ltd., New Delhi
<b>Reference Books:</b>	
1.	Machine Design by Pandya and Shaw, Charotar publications.
2.	Machine design, an integrated approach by R.L.Norton, Pearson Education
3.	Machine Design by Jain, Khanna Publications.
4.	Mechanical Engineering Design by Joseph Edward Shigley, McGraw-Hill Edition
<b>e-Resources:</b>	
1.	<a href="https://nptel.ac.in/courses/112/105/112105124/">https://nptel.ac.in/courses/112/105/112105124/</a>
2.	<a href="https://nptel.ac.in/courses/112/106/112106137/">https://nptel.ac.in/courses/112/106/112106137/</a>

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Code	Category	L	T	P	C	I.M	E.M	Exam
B20ME3103	PC	3	--	--	3	30	70	3 Hrs.
<b>MECHANICAL MEASUREMENTS AND METROLOGY</b>								
(For ME)								
<b>Course Objectives:</b>								
1.	To impart knowledge on various Metrological equipment's available for measurement.							
2.	To impart knowledge on various methods to measure physical variables.							
<b>Course Outcomes:</b> At the end of the course, students will be able to								
S.No	Outcome							Knowledge Level
1.	<b>Illustrate</b> the concept of measurements and measuring techniques.							K3
2.	<b>Understand</b> the principles of limits, fits, tolerances and gauges.							K3
3.	<b>Demonstrate</b> the techniques of linear and angular measurement.							K3
4.	<b>Describe</b> various acceptance tests on a machine tools and techniques of surface finish measurement.							K4
5.	<b>Understand</b> the principles of Optics and fibers in measurement.							K3
<b>SYLLABUS</b>								
<b>UNIT-I</b> (10 Hrs)	<b>Measurement System:</b> Concept of measurements, static performance characteristics, accuracy of measurement and its analysis. <b>Applied Mechanical Measurement:</b> Force (analytical balance, proving rings), Torque (dynamometers), strain (opto-mechanical method), Pressure (Mc-leod gauge), Flow (venturimeter, orificemeter, nozzle) and Temperature (bimetallic thermostat, liquid-in-glass, optical pyrometer)							
<b>UNIT-II</b> (10 Hrs)	<b>Basics of Metrology:</b> Introduction to metrology, Need of Inspection, Methods of Measurement, Precision and Accuracy, Factors affecting the accuracy of Measurement, Errors in Measurement <b>System of Limits, Fits, Tolerance and gauging:</b> limits, fits, Tolerances and Interchangeability, Plain limit gauges, Taylor's principle of Gauge Design, Comparators: Twisted strip type, Optical lever, Electric, Pneumatic and Optical							
<b>UNIT-III</b> (10 Hrs)	<b>Screw Thread and Gear Metrology:</b> Measurement of screw threads: Major diameter, Minor diameter, Effective diameter and pitch for Internal and External Threads, Measurement of spur gears: pitch, profile, lead, backlash, tooth thickness. <b>Linear and Angular Measurements:</b> Tool maker's microscope, Slip gauges, Optical bevel protractor, Sine bar, Angle gauges, Precision level, Autocollimator, Angle dekkor, Straightness measurement, Squareness testing, Flatness measurement, Roundness measurement							

<b>UNIT-IV</b> <b>(10 Hrs)</b>	<b>Metrology of Machine Tools:</b> Acceptance tests on Lathe, Milling machine and Radial drilling machine. <b>Measurement of Surface Finish:</b> Surface texture and its Elements, factors effecting the surface roughness, sampling length, Evaluation of surface finish, Principle of Stylus instrument, Stylus probe instruments (Profilometer, Tomlinson surface meter, Taylor Hobson Talysurf)
<b>UNIT-V</b> <b>(10 Hrs)</b>	<b>Introduction to fiber optics,</b> fiber types, properties of optical fibers and a fiber optic sensor configuration <b>Advances in Metrology:</b> Introduction, Laser beam as a light pointer, length/displacement measurement, temperature sensors, seismographic measurement.
<b>Text Books:</b>	
1.	Mechanical Measurements, by R.S.Sirohi, H.G. Radha Krishna, Wiley Eastern, New Delhi.
2.	A Text Book of Engineering Metrology, I.C.Gupta, DhanpatRai& Sons, Delhi.
3.	Process & Materials of Manufacture, R.A.Lindberg, 4th edition, Prentice-Hall of India, New Delhi.
<b>Reference Books:</b>	
1.	A.S.T.M.E., Hand book of Industrial Metrology, Prentice-Hall of India, New Delhi
2.	A.S.T.M.E., Hand book of Manufacturing Engineering.
3.	Manufacturing Processes & Materials for Engineers, L.E.Doyle& others, Prentice-Hall of India, New Delhi
4.	Manufacturing Technology by Adithan, New age international.
5.	Instrumentation for Engineering Measurements, by R.H. Cerni and L.E.Foster, J.Wiley& Sons, New York.
<b>e-Resources:</b>	
1.	<a href="https://nptel.ac.in/courses/112/106/112106138/">https://nptel.ac.in/courses/112/106/112106138/</a>
2.	<a href="https://metrology.news/">https://metrology.news/</a>

Code	Category	L	T	P	C	I.M	E.M	Exam
B20ME3104	PE	3	--	--	3	30	70	3 Hrs.

## COMPOSITE MATERIALS

(For ME)

### Course Objectives:

1.	To impart knowledge about composite materials and their properties and structure.
2.	To develop the student's skills in understanding the different manufacturing methods available for Metal Matrix and advanced composites.
3.	Illuminate the knowledge and analysis skills to understand the response of composites to stresses.

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

S.No	Outcome	Knowledge Level
1.	Describe the functional requirements of reinforcement and matrix and classification of composites based on structure and matrix.	K3
2.	Describe the properties of fibers and matrix for manufacturing polymer and metal matrix composites	K3
3.	Develop competency in composite manufacturing techniques and be able to select the appropriate technique for manufacturing Polymer matrix composites.	K4
4.	Develop competency in composite manufacturing techniques and be able to select the appropriate technique for manufacturing metal matrix composites.	K4
5.	Determine stresses and strains relation in composite materials.	K4

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## SYLLABUS

<b>UNIT-I (10Hrs)</b>	<b>Introduction:</b> Definition, Conventional monolithic v/s composite materials, Classification of Composite materials, Advantages of composites, Application of composites, functional requirements of reinforcement and matrix
<b>UNIT-II (10 Hrs)</b>	<b>Fibers, types, properties, Fabrication, and its applications:</b> Glass fibers, Carbon fibers, Kevlar fibers, whiskers, and their properties, Introduction to natural fibers <b>Matrix Materials and its Properties:</b> Polymer Matrix, Metal Matrix, Ceramic Matrix
<b>UNIT-III (10 Hrs)</b>	<b>Manufacturing of Polymer matrix composites:</b> Classification – Thermoset & Thermoplastic <b>Processing of Thermoset Matrix Composites-</b> Wet/Hand layup and spray techniques, Filament winding Process, Pultrusion Process, Autoclave method, Resin Transfer Moulding. <b>Processing of Thermoplastic Matrix Composites-</b> Film Stacking, Diaphragm Forming, Thermoplastic Tape Laying, Preparation of Molding compounds (sheet moulding and bulk moulding compound), Compression molding, Reaction Injection Molding



<b>UNIT-IV</b> <b>(10 Hrs)</b>	<b>Manufacturing of Metal Matrix Composites</b> <b>Liquid-State Processes</b> –Casting or liquid infiltration, Squeeze casting or pressure infiltration, Centrifugal Casting. <b>Solid-State Processes</b> - Solid State diffusion technique, Hot isostatic pressing. <b>Manufacturing of Ceramic Matrix Composites:</b> Liquid Metal Infiltration, Liquid phase sintering. <b>Manufacturing of Carbon-Carbon composites:</b> Impregnation carbonization Process, Pyrolysis Process, chemical vapor deposition (CVD) process
<b>UNIT-V</b> <b>(10 Hrs)</b>	<b>Micromechanics of Lamina:</b> Introduction, Rule-of-mixtures – Mass and Volume fractions of composite – simple problems, Four Elastic Constants of a Fibre Reinforced Composite under (a) Iso Strain condition (b) Iso Stress condition (c) Poisson’s Ratio (d) Shear Modulus - Simple problems <b>Macromechanics of Lamina:</b> Introduction, Hooke's law for different types of materials, Elastic Constants of anorthotropic Lamina, Relationship of Compliance and Stiffness Matrix to Elastic Constants of a Lamina- Simple problems on Compliance and Stiffness Matrix
<b>Textbooks:</b>	
1.	Composite Materials by Krishan K. Chawla, 3rd edition, Springer, USA 2011.
2.	Metal Matrix Composites by Nikhilesh Chawla • Krishan K. Chawla, 2 <sup>nd</sup> Edition, 2013.
3.	Mechanics of composite Materials by Autar K. Kaw, 2 <sup>nd</sup> Edition,2006.
4.	Material Science and Technology by V. C. H. Cahn, Vol. 13, 3rd edition, 2007.
<b>Reference Books:</b>	
1.	Hand Book of Composite Materials by E. D. Lubin, 3rd edition, Tata McGraw-Hill, 2003.
2.	Composite Materials: Processing and Technology by Muhammad M. Rafique,2nd edition, Academy Press, 2009.
3.	Composite Materials and structure by P. K. Sinha, IIT Kharagpur, India, 2006.
<b>e-Resources:</b>	
1.	<a href="https://nptel.ac.in/courses/112/104/112104229/">https://nptel.ac.in/courses/112/104/112104229/</a>
2.	<a href="https://nptel.ac.in/courses/112/104/112104168/">https://nptel.ac.in/courses/112/104/112104168/</a>

Code	Category	L	T	P	C	I.M	E.M	Exam
B20ME3105	PE	3	--	--	3	30	70	3 Hrs.

## MECHATRONICS

(For ME)

### Course Objectives:

1.	To equip the students with fundamental knowledge on mechatronic systems.
2.	To familiarize the student with interdisciplinary knowledge of electronics required for application in mechanical engineering.

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

S.No	Outcome	Knowledge Level
1.	<b>Understand</b> about various types of sensors, transducers and amplifiers applied in a mechatronic system.	K2
2.	<b>Identify</b> the use of signal converters, logic gates and actuation systems required for the design of mechatronic systems.	K2
3.	<b>Illustrate</b> mathematical models for physical systems using the fundamental knowledge of control systems.	K3
4.	<b>Produce</b> transfer function of first and second order systems with feedback loops.	K3
5.	<b>Develop</b> the knowledge on microcontrollers, programmable logic controllers and their applications in mechatronic systems.	K3

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## SYLLABUS

<b>UNIT-I</b> (10 Hrs)	<p><b>Introduction to Mechatronics</b></p> <p><b>Sensors &amp; Transducers:</b> Introduction, performance terminology, Classification of sensors: Potentiometer sensor, strain gauged element, Capacity element, LVDT, Optical Encoders, Selection of sensors.</p> <p><b>Signal Conditioning:</b> Introduction signal Conditioning-Operational amplifiers: Inverting amplifier, summing amplifier, Integrating amplifier, Difference amplifier, filtering process.</p>
<b>UNIT-II</b> (10 Hrs)	<p><b>Digital signals:</b> Digital and analog signals - DA and AD converter – Data Acquisition</p> <p><b>Digital logic:</b> Digital logic - Logic gates – Application of logic gates</p> <p><b>Pneumatic and hydraulic Actuation Systems:</b> Direction control valves –process control valve-cylinders, Mechanical actuation systems</p>
<b>UNIT-III</b> (10 Hrs)	<p><b>Electric Actuation System:</b> Switching devices: Mechanical switches, solid state switches – solenoids - DC motors, AC motors, stepper motors</p> <p><b>Basic System Models:</b> Modeling of one and two degrees of freedom Mechanical, Electrical, Fluid and thermal systems. Block diagram representations for these systems. Mechanical translational systems, Mechanical rotational systems, Electromechanical coupling</p>

<b>UNIT-IV (10 Hrs)</b>	<b>System Transfer functions:</b> The Transfer function, Laplace transforms, First order systems, Second order systems, systems in series, systems with feedback loops. <b>Closed loop controllers:</b> Continuous and discrete processes, control modes, Two step, Proportional, Derivative, Integral, PID controllers
<b>UNIT-V (10 Hrs)</b>	<b>Microprocessors:</b> Microprocessor systems, Micro controllers, Applications <b>PLC:</b> Introduction, basic structure, I/P, O/P, processing, programming, ladder diagrams, timers, internal relays and counters, data handling, analogue input and output, selection of PLC. <b>Case studies of Mechatronic Systems:</b> Pick and place robot, Digital camera, Automotive control
<b>Text Books:</b>	
1.	Mechatronics Electronic control systems in Mechanical and Electrical Engineering by W. Bolton, Pearson Education, 4th Edition,2011
2.	Introduction to Mechatronics – David and Alcaitore Michael B.Histand TMH, 4th Edition, 2006.
<b>Reference Books:</b>	
1.	Mechatronics System Design by Devdas Shetty and Richard A. Kolk, P.W.S. Publishing Company, 2001
<b>e-Resources:</b>	
1.	<a href="https://nptel.ac.in/courses/112107298">https://nptel.ac.in/courses/112107298</a>
2.	<a href="https://nptel.ac.in/courses/112103174">https://nptel.ac.in/courses/112103174</a>

Code	Category	L	T	P	C	I.M	E.M	Exam
B20ME3106	PE	3	--	--	3	30	70	3 Hrs.
<b>ADVANCED STRENGTH OF MATERIALS</b>								
(For ME)								
<b>Course Objectives:</b> The objective of this course is to:								
1.	Analyze the stresses produced in practical applications of curved bars.							
2.	Enrich the student on the concepts of shear force and bending moment diagrams of fixed beams with uniform and non-uniform cross sections, both under stability of supports and sinking of supports.							
3.	Make the student understand the concepts of shear force and bending moment diagrams of continuous beams with uniform and non-uniform cross sections, both under stability of supports as well as sinking of supports.							
4.	Enhance the knowledge of students on different theories applied for analysis of columns and struts.							
5.	Analyze the stresses produced in different rotating machine members.							
<b>Course Outcomes:</b> At the end of the course, student will be able to								
S.No	Outcome							Knowledge Level
1.	Investigate various curved bars subjected to different loading conditions for determination of stresses and strains.							K4
2.	Acquire the knowledge of constructing Shear Force and Bending Moment diagrams for fixed beams.							K3
3.	Acquire the knowledge of constructing Shear Force and Bending Moment diagrams for continuous beams.							K3
4.	Apply different theories to design the columns and struts subjected to different load conditions.							K4
5.	Determine the distribution of stresses produced in various rotating machine members.							K3
<b>SYLLABUS</b>								
<b>UNIT-I</b> (10 Hrs)	<b>Bending of Curved Bars:</b> Winkler-Bach theory of curved bars subjected to uniform bending moment – rectangular, circular, and trapezoidal cross sections, Stresses in a crane hook.							
<b>UNIT-II</b> (10 Hrs)	<b>Fixed Beams:</b> Relations between fixing moments of a fixed beam of uniform cross section, BMD & SFD of fixed beams of uniform and variable cross sections, Effect of sinking of support.							

<b>UNIT-III (10 Hrs)</b>	<b>Continuous beams:</b> Clapeyron's theorem of three moments for a continuous beam of varying and uniform cross sections, BMD & SFD of continuous beams of uniform cross section, Effect of sinking of support.
<b>UNIT-IV (12Hrs)</b>	<b>Columns and Struts:</b> Buckling of columns, Euler's theory – Columns with both ends hinged, both ends fixed, one end fixed and other end hinged, one end free and other end fixed, Limitation of Euler's formula, Empirical formulae – Rankine's formula, Column carrying eccentric load.
<b>UNIT-V (10Hrs)</b>	<b>Rotating rings and discs:</b> Stresses in rotating ring /wheel rim, Radial and circumferential stress distributions in disc of uniform thickness – solid and hollow discs, Disc of uniform strength.
<b>Textbooks:</b>	
1.	Analysis of Structures, Vol. – I by Vazirani and Ratwani, Khanna Publishers
2.	Strength of materials by Sadhu Singh, Khanna Publishers
<b>Reference Books:</b>	
1.	Strength of Materials, by Timoshenko, CBS Publishers and distributors.
2.	Strength of Materials by R. K. Rajput, S. Chand & Co Publishers.
<b>e-Resources:</b>	
1.	<a href="https://cosmolearning.org/courses/advanced-strength-of-materials/">https://cosmolearning.org/courses/advanced-strength-of-materials/</a>
2.	<a href="http://www.infocobuild.com/education/audio-video-courses/mechanical-engineering/AdvancedStrengthOfMaterials-IIT-Bombay/lecture-29.html">http://www.infocobuild.com/education/audio-video-courses/mechanical-engineering/AdvancedStrengthOfMaterials-IIT-Bombay/lecture-29.html</a> .

Code	Category	L	T	P	C	I.M	E.M	Exam
<b>B20ME3107</b>	<b>PE</b>	<b>3</b>	<b>--</b>	<b>--</b>	<b>3</b>	<b>30</b>	<b>70</b>	<b>3 Hrs.</b>
<b>MOOCS-I</b>								
(For ME)								
<p>MOOCs-IV course should belong to the B.Tech. Programme and that course should not be studied earlier. Students should select a course from SWAYAM/ NPTEL with minimum 12 weeks of duration.</p> <p>The percentage obtained for the candidate in MOOCs will be mapped to the grade table given in the Academic Regulations.</p>								



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B20ME3108	PC	-	--	3	1.5	15	35	3 Hrs.
<b>IC ENGINES AND KINEMATICS OF MACHINES(KOM) LAB</b>								
(For ME)								
<b>Course Objectives:</b>								
1	Students would appreciate the fundamentals of thermodynamics being extended to real time Applications.							
2	Students by themselves should be able to trouble shoot basic essential issues of automobiles.							
3	Students might come out with innovative ideas which may be extended in the form of projects.							
<b>Course Outcomes:</b> At the end of the course, students will be able to								
S.No	Outcome							Knowledge Level
1	Give hands-on experience with different test rigs of I.C Engines							K3
2	Know different methods of finding friction power in single and multi-cylinder engines.							K5
3	Estimate the economical speed of different engines.							K5
4	Evaluate the Gyroscopic couple, static & dynamic balancing methods and four bar chain mechanisms used in various applications.							K5
<b>SYLLABUS</b>								
<b>(a)</b>	<b>IC Engines Lab</b>							
1	Load test on single cylinder diesel Engine.							
2	Morse test on dual cylinder horizontal diesel engine.							
3	Heat balance sheet on I.C. Engines.							
4	Study of multi-cylinder engines and determination of its firing order.							
5	Performance test on multi cylinder diesel engine.							
6	To rectify basic essential issues of modern cars such as Jump starting, Tyre replacement & repair, dismantling some components to understand their mechanisms etc.							
<b>(b)</b>	<b>Kinematics of Machines Lab</b>							
1	Study of automobile mechanisms							
2	Verification of laws of balancing.							
3	Determination of ratios of angular speeds of shafts connected by Hooke's joint.							
4	Determination of the ratio of times and ram velocities of Whitworth quick return motion mechanism.							
5	To draw curves of slider displacement and crank angle and linear velocities w.r.t. time for a slider crank mechanism and compare with theoretical values.							
6	To determine the relation of gyroscopic couple and compare with the theoretical values.							

**Reference Books:**

1	Thermal Engineering, by R.K.Rajput.
2	Theory of Machines by S S Rattan.





Code	Category	L	T	P	C	I.M	E.M	Exam
B20ME3109	PC	-	--	3	1.5	15	35	3 Hrs.

### METROLOGY LAB

(For ME)

#### Course Objectives:

1	To demonstrate the fundamentals of Metrology and Measurement Engineering concepts.
2	To demonstrate the techniques and processes followed for calibrating of measuring instruments and to familiarize working with different tools used for linear and angular measurement.

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

S.No	Outcome	Knowledge Level
1	Calibrate the accuracy of measuring devices.	K4
2	Calculate linear and angular measurements using different measuring instruments.	K4

### SYLLABUS

1	Calibration of Vernier Calipers
2	Calibration of Outside Micrometer.
3	Calibration of Tool Room Microscope.
4	Calibration of Mechanical Comparator.
5	Measurement of taper angle using Dial Gauge and Sine Bar.
6	Study and use of Bevel Protractor.
7	Measurement of the height of Circular Spigot.
8	Measurement of angle of V-Groove.
9	Measurement of distance between two holes of a template using Vernier Height Gauge
10	Measurement of gear parameters
11	Measurement of thread parameters on Profile Projector
12	Measurement of tool angles on Profile Projector

#### Reference Books:

1	A Text Book of Engineering Metrology, LC.Gupta, DhanpatRai & Sons, Delhi.
2	Mechanical Measurements, by R.S. Sirohi, H.G. Radha Krishna, Wiley Eastern, NewDelhi
3	Manufacturing Processes & Materials for Engineers, LE. Doyle & others, Prentice-Hall of India, NewDelhi
4	Instrumentation for Engineering Measurements, by R.H. Cerniand LE.Foster, I.Wiley & Sons, NewYork.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20ME3110	SOC	1	--	2	2	--	50	3Hrs.

### PYTHON PROGRAMMING LAB

(For ME)

**Course Objectives:** The student who successfully completes this course will have:

1	To acquire programming skills in core Python.
2	To acquire skills on various data types.
3	To develop the skills related to pandas, matplotlib and numpy libraries.

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

S.No	Outcome	Knowledge Level
1	Write, Test and Debug Python Programs	K4
2	Use Conditionals and Loops for Python Programs	K3
3	Use functions and represent Compound data using Lists, Tuples and Dictionaries	K3
4	Use various applications using various python libraries.	K3

### SYLLABUS

1	Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and average of the three numbers and print out the values of total and average.
2	Write a program that uses a <i>for</i> loop to print the numbers 8,11,14,17,20,...,83,86,89.
3	Write a program that asks the user for their name and how many times to print it. The program should print out the user's name the specified number of times.
4	Use a <i>for</i> loop to print a triangle like the one below. Allow the user to specify how high the triangle should be.
5	Write a program that asks the user to enter a word and prints out whether that word contains any vowels.
6	Write a program that asks the user to enter two strings of the same length. The program should then check to see if the strings are of the same length. If they are not, the program should print an appropriate message and exit. If they are of the same length, the program should alternate the characters of the two strings. For example, if the user enters <i>abcde</i> and <i>ABCDE</i> the program should printout <i>AaBbCcDdEe</i> .
7	Write a program that asks the user for a large integer and inserts commas into it according to the standard American convention for commas in large numbers. For instance, if the user enters 1000000, the output should be 1,000,000.

8	Write a program that generates a list of 20 random numbers between 1 and 100. (a)Print the list. (b)Print the average of the elements in the list. (c)Print the largest and smallest values in the list. (d)Print the second largest and second smallest entries in the list (e)Print how many even numbers are in the list.
9	Write a function called <i>sum_digits</i> that is given an integer num and returns the sum of the digits of num.
10	Write a function called <i>number_of_factors</i> that takes an integer and returns how many factors the number has.
11	Write a function called <i>primes</i> that is given a number and returns a list of the first n primes. Let the default value of n be 100.
12	Write a function called <i>merge</i> that takes two already sorted lists of possibly different lengths, and merges them into a single sorted list. (a)Do this using the sort method. (b)Do this with out using the sort method.
13	Write a program to demonstrate Try/except/else.
14	Write a program to load an excel file, modify columns and rows in excel file and perform simple operations using panda's library.
15	Write a program to draw bar charts, line charts and scatter plots using matplotlib library.
16	Write a program to perform basic mathematical operations over a set of series using Numpy library.
<b>Reference Books:</b>	
1.	Introduction to Python Programming, Gowrishankar S, Veena A, CRC Press.
2.	Programming and Problem Solving with Python, Ashok NamdevKamthane, Amit Ashok Kamthane, TMH, 2019.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20MC3101	MC	3	--	--	--	--	--	3 Hrs.
<b>EMPLOYABILITY SKILLS</b>								
(Common to CE, EEE & ME)								
<b>Part-A: Verbal Ability</b>								
<b>Course Objectives:</b>								
1.	To introduce concepts required in framing grammatically correct sentences and identifying errors While using Standard English.							
2.	To familiarize the learner with high frequency words as they would be used in their professional career.							
3.	To inculcate logical thinking in order to frame and use data as per the requirement							
4.	To acquaint the learner of making a coherent and cohesive sentences and paragraphs for composing a written discourse.							
5.	To familiarize students with soft skills and how it influences their professional grow.							
<b>Course Outcomes:</b> The students will be able to								
S.No	Outcome							Knowledge Level
1	Detect grammatical errors in the text/sentences and rectify them while answering their competitive/company specific tests and frame grammatically Correct sentences while writing.							K3
2	Answer questions on synonyms, antonyms and other vocabulary-based Exercises while attempting CAT, GRE, GATE and other related tests.							K3
3	Use their logical thinking ability and solve questions related to analogy, Syllogisms, and other reasoning-based exercises.							K3
4	Choose the appropriate word/s/phrases suitable to the given context in order to make the sentence/paragraph coherent.							K3
<b>SYLLABUS</b>								
<b>UNIT-I</b>	Spotting Errors, Sentence Improvement							
<b>UNIT-II</b>	Synonyms, Antonyms, Frequently Confused Words, Foreign Phrases, Idioms and Phrasal Verbs, Collocations.							
<b>UNIT-III</b>	Foreign Phrases, Idioms and Phrasal Verbs, Collocations, Analogies, Odd One Out							
<b>UNIT-IV</b>	Sentence completion, Sentence Equivalence, Close Test							
<b>UNIT-V</b>	Reading Comprehension, Para Jumbles							
<b>Text Books:</b>								

1.	Oxford Learners,, Grammar–Finder by John Eastwood, Oxford Publication.
2.	RS Agarwal books on objective English and verbal reasoning
3.	English Vocabulary in Use-Advanced, Cambridge University Press
4.	Collocations In Use, Cambridge University Press
5.	Soft Skills & Employability Skills by Samina Pillai and Agna Fernandez, Cambridge University Press India Pvt .Ltd.
6.	Soft Skills, by Dr.K.Alex, S. Chand & Company Ltd., New Delhi

**Reference Books:**

1.	English Grammar in Use by Raymond Murphy, CUP
2.	Websites: Indiabix,800score, official CAT, GRE and GMAT sites
3.	Material from IMS, Career Launcher and Time institutes for competitive exams
4.	The Art of Public Speaking by Dale Carnegie
5.	The Leader in You by Dale Carnegie
6.	Emotional Intelligence by Daniel Golman
7.	Stay Hungry Stay Foolish by Rashmi Bansal
8.	I have a Dream by Rashmi Bansal.

**Part-B: Quantitative  
Aptitude-I**

**Course Objectives:**

1.	To familiarize students with basic problems on numbers and ratios problems.
2.	To enrich the skills of solving problems on time, work, speed, distance and also Measurement of units.
3.	To enable the students to work efficiently on percentage values related to shares, profit and Loss problems.
4.	To inculcate logical thinking by exposing the students to reasoning related questions.
5.	To inculcate logical thinking by exposing the students to reasoning related questions.

**Course Outcomes:**

S.No.	Course Outcome	Knowledge Level
1.	The students will be able to perform well in calculating on number problems and various units of ratio concepts	K3
2.	The students will be able to solve problems on time and distance and units related solutions	K3
3.	The students will become adept in solving problems related to profit and loss, in specific, quantitative ability	K3
4.	The students will present themselves well in the recruitment process using analytical and logical skills which he or she developed during the course as they are very important for any person to be placed in the industry	K3

5.	The students will learn to apply Logical thinking to the problems of Syllogisms and be able to effectively attempt competitive examinations like CAT, GRE, GATE for further studies	K3
<b>SYLLABUS</b>		
<b>UNIT-I</b>	Numbers, LCM and HCF, Chain Rule, Ratio and Proportion Importance of different types of numbers and uses of them: Divisibility tests, finding remainders in various cases, Problems related to numbers, Methods to find LCM, Methods to find HCF, applications of LCM, HCF. Importance of chain rule, Problems on chain rule, Introducing the concept of ratio in three Different methods, Problems related to Ratio and Proportion	
<b>UNIT-II</b>	Time and work, Time and Distance Problems on manpower and time related to work, Problems on alternate days, Problems on hours of working related to clock, Problems on pipes and cistern, Problems on combination of the some or all the above, Introduction of time and distance, Problems on average speed, Problems on Relative speed, Problems on trains, Problems on boats and streams, Problems on circular tracks, Problems on polygonal tracks, Problems on races.	
<b>UNIT-III</b>	Percentages, Profit Loss and Discount, Simple interest, Compound Interest, Partnerships, shares and dividends. Problems on percentages-Understanding of cost price, selling price, marked price, discount, percentage of profit, percentage of loss, percentage of discount, Problems on cost price, selling price, market price, discount. Introduction of simple interest, Introduction of compound interest, Relation between simple interest and compound interest, Introduction of partnership, Sleeping partner concept and problems, Problems on shares and dividends, and stocks.	
<b>UNIT-IV</b>	Introduction, number series, number analogy, classification, Letter series, ranking, directions Problems of how to find the next number in the series, Finding the missing number and related sums, Analogy, Sums related to number analogy, Ranking of alphabet, Sums related to Classification, Sums related to letter series, Relation between number series and letter series, Usage of directions north, south, east, west, Problems related to directions north, south, east, west.	
<b>UNIT-V</b>	Data sufficiency, Syllogisms Easy sums to understand data sufficiency, Frequent mistakes while doing data sufficiency, Syllogisms Problems.	
<b>Text Books:</b>		
1.	Quantitative aptitude by RS Agarwal	
2.	Verbal and nonverbal reasoning by RS Agarwal	
3.	Puzzles to puzzle you by shakunatala devi.	
<b>References:</b>		
1.	Barrons by Sharon Welner Green and IraK Wolf (Galgotia Publications pvt. Ltd.)	

2.	Websites: m4maths, Indiabix, 800score, official CAT, GRE and GMAT sites
3.	Material from IMS, Career Launcher and Time,, institutes for competitive exams
4.	Books for CAT by Arun sharma.
5.	Elementary and Higher algebra by HS Hall and SR Knight.
<b>Websites:</b>	
1.	<a href="http://www.m4maths.com">www.m4maths.com</a>
2.	<a href="http://www.Indiabix.com">www.Indiabix.com</a>
3.	<a href="http://www.800score.com">www.800score.com</a>
4.	Official GRE site
5.	Official GMAT site





## SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JNTUK, Kakinada), (Recognized by AICTE, New Delhi)

UG Programmes CE,CSE,ECE,EEE,IT & ME are Accredited by NBA

CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204

Regulation: R20		III / IV - B.Tech. II - Semester							
MECHANICAL ENGINEERING									
SCHEME OF INSTRUCTION & EXAMINATION (With effect from 2020-21 admitted Batch onwards)									
Course Code	Course Name	Category	Cr	L	T	P	Int. Marks	Ext. Marks	Total Marks
B20ME3201	CAD/CAM	PC	3	3	0	0	30	70	100
B20ME3202	Heat Transfer	PC	3	3	0	0	30	70	100
B20ME3203	Industrial Engineering and Management	PC	3	3	0	0	30	70	100
#PE-II	Professional Elective -II	PE	3	3	0	0	30	70	100
#OE-II	Open Elective-II	OE	3	3	0	0	30	70	100
B20ME3208	CAD/CAM Lab	PC	1.5	0	0	3	15	35	50
B20ME3209	Heat Transfer Lab	PC	1.5	0	0	3	15	35	50
B20ME3210	Industrial Engineering Lab	PC	1.5	0	0	3	15	35	50
B20HS3203	Soft Skills (Skill Oriented Course)	SOC	2	1	0	2	--	50	50
B20HS3204	*Gender Sensitization	HS	0	2	0	0	--	--	--
<b>TOTAL</b>			<b>21.5</b>	<b>18</b>	<b>0</b>	<b>11</b>	<b>195</b>	<b>505</b>	<b>700</b>

	Course Code	Course
#PE-II	B20ME3204	Refrigeration and Air Conditioning
	B20ME3205	Design of Transmission Elements
	B20ME3206	Optimization Techniques
	B20ME3207	MOOCs –II
#OE-II	Student has to study one Open Elective offered by CE or CSE or ECE or EEE or IT or S&H from the list enclosed.	

**\*Note:** Gender Sensitization is a Self-Learning noncredit Audit Course



Code	Category	L	T	P	C	I.M	E.M	Exam
B20ME3201	PC	3	--	--	3	30	70	3 Hrs.
<b>CAD/CAM</b>								
(For ME)								
<b>Course Objectives:</b> The objective of this course is to:								
1.	Impart the student with the fundamentals of CAD and Applications of computers in CAD							
2.	Acquaint the student with the concepts of Artificial intelligence in design and manufacturing fields.							
3.	Acquaint the student in using advanced modelling approaches and tools for real - world mechanical design problems that will enable him to execute comprehensive and professional engineering projects and understand the role of computers in manufacturing.							
4.	Educate the student about the role of computers in different phases of manufacturing.							
<b>Course Outcomes:</b> At the end of the course, students will be able to								
S.No	Outcome							Knowledge Level
1.	Understand the fundamentals of CAD and Applications of computers in CAD							K3
2.	Apply the principles of transformations and geometric modeling in CAD.							K3
3.	Analyze advanced computational tools for complex part analysis and apply the principles of artificial intelligence and expert systems in CAD applications.							K4
4.	Illustrate concepts of CAM, CNC, group technology and computer aided process planning methods.							K3
5.	Demonstrate various computer aided material handling systems and computer aided inspection and quality control techniques.							K3
<b>SYLLABUS</b>								
<b>UNIT-I</b> (10 Hrs)	<b>Fundamentals of CAD</b> - Introduction - The design process - Application of computers for design - Operating systems - Hardware in CAD: The design workstation - I/O Devices - CAD system configuration - Creating database for manufacturing - Benefits of CAD.							
<b>UNIT-II</b> (10 Hrs)	<b>Interactive Computer Graphics</b> - Graphic display devices- Graphics system- Graphics standards - Graphical user interface- Transformation systems- windowing - clipping - 2D and 3D transformations - Linear transformation- Geometric Modeling - Modeling Techniques - Wire frame Modeling - Surface Modeling - 3 D Solid Modeling.							
<b>UNIT-III</b> (10 Hrs)	<b>Introduction to Finite Element Analysis</b> – Steps of FEM for solving physical problem, CAD techniques to finite element data preparation- Automatic mesh generation- Presentation of results, CAD applications of FEM. <b>Introduction to Artificial Intelligence</b> - Applications of AI in design and CAD.							

<b>UNIT-IV (10 Hrs)</b>	<b>Introduction to CNC and CAM:</b> Merits & demerits, Classification, manual part programming, Group technology and Coding systems (OPTIZ coding system only) <b>Computer aided process planning:</b> Introduction to process planning, Methods of process planning, Computer aided process planning
<b>UNIT-V (10 Hrs)</b>	<b>Computer aided material handling:</b> Robots: Structure and operation of Robots, robot sensors and applications. Automatic conveyor systems. Automated guided vehicles. <b>Computer aided inspection and quality control:</b> Quality assurance and quality control. Contact and Non-contact inspection -Coordinate measuring machine.
<b>Textbooks:</b>	
1.	CAD/CAM-Computer Aided Design & Manufacturing, by M.D. Groover & E.W. Zimmer.
2.	Computer Aided Design and Manufacturing, by Dr. Sadhu Singh, Khanna Publishers.
<b>Reference Books:</b>	
1.	Computer Integrated Design and Manufacturing, by David D. Bedworth, Mark R. Henderson & Philip M. Wolfe, McGraw-Hill Book Company, Singapore
2.	Computer Aided Manufacturing, by P.N. Rao, N.K. Tewari & T.K. Kundra, Tata McGraw- Hill publishing company Ltd, NewDelhi.
3.	CAD/CAM/CIM by Radhakrishna, New age international
<b>Web links:</b>	
1.	<a href="https://nptel.ac.in/courses/112102102">https://nptel.ac.in/courses/112102102</a>
2.	<a href="https://archive.nptel.ac.in/courses/112/102/112102101/">https://archive.nptel.ac.in/courses/112/102/112102101/</a>

Estd. 1980

AUTONOMOUS

Code	Category	L	T	P	C	I.M	E.M	Exam
B20ME3202	PC	3	--	--	3	30	70	3 Hrs.

## HEAT TRANSFER

(For ME)

### Course Objectives:

1.	To make the student calculate the heat transfer phenomena through conduction.
2.	To make the student calculate the heat transfer rate in convection.
3.	To make the student determine the overall heat transfer coefficient in heat exchangers and boiling and condensation phenomena.
4.	To make the student to evaluate the heat transfer by radiation.

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

S.No	Outcome	Knowledge Level
1.	Apply the modes of heat transfer and study the problems involving steady and unsteady state heat conduction in various Cross sections.	K3
2.	Formulate and solve the heat transfer coefficients for natural and forced convection for various cross section areas.	K3
3.	Design Simple heat exchanger units, acquiring basic knowledge on boiling and condensation heat transfer.	K4
4.	Analyse radiation heat transfer between black body and gray body surfaces.	K4

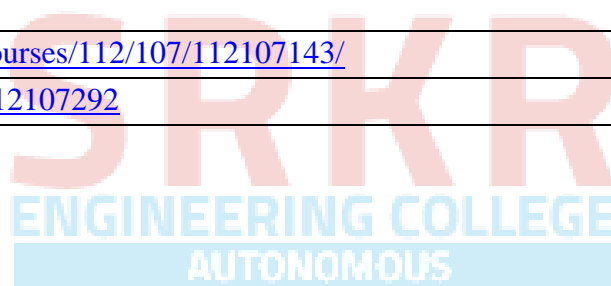
## SYLLABUS

<b>UNIT-I</b> (10Hrs)	<p><b>Introduction:</b> Modes and Mechanisms of Heat Transfer – Basic Laws of Heat Transfer – General Applications of Heat Transfer.</p> <p><b>Conduction Heat Transfer:</b> Fourier Rate Equation – General Heat Conduction Equation In Cartesian, Cylindrical and Spherical Coordinates, Simplification and Forms of the Field Equation – Steady, Unsteady and Periodic Heat Transfer – Boundary and Initial Conditions.</p> <p><b>One Dimensional Steady State Heat Conduction:</b> In Slabs, Hollow Cylinders and Spheres – Overall Heat Transfer Coefficient – Electrical Analogy – Critical Radius/Thickness of Insulation.</p>
<b>UNIT-II</b> (10 Hrs)	<p><b>Heat Transfer in Extended Surface (Fins):</b> – efficiency, effectiveness and temperature distribution on Long Fin, Fin with Insulated Tip and Short Fin, Application to Errors in Temperature Measurement.</p> <p><b>One Dimensional Transient Heat Conduction:</b> In Systems with Negligible Internal Resistance Significance of Biot and Fourier Numbers – Chart Solutions of Transient Conduction Systems – Problems on Semi-infinite Body.</p>
<b>UNIT-III</b> (12 Hrs)	<p><b>Convective Heat Transfer:</b> Dimensional Analysis – Buckingham II Theorem and Its Application for Developing Semi – Empirical Non-Dimensional Correlations for Convective Heat Transfer – Significance of Non-Dimensional Numbers.</p>

	<p><b>Forced Convection:</b></p> <p><b>External Flows:</b> Concepts of Hydrodynamic and Thermal Boundary Layer and Use of Empirical Correlations for Convective Heat Transfer for Flow Over – Flat Plates, Cylinders and Spheres.</p> <p><b>Internal Flows:</b> Division of Internal Flow through Concepts of Hydrodynamic and Thermal Entry Lengths – Use of Empirical Relations for Convective Heat Transfer in Horizontal Pipe Flow, Annular Flow.</p> <p><b>Free Convection:</b> Development of Hydrodynamic and Thermal Boundary Layer along a Vertical Plate – Use of Empirical Relations for Convective Heat Transfer on Plates and Cylinders in Horizontal and Vertical Orientation.</p>
<b>UNIT-IV (8 Hrs)</b>	<p><b>Heat Transfer with Phase Change:</b> Boiling: Pool Boiling – Regimes, Determination of Heat Transfer Coefficient in Nucleate Boiling, Critical Heat Flux and Film Boiling.</p> <p><b>Condensation:</b> Film wise and Drop wise Condensation – Nusselt’s Theory of Condensation on a Vertical Plate- Film Condensation on Vertical and Horizontal Cylinders Using Empirical Correlations.</p> <p><b>Heat Exchangers:</b> Classification of Heat Exchangers – Overall Heat Transfer Coefficient and Fouling Factor –Concepts of LMTD and NTU Methods – Problems using LMTD and NTU Methods.</p>
<b>UNIT-V (10 Hrs)</b>	<p><b>Radiative Heat Transfer:</b> Emission Characteristics and Laws of Black-Body Radiation – Irradiation –Total and Monochromatic Quantities– Laws of Planck, Wien, Kirchoff, Lambert, Stefan And Boltzmann – Heat Exchange Between Two Black Bodies – Concepts of Shape Factor – Emissivity – Heat Exchange Between Gray Bodies – Radiation Shields – Electrical Analogy for Radiation Networks.</p>
<b>Text Books:</b>	
1.	Fundamentals of Engg. Heat and Mass Transfer, R.C.Sachdeva, New Age International Publications, Fifth edition.
2.	Heat Transfer, P.K.Nag, TMH Publications, Third edition.
<b>Reference Books:</b>	
1.	Heat Transfer, J. P. Holman, TMH Publications, Special Indian edition.
2.	Principles of Heat Transfer, Frank Kreith, R. M. Manglik& M. S. Bohn, Cengage learning publishers, Special edition.
3.	Heat and Mass Transfer, Domkundwar, Arora, Domkundwar, Dhanpath Rai & Co. Publications.
4.	Heat and Mass Transfer, Cengel, McGraw Hill Publications, Fifth edition.
5.	Heat and mass transfer, R.K. Rajput, S. Chand Publications, Revised edition.
<b>e-Resources:</b>	
1.	<a href="https://nptel.ac.in/courses/112101097/">https://nptel.ac.in/courses/112101097/</a>
2.	<a href="http://web.mit.edu/lienhard/www/ahttv212.pdf">http://web.mit.edu/lienhard/www/ahttv212.pdf</a>
3.	<a href="https://www.grc.nasa.gov/www/k-12/airplane/heat.html">https://www.grc.nasa.gov/www/k-12/airplane/heat.html</a>

Code	Category	L	T	P	C	I.M	E.M	Exam
B20ME3203	PC	3	--	--	3	30	70	3 Hrs.
<b>INDUSTRIAL ENGINEERING AND MANAGEMENT</b>								
(For ME)								
<b>Course Objectives:</b> Students learn								
1.	To know the management practices and to handle the industrial disputes in industry							
2.	To know the production activities and maintenance practices in industry							
3.	To know the work study procedures and quality concepts to increase productivity							
<b>Course Outcomes:</b> At the end of the course, students will be able to								
S.No	Outcome							Knowledge Level
1.	Apply the knowledge of industrial and personal management for the settlement of industrial disputes							K3
2.	Develop the production planning activities for the advancement of productivity							K3
3.	Illustrate various economics of plant layout for the better maintenance of plant							K3
4.	Interpret the concepts of work-study to evaluate the performance							K4
5.	Apply the tools and techniques of quality management to manufacturing and quality control							K3
<b>SYLLABUS</b>								
<b>UNIT-I (10Hrs)</b>	<b>Concepts of Industrial Management:</b> Principles of Management, Functions of management, Principles of organization, Types of organization <b>Personnel management and Industrial relations:</b> Functions of personnel management, Theories of motivation, Promotion, Transfer, Lay off and Discharge, Labor turnover, Trade unions, Industrial disputes, Strikes, Lock-out, Picketing, Gherao, Settlement of industrial disputes, Collective bargaining, Industrial dispute act 1947.							
<b>UNIT-II (08 Hrs)</b>	<b>Production planning and control:</b> Types of productions, Production cycle, Product design and development, Process planning, Forecasting, Loading, Scheduling, Dispatching, Routing, Progress control.							
<b>UNIT-III (10 Hrs)</b>	<b>Plant location &amp; Plant layout:</b> Economics of plant location, Rural Vs Suburban sites, Types of layouts, Types of buildings. <b>Materials handling:</b> Principles, Concept of unit load, Palletization and Containerization, Selection of material handling equipment, Types and applications of material handling equipment.							
<b>UNIT-IV (10 Hrs)</b>	<b>Work study:</b> Concept of productivity, Method study – Basic steps in method study, Process charts, Diagrams, Models and Templates, Principles of motion economy, Micro motion							

	study, Therbligs, SIMO chart, Work measurement – Stop watch procedure of time study, Performance rating, Allowances
<b>UNIT-V (10 Hrs)</b>	<b>Materials management:</b> Introduction, Purchasing, Objectives of purchasing department, Buying techniques, Purchase procedure, Stores and material control, receipt and issue of materials, Store records, Inventory control, EOQ model (simple problems). <b>Quality control:</b> Control charts of variables and attributes. Single and double sampling plans.
<b>Text Books:</b>	
1.	Industrial Engineering and Management by Dr. O P Khanna
<b>Reference Books:</b>	
1.	Principles of Management by Koontz & Donnel.
2.	Production and Operations Management by Everette Adam & Ronald Ebert
3.	Industrial Engineering and Production Management by Martand Telsang
4.	Operations Management by John McClain & Joseph Thames.
<b>e-Resources:</b>	
1.	<a href="https://archive.nptel.ac.in/courses/112/107/112107143/">https://archive.nptel.ac.in/courses/112/107/112107143/</a>
2.	<a href="https://nptel.ac.in/courses/112107292">https://nptel.ac.in/courses/112107292</a>



Code	Category	L	T	P	C	I.M	E.M	Exam
B20ME3204	PE	3	--	--	3	30	70	3 Hrs.
<b>REFRIGERATION &amp; AIR CONDITIONING</b>								
(For ME)								
<b>Course Objectives:</b>								
1.	Understand the principles of refrigeration and aircraft refrigeration systems.							
2.	Have the complete knowledge of the Vapour Compression Refrigeration System and its performance.							
3.	Understand the working of Vapour Absorption refrigeration system.							
4.	Understand the working of Steam Jet Refrigeration system.							
5.	Understand the principles and processes of psychrometry.							
6.	Develop the knowledge of students in selecting the right equipment for a particular application of Air- conditioning.							
<b>Course Outcomes:</b> At the end of the course, students will be able to								
S.No	Outcome							Knowledge Level
1.	Illustrate the fundamental principles and applications of refrigeration and air conditioning system.							K3
2.	Analyze cooling capacity and performance of refrigeration systems							K4
3.	Examine the properties, applications and environmental issues of different refrigerants							K3
4.	Understand the vapour absorption and other non-conventional refrigeration systems and their application as alternatives to VCR systems.							K3
5.	Analyze the air conditioning processes using principles of Psychrometry							K4
<b>SYLLABUS</b>								
<b>UNIT-I (10Hrs)</b>	<b>Introduction to Refrigeration:</b> Necessity of refrigeration and air conditioning, applications, unit of refrigeration. Carnot cycle, Bell Coleman cycle, Open and Dense air systems, Actual air refrigeration system –numerical problems. Refrigeration needs of aircrafts, methods of air refrigeration systems.							
<b>UNIT-II (10 Hrs)</b>	<b>Vapour Compression Refrigeration System</b> - Basic Cycles- Working principle and Essential components of the plant – COP – Representation of cycle on T-S and P-h charts- Effect of sub cooling and super heating - cycle analysis. Actual cycle, Influence of various parameters on system performance -numerical Problems. Refrigerants- Classifications- Desirable properties.							
<b>UNIT-III (10 Hrs)</b>	<b>Vapour Absorption Refrigeration (VAR) System</b> – Description and Working of NH <sub>3</sub> – Water System and Li Br – Water (Two Shell & Four Shell) System – Calculation of Max							

	COP, Principle of Operation of Three Fluid Absorption System. <b>Steam Jet Refrigeration System:</b> Working Principle and Basic Components – Nonconventional refrigeration methods: Principle and operation (i) Thermoelectric refrigerator (ii) Vortex tube or Hilsch tube.
<b>UNIT-IV (10 Hrs)</b>	<b>Psychrometry:</b> Psychrometric properties and relations- Psychrometric chart- Psychrometric processes- Human comfort and comfort chart- Effective temperature and factors governing effective temperature.
<b>UNIT-V (10 Hrs)</b>	<b>Air Conditioning:</b> Summer, Winter and year round air conditioning- Different types of Air conditioning load - By pass factor, RSHP, GSHF- Fresh air quantity- Cooling coils and Dehumidity- Air washers.
<b>Textbooks:</b>	
1.	A Course in Refrigeration and Air Conditioning, S. C Arora & Domkundwar, Dhanpatrai Publications.
2.	Refrigeration and Air conditioning, by R. S. Khurmi and J. K. Gupta, S Chand publications.
<b>Reference Books:</b>	
1.	Refrigeration and Air conditioning, by Jordan R.C. and Priester G.B.
2.	Principles of Refrigeration, by Dossat.
3.	Refrigeration and Air-conditioning, by W.P.Stoecky.
4.	Refrigeration and Air Conditioning, CP Arora, TMH.
<b>e-Resources:</b>	
1.	<a href="https://nptel.ac.in/courses/112105128">https://nptel.ac.in/courses/112105128</a>
2.	<a href="https://nptel.ac.in/courses/112107208">https://nptel.ac.in/courses/112107208</a>



Code	Category	L	T	P	C	I.M	E.M	Exam
B20ME3205	PE	3	--	--	3	30	70	3 Hrs.

## DESIGN OF TRANSMISSION ELEMENTS

(For ME)

**Course Objectives:** Students are expected to

1.	Design and formulate, to analyze stresses and strains in transmission elements like gears, bearings, etc. under static and dynamic load conditions
2.	Design of Internal combustion engine parts like cylinder, pistons, connecting rod etc.
3.	Understand the stresses on flexible machine elements like wire ropes, chain drives etc.

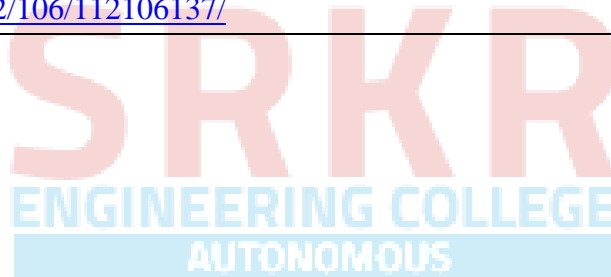
**Course Outcomes:** At the end of the course, students will be able to

S.No	Outcome	Knowledge Level
1.	Design of spur, helical and bevel gears based on their load carrying capacity.	K4
2.	Design various parts of IC Engines such as cylinders, pistons, connecting rods & cross heads.	K4
3.	Design the sliding and roller contact bearings under various environmental and service Conditions.	K4
4.	Evaluate the stresses induced and design the shafts and couplings.	K4
5.	Select and Design wire ropes and chain drives for the specified application.	K4

## SYLLABUS

<b>UNIT-I (10Hrs)</b>	<b>Gears:</b> Classification of gears, Standard tooth systems. Spur, Helical and Bevel gears. Terminology of each. Tooth failure. Face width and beam strength. Lewis equation. Design for dynamic and wear loads.
<b>UNIT-II (10Hrs)</b>	<b>I.C Engine elements:</b> Design of cylinders and heads, Design of pistons, Design of connecting rods and Design of cross-heads.
<b>UNIT-III (12Hrs)</b>	<b>Sliding contact bearings:</b> Lubrication modes. Temperature effect on viscosity. Full Journal bearing design. Bearing modulus. McKee equations. Heating of bearings. Collar and thrust bearings. <b>Rolling Contact Bearings:</b> Static and dynamic load capacity. Equivalent bearing load. Load-life relationships. Load factor. Selection of bearings from manufacturer's catalogue
<b>UNIT-IV (10Hrs)</b>	<b>Shafts:</b> Shafts design on strength basis, torsional rigidity basis, Design of hollow shafts, flexible shafts, ASME codes for shafts. <b>Couplings:</b> Rigid and flange couplings and flexible couplings.

<b>UNIT-V</b> <b>(8Hrs)</b>	<b>Wire ropes:</b> Construction, Classification and designation, Stresses in wire ropes, Design for service, advantage of wire ropes over fiber ropes <b>Chain drives:</b> Terminology and classification, Design procedure for service. Advantages and disadvantages of chain drive over rope drive
<b>Textbooks:</b>	
1.	Design of Machine Elements by V.B.Bhandari, TMH Publishing Co. Ltd., New Delhi.
2.	A Text Book of Machine Design by R.S.Khurmi, Eurasia Publishing House Ltd., New Delhi
<b>Reference Books:</b>	
1.	Machine Design by Pandya and Shaw, Charotar publications.
2.	Machine design, an integrated approach by R.L.Norton, Pearson Education
3.	Machine Design by Jain, Khanna Publications.
4.	Mechanical Engineering Design by Joseph Edward Shigley, McGraw-Hill Edition
<b>e-Resources:</b>	
1.	<a href="https://nptel.ac.in/courses/112/105/112105124/">https://nptel.ac.in/courses/112/105/112105124/</a>
2.	<a href="https://nptel.ac.in/courses/112/106/112106137/">https://nptel.ac.in/courses/112/106/112106137/</a>



Code	Category	L	T	P	C	I.M	E.M	Exam
B20ME3206	PE	3	--	--	3	30	70	3 Hrs.
<b>OPTIMIZATION TECHNIQUES</b>								
(For ME)								
<b>Course Objectives:</b>								
1.	To understand the theory of optimization methods and algorithms developed for solving various types of optimization problems.							
2.	To apply classical and numerical techniques of optimization to concrete Engineering problems.							
3.	To develop and promote research interest in applying traditional and non-traditional optimization techniques to problems of Engineering and Technology.							
<b>Course Outcomes:</b> At the end of the course, students will be able to								
S.No	Outcome							Knowledge Level
1.	Understand and apply the classical optimization techniques to simple practical problems.							K3
2.	Understand and apply the numerical optimization techniques to solve single variable problems.							K3
3.	Formulate and solve the multi-variable optimization problems using numerical optimization techniques.							K3
4.	Understand the concepts of genetic algorithms as a means of solving optimization problems.							K3
5.	Formulate and apply multi-objective optimization techniques to solve engineering problems.							K3
<b>SYLLABUS</b>								
<b>UNIT-I (10Hrs)</b>	<b>Classical Optimization Techniques:</b> Single variable optimization - local and global minimum, multi variable optimization without constraints, multi variable optimization with constraints – method of Lagrange multipliers, Kuhn-Tucker conditions, merits and demerits of classical optimization techniques.							
<b>UNIT-II (10Hrs)</b>	<b>Numerical Methods For Single Variable Optimization Problems:</b> Unimodal function, Dichotomous search, Fibonacci method, Golden section method, Quadratic interpolation method, Newton method, Secant method.							
<b>UNIT-III (12Hrs)</b>	<b>Numerical Methods For Multi Variable Optimization Problems:</b> Nelder Mead's Simplex search method, Pattern Search methods – Hooke and Jeeve's method, Powell's method, Gradient of a function, Steepest descent method, Sequential linear programming for constrained problems, Exterior and interior penalty function methods for handling constraints.							

<b>UNIT-IV (10Hrs)</b>	<b>Genetic Algorithms:</b> Differences and similarities between conventional and evolutionary algorithms, working principle, reproduction, crossover, mutation, termination criteria, different reproduction and crossover operators, GA for constrained optimization, draw backs of GA.
<b>UNIT-V (8Hrs)</b>	<b>Multi-Objective Optimization:</b> Utility function method, Inverted utility function method, Global criterion method, Bounded objective function method, Lexicographic method, Goal Programming method, Example of Minimization of weight and deflection of a cantilever beam subject to stress constraints.
<b>Textbooks:</b>	
1.	Engineering Optimization – S.S.Rao, New Age Publishers.
<b>Reference Books:</b>	
1.	Optimization for Engineering Design – Kalyanmoy Deb, PHI Publishers.
2.	Multi objective optimization by Kalyanmoy Deb, PHI Publishers.
<b>e-Resources:</b>	
1.	<a href="https://nptel.ac.in/courses/111105039">https://nptel.ac.in/courses/111105039</a>
2.	<a href="https://nptel.ac.in/courses/112101298">https://nptel.ac.in/courses/112101298</a>



Code	Category	L	T	P	C	I.M	E.M	Exam
B20ME3207	PE	3	--	--	3	30	70	3 Hrs.
<b>MOOCS-II</b>								
(For ME)								
<p>MOOCS-IV course should belong to the B.Tech. Programme and that course should not be studied earlier. Students should select a course from SWAYAM/ NPTEL with minimum 12 weeks of duration. The percentage obtained for the candidate in MOOCS will be mapped to the grade table given in the Academic Regulations.</p>								



Code	Category	L	T	P	C	I.M	E.M	Exam
B20ME3208	PC	--	--	3	1.5	15	35	3 Hrs.
<b>CAD/CAM LAB</b>								
(For ME)								
<b>Course Objectives:</b>								
1.	Introduction to CAD package in design and drafting of the different parts by using computer aided modelling.							
2.	Develop the design skills of the students to practice the different 2D/3D engineering drawings							
3.	Application of CAD packages in solving the simple problems in modeling and analysis.							
4.	Imparting the students with the necessary knowledge to write the part program of CNC machine.							
<b>Course Outcomes:</b> At the end of the course, students will be able to								
S.No.	Outcome							Knowledge Level
1.	To impart the students with necessary computer aided modeling skills using standard CAD packages.							K4
2.	To expose the students to the techniques of CNC programming and cutting tool path generation through CNC simulation software by using G-Codes and M-codes and writing part program for simple machine parts.							K5
<b>SYLLABUS</b>								
<b>LIST OF EXERCISES</b>								
<b>CAD Exercises:</b>								
1.	Drawing of primitives (line, arc, circle, ellipse, triangle etc.) and 2D sketching.							
2.	Solid modeling Techniques Using any standard CAD Packages (3D Part Geometric Modeling Creation of simple mechanical components)							
3.	Creation of 3D assembly model machine elements like Oldham's coupling, Muff coupling etc							
4.	Finite Element Analysis of simple Structural elements like bar, truss, beam etc.							
<b>CAM Exercises:</b>								
5.	Preparation of manual part programming for CNC Lathe. (Operations like Facing, Step Turning, threading etc.)							
6.	Preparation of manual part programming for CNC Milling.(Operations linear, circular interpolations, drilling cycle etc)							
<b>Reference Books:</b>								
1.	CAD/CAM Theory and Practice by Ibrahim Zeid.							
2.	CAD/CAM Principles and Applications by P.N. Rao, Tata McGraw Hill Publishing Company Ltd.							
3.	Computer Integrated Design and Manufacturing by David D. Bedworth, Mark R. Henderson, Philip M. Wolfe.							

Code	Category	L	T	P	C	I.M	E.M	Exam
B20ME3209	PC	--	--	3	1.5	15	35	3 Hrs.

### HEAT TRANSFER LAB

(For ME)

#### Course Objectives:

1.	This course is designed to introduce a basic study, the phenomena of heat and mass transfer, and to provide useful information concerning the performance and design of particular systems and processes.
2.	A knowledge-based design problem requiring the formulations of solid conduction and fluid convection and the technique of numerical computation.
3.	Examine the basic concepts of heat transfer models - thermal gradients, conduction, convection, and radiation.
4.	To help the student develop skills that would apply to lifelong learning.

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

S.No.	Outcome	Knowledge Level
1.	Conduct experiments on conduction, convection and radiation of heat; collect data, perform analysis and interpret results to draw valid conclusions through standard test procedures	K4
2.	Determine thermal properties and performance of heat exchanger	K4

### SYLLABUS

#### LIST OF EXPERIMENTS

1.	Determination of Thermal Conductivity for a Given Copper Metal Rod.
2.	Determination of Thermal Conductivity for a Composite Wall.
3.	Determination of Thermal Conductivity of Insulating Powder.
4.	Determination of Heat Transfer through Pin-Fin.
5.	Determination of Heat Transfer through Forced Convection.
6.	Determination of Heat Transfer through Natural Convection.
7.	Determination of overall heat transfer coefficient for Parallel and Counter Flow Heat Exchanger.
8.	Measure the Emissivity of given test surface.
9.	Measurement of Stefan Boltzmann constant.
10.	Determination of Heat Transfer through Drop Wise and Film Wise Condensation.
11.	Determination of Two phase heat Transfer.
12.	Study of Refrigeration and Air Conditioning Test Rig.

<b>Reference Books:</b>	
1.	Yunus A. Cengel, “Heat Transfer a Practical Approach”, Tata McGraw-Hill Education.
2.	R. C. Sachdeva, “Fundamentals of Engineering, Heat and Mass Transfer”, New Age publication.
3.	Heat & Mass Transfer by P.K. Nag, McGraw Hill.





Code	Category	L	T	P	C	I.M	E.M	Exam
B20ME3210	PC	-	--	3	1.5	15	35	3 Hrs.

### INDUSTRIAL ENGINEERING LAB

(For ME)

#### Course Objectives:

1	To make students acquainted with the different control charts and probability distribution curves.
2	To make students aware with the different types of process charts for improving method of doing work.
3	To make students learn the impact of work on human physiology and physiological constraints of body.

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

S.No	Outcome	Knowledge Level
1	Analyze Shewart Normal Bowl theory.	K4
2	Evaluate the process and product quality by Statistical Quality Control Techniques.	K5
3	Practices Work Study Techniques for man, machine and work place to improve productivity.	K3

### SYLLABUS

1	To show that the sample means from a Normal universe follow a Normal distribution.
2	To show that the sample means from a Non-normal universe follow a Normal distribution.
3	To draw the control charts for mean and range for the measurements of output of a manufacturing process and to study its process capability.
4	To draw p – chart for fraction defective of constant sample sizes and to check the control of process for a given set of marbles/plastic balls.
5	To draw p – chart for fraction defective of variable sample sizes and to check the control of the process for a given set of marbles / plastic balls.
6	To draw the control chart for defects observed on a given lot of steel discs.
7	To conduct Single Sampling Plan on a given lot of marbles, and hence to draw its operating characteristic curve.
8	To draw two handed process charts for Bolt and Washers assembly of present and improved methods.
9	To draw Multiple Activity chart using an Electric toaster.
10	To measure the skill of the subject in the movement of Wrist and Fingers using pin board, and hence to estimate the standard time for the best method of performance.
11	To measure the Heart beat using Stethoscope and to study the changes in heart rate for different subjects using Treadmill.
12	To measure the Heart rate during working and recovery periods of the subjects under different loads, using Bicycle Ergometer.

**Reference Books:**

1	Industrial Engineering Management by Dr. O.P. Khanna.
2	Industrial Engineering and Production Management by Telsay, S. Chand & Co



Code	Category	L	T	P	C	I.M	E.M	Exam
B20HS3203	SOC	1	--	2	2	--	50	3Hrs.
<b>SOFT SKILLS</b>								
(Common to CE, EEE, & ME)								
<b>Course Objectives:</b>								
1.	To familiarize students with soft skills and how they influence their professional growth.							
2.	To build/refine the professional qualities/skills necessary for a productive career and to instill Confidence through attitude building.							
<b>Course Outcomes: Students will be able to</b>								
S.No	Outcome							Knowledge Level
1	Apply soft skills in the work place and build better personal and professional relationships making informed decisions.							K3
2	Participate in group discussions/group activities, exhibit team spirit, use language effectively according to the situation, respond to their interviewer/employer with a positive mind, make answers to the questions asked during their technical/personal interviews, exhibit skills required for the different kinds of interviews (stress, technical, HR) that they would face during the course of their recruitment process.							K3
<b>SYLLABUS</b>								
1.	Introduction to Soft Skills, Significance of Inter & Intra-Personal Communication							
2.	SWOT Analysis, Creativity & Problem Solving							
3.	LSRW, JAM, Presentation Skills							
4.	Building a positive attitude, Leadership & Team Work							
5.	Goal Setting – Guidelines for Goal Setting							
6.	Group Discussion: Essential guidelines							
7.	Telephone Etiquette, Telephonic Interview							
8.	Resume Preparation: Common resume blunders, tips for betterment, Resume Review							
9.	Employability Skills: Emotional Intelligence, Report Writing, Social Consciousness and Social Entrepreneurship, Stress Management.							
10.	Awareness about Industry, Companies, Importance of researching the prospective workplace, Knowing about Selection Process							
11.	Interview Skills: Types of Interviews, Mock Interview, Do's and Don'ts of Interview.							
<b>Text Books:</b>								
1	Soft Skills & Employability Skills by Samina Pillai and Agna Fernandez, Cambridge University Press India Pvt. Ltd.							

2	Soft Skills, by Dr. K. Alex, S. Chand & Company Ltd., New Delhi
<b>Reference Books:</b>	
1	The Art of Public Speaking by Dale Carnegie
2	The Leader in You by Dale Carnegie
3	Emotional Intelligence by Daniel Golman
4	Stay Hungry Stay Foolish by Rashmi Bansal
5	I have a Dream by Rashmi Bansal.
<b>Additional Materials</b>	
1	<a href="https://www.youtube.com/watch?v=LTnI7cmpDZI">https://www.youtube.com/watch?v=LTnI7cmpDZI</a>
2	<a href="https://www.youtube.com/watch?v=ic5O2sxhH9M">https://www.youtube.com/watch?v=ic5O2sxhH9M</a>
3	<a href="https://www.youtube.com/watch?v=4ZQkYSpmOdU">https://www.youtube.com/watch?v=4ZQkYSpmOdU</a>
4	<a href="https://www.youtube.com/watch?v=d8p-5WcXoRs">https://www.youtube.com/watch?v=d8p-5WcXoRs</a>
5	<a href="https://www.youtube.com/watch?v=yZOar04g4zk&amp;t=94s">https://www.youtube.com/watch?v=yZOar04g4zk&amp;t=94s</a>



Code	Category	L	T	P	C	I.M	E.M	Exam
B20HS3204	HS	2	--	--	--	--	--	--
<b>GENDER SENSITIZATION</b>								
(Common to ALL Branches)								
<b>Course Objectives:</b>								
1.	To develop students' sensibility with regard to issues of gender in contemporary India.							
2.	To provide a critical perspective on the socialization of men and women.							
3.	To introduce students to information about some key biological aspects of genders.							
4.	To help students reflect critically on gender violence and workplace security.							
5.	To expose students to more egalitarian interactions between men and women.							
<b>Course Outcomes:</b> At the end of the course, students will be able to								
S.No	Outcome							Knowledge Level
1.	Understand the important issues relating to gender in contemporary India.							K2
2.	Get sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender.							K2
3.	Attain a finer grasp of how gender discrimination works in our society and how to counter it.							K2
4.	Acquire insight into the gendered division of labour and its relation to politics and economics.							K2
5.	Develop a sense of appreciation for both men and women in all walks of life.							K3
<b>SYLLABUS</b>								
<b>UNIT-I</b>	<b>Understanding Gender and Related Concepts - Gender in Everyday Life</b> Introduction: Conceptual Connotation – Sex and Gender – Basic Gender Concepts - Gendered Socialization – Gender Stereotypes –Exploring Attitudes towards Gender – Gender Roles & Relationships - Myths – Gender in Indian society – Early days – Later Vedic Period –Medieval and British Period – Independent India.							
<b>UNIT-II</b>	<b>Introduction to Gender Justice- Notion and Significance</b> Division and Valuation of Work – Housework- The Invisible Work - “My Mother doesn't work,” - Offences against Women –Fact and Fiction - Status of Women in Society – Gender and Human Rights - Gender Equality – Gender Justice – Notion and Significance							
<b>UNIT-III</b>	<b>International and Constitutional Perspectives on Gender Equality</b> The International Bill of Rights, 1979 –Declaration on the Elimination of Violence against women 1993 –The Rights of Women –Beijing Platform for Action 1995 – Constitutional Guarantees – Fundamental Rights – Equality.							

<b>UNIT-IV</b>	<b>Gender and Culture</b> Gender and Film - Gender and Electronic Media – Gender and Advertisement – Gender and Popular Literature – Gender Issues - Gender-Sensitive Behaviour – Gender being Together as Equals.
<b>UNIT-V</b>	<b>Gender Violence- Within and Beyond</b> Violence – Gender Violence – Types of Gender Violence –Gender Violence in Indian Perspective – -Women Specific Legislations for the Elimination of Violence Within and Beyond.
<b>Reference Books:</b>	
1.	“Towards A World Of Equals: A Bilingual Textbook on Gender” by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas, and Susie Tharu, Published by Telugu Akademi (2015).
2.	Ferber, Holcomb & Wentling, Sex, Gender & Sexuality: The New Basics, Oxford Univ. Press 2008.
3.	Flavia Agnes, Sudhir Chandra, Monmayee Basu, Women and Law in India, Oxford Univ. Press 2004.
4.	Mamta Rao, Law Relating to Women and Children, Eastern Book Co, Lucknow.
5.	K.I. Vibhute, Criminal Law, Lexis Nexis, 12th Edn.
6.	N. Prabha Unnithan (ed.), Crime & Justice in India, Sage Pub., 2013.
7.	Ritu Gupta, Sexual Harassment at Workplace, Lexis Nexis, 2013.
8.	IGNOU: Gender Sensitization: Society, Culture and Change ( 2019) BGSE001, New Delhi IGNOU.
<b>Web links:</b>	
1.	<a href="https://nptel.ac.in/courses/110105080">https://nptel.ac.in/courses/110105080</a>
2.	<a href="https://www.youtube.com/watch?v=2Xfp2eiTte0">https://www.youtube.com/watch?v=2Xfp2eiTte0</a>
3.	<a href="https://www.youtube.com/watch?v=-FCEBe5VNcA&amp;t=41s">https://www.youtube.com/watch?v=-FCEBe5VNcA&amp;t=41s</a>
4.	<a href="https://www.youtube.com/watch?v=7n9IOH0NvyY">https://www.youtube.com/watch?v=7n9IOH0NvyY</a>
5.	<a href="https://www.youtube.com/watch?v=dpC2jGqu4G0">https://www.youtube.com/watch?v=dpC2jGqu4G0</a>
6.	<a href="https://www.youtube.com/watch?v=kcW4ABcY3zI&amp;t=99s">https://www.youtube.com/watch?v=kcW4ABcY3zI&amp;t=99s</a>
7.	<a href="https://www.youtube.com/watch?v=dIXw1PbnWKM">https://www.youtube.com/watch?v=dIXw1PbnWKM</a>
8.	<a href="https://www.youtube.com/watch?v=9bayaZ18_po">https://www.youtube.com/watch?v=9bayaZ18_po</a>
9.	<a href="https://www.youtube.com/watch?v=ZbLq23cGFV4&amp;t=1662s">https://www.youtube.com/watch?v=ZbLq23cGFV4&amp;t=1662s</a>
10.	<a href="https://www.youtube.com/watch?v=61aYvb0Vo68">https://www.youtube.com/watch?v=61aYvb0Vo68</a>
11.	<a href="https://www.youtube.com/watch?v=728H4Khf7Gk&amp;t=1793s">https://www.youtube.com/watch?v=728H4Khf7Gk&amp;t=1793s</a>
12.	<a href="https://www.youtube.com/watch?v=y2Yk-rSZ7PI">https://www.youtube.com/watch?v=y2Yk-rSZ7PI</a>
13.	<a href="https://www.youtube.com/watch?v=wSqFvcjDpos">https://www.youtube.com/watch?v=wSqFvcjDpos</a>
14.	<a href="https://www.youtube.com/watch?v=AljDd7nj9wE">https://www.youtube.com/watch?v=AljDd7nj9wE</a>
15.	<a href="https://www.youtube.com/watch?v=MKPM0f2fOjM">https://www.youtube.com/watch?v=MKPM0f2fOjM</a>