ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
Course structure for Four Year Regular B.Tech. Degree Program
(Effective for the batches admitted from 2020-21)
MECHANICAL ENGINEERING (ME)

INDUCTION PROGRAM (3 Weeks duration)
❖ Physical activity ❖ Creative Arts ❖ Universal Human Values ❖ Literary ❖ Proficiency Modules ❖ Lectures by Eminent People ❖ Visits to local Areas ❖ Familiarization to Dept./Branch & Innovations

Semester I (First year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P	C	CIE	SEE	Total
1	Basic Science course	20ABS9901	Algebra and Calculus	3	0	0	3	30	70	100
2	Basic Science courses	20ABS9903	Engineering Physics	3	0	0	3	30	70	100
3	Engineering Science Courses	20AES0202	Basics of Electrical & Electronics Engineering	3	0	0	3	30	70	100
4	Engineering Science Courses	20AES0301	Engineering Graphics	1	0	4	3	30	70	100
5	Engineering Science Courses	20AES0501	Problem Solving and Programming	3	0	0	3	30	70	100
6	Engineering Science Courses (LAB)	20ABS9910	Engineering Physics Lab	0	0	3	1.5	30	70	100
7	Basic Science course (LAB)	20AES0204	Basics of Electrical & Electronics Engineering Lab	0	0	3	1.5	30	70	100
8	Engineering Science Courses (LAB)	20AES0503	Problem Solving and Programming Lab	0	0	3	1.5	30	70	100
			Total credits				**19.5**	**240**	**560**	**800**

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Semester II (First year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P	C	CIE	SEE	Total
1	Basic Science courses	20ABS9906	Differential Equations and Vector Calculus	3	0	0	3	30	70	100
2	Basic Science course	20ABS9905	Engineering Chemistry	3	0	0	3	30	70	100
3	Humanities and Social science	20AHS9901	Communicative English	3	0	0	3	30	70	100
4	Engineering Science Courses	20AES0509	Basics of Python Programming	3	0	0	3	30	70	100
5	Engineering Science Courses	20AES0304	Engineering Workshop Practice	1	0	4	3	30	70	100
6	Humanities and Social science LAB	20AHS9902	Communicative English Lab	0	0	3	1.5	30	70	100
7	Basic Science course (LAB)	20ABS9910	Engineering Chemistry Lab	0	0	3	1.5	30	70	100
8	Engineering Science Courses/Prof Core (Interdisciplinary) (LAB)	20AES0510	Basics of Python Programming Lab	0	0	3	1.5	30	70	100
	Mandatory course (AICTE suggested)	20AMC9902	Constitution of India	2	0	0	0	30	-	30
			Total credits				**19.5**	**270**	**560**	**830**

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Semester III (Second year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P	C	CIE	SEE	Total
1	Basic Science courses	20ABS9913	Probability & Statistics, PDE	3	0	0	3	30	70	100
2	Professional Core Course	20APC0308	Thermodynamics	3	0	0	3	30	70	100
3	Professional Core courses	20APC0301	Engineering Mechanics	3	0	0	3	30	70	100
4	Professional Core courses	20APC0306	Material Science and Engineering	3	0	0	3	30	70	100
5	Professional Core courses	20APC0303	Machine Drawing	3	0	0	3	30	70	100
6	Professional Core courses (LAB)	20APC0307	Material Science and Engineering Lab	0	0	3	1.5	30	70	100
7	Professional Core courses (LAB)	20APC0313	Mechanical Engineering Workshop Practice	0	0	3	1.5	30	70	100
8	Professional Core courses (LAB)	20APC0324	CAD Lab	0	0	3	1.5	30	70	100
	Skill oriented course*	20ASC0301	CATIA Lab	1	0	2	2	100	-	100
	Mandatory course (AICTE suggested)	20AMC9903	Environmental Studies	2	0	0	0	30	-	30
			Total credits				**21.5**	**370**	**560**	**930**

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Semester IV (Second year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P	C	CIE	SEE	Total
1	Engineering Science Courses	20AES0505	Internet of Things (IoT)	3	0	0	3	30	70	100
2	Basic Science Course / Prof core course	20AES0324	Thermal Engineering	3	0	0	3	30	70	100
3	Professional Core courses	20APC0312	Manufacturing Technology	3	0	0	3	30	70	100
4	Professional Core courses	20APC0302	Mechanics of Materials	3	0	0	3	30	70	100
5	Humanities and Social Sciences	20AHSMB01	Managerial Economics and Financial Analysis	3	0	0	3	30	70	100
6	Humanities and Social Sciences	20AHS9905	Universal Human Values	3	1	0	3	30	70	100
7	Engineering Science Courses (LAB)	20AES0506	Internet of Things (IoT) Lab	0	0	3	1.5	30	70	100
8	Professional Core courses (LAB)	20APC0326	Thermal Engineering Lab	0	0	3	1.5	30	70	100
9	Professional Core courses (LAB)	20APC0303	Mechanics of Materials Lab	0	0	3	1.5	30	70	100
10	Skill oriented course*	20ASC0302	Manufacturing Process Lab	1	0	2	2	100	-	100
			Total credits				**24.5**	**370**	**630**	**1000**
Internship 2 Months (Mandatory) during summer vacation										
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)				**4**		**0**	**4**	**100**	**-**	**100**

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Semester V (Third year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P	C	CIE	SEE	Total
1	Professional Core courses	20APC0327	Machine Tools	3	0	0	3	30	70	100
2	Professional Core courses	20APC0309	Kinematics of Machines	3	0	0	3	30	70	100
3	Professional Core courses	20APC0323	Operations Research	3	0	0	3	30	70	100
4	Open Elective Course/Job oriented elective	20AOE0301	Management Science	2	0	2	3	30	70	100
		20AOE0302	Optimization Techniques							
		20AOE0303	Industrial Engineering and Management							
5	Professional Elective courses	20APE0301	Automobile Engineering	3	0	0	3	30	70	100
		20APE0302	Design for Manufacturing and Assembly							
		20APE0303	Manufacturing Methods in Precision Engineering							
6	Professional Core courses Lab	20APC0328	CAM Lab	0	0	3	1.5	30	70	100
7	Professional Core courses Lab	20APC0329	Machine Tools Lab	0	0	3	1.5	30	70	100
8	Skill advanced course/ soft skill course*	20ASC0303	CREO	1	0	2	2	100	-	100
	Mandatory course (AICTE suggested)	20AMC9904	Professional Ethics and Human Values	2	0	0	0	30	-	30
Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester				0	0	0	1.5	50	-	50
			Total credits				**21.5**	**390**	**490**	**880**
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)				**4**		**0**	**4**	**100**	**-**	**100**

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Semester VI (Third year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P	C	CIE	SEE	Total
1	Professional Core courses	20APC0317	Heat Transfer	3	1	0	3	30	70	100
2	Professional Core courses	20APC0316	Design of Machine Elements	3	0	0	3	30	70	100
3	Professional Core courses	20APC0314	Fluid Mechanics & Hydraulic Machinery	3	0	0	3	30	70	100
4	Professional Elective courses	20APE0304	Automotive Transmission	3	0	0	3	30	70	100
		20APE0305	Composite materials							
		20APE0306	Renewable Energy Technologies							
5	Open Elective Course/Job oriented elective	20AOE0503	Mobile App development	2	0	2	3	30	70	100
		20AOE0201	Neural Networks and Fuzzy Logic							
		20AOE0401	Sensor Networks							
6	Professional Core courses Lab	20APC0315	Fluid Mechanics & Hydraulic Machinery Lab	0	0	3	1.5	30	70	100
7	Professional Core courses Lab	20APC0318	Heat Transfer Lab	0	0	3	1.5	30	70	100
8	Professional Core courses Lab	20APC0330	CAE Lab	0	0	3	1.5	30	70	100
9	Skill advanced course/ soft skill course*	20ASC0304	CNC	1	0	2	2	100	-	100
10	Mandatory course (AICTE)	20AMC9901	Biology for Engineers	2	0	0	0	30	-	30
			Total credits				**21.5**	**370**	**560**	**930**
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)				**4**		**0**	**4**	**100**	**-**	**100**
Industrial/Research Internship (Mandatory) 2 Months during summer vacation										

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Semester VII (Fourth year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P	C	CIE	SEE	Total
1	Professional Elective courses	20APE0307	Alternative Fuels and Emission Control in Automotives	3	0	0	3	30	70	100
		20APE0308	Finite Element Analysis							
		20APE0309	Computational Fluid Dynamics							
2	Professional Elective courses	20APE0310	Power Transmission in Hybrid and Electric Vehicles	3	0	0	3	30	70	100
		20APE0311	Material Characterization							
		20APE0312	Optimization Techniques through MATLAB							
3	Professional Elective courses	20APE0313	Total Quality Management	3	0	0	3	30	70	100
		20APE0314	Power Plant Engineering							
		20APE0315	Autotronics (Automobile Electronics)							
4	Open Elective Courses/ Job oriented elective	20APC0515	Operating Systems	2	0	2	3	30	70	100
		20AOEMB03	Intellectual Property Rights							
		20AOE9903	Environmental Waste Management							
5	Open Elective Courses/ Job oriented elective	20AOE9901	Research Writing Skills	2	0	2	3	30	70	100
		20AOE0501	E Commerce							
		20AHSMB02	Entrepreneurship							
6	*Humanities and Social Science Elective		Universal Human Values	3	0	0	3	30	70	100
			Understanding Harmony							
7	Skill advanced course/ soft skill course*	20ASC0305	MATLAB	1	0	2	2	100	-	100
Industrial/Research Internship 2 Months (Mandatory) after third year (to be evaluated during VII semester				0	0	0	3	100	-	100
			Total credits				**23**	**380**	**420**	**800**
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)				**4**	**-**	**0**	**4**	**100**	**-**	**100**

Semester VIII (Fourth year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P	C	CIE	SEE	Total
1	Major Project	PROJ	Project Project work, seminar and internship in industry	0	0	0	12	60	140	200
INTERNSHIP (6 MONTHS)										
			Total credits				**12**	60	140	200

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Year : I **Semester** : I **Branch of Study : Common to all**

Subject Code	Subject Name	L	T	P	Credits
20ABS9901	Algebra & Calculus	3	0	0	3

Course Outcomes:

1. Develop the use of matrix algebra techniques that is needed by engineers for practical applications
2. Utilize mean value theorems to real life problems
3. Familiarize with functions of several variables which is useful in optimization
4. Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems
5. Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions

UNIT I

Matrix Operations and Solving Systems of Linear Equations: Rank of a matrix by echelon form, solving system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalization of a matrix, quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.

UNIT II

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders (without proof);

UNIT III

Multivariable calculus: Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT IV

Double Integrals: Double integrals, change of order of integration, double integration in polar coordinates, areas enclosed by plane curves.

UNIT V

Multiple Integrals and Special Functions: Evaluation of triple integrals, change of variables between Cartesian, cylindrical and spherical polar co-ordinates, Beta and Gamma functions and their properties, relation between beta and gamma functions.

Textbooks:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.

References:

1. Dr. T. K. V Iyengar, B.Krishna Gandhi, S. Ranganatham and M.V.S.S.N Prasad, Mathematics-1, S.Chand publications.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
4. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 201.

List of COs	PO no. and keyword	Competency	Performance Indicator

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CO 1	PO1: Engineering knowledge	1.1	1.1.1
CO 2	PO1: Engineering knowledge	1.1	1.1.1
CO 3	PO1: Engineering knowledge	1.1	1.1.1
CO 4	PO2 : Problem analysis	2.1	2.1.3
CO 5	PO2 : Problem analysis	2.1	2.1.3

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Year : I Semester : I Branch of Study : ME

Subject Code	Subject Name	L	T	P	Credits
20ABS9903	Engineering Physics	3	0	0	3

Course Outcomes:

1. Explain physics applied to solve engineering problems
2. Apply the principles of acoustics in designing of buildings
3. Explains the applications of ultrasonic in various engineering fields
4. Apply electromagnetic wave propagation in different Optical Fibers and the concepts of lasers in various applications.
5. Explains the concepts of dielectric and magnetic materials and Identify the sensors for various engineering applications

UNIT I

Mechanics: Basic laws of vectors and scalars – rotational frames-conservative forces- F=-gradV, torque and angular momentum-Newton's laws in inertial and linear accelerating non-inertial frames of reference-rotating frame of reference with constant angular velocity-qualitative explanation of Foucault's pendulum-rigid body-angular velocity vector-center of mass-gravitation and Keplar's Law (Qualitative).

UNIT II

Crystallography And Ultrasonics: Crystallography – Introduction – Space Lattice – Unit Cell – Lattice Parameters – Bravais Lattice – Crystal Systems – Packing Fractions of SC, BCC and FCC. X-Ray Diffraction – Braggs Law – Powder Method.

Ultrasonics: Introduction, Properties and Production by magnetostriction & piezoelectric methods - acoustic grating-Non Destructive Testing–pulse echo system through transmission and reflection modes-A,B and C–scan displays, Medical applications.

UNIT III

Dielectric and Magnetic Materials: Dielectric polarizability, Susceptibility and Dielectric constant-Types of polarizations: Electronic , Ionic, Orientation Polarizations (Qualitative)-Frequency dependence of polarization-Lorentz (internal) field-Claussius-Mosotti equation-Applications of Dielectrics.

Introduction-Magnetic dipole moment – Magnetization – Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Classification of Magnetic materials-Domain Concepts of ferromagnetism – Hysteresis – soft and hard magnetic materials-Magnetic device applications.

UNIT IV

Lasers and Fiber Optics: Introduction-Characteristics of Laser – Spontaneous and Stimulated emission of radiation-Einstein's coefficients-Population inversion-Pumping Mechanisms -He- Ne laser, Nd-YAG laser-Semiconductor laser-Applications of laser.

Introduction to Optical Fibers – Total Internal Reflection-Construction of optical fibers, Critical angle of propagation – Acceptance angle – Numerical Aperture-Classification off ibers based on Refractive index profile & modes – Propagation of electromagnetic wave through optical fiber-importance of V number-Block Diagram of Fiber optic Communication system-Medical Applications.

UNIT V

Nanomaterials: Introduction – Significance of nanoscale and types of nanomaterials – Physical properties, optical, thermal, mechanical and magnetic properties – Synthesis of nanomaterials by Top down and bottom up approaches, ball mill, chemical vapour depositon and sol-gel – Applications of nanomaterials.

Textbooks:

1. M. N. Avadhanulu, P.G. Kshirsagar&TVS Arun Murthy". A Text book of Engineering Physics"-S.Chand Publications,11th Edition2019
2. Shatendra Sharma, Jyotsna Sharma, " Engineering Physics", Pearson Education, 2018

References:

1. K.Thyagarajan "Engineering Physics",-Mc Graw Hill Publishing Company Ltd,2016
2. MKVarma "Introduction to Mechanics"-Universities Press-2015.
3. D.K. Bhattacharya and A.Bhaskaran,"Engineering Physics"-Oxford Publications-2015
4. IanRSinclair,Sensor andTransducers,3rd eds,2001,Elsevier(Newnes)

COs	PO no. and keyword	Competency	Performance Indicator
CO 1	PO1 : Engineering knowledge	1.2	1.2.1
CO 2	PO1 : Engineering knowledge	1.2	1.2.1
CO 3	PO1 : Engineering knowledge	1.2	1.2.1
CO 4	PO1 : Engineering knowledge	1.2	1.2.1
CO 5	PO1 : Engineering knowledge	1.2	1.2.1

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Year: I **Semester : II** **Branch of Study : ME**

Subject Code	Subject Name	L	T	P	Credits
20AES0202	Basics of Electrical & Electronics Engineering	3	0	0	3

Course Outcomes: Students should be able to
CO 1: Apply concepts of KVL/KCL in solving DC circuits
CO 2: Illustrate working principles of induction motor - DC Motor
CO 3: Identify type of electrical machine based on their operation
CO 4: Describe operation and characteristics of diodes and transistors.
CO 5: Make use of diodes and transistors in simple, typical circuit applications.
CO 6: Understand operation of basic op-amp circuits.

PART-A (Electrical Engineering)

UNIT I

DC & AC Circuits: Electrical circuit elements (R - L and C) - Kirchhoff laws - Series and parallel connection of resistances with DC excitation. Superposition Theorem - Representation of sinusoidal waveforms - peak and rms values - phasor representation - real power - reactive power - apparent power - power factor - Analysis of single-phase ac circuits consisting of RL - RC - RLC series circuits.

UNIT II

DC & AC Machines: Principle and operation of DC Generator - EMF equations - OCC characteristics of DC generator – principle and operation of DC Motor – Performance Characteristics of DC Motor - Speed control of DC Motor – Principle and operation of Single Phase Transformer - OC and SC test on transformer - principle and operation of Induction Motor [Elementary treatment only]

UNIT III

Basics of Power Systems: Layout & operation of Hydro, Thermal, Nuclear Stations - Solar & wind generating stations – Typical AC Power Supply scheme – Elements of Transmission line – Types of Distribution systems: Primary & Secondary distribution systems.

Text Books:

1. D. P. Kothari and I. J. Nagrath - "Basic Electrical Engineering" - Tata McGraw Hill - 2010.
2. V.K. Mehta & Rohit Mehta, "Principles of Power System" – S.Chand – 2018.

References:

1. L. S. Bobrow - "Fundamentals of Electrical Engineering" - Oxford University Press - 2011.
2. E. Hughes - "Electrical and Electronics Technology" - Pearson - 2010.
3. C.L. Wadhwa – "Generation Distribution and Utilization of Electrical Energy", 3rd Edition, New Age International Publications.

PART-B (Electronics Engineering)

UNIT I

Analog Electronics: Overview of Semiconductors, PN junction diode, Zener diode, Applications of diode as switch and rectifier, Zener diode as regulator, special purpose diodes: schottky diode, tunnel diode, varactor diode, photodiode, phototransistor and LED.

BJT construction, operation, configuration and characteristics, JFET and MOSFET construction, operation, characteristics (CS configuration), applications

Operational Amplifiers: Introduction, block diagram, basic op-amp circuits: Inverting, Non Inverting, summer, subtractor, voltage follower.

UNIT II

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Digital Electronics: Introduction, Switching and Logic Levels, Digital Waveform, characteristics of digital ICs, logic gates, number systems, combinational circuits - adders, multiplexers, decoders; introduction to sequential circuits, flip flops, shift register, binary counter.

UNIT III

Communication Systems: Introduction, Elements of Communication Systems, EM spectrum, basics of electronic communication, Amplitude and Frequency modulation, Pulse modulation, Communication receivers, Examples of communication systems: Microwave & Satellite, Fibre optic, Television, mobile communication (block diagram approach).

Text Books:

1. D.P. Kothari, I.J.Nagrath, Basic Electronics, 2nd edition, McGraw Hill Education(India)Private Limited
2. S.K. Bhattacharya, Basic Electrical and Electronics Engineering, 2nd edition, Pearson India Private Limited.

References:

1. R. Muthu subramanian, S. Salivahanan, "Basic Electrical and Electronics Engineering", Tata McGraw-Hill Education, Reprint 2012.
2. David Bell, Electronic Devices and Circuits: Oxford University Press, 5th edition. 2008.

Note: This table also should be in portrait only

List of COs	PO no. and keyword	Competency	Performance Indicator
CO1	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO2	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO3	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO4	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO5	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO6	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1

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Year: I **Semester: I/II** **Branch of Study: Common to all Branches**

Subject Code	Subject Name	L	T	P	Credits
20AES0301	Engineering Graphics	1	0	4	3

Course Outcomes:

CO: 1 Draw various curves applied in engineering.
CO: 2 Show projections of solids and sections graphically.
CO: 3 Draw the development of surfaces of solids.
CO: 4 Use computers as a drafting tool.
CO: 5 Draw isometric and orthographic.

Unit I: Introduction to Engineering graphics: Principles of Engineering Graphics and their significance- Conventions in drawing-lettering - BIS conventions.

a) Conic sections including the rectangular hyperbola- general method only,
b) Cycloid, epicycloids and hypocycloid

Unit II: Projection of points, lines: Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line, traces.

Unit III: Projections of Planes: Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line. Projections of regular plane surfaces.
Projections of Solids: Projections of regular solids inclined to one or both planes by rotational or auxiliary views method.

Unit IV: Sections of solids: Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections.

Development of surfaces: Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts.

Unit V: Orthographic Projections: Systems of projections, conventions and application to orthographic projections.

Isometric Projections: Principles of isometric projection- Isometric scale; Isometric views: lines, planes, figures, simple and compound solids.

Text Books and Reference Books:

1. K.L.Narayana & P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers
2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers
3. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill
4. Shah and Rana, Engineering Drawing, 2/e, Pearson Education
5. Basant Agarwal & C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill

Additional Sources
YouTube: http-sewor,Carleton.cag,kardos/88403/drawings.html conic sections-online, red woods.edu

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 1: Engineering knowledge	1.3	1.3.1

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CO: 2	PO 3: Design/Development of Solutions	3.2	3.2.1
CO: 3	PO 1: Engineering knowledge	1.3	1.3.1
CO: 4	PO 3: Design/Development of Solutions	3.2	3.2.2
CO: 5	PO 5: Problem analysis	5.1	5.1.1

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MECHANICAL ENGINEERING (ME)

Year : I Semester : I Branch of Study : Common to All

Subject Code	Subject Name	L	T	P	Credits
20AES0501	Problem Solving and Programming	3	0	0	3

Course outcomes: Student should be able to

1. Create interactive visual programs using Scratch.
2. Develop flowcharts using raptor to solve the given problems.
3. Develop Python programs for numerical and text based problems
4. Develop graphics and event based programming using Python
5. Develop Python programs using beautiful Pythonic idiomatic practices

UNIT I

Visual Programming through Scratch and App Inventor: Introduction to programming concepts with scratch, Scratch environment, sprites looks and motion, Angles and directions, repetition and variation, changing costumes, adding background, Input/Output, variables and operators. Working with sounds and sprite communication and creating stories, App Generation.

UNIT II

Flowchart design through Raptor: Flow chart symbols, Input/Output, Assignment, operators, conditional if, repetition, function and sub charts. Example problems(section 1) – Finding maximum of 3 numbers, Unit converters, Interest calculators, multiplication tables, GCD of 2 numbers
Example problems (section 2) - Fibonacci generation, prime number generation. Minimum, Maximum and average of n numbers, Linear search, Binary Search.

UNIT III

Introduction to Python: Python – Numbers, Strings, Variables, operators, expressions, statements, String operations, Math function calls, Input / Output statements, Conditional If, while and for loops, User defined Functions, parameters to functions, recursive functions, Turtle Graphics.

UNIT IV

Data Structures and Idiomatic Programming in Python: Lists, Tuples, Dictionaries, Strings, Files and their libraries. Beautiful Idiomatic approach to solve programming problems.

UNIT V

Event driven Programming: Turtle Bar Chart, Event Driven programming. Key press events, Mouse events, timer events.

Text Books:

https://www.cse.msu.edu/~stockman/ITEC/Scratch/BGC2011Scratch-Rev1.pdf
https://nostarch.com/scratchplayground
http://fusecontent.education.vic.gov.au/9f79537a-66fc-4070-a5ce
e3aa315888a1/scratchreferenceguide14.pdf
https://raptor.martincarlisle.com/
http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
https://zhanxw.com/blog/wp-content/uploads/2013/03/BeautifulCode_2.pdf
http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf

List of COs	PO no. and keyword	Competency	Performance Indicator
CO1	PO3: Design/Development of Solutions	3.1	3.1.4
CO2	PO3: Design/Development of Solutions	3.1	3.1.4
CO3	PO2: Problem analysis	2.2	2.2.2
CO4	PO2: Problem analysis	2.2	2.2.2

	PO3: Design/Development of Solutions	3.1	3.1.4
CO5	PO3: Design/Development of Solutions	3.1	3.1.4

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Year: I **Semester : II** **Branch of Study : ME**

Subject Code	Subject Name	L	T	P	Credits
20ABS9910	**Engineering Physics Lab**	0	0	3	1.5

Course Outcomes:

1. Operate various optical instruments and Estimate wavelength of laser and particles size using laser.
2. Estimate the susceptibility and related magnetic parameters of magnetic materials and plot the intensity of the magnetic field of circular coil carrying current with distance.
3. Evaluate the acceptance angle of an optical fiber and numerical aperture anddetermine magnetic susceptibility of the material and its losses by B-H curve.
4. Identify the type of semiconductor i.e., n-type or p-type using Hall effect.
5. Apply the concepts of sensors for various applications.

List of Experiments

1. Determination of wavelength of LASER light using diffraction grating.
2. Determination of particle size using LASER.
3. Determination of spring constant of springs using Coupled Oscillator.
4. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
5. Determination of Dielectric constant of dielectric material using charging and discharging of capacitor.
6. Magnetic field along the axis of a circular coil carrying current.
7. Rigidity modulus of material of a wire-dynamic method (Torsional pendulum)
8. Study the variation of B versus H by magnetizing the magnetic material (B-H curve)
9. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle
10. Measurement of magnetic susceptibility by Gouy's method
11. Determination of ultrasonic velocity in liquid (Acoustic grating)
12. Determination of pressure variation using Strain Guage sensor
13. Determination of temperature change using Strain Guage sensor.
14. Determination of pressure variations using optical fiber sensors.
15. Determination of temperature changes using optical fiber sensors.

References:

1. S. Balasubramanian, M.N.Srinivasan, "A Text book of Practical Physics"-S Chand Publishers, 2017.
2. http://vlab.amrita.edu/index.php-VirtualLabs, Amrita University.

List of COs	PO no. and keyword	Competency	Performance Indicator
CO 1	PO 4: Conduct Investigations of complex problems	4.3	4.3.3
CO 2	PO 4: Conduct Investigations of complex problems	4.3	4.3.1
CO 3	PO 4: Conduct Investigations of complex problems	4.3	4.3.1
CO 4	PO 4: Conduct Investigations of complex problems	4.3	4.3.2
CO 5	PO 4: Conduct Investigations of complex problems	4.3	4.3.2

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Year: I **Semester: II** **Branch of Study: CE,ME &CSE**

Subject Code	Subject Name	L	T	P	Credits
20AES0204	**Basics of Electrical & Electronics Engineering Lab**	0	0	3	1.5

Course Objectives: Students should be able to

CO1: Verify Kirchoff's Laws & Superposition theorem for dc supply
CO2.Analyze the performance of AC and DC Machines by testing.
CO3.Study I – V Characteristics of PV Cell & Perform speed control of dc shunt motor
CO4: Ability to operate diodes for finding V-I Characteristics.
CO5: Ability to construct and operate rectifiers without & with filters
CO6: Ability to construct and operate BJT & FET Characteristics.

List of Experiments:

PART-A

1.Verification of Kirchhoff laws.
2.Verification of Superposition Theorem.
3.Open circuit characteristics of a DC Shunt Generator.
4.Speed control of DC Shunt Motor.
5.OC & SC test of 1 – Phase Transformer.
6.Brake test on 3 - Phase Induction Motor.
7.Brake test on DC Shunt Motor

PART-B

1. PN Junction Diode Characteristics.
2. Zener Diode Characteristics.
3. Rectifiers (With and Without Filter).
4. BJT Characteristics (CB Configuration).
5. BJT Characteristics (CE Configuration).
6. FET Characteristics(CS Configuration).

CO	PO	CI	PI
CO1	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO2	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO3	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO4	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO5	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1

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Year: I **Semester : I** **Branch of Study : Common to all**

Subject Code	Subject Name	L	T	P	Credits
20AES0503	Problem Solving and Programming Lab	0	0	3	1.5

Course outcomes: Student should be able to

1. Create interactive visual programs using Scratch.
2. Develop flowcharts using raptor to solve the given problems.
3. Develop Python programs for numerical and text-based problems
4. Develop graphics and event-based programming using Python
5. Develop Python programs using beautiful Pythonic idiomatic practices

1. Design a script in Scratch to make a sprite to draw geometrical shapes such as Circle, Triangle, Square, Pentagon.
2. Design a script in Scratch to make a sprite to ask the user to enter two different numbers and an arithmetic operator and then calculate and display the result.
3. Design a Memory Game in Scratch which allows the user to identify positions of similar objects in a 3 x 3 matrix.
4. Construct flowcharts to
   a. calculate the maximum, minimum and average of N numbers
   b. develop a calculator to convert time, distance, area, volume and temperature from one unit to another.
5. Construct flowcharts with separate procedures to
   a. calculate simple and compound interest for various parameters specified by the user
   b. calculate the greatest common divisor using iteration and recursion for two numbers as specified by the user
6. Construct flowcharts with procedures to
   a. generate first N numbers in the Fibonacci series
   b. generate N Prime numbers
7. Design a flowchart to perform Linear search on list of N unsorted numbers(Iterative and recursive)
8. Design a flowchart to perform Binary search on list of N sorted numbers(Iterative and recursive)
9. Design a flowchart to determine the number of characters and lines in a text file specified by the user
10. Design a Python script to convert a Binary number to Decimal number and verify if it is a Perfect number.
11. Design a Python script to determine if a given string is a Palindrome using recursion
12. Design a Python script to sort numbers specified in a text file using lists.
13. Design a Python script to determine the difference in date for given two dates in YYYY:MM:DD format(0 <= YYYY <= 9999, 1 <= MM <= 12, 1 <= DD <= 31) following the leap year rules.
14. Design a Python Script to determine the Square Root of a given number without using inbuilt functions in Python.
15. Design a Python Script to determine the time difference between two given times in HH:MM:SS format.(0 <= HH <= 23, 0 <= MM <= 59, 0 <= SS <= 59)
16. Design a Python Script to find the value of (Sine, Cosine, Log, PI, *e*) of a given number using infinite series of the function.
17. Design a Python Script to convert a given number to words
18. Design a Python Script to convert a given number to roman number.
19. Design a Python Script to generate the frequency count of words in a text file.
20. Design a Python Script to print a spiral pattern for a 2-dimensional matrix.
21. Design a Python Script to implement Gaussian Elimination method.
22. Design a Python script to generate statistical reports (Minimum, Maximum, Count, Average, Sum etc.) on public datasets.

23. Design a Python script using the Turtle graphics library to construct a turtle bar chart representing the grades obtained by N students read from a file categorising them into distinction, first class, second class, third class and failed.

Text Book:

http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf

List of COs	PO no. and keyword	Competency	Performance Indicator
CO1	PO3: Design/Development of Solutions	3.1	3.1.4
CO2	PO3: Design/Development of Solutions	3.1	3.1.4
CO3	PO2: Problem analysis	2.2	2.2.2
CO4	PO2: Problem analysis PO3: Design/Development of Solutions	2.2 3.1	2.2.2 3.1.4
CO5	PO3: Design/Development of Solutions	3.1	3.1.4

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Year: I **Semester : II** **Branch of Study : CE & ME**

Subject Code	Subject Name	L	T	P	Credits
20ABS9906	Differential Equations and Vector Calculus	3	0	0	3

Course Outcomes:

1. Apply the mathematical concepts of ordinary differential equations of higher order.
2. Solve the differential equations related to various engineering fields.
3. Identify solution methods for partial differential equations that model physical processes.
4. Interpret the physical meaning of different operators such as gradient, curl and divergence.
5. Estimate the work done against a field, circulation and flux using vector calculus.

UNIT I

Linear Differential Equations of Higher Order: Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator, rules for finding particular integral, method of variation of parameters.

UNIT II

Equations Reducible to Linear Differential Equations and Applications: Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients, Applications: Mass spring system and L-C-R Circuit problems

UNIT III

Partial Differential Equations – First order:

First order partial differential equations, solutions of first order linear and non-linear PDEs.
Solutions to homogenous and non-homogenous higher order linear partial differential equations.

UNIT IV

Multivariable Calculus (Vector differentiation): Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, vector identities

UNIT V

Multivariable Calculus (Vector integration): Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof).

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2011.

References:

1. Dr. T. K. V. Iyengar, Engineering Mathematics-I, S. Chand publishers
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
3. N. P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi publication, 2008

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Year: I **Semester : II** **Branch of Study : ME**

Subject Code	Subject Name	L	T	P	Credits
20ABS9905	Engineering Chemistry	3	0	0	3

Course Outcomes:

1. Differentiate between hard water and soft water. Understand the disadvantages of using hard water domestically and industrially. Select and apply suitable treatments domestically and industrially
2. Understand the electrochemical sources of energy
3. Demonstrate the corrosion prevention methods and factors affecting corrosion
4. Explain the preparation, properties, and applications of thermoplastics & thermo settings, elastomers & conducting polymers.
5. Explain calorific values, octane number, refining of petroleum and cracking of oils
6. Explain the manufacturing of portland cement and concrete formation
7. Summarize the application of SEM, TEM and X-ray diffraction in surface characterization
8. Explain the principles of spectrometry, GC and HPLC in separation of gaseous and liquid mixtures

UNIT I

Water Technology: Introduction –Soft Water and hardness of water, Estimation of hardness by EDTA Method - Boiler troubles - scale and sludge, Industrial water treatment – specifications for drinking water, Bureau of Indian Standards(BIS) and World health organization(WHO) standards, zeolite and ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electrodialysis.

UNIT II

Electrochemistry and applications: Electrodes – concepts, electrochemical cell, Nernst equation, cell potential calculations. Primary cells – Fuel cells, hydrogen-oxygen, methanol fuel cells – working of the cells. Secondary cells – lead acid, nickel-metal hydride and lithium ion batteries- working of the batteries including cell reactions.

Corrosion: Introduction to corrosion, electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, metal oxide formation by dry electrochemical corrosion, Pilling Bedworth ratios and uses, environmental factors (pH, temperature, DO) affecting corrosion rate, Pourbaix diagrams for iron and aluminium, protection – corrosion inhibitors with specific examples, cathodic and anodic protection, electroplating and electro less plating (Nickel and Copper).

UNIT III

Polymers and Fuel Chemistry: Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, copolymerization (stereospecific polymerization) with specific examples and mechanisms of polymer formation.

Thermoplastics and Thermo-sets, Elastomers – applications with specific examples.

Conducting polymers – polyacetylene, polyaniline, polypyrroles – mechanism of conduction and applications.

Fuels – Types of fuels, calorific value, numerical problems based on calorific value; Analysis of coal, refining of petroleum, liquid fuels, fuels for IC engines, knocking and anti-knock agents, Octane and Cetane values, cracking of oils; alternative fuels- propane, methanol and ethanol, bio fuels.

UNIT IV

Cement and Concrete Chemistry: Introduction to building materials – Portland cement, constituents, manufacturing process-raw materials for manufacturing process, reactions below 1300 ^{o}C and reactions between 1300 and 1450 ^{o}C, reactions during cooling, grinding or storage, chemical equations, phases of cement clinker (alite, belite, aluminate and ferrite), reactivity of clinker phases, parameters to characterize the clinker formation: lime saturation factor (LSF), silica ratio (SR) and alumina ration (AR), chemistry of setting and hardening of cement (hydration, hydrolysis, equations), scheme of concrete formation,

admixtures for concrete improvement – retarders, accelerators, air-entraining agents, grinding agents, super plasticizers, dispersants, etc.

UNIT V

Surface Chemistry and Applications: Introduction to surface chemistry, colloids, nanometals and nanometal oxides, micelle formation, synthesis of colloids (any two methods with examples), chemical and electrochemical methods (not more than two methods) of preparation of nanometals and metal oxides, stabilization of colloids and nanomaterials by stabilizing agents, characterization of surface by physicochemical methods (SEM, TEM, X-ray diffraction), solid-gas interface, solid-liquid interface, adsorption isotherm, BET equation (no derivation), calculation of specific surface area of solids, numerical problems, functionalization of surface of nanomaterials– applications of colloids and nanomaterials – catalysis, medicine, sensors, etc.

Text books:

1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference books:

1. H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997.
2. D.J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth-Heineman,1992.
3. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.

List of COs	PO no. and keyword	Competency	Performance Indicator
CO 1	PO1:Engineering knowledge	1.2	1.2.1
CO 2	PO1:Engineering knowledge	1.4	1.4.1
CO 3	PO1:Engineering knowledge	1.2	1.2.1
CO 4	PO1:Engineering knowledge	1.2	1.2.1
CO 5	PO2: Problem Analysis	2.4	2.4.4
CO 6	PO1:Engineering knowledge	1.4	1.4.1
CO 7	PO2: Problem Analysis	2.4	2.4.4
CO 8	PO2: Problem Analysis	2.4	2.4.4

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B.Tech I-Year **Semester** : **II** **Branch :** Common to all

Subject Code: **20AHS9901**	**Communicative English**	L T P 2 0 0	Credits:2

Course Outcomes:

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

1. Identify the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English
2. Formulate sentences using proper grammatical structures and correct word forms
3. Speak clearly on a specific topic using suitable discourse markers in informal discussions
4. Write summaries based on global comprehension of reading/listening texts
5. Produce a coherent paragraph interpreting a figure/graph/chart/table
6. Take notes while listening to a talk/lecture to answer questions

Syllabus

Unit 1 : EXPLORATION **10 Hours (4L+6P)**

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.

Reading: A Proposal to Girdle the Earth, Nellie Bly - Skimming to get the main idea of a text; scanning to look for specific pieces of information.

Reading for Writing: Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph.

Grammar and Vocabulary: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and un countable; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences.

Unit 2: ON CAMPUS **10 Hours (4L+6P)**

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts.

Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks.

Reading: The District School As It Was by One who Went to it, Warren Burton - Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Writing: Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters.

Grammar and Vocabulary: Cohesive devices -linkers, sign posts and transition signals; use of articles and zero article; prepositions.

Unit 3: THE FUTURE OF WORK **10 Hours (4L+6P)**

Listening: Listening for global comprehension and summarizing what is listened to.

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed **Reading:** The Future of Work - Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension.

Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.

Grammar and Vocabulary: Verbs -tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Unit 4: FABRIC OF CHANGE **8 Hours (2L+6P)**

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.

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Reading: H.G.Wells and the Uncertainties of Progress, Peter J.Bowler - Studying the use of graphic elements in texts to convey information, reveal trends / patterns / relationships, communicate processes or display complicated data.

Writing: Information transfer; describe, compare, contrast, identify significance / trends based on information provided in figures/charts/graphs/tables.

Grammar and Vocabulary: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms.

Unit 5: TOOLS FOR LIFE **8 Hours (2L+6P)**

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.

Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides.

Reading: Leaves from the Mental Portfolio of a Eurasian, Sui Sin Far - Reading for comprehension.

Writing: Writing structured essays on specific topics using suitable claims and evidences.

Grammar and Vocabulary: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject- verb agreement)

Suggested books:

Text Book: English all round: Communication Skills for Under graduation Learners Vol. I, Orient BlackSwan Publisers, First Edition 2019.

Reference Books

1. Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge,2014.
   Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley,ELT; 2nd Edition, 2018.
2. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
3. Hewings, Martin. *Cambridge Academic English (B2).* CUP, 2012.

Sample Web Resources

Grammar/Listening/Writing, 1-language.com, http://www.5minuteenglish.com/, https://www.englishpractice.com/, Grammar/Vocabulary, English Language Learning Online http://www.bbc.co.uk/learningenglish/, http://www.better-english.com/, http://www.nonstopenglish.com/, https://www.vocabulary.com/, BBC Vocabulary Games

Free Rice Vocabulary Game

Reading

https://www.usingenglish.com/comprehension/, https://www.englishclub.com/reading/short-stories.htm, https://www.english-online.at/

Listening

https://learningenglish.voanews.com/z/3613, http://www.englishmedialab.com/listening.html

Speaking

https://www.talkenglish.com/, BBC Learning English – Pronunciation tips, Merriam-Webster – Perfect pronunciation Exercises

All Skills

https://www.englishclub.com/, http://www.world-english.org/, http://learnenglish.britishcouncil.org/

Online Dictionaries, Cambridge dictionary online, MacMillan dictionary, Oxford learner's dictionaries

List of COs	PO no. and keyword	Competency Indicator: Description	Performance Indicator: Description
CO1.	PO6 Apply contextual knowledge to assess societal, health, safety, legal, and cultural issues.	6.1	6.1.1
CO2.	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.1	10.1.1

CO3.	PO9-Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	9.2	9.2.1
CO4.	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.1 .	10.1.1
CO5	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.3	10.3.1
CO6.	PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	10.2	10.2.1

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B.Tech I-Year **Semester** : II **Branch :** Common to all

Subject Code: **20AES0509**	Subject Name: **Basics of Python Programming**	L T P 3 0 0	Credits:3

Course Objectives
After successful completion of the course, students will be able to:
CO1. Demonstrate knowledge on Python constructs to solve basic problems.
CO2. Develop and use Python modules to provide solutions to problems.

UNIT-I: INTRODUCTION TO PROBLEM SOLVING AND PYTHON PROGRAMMING
Problem Solving Aspect: top-down design, implementation of algorithms, building blocks of flow charts, program verification and efficiency of algorithms.
Python Programming: tokens, literals, identifiers, keywords, special symbols and operators; fundamental data types, expressions, type conversions, handling Input and output in Python.

UNIT-II: CONTROL STRUCTURES
Selection Statements: if statement, if-else statement, if-elif-else statement, nested-if statement.
Iterative Statements: while loop, for loop, break statement, continue statement, pass and else statements used with loops.

UNIT-III: SEQUENCES, SETS, DICTIONARIES AND DATA STRUCTURES
Sequences: Lists and operations - creating, inserting elements, updating elements, deleting elements, searching and sorting, list comprehensions, nested lists; tuples - creating, searching and sorting, nested tuples; strings - Initializing a string and string operations, string handling methods, string formatting; sets - set creation and operations; dictionaries - operations on dictionaries, dictionary methods, sorting elements using lambdas.

UNIT-IV: MODULAR PROGRAMMING AND FILE HANDLING
Modular Programming: need for functions, function definition, function call, variable scope and lifetime, return statement, positional arguments, keyword arguments, default arguments and variable-length arguments, recursive functions; Modules - math, NumPy, date and time.
File Handling: types of files, opening and closing files, reading and writing data.

UNIT-V: DATA REPRESENTATION AND VISUALIZATION
Pandas: creating data frame, reading data from CSV files, indexing and selecting data, dealing with rows and columns; Visualization - bar plots, histogram, Scatter Plot.

TEXT BOOKS:
1. R. Nageswara Rao, *Core Python Programming*, 2nd edition, Dreamtech Press, 2018.
2. R. G. Dromey, *How to solve it by Computer*, Pearson, 2006.

REFERENCE BOOKS:
1. Reema Thareja, *Python Programming using Problem Solving Approach*, 1st edition, Oxford University Press, 2017.
2. Charles Dierbach, *Introduction to Computer Science using Python: A Computational Problem-Solving Focus*, Wiley India, 2016.

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MECHANICAL ENGINEERING (ME)

Year : I **Semester : II** **Branch of Study : CE, ECE, ME, EEE**

Subject Code	Subject Name	L	T	P	Credits
20AES0304	Engineering Workshop Practice	1	0	4	3

Course Outcomes:

CO: 1 Apply wood working skills in real world applications.
CO: 2 Build different parts with metal sheets in real world applications.
CO: 3 Apply fitting operations in various applications.
CO: 4 Apply different types of basic electric circuit connections.
CO: 5 Demonstrate soldering and brazing.

Wood Working:
Familiarity with different types of woods and tools used in wood working and make following joints

a) Half – Lap joint
b) Mortise and Tenon joint
c) Corner Dovetail joint or Bridle joint

Sheet Metal Working:
Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets

a) Tapered tray b) Conical funnel

c) Elbow pipe d) Brazing

Fitting:
Study the difference types of fits and tolerances, surface finishing materials. Familiarity with different types of tools used in fitting and do the following fitting exercises

a) V-fit b) Dovetail fit

c) Semi-circular fit d) Bicycle tyre puncture and change of two wheeler tyre

Electrical Wiring:

Study the different types of circuits and connections,
Familiarities with different types of basic electrical circuits and make the following connections.

a) Parallel and series b) Two-way switch

c) Godown lighting d) Tube light

e) Three phase motor f) Soldering of wires

List of COs	öPO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 1: Engineering knowledge	1.3	1.3.1
CO: 2	PO 3: Design/Development of Solutions	3.2	3.2.1
CO: 3	PO 1: Engineering knowledge	1.3	1.3.1

CO: 4	PO 3: Design/Development of Solutions	3.2	3.2.2
CO: 5	PO 2: Problem analysis	2.3	2.3.2

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B. Tech I-Year **Semester: II** **Branch : Common to all**

Subject Code: 20AHS9902	Subject Name: **Communicative English Lab**	L T P 0 0 2	Credits:1.5

Course Outcomes

1. Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills
2. Apply communication skills through various language learning activities
3. Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
4. Evaluate and exhibit acceptable etiquette essential in social and professional settings.
5. Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.

Syllabus

Unit 1
1. Phonetics for listening comprehension of various accents
2. Reading comprehension
3. Describing objects/places/persons

Unit 2
1. JAM
2. Group Discussions
3. Oral Presentations – Power Point Presentations and Poster Presentations

Unit 3
1. Situational dialogues – Greeting and Introduction
2. Formal letter writing and e-mail writing

Unit 4
1. Asking for Information and Giving Directions
2. CV/Resume writing – Cover letter

Unit 5
1. Vocabulary Building
2. Debates

Software Source:

K-Van Solutions Software

Reference:

Teaching English - British Council

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Year: I **Semester : II** **Branch of Study : ME**

Subject Code	Subject Name	L	T	P	Credits
20ABS9910	Engineering Chemistry Lab	0	0	3	1.5

Course Outcomes:

1. Determine the cell constant and conductance of solutions
2. Prepare advanced polymer materials
3. Determine the physical properties like surface tension, adsorption and viscosity
4. Estimate the Iron and Calcium in cement
5. Calculate the hardness of water

List of Experiments:

1. Determination of Hardness of a groundwater sample.
2. pH metric titration of (i) strong acid vs. strong base, (ii) weak acid vs. strong base
3. Determination of cell constant and conductance of solutions
4. Potentiometry - determination of redox potentials and emfs
5. Determination of Strength of an acid in Pb-Acid battery
6. Preparation of a polymer
7. Determination of viscosity of polymer solution using survismeter
8. Determination of percentage of Iron in Cement sample by colorimetry
9. Estimation of Calcium in port land Cement
10. Preparation of nanomaterials
11. Adsorption of acetic acid by charcoal
12. Determination of percentage Moisture content in a coal sample

COs	PO no. and keyword	Competency	Performance Indicator
CO 1	PO 4: Conduct Investigations of complex problems	4.3	4.3.3
CO 2	PO 4: Conduct Investigations of complex problems	4.3	4.3.1
CO 3	PO 4: Conduct Investigations of complex problems	4.3	4.3.1
CO 4	PO 4: Conduct Investigations of complex problems	4.3	4.3.2
CO 5	PO 4: Conduct Investigations of complex problems	4.3	4.3.2

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Year: I **Semester : II** **Branch of Study : ME**

Subject Code	Subject Name	L	T	P	Credits
20AES0510	**Basics of Python Programming Lab**	0	0	3	1.5

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO1. Develop scripts using Scratch tool to simulate simple problems.
CO2. Apply Python Constructs and Modules to develop solutions for real-life problems.
CO3. Function effectively as an individual and in team to foster knowledge and creativity.
CO4. Write and present a substantial technical report/ document effectively.

PRACTICAL EXERCISES:

1) a) Design a script in Scratch to simulate Airplane for take-off and land.
   b) Design a script in Scratch to make a sprite to ask the user to enter two different numbers and an arithmetic operator and then calculate and display the result.

2) a) Design a script in Scratch to calculate factorial of a given number.
   b) Design a script in Scratch to simulate Maze game. (Hint: To get Maze images refer http://inventwithScratch.com/downloads/)

3) a) Write a python script to read two integer numbers and perform arithmetic operations.
   b) Write a python script to evaluate following expressions by considering necessary inputs.
   i) $ax^2 + bx + c$ ii) $ax^5 + bx^3 + c$ iii) (ax + b) / (ax - b) iv) x - a / b + c

4) a) Write a python script to convert given decimal number into octal, hexa decimal and binary.
   b) Write a python script to read four integer values separated with commas and display the sum of those four numbers.
   c) Write a python script to print "SVEC" with prefix of ten spaces by using format().

5) a) Write a python script to calculate electricity bill based on following slab rates.

Consumption units	**Rate (in Rupees/Unit)**
0-100	4
101-150	4.6
151-200	5.2
201-300	6.3
Above 300	8

(Hint: To get Consumption units take current Meter reading, old meter reading from the user as input)

b) Print the following pattern using python script.

```
        1
    1   2   1
  1   2   3   2   1
1   2   3   4   3   2   1
```

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1 2 3 4 5 4 3 2 1

6) a) Write a python script to read *N* student details like name, roll number, branch and age. Sort the student details based on their names and display.
   b) Write a python script to delete duplicate strings from a list of strings. (Insertion order should maintain after deleting duplicate string).
   c) Write a python script to read N number of student details into nested list and convert that as a nested dictionary.
7) a) Design a function that can perform sum of two or three or four numbers.
   b) Write a python script to implement towers of Hanoi problem.
   c) Write a Python function primesquare(l) that takes a nonempty list of integers and returns True if the elements of l alternate between perfect squares and prime numbers, and returns False otherwise. Note that the alternating sequence of squares and primes may begin with a square or with a prime. Here are some examples to show how your function should work.

```
>>>primesquare([4])True
>>>primesquare([4,5,16,101,64])True
>>>primesquare([5,16,101,36,27]) False
```

8) a) Write a python script to perform arithmetic operations on numpyarrays.
   b) Write a python script to perform following matrix operations using numpy.
      i)Dot product ii) Matrix product iii) Determinant iv) Inverse
9) a) Write a python script to Create Pandas dataframe using list of lists.
   b) Write a python script to load data from a CSV file into a Pandas DataFrame and perform basic operations on it.
10) a) Draw a Scatter Plot by considering an appropriate data set.
    b) Draw histograms by considering an appropriate data set.

TEXT BOOK:

1. R. Nageswara Rao, *Core Python Programming*, 2nd edition, Dreamtech Press, 2018.

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MECHANICAL ENGINEERING (ME)

Year: I **Semester: II** **Branch of Study : ME**

Subject Code	Subject Name	L	T	P	Credits: 0
20AMC9902	CONSTITUTION OF INDIA	2	0	0	

Course Outcomes:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the Powers and functions of Governor, President, Judiciary.
5. Discuss the functions of local administration bodies.

Syllabus

Unit:1 **4hrs**

History of Making of the Indian Constitution - History Drafting Committee, (Composition & Working)

Unit:2 **8hrs**

Philosophy of the Indian Constitution - Preamble Salient Features

Unit:3 **8hrs**

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

Unit:4 **8hrs**

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

Unit:5 **8hrs**

Local Administration - District's Administration head: Role and Importance - Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation - Pachayati raj: Introduction, PRI: ZillaPachayat - Elected officials and their roles, CEO Zilla Panchayat: Position and role - Block level: Organizational Hierarchy (Different departments) - Village level: Role of Elected and Appointed officials - Importance of grass root democracy.

Suggested books for reading:

1. The Constitution of India, 1950 (Bare Act), Government Publication.

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

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO 1	PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice	6.2.	6.2.1
CO 2	PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice	6.2.	6.2.1
CO 3	PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice	6.2.	6.2.1
CO 4	PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice	6.2.	6.2.1
CO 5	PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice	6.2	6.1.1

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Year : II B.Tech **Semester: I** **Branch of Study: CE and ME**

Subject Code:20ABS9913	Subject Name: Probability & Statistics, PDE	L T P 3 0 0	Credits 3

Course Outcomes:

1) Understand the concepts of Central Tendency, Correlation, Regression concepts.
2) Apply discrete and continuous probability distributions
3) Design the components of a classical hypothesis test for large samples.
4) Infer the statistical inferential methods based on small sampling tests.
5) Find the general solution of the PDEs bearing applications

Unit I: Descriptive statistics :
Measures of Central tendency, Measures of Variability (spread or variance), correlation, correlation coefficient, rank correlation, regression coefficients, method of least squares, regression lines

Unit II: Probability
probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous)**,** probability distribution: Binomial - Poisson approximation to the binomial distribution and normal distribution-their properties.

Unit III: Testing of Hypothesis
Formulation of null hypothesis, critical regions, level of significance. Large sample tests: test for single proportion, difference of proportions, test for single mean and difference of means.

Unit IV: Small Sample Tests
Student t-distribution (single mean, two means and paired t-test), Testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit.

Unit V: Applications of Partial Differential Equations
Method of separation of variables, solution of 1D-wave, 1D-heat and 2D-Laplace's equation in Cartesian coordinates

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43/e, 2010.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006.

References:

1. S.Chand ,Engineering Mathematics-II by Dr.T.K.V.Iyengar, Dr.B.Krishna Gandhi, S.Ranganatham, Dr.M.V.S.S.N.Prasad
2. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9/e, Wiley India, 2009.
3. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India,1995.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2008.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Apply the knowledge of mathematics	1.1	1.1.1
CO2	PO1: Apply the knowledge of mathematics	1.1	1.1.1

CO3	PO1: Apply the knowledge of mathematics	1.1	1.1.1
CO4	PO1: Knowledge of Engineering fundamentals	**1.2**	**1.2.2**
CO5	PO2: First principles of mathematics	2.4	2.4.1

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MECHANICAL ENGINEERING (ME)

Year : II **Semester** : I **Branch of Study : ME**

Subject Code	Subject Name	L	T	P	Credits
20APC0308	Thermodynamics	3	0	0	3

Course Outcomes:

1. Explain the importance of thermodynamic properties related to conversion of heat energy into work.
2. Apply the laws of thermodynamics to boilers, heat pumps, refrigerators, heat engines, compressors and nozzles.
3. To understand concept of Entropy and Availability of system
4. Utilize steam properties to design steam based components.
5. Compare thermodynamic relations and air standard cycles.

UNIT I

Introduction: Basic Concepts: Macroscopic and microscopic viewpoints, definitions of thermodynamic terms, quasi – static process, point and path function, forms of energy, ideal gas and real gas, Zeroth law of thermodynamics.

Properties of Steam and use of Steam Tables: Pure Substances, P-V-T surfaces, T-s and h-s diagram, Mollier chart, dryness fraction, property tables, analysis of steam undergoing various thermodynamic processes using Mollier chart– steam calorimetry

UNIT II

First law of Thermodynamics: Joule's experiment - first law of thermodynamics, corollaries-perpetual motion machines of first kind, first law applied to non-flow and flow process- limitations of first law of thermodynamics.

Second Law of Thermodynamics: Kelvin - Planck statement and Clausius statement and their equivalence, corollaries - perpetual motion machines of second kind - reversibility and irreversibility, cause of irreversibility - Carnot cycle, heat engine, heat pump and refrigerator, Carnot theorem, Carnot efficiency

UNIT III

Entropy: Clausius inequality - Concept of Entropy- entropy equation for different processes and systems

Availability and Irreversibility: Definition of exergy and energy, expressions for availability and irreversibility. Availability in steady flow, non-flow processes and irreversibility.

UNIT IV

Avogadro's law, equation of state, ideal gas equation, Vander Waal's equation, reduced properties, law of corresponding states, compressibility chart. Gibbs-Dalton law, volumetric analysis of gas mixture, apparent molecular weight and gas constant, specific heat of a gas mixture, adiabatic mixing of perfect gases, gas and vapour mixtures.

UNIT V

Thermodynamic Relations: Maxwell relations, TdS equations, difference in heat capacities, ratio of heat capacities, Energy equation, Joule Thompson coefficient, Clausius-Clapeyron equation. Reactive mixture of gases

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Text Books:

1. P. K. Nag, Engineering Thermodynamics, 5/e, Tata McGraw Hill, 2013.
2. Yunus A. Cengel, Michaela A. Boles, Thermodynamics, 7/e, Tata McGraw Hill, 2011.

Reference Books:

1. J. B. Jones and G. A. Hawkins, Introduction to Thermodynamics, 2/e, John Wiley & Sons, 2012.
2. Moran, Michael J. and Howard N. Shapiro, Fundamentals of Engineering Thermodynamics, 3/e, Wiley, 2015
3. Claus Borgnakke Richard E. Sonntag, Fundamentals of Thermodynamics, 7/e, Wiley, 2009
4. R. K. Rajput, S. Chand & Co., Thermal Engineering, 6/e, Laxmi publications, 2010.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 2: Problem analysis	2.5	2.1.3
CO: 2	PO 1: Engineering knowledge PO 2: Problem analysis	2.2	2.2.3
CO: 3	PO 1: Engineering knowledge PO 2: Problem analysis	2.1	2.1.3
CO: 4	PO 1: Engineering knowledge PO 2: Problem analysis PO 3: Design/development of solutions	2.2	2.2.3
CO: 5	PO 1: Engineering knowledge PO 2: Problem analysis	2.4	2.4.3

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Year : II **Semester** : I **Branch of Study : ME**

Subject Code	Subject Name	L	T	P	Credits
20APC0301	Engineering Mechanics	3	0	0	3

Course Outcomes:

1. Resolve forces and moments in mechanical systems.
2. Identify the frictional forces and its influence on equilibrium.
3. Find the centre of gravity and moment of inertia for various geometric shapes
4. Demonstrations of equilibrium of ideal systems and estimation of the work done by the force and the couple
5. Determine the displacement, velocity and acceleration relations in dynamic systems

UNIT I

Introduction to Engineering Mechanics: Composition and resolution of forces, parallelogram law, principle of transmissibility, types of force systems - concurrent and concurrent coplanar forces, resultant of coplanar force systems couple, moment of a force Varignon's theorem, concept of equilibrium of coplanar force systems.

UNIT II

Friction: Laws of friction, types of friction, equilibrium of force systems involving frictional forces. Free body diagrams involving frictional forces.
Analysis of Structures: Introduction to plane trusses, analysis of plane trusses by method of joints.

UNIT III

Properties of Surfaces and Volumes: Centroid and center of gravity, derivation of centroids from first moment of area, centroids of composite sections, center of gravity of common volumes - cylinder, cone, sphere, theorem of Pappus-guldinus.

Moment of Inertia: Area moment of inertia of plane and composite shapes, parallel axis theorem, perpendicular axis theorem, polar moment of inertia, mass moment of inertia of common volumes thin plates, cylinder, cone, sphere, rectangular prism, radius of gyration

UNIT IV

Virtual Work: Equilibrium of ideal systems, work done by a force, work done by a couple, principle of virtual work.
Kinematics: Equations of motion for rigid bodies, constant and variable acceleration, rectilinear and curvilinear motion and motion under gravity -projectile motion, use of rectangular coordinates, radius of curvature, rotation of a rigid body about a fixed axis.

UNIT V

Kinetics: Principles of dynamics - Newton's Laws of motion, D'Alembert's principle in rectilinear translation, principle of work and energy.
Ideal Systems: Principle of conservation of energy, concept of power, conservation of linear and angular momentum, principle of momentum and impulse, impact - types of impact.

Text Books:

1. N H Dubey, Engineering Mechanics: Statics and Dynamics, McGraw Hill, 2014.
2. S Timoshenko, DH Young, JV Rao, Sukumar Pati, Engineering Mechanics (in SI units), 5/e, McGraw Hill, 2013.
3. S S Bhavikatti, Engineering Mechanics, 4/e, New Age International, 2008

References:

1. Irving Shames, G K M Rao, Engineering Mechanics: Statics and Dynamics, 4/e, Pearson, 2009.
2. K L Kumar, Veenu Kumar, Engineering Mechanics, 4/e, Tata McGraw Hill, 2010.

List of COs	PO no. and keyword	Competency	Performance Indicator
CO: 1	PO1: Engineering knowledge	1.3	1.3.1
CO: 2	PO2: Modern tool usage	2.1	2.1.3
CO: 3	PO4: Conduct investigations of complex problems	4.1	4.1.2
CO: 4	PO2: Problem analysis	2.1	2.1.2
CO: 5	PO7: Environment and sustainability:	7.1	7.1.2

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Year : II **Semester** : I **Branch of Study : ME**

Subject Code	Subject Name	L	T	P	Credits
20APC0306	Material Science and Engineering	3	0	0	3

Course Outcomes:

1. Explain the principles of binary phases
2. Apply heat treatment to different applications and its defects
3. Select steels and cast irons for a given application
4. Utilize non ferrous metals and alloys in engineering
5. Choose composites for various applications. Assess the properties of Nano-materials and their applications

UNIT I

Structure of Metals: Crystal Structures: Unit cells, Metallic crystal structures, Imperfection in solids: Point, Line, interstitial and volume defects; dislocation strengthening mechanisms and slip systems.

Constitution of Alloys: Necessity of Alloying, substitutional and interstitial solid solutions-Phase diagrams: Interpretation of binary phase diagrams and microstructure development; Iron-Iron carbide diagram and microstructural aspects of ferrite, cementite, austenite, ledeburite, andcastiron.

UNIT II

Heat Treatment of Steels: Annealing, tempering, normalizing and spheroidizing, Continuous cooling curves and interpretation of final micro structures and properties austempering, mar tempering, casehardening, carburizing, nitriding, cyaniding, carbo-nitriding, flame and induction hardening.

UNIT III

Steels: Plain carbon steels, used limitations of plain carbon steels. AISI & BIS classification of steels. Classification, Microstructure, properties and applications of alloy steels and tool steels.

Cast irons: Micro structure, properties and applications of white cast iron, malleable cast iron, grey cast iron, nodular cast iron and alloy cast iron.

UNIT IV

Non-ferrous Metals and Alloys: Micro structure, properties and applications of copper, bearing materials and its alloys, aluminum and its alloys. Study of Al-Cu phase diagram, precipitation hardening. Microstructure, properties and applications of titanium and its alloys

UNIT V

Ceramics, Polymers and Composites: Structure, properties and applications of ceramics, polymers and Composites. Introduction to super alloys and Nano materials.

Text Books:

1. Sydney H. Avner, Introduction to Physical Metallurgy, 2/e, Tata McGraw- Hill, 1997.
2. George E. Dieter, Mechanical Metallurgy, 3/e, McGraw-Hill, 2013.

Reference Books:

1. V. Raghavan, Material Science and Engineering, 5/e, Prentice Hall of India, 2004.
2. R. Balasubramaniam, Callister's Material Science and Engineering, 2/e, Wiley India, 2014.
3. Y. Lakhtin, Engineering Physical Metallurgy, University Press of the Pacific, 2000.

L. H.Van Vlack, Elements of Material Science and Engineering, 6/e, Pearson Education, 2008

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List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 1: Engineering knowledge	1.3	1.3.1
CO: 2	PO 5: Modern tool usage	5.2	5.2.2
CO: 3	PO 5: Modern tool usage	5.2	5.1.2
CO: 4	PO 5: Modern tool usage	5.2	5.2.2
CO: 5	PO 1: Engineering knowledge	1.6	1.3.1
	PO 7: Environment and sustainability	7.4	7.2.1

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Year : II **Semester** : I **Branch of Study : ME**

Subject Code	Subject Name	L	T	P	Credits
20APC0303	Machine Drawing	3	0	0	3

Course Outcomes:

1 Understand the Concepts of Conventional Representation of Materials & Machine Elements
2 Draw the Machine Elements and simple parts
3 Draw the assembled views for the part drawings of the Engine parts
4 Draw the assembled views for the part drawings of the other machine parts – Screws jacks, Machine Vices Plummer block, Tailstock.
5 Draw the assembled views for the part drawings of the Valves

UNIT I

Machine Drawing Conventions: Need for drawing conventions-conventional representation of material, common machine elements and parts such as screws, nuts, bolts, keys.

Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.

Title boxes, their sizes, location and details - common abbreviations& their liberal usage.

UNIT II

Design of Machine elements and simple parts:

Selection of views, additional views for the following machine elements and parts with drawing proportions

Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws, keys, cottered joints and knuckle joint, riveted joints for plates, flanged and protected flanged joint. Shaft coupling, spigot and socket joint, journal and foot step bearing.

UNIT III

Assembly Drawings: Drawings of assembled views for the part drawings of the following.
Engine parts- stuffing boxes, Cross heads, Eccentrics, Petrol Engine-connecting rod, piston assembly.
Other Machine parts- Screw jack, machine vice, single tool post.
Valves: Steam stop valve, feed check valve. Non- return value

Textbooks:

1. Machine Drawing- K.L. Narayana, P.Kannaiah & K.Venkata Reddy, New Age Publishers, 4th Edition, 2012.
2. Machine Drawing / N.D. Bhatt / Charotar
3. Machine Drawing – N Siddeswar, P. Kannaiah, VVS Sastry, Mc Graw Hill,2015.

References:

1. Machine Drawing- P.S. Gill, S.K. Kataria & Sons, 17th Edition, 2012
2. Machine Drawing- Dhawan, S.Chand Publications, 1st Revised Edition,1998.
3. Machine Drawing – Ajeet Singh, McGraw Hill, 2012
4. Machine Drawing- Luzzader, PHI Publishers,11th Edition

List of COs	PO No. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 3: Design/development of solutions	3.4	3.4.2

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CO: 2	PO 2: Problem analysis	2.1	2.1.2
CO: 3	PO 3: Design/development of solutions	3.3	3.3.1
CO: 4	PO 5: Modern tool usage	5.1	5.1.2
CO: 5	PO 1: Engineering knowledge	1.1	1.1.2

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MECHANICAL ENGINEERING (ME)

Year : II **Semester** : I **Branch of Study : ME**

Subject Code	Subject Name	L	T	P	Credits
20APC0307	Material Science and Engineering Lab	0	0	3	1.5

Course Outcomes:

1 Identify various microstructures of steels and cast irons.
2 Visualize grains and grain boundaries
3 Evaluate hardness of treated and untreated steels.
4 Summarize the importance of hardening of steels.
5 Study the Micro structure of Heat treated steels.

List of Experiments:

1. Study of microstructure of pure metals – Iron, copper and aluminum.
2. Study of microstructure of low carbon steel, mild steel and high carbon steel.
3. Study of microstructure of cast irons.
4. Study of microstructure of non-ferrous alloys – aluminum, copper, titanium, nickel and their alloys.
5. Study hardenability of steels by Jominy End Quench Test.
6. Study of microstructure of heat treated steels.
7. Find hardness of various untreated and treated steels.
8. Study of microstructure of ceramics, polymeric materials.

List of COs	PO No. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 5: Modern tool usage	5.5	5.5.2
CO: 2	PO 4: Conduct investigations of complex problems	4.1	4.1.2
CO: 3	PO 4: Conduct investigations of complex problems	4.3	4.3.1
CO: 4	PO 4: Conduct investigations of complex problems	4.1	4.1.4
CO: 5	PO 5: Modern tool usage	5.5	5.5.2

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Year : II **Semester** : I **Branch of Study : ME**

Subject Code	Subject Name	L	T	P	Credits
20APC0313	Mechanical Engineering Workshop Practice	0	0	3	1.5

Course Outcomes:

CO: 1 Make moulds for sand casting
CO: 2 Develop different weld joints
CO: 3 Assemble or disassemble of machine components
CO: 4 Make plastic components
CO: 5 Use power tools and find applications of hydraulic and pneumatic circuits

I Foundry Practice: (2 Sessions)

1. (a) Determination of average grain size for sand sample using sieve shaker

(b) Preparation of a green sand mould using single piece pattern

2. Preparation of a green sand mould using split piece pattern with core and demonstration of casting.

II Welding Practice: (2 Sessions)

i) Lap joint, butt joint and T joint using arc welding.

ii) Lap joint using resistance spot welding

iii) Lap and butt joints using gas welding

III Assembling/Disassembling Practice: (3 Sessions)

i) Bicycle

ii) Clutch and carburetor

iii) Two wheeler engine

IV Manufacture of a Plastic Component (2 Sessions)

i) Use of injection moulding machine

ii) Joining of plastic components

V Use of Power Tools (2 Sessions)

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Year : II **Semester** : I **Branch of Study : ME**

Subject Code	Subject Name	L	T	P	Credits
20APC0324	COMPUTER AIDED DRAFTING Lab	0	0	3	1.5

Course Outcomes:

1. Understand the CAD software
2. Understand the elements of CAD tools
3. Design the draw, modify toolbar
4. Design the solids, intersection in 3D
5. Analyze the perceptive views and orthographic views

LIST OF EXPERIMENTS:

I Introduction to Computer Aided Drafting software packages.
II. Practice on basic elements of a Computer Aided Drafting packages
III. Practice on features of a Computer Aided Drafting package
IV Drafting of Solids, Intersection of Solids
V Drafting of Perspective views
VI Drafting of Orthographic views of simple parts

Note: Any of the standard Software Packages like – AUTO CAD, Pro-E, Uni – Graphics, Catia …. Etc may be used

COs	PO No. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 3: Design/development of solutions	3.4	3.4.2
CO: 2	PO 2: Problem analysis	2.1	2.1.2
CO: 3	PO 3: Design/development of solutions	3.3	3.3.1
CO: 4	PO 5: Modern tool usage	5.1	5.1.2
CO: 5	PO 1: Engineering knowledge	1.1	1.1.2

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Year : II **Semester** : I **Branch of Study : ME**

Subject Code	Subject Name	L	T	P	Credits
20ASC0301	CATIA Lab	1	0	2	2

Course Outcomes:

1. Design of 2D models using software
2. Design of 3D models and analysis
3. Create simulation of any simple components
4. Design and simulation of machine components
5. Analysis of any components using software

List of experiments:

1. Any simple 2D drawing using CATIA.
2. 3D modelling using CATIA, Creo, Solid works, etc.,
3. Simulation of simple 3D models.

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Year : II **Semester** : I **Branch of Study : ME**

Subject Code	Subject Name	L	T	P	Credits
20AMC9903	Environmental Studies	2	0	0	0

Course Outcomes:

1. Students get sufficient information that clarifies modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.
2. Students realize the need to change their approach, so as to perceive our own environmental issues correctly, using practical approach based on observation and self-learning.
3. Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.
4. . Interpretation of different types of environmental pollution problems and designing of new solid waste management techniques usage
5. To get knowledge on various environmental acts and to engage all the students life - long learning of rain water harvesting

UNIT – I

18Hr

Multidisciplinary Nature o**f Environmental Studies:** Introduction – Multidisciplinary Nature of Environmental Studies – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources: Renewable and non-renewable energy resources – Natural resources and associated problems.

Forest resources: Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources: Use and over utilization of surface and sub-surface – Floods, drought, conflicts over water, dams – benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticides problems, water logging, salinity, case studies.

Energy resources: Renewable and non-renewable energy resources.

UNIT – II

20Hr

Ecosystems: Concept of an ecosystem. – Structure and functions of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Biodiversity And Its Conservation : Introduction- Definition: genetic, species and ecosystem diversity – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man – wildlife conflicts – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III

10Hr

Environmental Pollution: Definition, Causes, effects and its control measures of : Air Pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution and Nuclear hazards.

Solid Waste Management: Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone, Tsunami and landslides.

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UNIT – IV

15Hr

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting and watershed management – Resettlement and rehabilitation of people – Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies– Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Public awareness.

UNIT – V

10Hr

Human Population and the Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

TEXT BOOKS:

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Kaushik, New Age Publishers.
3. Environmental Studies by Sri Krishna Hitech publishing Pvt. Ltd.

REFERENCES:

1. Environmental studies by R.Rajagopalan, Oxford University Press.
2. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
3. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.
4. Environmental studies by A. Ravi Krishnan, G. Sujatha Sri Krishna Hitech publications.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO:1	PO1:Apply the knowledge of Basic science	1.2	1.2.1
CO:2	PO1:Apply the knowledge of Basic science	1.2	1.2.1
CO:3	PO1:Apply the knowledge of Basic science	1.2	1.2.1
CO:4	PO1:Apply the knowledge of Basic science	1.2	1.2.1
CO:5	PO1:Apply the knowledge of Basic science	1.2	1.2.1

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Year : II **Semester** : II **Branch of Study : ME**

Subject Code	Subject Name	L	T	P	Credits
20AES0324	Thermal Engineering	3	0	0	3

Course Outcomes:

1. To student can know working of both S.I and C.I engines with the help of indicator diagrams.
2. Student can understand the fuel supply systems, cooling, lubrication and ignition systems
3. Student can understand the flame propagation inside the cylinder, stages of combustion in S.I and C.I engines
4. To familiar with indicated power, brake power and friction power and their methods of measurement
5. the working of reciprocating and rotary air compressors. Student can calculate work done by single and multistage reciprocating air compressors.

UNIT I

I.C. ENGINES: Definition of Engine And Heat Engine, I.C Engine Classification – Parts of I.C. Engines, Working of I.C. Engines, Two Stroke & Four Stroke I.C. Engines SI & CI Engines, Valve and Port Timing Diagrams.

UNIT II

Fuel System: S.I. Engine: Fuel Supply Systems, carburetor types Air Filters, Mechanical and Electrical Fuel Pump – Filters– Gasoline Injection Systems.. Cooling & Lubrication Systems: Cooling Requirements, Air Cooling, Liquid Cooling, Thermo Siphon, Water And Forced Circulation System; Lubrication Systems-Flash, Pressurized and Mist Lubrication. Ignition System: Function Of An Ignition System, Battery coil Ignition System, Magneto Coil Ignition System, Electronic Ignition System using Contact Breaker, Electronic Ignition using Contact Triggers – Spark Advance And Retard Mechanism.

UNIT III

Fuels and Combustion: S I engine: Normal Combustion and Abnormal Combustion – Importance of Flame Speed and Effect of Engine Variables – Type of Abnormal Combustion, Pre-Ignition and Knocking (Explanation) – Fuel Requirements and Fuel Rating, Anti Knock Additives, Combustion Chambers. C.I. Engines: Stages Of Combustion – Delay Period And Its Importance – Effect Of Engine Variables – Diesel Knock– Combustion Chambers (DI And IDI), Fuel Requirements And Fuel Rating.

UNIT IV

Testing and Performance : Parameters of Performance - Measurement of Cylinder Pressure, Fuel Consumption, Air Intake, Exhaust Gas Composition, Brake Power – Determination of Frictional Losses And Indicated Power – Performance Test – Heat Balance Sheet and Chart.

UNIT V

Air Compressors: Reciprocating Compressors, Effect of Clearance volume in Compressors, Volumetric Efficiency, Single Stage and Multi Stage Compressors.

GAS TURBINES: Simple Gas Turbine Plant – Ideal Cycle, Essential Components – Parameters of Performance. jet propulsion: Principle of Operation – Classification of Jet Propulsive Engines – Working Principles with Schematic Diagrams and Representation on T-S Diagram.

Text Books:

1. Internal Combustion Engines / V. Ganesan- TMH, 4th Edition,2012
2. Thermal Engineering / Rajput / Lakshmi Publications, 9th Edition,2013

Reference Books:

1. I.C. Engines fundamentals, Heywood, McGrawHIll, 1st Edition,2011
2. IC Engines – Mathur& Sharma – DhanpathRai& Sons, ,2010
3. Engineering fundamentals of IC Engines – Pulkrabek, Pearson, PHI, 2nd Edition,2009
4. Thermal Engineering, Rudramoorthy – TMH, 10th Edition,2010
5. Thermodynamics & Heat Engines, B. Yadav, Central publishing house., Allahabad, 2002
6. Thermal Engineering – R.S. Khurmi & J.K.Gupta – S.Chand, 15th Edition,2012

COs	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO 5: Modern tool usage	5.2	5.2.2
CO2	PO 1: Engineering knowledge	1.2	1.2.2
CO3	PO 5: Modern tool usage	5.2	5.2.2
CO4	PO 5: Modern tool usage	5.2	5.2.2
CO5	PO 1: Engineering knowledge PO 7: Environment and sustainability	1.6 7.2	1.3.1 7.2.1

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Year : II **Semester** : II **Branch of Study : ME**

Subject Code	Subject Name	L	T	P	Credits
20APC0312	Manufacturing Technology	3	0	0	3

Course Outcomes:

1. Demonstrate different metal casting processes and gating systems
2. Classify working of various welding processes
3. Evaluate the forces and power requirements in rolling process
4. Apply the principles of various forging operations
5. Outline the manufacturing methods of plastics and ceramics.

UNIT I

Introduction: Importance and selection of manufacturing processes, classification and selection of manufacturing processes.

Casting Processes: Introduction to casting process, process steps; pattern: types, materials and allowance; Cores and design of gating system , Gating ratio and time of filling the cavity; Solidification of casting: Concept, solidification of pure metal and alloy; Special casting processes: Shell casting, investment casting, die casting, centrifugal casting, casting defects and remedies.

UNIT II

Metal Forming: Introduction, nature of plastic deformation, hot and cold working, mechanics of metal forming; Rolling: Principle, types of rolling mill and products, roll passes, forces in rolling and power requirements; Extrusion: Basic extrusion process and its characteristics, hot extrusion and cold extrusion, wire drawing, tube drawing.

UNIT III

Forging: Principles of forging, tools and dies. Types: Smith forging, drop forging, forging hammers, rotary forging and forging defects. Sheet metal forming: blanking, piercing, bending, stamping.

UNIT IV

Material Joining Processes: Classification of welding processes, types of welds and welded joints, arc welding, submerged arc welding, gas tungsten arc welding, gas metal arc welding. applications, advantages and disadvantages of the above processes, other fabrication processes. soldering and brazing: Types and their applications, Welding defects: causes and remedies.

UNIT V

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.

Text Books :

1. Rao P.N., Manufacturing Technology – Volume I, 5/e, McGraw-Hill Education, 2018.
2. Kalpakjian S and Schmid S.R., Manufacturing Engineering and Technology, 7/e, Pearson, 2018

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Reference Books:

1. Millek P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes and Systems, 4/e, John Wiley and Sons Inc, 2010.
2. Sharma P.C., A Text book of Production Technology, 8/e, S Chand Publishing, 2014.
3. Ian Gibson, David W. Rosen, Brent Stucker, Additive Manufacturing Technologies:

List of COs	PO no. and keyword	Competency	Performance Indicator
CO: 1	PO 1: Engineering knowledge	1.6	1.3.1
CO: 2	PO 5: Modern tool usage	5.2	5.2.2
CO: 3	PO 2: Problem analysis	2.5	2.1.2
CO: 4	PO 5: Modern tool usage:	5.2	5.2.2
CO: 5	PO 7: Environment and sustainability	7.4	7.4.1

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Year : II **Semester** : II **Branch of Study : ME**

Subject Code	Subject Name	L	T	P	Credits
20APC0302	Mechanics of Materials	3	0	0	3

Course Outcomes:

1 Apply the concepts of stress and strain to machine numbers
2 Determine, shear forces, and bending moments in beams
3 To find slope and deflection in beams, determine shear forces and bending moments in beams
4 Estimate the stresses in machine members such as shafts and springs and design
5 Estimate the stresses in thin cylinders due to internal pressure

UNIT I

Stresses and Strains: Types of stresses and strains, stress-strain relations, stress-strain diagram for ductile and other materials, axial loaded bars of uniform and varying cross section, compound bars, relation between three elastic moduli, thermal stresses. Strain energy, resilience

Principal stresses and strains: Biaxial state of stress with and without shear - Mohr's Circle and analytical methods.

UNIT II

Analysis of Beams: Types of beams and loads, shear force and bending moment diagram for cantilever, simply supported and overhanging beams for different types of loadings, point of contra flexure, relation between shearing force and bending moment.

Bending Stresses: Flexural equation, bending stress distribution and efficiency of various cross sections of beams.

UNIT III

Deflection of Beams: Differential equations of the deflection curve, Slope and deflection: using double integration method, Macaulay's method and Moment area method for simply supported, cantilever and overhanging beams. Deflection under single and several loads.

UNIT IV

Torsional and shear stresses: Theory of pure torsion, Shear Stresses: Shear stress distribution for different cross sections of beams.

UNIT V

Buckling of Columns: Analysis of columns to evaluate buckling loads with different boundary conditions, Euler's formula and its limitations, Rankine's formula.

Thin Cylinders: hoop and stresses, longitudinal, cylindrical and spherical shells subjected to internal pressure calculation of volumetric strain.

Text Books :

1. F.P. Beer, E.R. Johnston, Jr & John. T. De Wolf, Mechanics of Materials, 7/e, Tata McGraw-Hill, 2016.
2. SS Rattan, Strength of materials, 3/e, Tata McGraw-Hill, 2016.

Reference Books:

1. Timoshenko, Strength of Materials Part-I& II, 3/e, CBS Publishers, 2004.
2. Popov, Mechanics of Solids, 2/e, New Pearson Education, 2015.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 1: Engineering knowledge	1.3	1.3.1
CO: 2	PO 2: Problem analysis:	2.1	2.1.3

CO: 3	PO 4: Conduct investigations of complexproblems	4.1	4.1.2
CO: 4	PO 2: Problem analysis:	2.1	2.1.2
CO: 5	PO 1: Engineering knowledge:	2.6	2.6.3

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Year : II **Semester** : II **Branch of Study : ME**

Subject Code	Subject Name	L	T	P	Credits
20AOEMB01	Managerial Economics and Financial Analysis	3	0	0	3

Course Outcomes:

1. Understand the fundamentals of Economics and Managerial economics viz., Demand, Production, cost, revenue and markets.
2. Apply the Concept of Production cost and revenues for effective Business decision
3. Analyze how to invest their capital and maximize returns.
4. Evaluate the capital budgeting techniques.
5. Define the concepts related to financial accounting and management and able to develop the accounting statements and evaluate the financial performance of business entity

UNIT - I Managerial Economics

Introduction – meaning, nature, meaning, significance, functions, and advantages, ME and its role in other fields. Demand - Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing forecasting, Methods.

UNIT - II Production and Cost Analysis

Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least- cost combination– Short run and Long run Production Function- Isoquants and Isocosts, MRTS - Cobb-Douglas Production Function - Laws of Returns - Internal and External Economies of scale. Cost & Break-Even Analysis - Cost concepts and Cost behavior- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems)-Managerial significance and limitations of Break-Even Analysis.

UNIT - III Business Organizations and Markets

Introduction – Nature, meaning, significance, functions and advantages. Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition–Oligopoly-Price-Output Determination - Pricing Methods and Strategies

UNIT - IV Capital Budgeting

Introduction to Capital, Sources of Capital. Short-term and Long-term Capital : Working capital, types, Estimating Working capital requirements. Capital Budgeting – Features, Proposals, Time value of money. Methods and Evaluation of Projects – Pay Back Method, Accounting Rate of Return (ARR), Net Present Value (NPV), and Internal Rate Return (IRR) Method (simple problems).

UNIT - V Financial Accounting and Analysis

Introduction – Nature, meaning, significance, functions and advantages. Concepts and Conventions- Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

Textbooks:

1. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019

Reference Books:

1. Ahuja Hl Managerial economics Schand,3/e,2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2013.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage, 2013.

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Online Learning Resources:

https://www.slideshare.net/123ps/managerial-economics-ppt
https://www.slideshare.net/rossanz/production-and-cost-45827016
https://www.slideshare.net/darkyla/business-organizations-19917607
https://www.slideshare.net/balarajbl/market-and-classification-of-market
https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
https://www.slideshare.net/ashu1983/financial-accounting.

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Year : II **Semester** : II **Branch of Study : ME**

Subject Code	Subject Name	L	T	P	Credits
20APC0326	Thermal Engineering Lab	0	0	3	1.5

Course Outcomes:

1 To student can know working of both S.I and C.I engines with the help of indicator diagrams.
2 Student can understand the fuel supply systems, cooling, lubrication and ignition systems
3 Student can understand the flame propagation inside the cylinder, stages of combustion in S.I and C.I engines
4 To familiar with indicated power, brake power and friction power and their methods of measurement
5 the working of reciprocating and rotary air compressors. Student can calculate work done by single and multistage reciprocating air compressors.

List of Experiments:

1. Valve / Port Timing Diagrams of an I.C. Engines
2. Performance Test on a 4 -Stroke Diesel Engines
3. Performance Test on 2-Stroke Petrol engine
4. Evaluation of Engine friction by conducting Morse test on 4-Stroke Multi cylinder Engine
5. Retardation and motoring test on 4- stroke engine
6. Heat Balance of an I.C. Engine.
7. Air/Fuel Ratio and Volumetric Efficiency of an I.C. Engines.
8. Performance Test on Variable Compression Ratio Engines for CI Engines
9. Performance Test on Reciprocating Air – Compressor Unit
10. Study of Boilers
11. Dismantling / Assembly of Engines to identify the parts and their position in an engine.
12. Engine Emission Measurement for SI & CI Engines.

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Year : II **Semester** : II **Branch of Study : ME**

Subject Code	Subject Name	L	T	P	Credits
20APC0303	Mechanics of Materials Lab	0	0	3	1.5

Course Outcomes:

1 Analyze the strength of the beam, SSB
2 Design the various types of springs and their loads
3 Test the load and strength of bricks, cubes.
4 Define and analyze shear test, stress
5 Design the strain, stress and compression

List of Experiments:

1. Direct tension test beam
2. Bending test on
   a) Simply supported beam
   b) Cantilever beam
3. Torsion test
4. Hardness test
5. Brinells hardness test
6. Rockwell hardness test
7. Test on springs
8. Compression test on cube
9. Impact test
10. Punch shear test

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MECHANICAL ENGINEERING (ME)

Year : II **Semester** : II **Branch of Study : ME**

Subject Code	Subject Name	L	T	P	Credits
20ASC0302	Manufacturing Process Lab	0	0	3	1.5

Course Outcomes:

1 Fabricate different types of components using various manufacturing techniques.
2 Carry out Pattern preparation and Estimate the Sand properties
3 Carry out the Welding process to join the components
4 Carry out Blanking & Piercing operation
5 Adapt material forming methods.

1. METAL CASTING
   a) Gating Design and pouring time and solidification time calculations.
   b) Sand Properties Testing – Exercise for Strength and Permeability.
   c) Molding, Melting and Casting for ferrous/ non ferrous materials.

2. WELDING
   a) Arc Welding: Lap & Butt Joint - 2 Exercises
   b) Spot Welding - 1 Exercise
   c) TIG Welding - 1 Exercise
   d) Plasma welding and Brazing - 2 Exercises (Water Plasma Device).

3. MECHANICAL PRESS WORKING
   a) Blanking & Piercing operation and study of simple, compound and progressive press tool.
   b) Hydraulic Press: Deep drawing and extrusion operation.
   c) Bending and other operations.

COs	PO No. and keyword	Competency Indicator	Performance Indicator
CO1	PO 5: Modern tool usage	5.2	5.2.2
CO2	PO 1: Engineering knowledge	1.2	1.2.2
CO3	PO 5: Modern tool usage	5.2	5.2.2
CO4	PO 5: Modern tool usage	5.2	5.2.2
CO5	PO 1: Engineering knowledge PO 7: Environment and sustainability	1.6 7.2	1.3.1 7.2.1

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
Course structure for Four Year Regular B.Tech. Degree Program
(Effective for the batches admitted from 2020-21)
MECHANICAL ENGINEERING (ME)

Year : II **Semester** : II **Branch of Study : Common to all**

Subject Code	Subject Name	L	T	P	Credits
20AHS9905	Universal Human Values	3	1	0	3

Course Outcomes:

1 Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2 Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3 Strengthening of self-reflection.
4 Development of commitment and courage to act
5

UNIT – 1**: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**

- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current. scenario
- Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT II**: Understanding Harmony in the Human Being - Harmony in Myself!**

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

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

UNIT III: **Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship**.

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship

- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

UNIT IV: **Understanding Harmony in the Nature and Existence - Whole existence as Coexistence**

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature
- Understanding Existence as Co-existence of mutually interacting units in all- pervasive space
- Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

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UNIT- V**: Implications of the above Holistic Understanding of Harmony on Professional Ethics.**

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

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Course Outcomes:

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

1. Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
2. They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
3. They would have better critical ability.
4. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
5. It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

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TEXT BOOKS

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

REFERENCE BOOKS

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
5. E. FSchumacher. "Small is Beautiful"
6. Slow is Beautiful –Cecile Andrews
7. J C Kumarappa "Economy of Permanence"
8. Pandit Sunderlal "Bharat Mein Angreji Raj"
9. Dharampal, "Rediscovering India"
10. Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule"
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland(English)
13. Gandhi - Romain Rolland (English)