Course Structure for CSE (Academic Year 2020-21)

Semester I

Sr. No.	Course code	Category	Subject	L	T	P	Credits	Scheme of Examination		Total Marks
								CA	FE	
1	18BTMT101	BSC	Linear Algebra and Calculus (T)	3	1	0	4	40	60	100
2	20BTPY002	BSC	Engineering Physics (T)	3	0	0	3	40	60	100
3	20BTEC005	ESC	Basics of Electrical and Electronics Engineering(T)	3	0	0	3	40	60	100
4	18BTME011	ESC	Engineering Graphics	1	0	4	3	50	50	100
5	20BTEG104	HSM	English Communication for Engineers	2	0	0	2	50	--	50
6	20BTPY012	BSC	Physics Laboratory	0	0	2	1	40	60^	100
7	18BTEC015	ESC	Basics of Electrical and Electronics Engineering Lab	0	0	2	1	40	60^	100
8	20BTEG114	HSM	English Communication for Engineers Laboratory	0	0	2	1	50	--	50
			Total	**12**	**1**	**10**	**18**			**700**

Semester II:

Sr. No.	Course code	Category	Subject	L	T	P	Credits	Scheme of Examination		Total Marks
								CA	FE	
1	18BTMT201	BSC	Ordinary Differential Equations and Advanced Calculus(T)	3	1	0	4	40	60	100
2	20BTCH003	BSC	Engineering Chemistry(T)	3	0	0	3	40	60	100
3	18BTCS006	ESC	Programming for Problem Solving(T)	2	0	0	2	40	60	100
4	18BT(branch code)202	DCC	Branch Specific*(T)	3	0	0	3	40	60	100
5	20BTCH013	BSC	Chemistry Laboratory	0	0	2	1	40	60^	100
6	18BTCS016	ESC	Programming Lab	0	0	4	2	40	60^	100
7	18BTME017	ESC	Engineering Workshop	0	0	4	2	50	--	50
8	18BT(branch code)212	DCC	Branch Specific Lab*	0	0	2	1	40	60^	100
			Total	**11**	**1**	**12**	**18**			**750**

Branch Specific*: (Computer Science and Engineering): Digital Electronics and Logic Design.

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Course Structure for ECE and IT (Academic Year 2020-21)

Semester I

Sr. No.	Course code	Category	Subject	L	T	P	Credits	Scheme of Examination		Total Marks
								CA	FE	
1	18BTMT101	BSC	Linear Algebra and Calculus (T)	3	1	0	4	40	60	100
2	20BTCH003	BSC	Engineering Chemistry(T)	3	0	0	3	40	60	100
3	20BTEC005	ESC	Basics of Electrical and Electronics Engineering(T)	3	0	0	3	40	60	100
4	18BTME011	ESC	Engineering Graphics	1	0	4	3	50	50	100
5	20BTEG104	HSM	English Communication for Engineers	2	0	0	2	50	--	50
6	20BTCH013	BSC	Chemistry Laboratory	0	0	2	1	40	60^	100
7	18BTEC015	ESC	Basics of Electrical and Electronics Engineering Lab	0	0	2	1	40	60^	100
8	20BTEG114	HSM	English Communication for Engineers Laboratory	0	0	2	1	50	--	50
			Total	**12**	**1**	**10**	**18**			**700**

Semester II:

Sr. No.	Course code	Category	Subject	L	T	P	Credits	Scheme of Examination		Total Marks
								CA	FE	
1	18BTMT201	BSC	Ordinary Differential Equations and Advanced Calculus(T)	3	1	0	4	40	60	100
2	20BTPY002	BSC	Engineering Physics (T)	3	0	0	3	40	60	100
3	18BTCS006	ESC	Programming for Problem Solving(T)	2	0	0	2	40	60	100
4	18BT(branch code)202	DCC	Branch Specific*(T)	3	0	0	3	40	60	100
5	20BTPY012	BSC	Physics Laboratory	0	0	2	1	40	60^	100
6	18BTCS016	ESC	Programming Lab	0	0	4	2	40	60^	100
7	18BTME017	ESC	Engineering Workshop	0	0	4	2	50	--	50
8	18BT(branch code)212	DCC	Branch Specific Lab*	0	0	2	1	40	60^	100
			Total	**11**	**1**	**12**	**18**			**750**

Branch Specific*: (Electronics and Communication Engineering): Electronics Device and Circuit,
(Information Technology): Digital Electronics and Microprocessor

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Course Structure for Mechanical and Civil Engineering (Academic Year 2020-21)

Semester I:

Sr. No.	Course Code	Category	Subject	L	T	P	Credits	Scheme of Examination		Total Marks
								CA	FE	
1	18BTMT101	BSC	Linear Algebra and Calculus (T)	3	1	0	4	40	60	100
2	20BTCH003	BSC	Engineering Chemistry (T)	3	0	0	3	40	60	100
3	18BTCS006	ESC	Programming for Problem Solving (T)	2	0	0	2	40	60	100
4	20BTEG104	HSM	English Communication for Engineers	2	0	0	2	50	--	50
5	20BTCH013	BSC	Chemistry Laboratory	0	0	2	1	40	60^	100
6	18BTCS016	ESC	Programming Lab	0	0	4	2	40	60^	100
7	20BTEG114	HSM	English Communication for Engineers Laboratory	0	0	2	1	50	--	50
8	18BTME011	ESC	Engineering Graphics	1	0	4	3	50	50	100
			Total	**11**	**1**	**12**	**18**			**650**

Semester II:

Sr. No.	Course Code	Category	Subject	L	T	P	Credit	Scheme of Examination		Total Marks
								CA	FE	
1	18BTMT201	BSC	Ordinary Differential Equations and Advanced Calculus (T)	3	1	0	4	40	60	100
2	20BTPY002	BSC	Engineering Physics (T)	3	0	0	3	40	60	100
3	20BTEC005	ESC	Basics of Electrical and Electronics Engineering (T)	3	0	0	3	40	60	100
4	18BTME017	ESC	Engineering Workshop	0	0	4	2	50	--	50
5	18BT(branch code)202	DCC	Branch Specific*(T)	3	0	0	3	40	60	100
6	20BTPY012	BSC	Physics Laboratory	0	0	2	1	40	60^	100
7	18BTEC015	ESC	Basics of Electrical and Electronics Engineering Lab	0	0	2	1	40	60^	100
8	18BT(branch code)212	DCC	Branch Specific Lab*	0	0	2	1	40	60^	100
			Total	**12**	**1**	**10**	**18**			**800**

Branch Specific* (Mechanical Engineering): Basics of Mechanical Engineering, (Civil Engineering): Applied Mechanics

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Course Structure for Aerospace Engineering (Academic Year 2020-21)

Sr. No.	Course Code	Category	Subject (Semester I)	L	T	P	Credits	Scheme of Examination		Total Marks
								CA	FE	
1	18BTMT101	BSC	Linear Algebra and Calculus (T)	3	1	0	4	40	60	100
2	20BTCH003	BSC	Engineering Chemistry (T)	3	0	0	3	40	60	100
3	18BTCS006	ESC	Programming for Problem Solving(T)	2	0	0	2	40	60	100
4	20BTEG104	HSM	English Communication for Engineers	2	0	0	2	50	--	50
5	20BTCH013	BSC	Chemistry Laboratory	0	0	2	1	40	60^	100
6	18BTCS016	ESC	Programming Lab	0	0	4	2	40	60^	100
7	20BTEG114	HSM	English Communication for Engineers Laboratory	0	0	2	1	50	--	50
8	18BTAE107	DCC	Thermodynamics (T)	2	0	0	2	40	60	100
9	18BTAE251	DCC	Material Engineering and Aerospace Materials#	2	0	0	-	--	--	
			Total	**14**	**1**	**8**	**17**			**650**

Sr. No.	Course Code	Category	Subject (Semester II)	L	T	P	Credits	Scheme of Examination		Total Marks
								CA	FE	
1	18BTMT201	BSC	Ordinary Differential Equations and Advanced Calculus (T)	3	1	0	4	40	60	100
2	20BTPY002	BSC	Engineering Physics (T)	3	0	0	3	40	60	100
3	20BTEC005	ESC	Basics of Electrical and Electronics Engineering (T)	3	0	0	3	40	60	100
4	18BTME011	ESC	Engineering Graphics	1	0	4	3	50	50	100
5	18BTAE202	DCC	Branch Specific* (T)	3	0	0	3	40	60	100
6	20BTPY012	BSC	Physics Laboratory	0	0	2	1	40	60^	100
7	18BTEC015	ESC	Basics of Electrical and Electronics Engineering Lab	0	0	2	1	40	60^	100
8	18BTAE212	DCC	Branch Specific Lab*	0	0	2	1	40	60^	100
9	18BTAE151	ESC	Workshop Practice#	0	0	4	-	--		
			Total	**13**	**1**	**14**	**19**			**800**

Audit Course, Branch Specific* (Aerospace Engineering) - Engineering Mechanics

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Detailed first year curriculum contents

Course Code	Course Title				Category
18BTMT101	Linear Algebra and Calculus				BSC
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
3	1	-	40	60	4

Prerequisite: Matrix algebra, Basics of limit continuity and differentiability

Course Objectives:

The main purpose of this course is to:

- Understand linear algebra and its applicability in different engineering fields.
- Incorporate the knowledge of calculus to support to their concurrent and subsequent engineering studies.
- Expose the concept of integral calculus.
- Introduce the concepts of vector spaces and linear mapping.
- Express a periodic function by Fourier series and to learn their applications.

Unit I

Matrices (9)

Rank, Canonical form, Normal Form, System of Linear Equations, Orthogonal Transformations, Eigen Values and Eigen Vectors, Diagonalization of Matrices, Cayley Hamilton Theorem , Applications to problems in Engineering.

Unit II

Linear Algebra and Mapping (9)

Vector Spaces, Subspaces, linear dependence and independence of vectors, bases, dimensions. Row and Column Linear mappings, representation by matrices, rank-nullity theorem, Inner Product Spaces.

Unit III

Limit, Continuity and differentiation of univariate function (9)

Limit, Continuity, indeterminate forms, Rolle's Theorem, Lagrange's theorem and Cauchy's theorem, Successive Differentiation, Leibnitz Theorem

Unit IV

Infinite Series & Expansion of Functions (9)

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Convergence of sequence and series, Tests for Convergence, Comparison test, Ratio Test, Raabe's Test, Cauchy's Test, Integral Test, Alternating Series, Absolute and Conditional Convergence, Range of Convergence, Power series, Taylor's series, McLaurin's Series, Expansion of Standard functions.

Unit V

Integral Calculus and Fourier Series **(9)**

Reduction Formulae, Beta and Gamma Functions,
Dirichlet's conditions, Full range and Half range Fourier series, Harmonic analysis, Applications to problems in Engineering.

Note: Every student should make one Mathematical Model and submit it as a part of Tutorial.

Course Outcomes:

After learning this course, students shall be able to:

- Apply linear algebra to solve real life problems.
- Resolve the problems based on linear algebra.
- Understand applications of integral calculus.
- Express periodic function in terms of Fourier sine and Fourier cosine series.
- Evaluate complicated and improper integrals by using reduction formulae and Beta-Gamma functions respectively.

Text Books:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley Eastern Ltd, 10th edition.
2. Maurice D. Weir, Joel Hass, Frank R. Giordano, "Thomas' Calculus", Pearson Education, 12th edition.
3. Serge Lang, "Linear Algebra", Springer, 3rd edition.

References:

1. Howard Anton and Chris Rorres, "Elementary Linear Algebra", John Wiley and Sons, 10th edition.
2. C.R. Wylie, "Advanced Engineering Mathematics", McGraw Hill Publications, New Delhi, .
3. Peter V. O' Neil, "Advanced Engineering Mathematics", Thomson Brooks/Cole, Singapore, 7th edition.
4. Shanti Narayan, "Differential Calculus", S. Chand and Company, New Delhi.
5. George Simmons, "Differential Equation with Applications", (2nd edition) McGraw-Hill Education (India) Private Limited, New Delhi.
6. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication.

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Course Code		Course Title		Category	
20BTPY002		Engineering Physics		Basic Science	
Contact hours per week			CA	FE	Credits
L	T	D/P			
3	0	0	40	60	3

Prerequisite: Physics at 10+2 level

Course Objectives:

1. Understand the basic properties of nanostructures and their applications on the basis of quantum physics.
2. Acquire fundamental understanding, develop scientific thinking and problem-solving skills in Acoustics and Ultrasonics to implement in various engineering fields.
3. Understand, analyze and apply the concepts of Polarization, interference and diffraction for various engineering applications.
4. Study the fundamentals, advantages and advances in Lasers, photonics and Fiber optic communication systems.
5. Understand the concepts of renewable energy, efficiency of energy transformations and use of alternate energy to solve real world problems.

Unit 1- Quantum Physics and Nanotechnology (09 Hours)

Introduction, Dual nature of light, de` Broglie waves, Heisenberg uncertainty principle, Wave function and Schrödinger equation (time independent and dependent), particle in an infinite potential well, Eigenvalues and Eigen function, particle in an finite potential well (No derivation), Quantum mechanical tunneling effect

Introduction to nanotechnology, Properties of nanomaterials – Optical, Electrical, Mechanical, Magnetic, Methods for synthesis of nanomaterials- Ball milling, Wet chemical, Vapour deposition, Laser Ablation, Characterization techniques – X ray Diffraction (XRD), Scanning Tunneling Microscopy (STM), Application in field of Automobile, Electronics, Medical, IT.

Microscopy (STM, AFM, UVB) and Spectroscopy techniques(UV , Visible)

Unit 2- Architectural acoustics and Ultrasonics (09 Hours)

Characteristics of sound waves, Noise and musical sound, reflection of sound waves, defects due to reflected sound,absorption of sound, determination of the time of Reverberation:Sabine's formula, determination of absorption coefficient, factors affecting the architectural acoustics and remedies, acoustic materials

Classification of sound waves, properties of ultrasonic waves, generation of ultrasonic wave-

piezoelectric oscillator and magnetostriction oscillator, detection of ultrasonic waves, cavitation, applications- echo sounder, SONAR, ultrasonic inspection method of non destructive testing, industrial applications, chemical applications, biological and medical applications

Unit 3- Wave optics and Applications **(09 Hours)**

Interference – Interference in uniform and non-uniform thickness thin films, fringe width, formation of Newton's rings and its application (i) for the determination of wavelength of incident light or radius of curvature of a given plano-convex lens (ii) Testing of optical flatness of surfaces,(iii) Anti-reflection coating. Applications such as Laser Interferometer Gravitational Wave Observatory

Diffraction – Fraunhofer diffraction at Single slit, plane diffraction grating, Conditions for maxima and minima. Applications such as X-ray diffraction - double-helix structure of DNA,

Polarization - Definition, Huygen's theory, Retardation plate, Generation and Analysis of Plane polarized, circularly polarized and elliptically polarized light, Application: LCD

Unit 4- LASER and Photonics **(09 Hours)**

Laser characteristics , Process involved in laser: induced absorption, spontaneous emission, stimulated emission –metastable state-population inversion - pumping action - active medium - Types of laser : Ruby laser, He:Ne laser, Semiconductor laser – Applications such as Remote sensing, holography, Laser guidance

Optical fiber, Index profile, Numerical aperture, V number, Applications: fiber optic communication system, Specialty fibers (Photonics crystal fiber, Fiber Bragg grating), fiber optic based sensors

Unit 5- Physics for Sustainable Energy **(09 Hours)**

Broad overview of renewable energy and its need – Solar energy: Energy conversion and efficiency – Solar cells –Wind energy: Basic components and principle of wind energy conversion - Ocean energy: Wave energy – Wave energy conversion mechanisms – Tidal energy, Ocean thermal energy – Geothermal energy: Geothermal sources – Biomass: Biomass and bio-fuels – bio-energies from wastage – Fuel cells

Course Outcomes:

1. Demonstrate a fundamental understanding of the relation between nanotechnology and quantum physics to explore the properties of solids and their applications.
2. Demonstrate a fundamental understanding, evaluation and implementation of Acoustics and production of Ultrasonic in various engineering applications.

3. Demonstrate a fundamental understanding of interference, diffraction and Polarization in everyday activities.
4. Apply the basic principles of Lasers, photonics in a wide range of engineering applications to solve real - world problems.
5. Describe the sources and systems of renewable energy

Text Books:

1. Avadhanulu M N and Kshir Sagar P G, "A Text Book of Engineering Physics", 2010
2. Sulabha K. Kulkarni, "Nanotechnology: Principles and Practices", Springer, 2015.
3. Arther Beiser, "Concepts of Modern Physics", Tata Mcgraw Hill, 1994.

References:

1. Hecht E, "Optics", Pearson Education, 2017.
2. John Buck, "Fundamentals of Optical Fibers", , 2004.
3. Godfrey Boyle, "A Renewable Energy: Power sustainable future", Oxford University Press, UK, 2012.
4. David Halliday and Robert Resnic," Fundamentals of Physics", Wiley, 2018
5. Ruby Das , C. S. Robinson , Rajesh Kumar , Prashant Kumar Sahu, "Engineering Physics Practical", University Science Press, 2015
6. https://nptel.ac.in/
7. https://swayam.gov.in/
8. https://www.ligo.caltech.edu/
9. https://educationalgames.nobelprize.org/educational/medicine/dna_double_helix/readmore.html
10. https://www.sciencehistory.org/historical-profile/james-watson-francis-crick-maurice-wilkins-and-rosalind-franklin
11. https://www.neonscience.org/lidar-basics
12. https://www.eltronis.com/events/holograms-what-are-they-and-how-are-they-made/
13. https://www.explainthatstuff.com/holograms.html

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Course Code	Course Title				Category
20BTPY012	Physics Laboratory				Basic Science
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
0	0	2	40	60	1

Prerequisite: Physics at 10+2 level

Course Objectives:

1. To enable the students to learn the concepts of error and its analysis
2. To enable the student to formulate, conduct, analyze, and interpret experiments
3. To use various techniques for measurement, control and analysis of engineering problems.
4. To develop a scientific temper and analytical capability as part of a team.

LIST OF EXPERIMENTS

1	Determination of velocity of ultrasonic waves in liquid using ultrasonic Interferometer
2	(a)Measurement of sound pressure level (b)Determination of sound absorption coefficient of given materials
3	Determination of radius of curvature of a plano-convex lens using Newton's Rings method
4	Determination of wavelength of spectral lines by using a plane diffraction grating and spectrometer
5	Verification of Malus law for polarization of light
6	Determination of wavelength of He-Ne laser beam
7	Study of V-I characteristics of Solar Cell
8	Determination of numerical aperture of optical fiber
9	A. Demo Experiment: I. Synthesis of Silver Nanoparticles by wet chemical method B. Virtual Lab Experiment: I. Determination of refractive index of liquid medium by Newton's rings experiment II. Determination and verification of Brewster's law

Course Outcomes:

1. Apply basic laboratory practices of data collection, evaluation and analysis of results.
2. Able to use various scientific instruments with optimized conditions.
3. Develop an understanding of professional and ethical responsibility.
4. Stimulate the scientific temper and analytical capabilities.

Text Books:

1. Ruby Das , C. S. Robinson , Rajesh Kumar, Prashant Kumar Sahu, "Engineering Physics Practical", University Science Press, 2015
2. Shukla R. K. and Anchal Srivastava, "Practical Physics", New Age International (P) Ltd, Publishers, 2006

References:

1. Physics Lab manual of MIT ADT University,
2. Dattu R.Joshi, "Engineering Physics", Tata McGraw- Hill, New Delhi, 2010
3. A.C. Melissinos, "Experiments in Modern Physics", Academic Press, N.Y., 1966.
4. J.R. Taylor, "An Introduction to Error Analysis", University Science Books, Mill Valley, California, 1982.
5. David Halliday and Robert Resnic, "Fundamentals of Physics", Wiley, 2018
6. S. D. Solomon et al, "Synthesis and study of silver nanoparticles", J. Chemical Education, (2007), 84, 322-325
7. Virtual lab Experiment: http://vlabs.iitb.ac.in/vlabs/labsps.html

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Course Code	Course Title				Category
20BTCH003	Engineering Chemistry				Basic Science
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
3	0	0	40	60	3
Prerequisite: Chemistry at 10+2 level.					

Course Objectives:

The main purpose of this course is to,

1. Understand the basic and contemporary technology involved in purification and improving the quality of water to solve real world domestic and industrial problems.
2. Understand the different chemical features of polymers for effective engineering applications and developing novel engineering materials.
3. Study and explore the advantages of various fossil fuels and derived fuels with their properties for day to day real life applications.
4. Study corrosion mechanism and electrochemical reactions causing corrosion and processes used for corrosion control involved in different industries and scientific applications.
5. Acquire fundamental understanding of spectroscopic techniques to characterize novel structures, materials and explore the applicability.

I. WATER TECHNOLOGY FOR INDUSTRY AND GREEN CHEMICAL PROCESSES (9)

Water quality parameters: Hardness of water - estimation of hardness (EDTA method) COD/BOD: determination Alkalinity- determination, pH: acid-base titration, Disadvantages of using hard water in boilers: Scale, sludge formation, priming, foaming and boiler corrosion, Prevention: Internal conditioning and External Conditioning: Zeolite and ion exchange methods, Reverse Osmosis, Principles of green chemistry, environmentally benign synthetic methods for preparation of Adipic acid, polycarbonate and Indigo.

II. SUSTAINABLE ENGINEERING POLYMERS: CONCEPT AND APPLICATIONS (9)

Classification of polymers, types of polymerization reactions - mechanism of polymerization, , Polymerization techniques: Bulk polymerization, Solution polymerization,, Suspension polymerization and Emulsion polymerization, Synthesis and properties of important resins: Polystyrene, PVC, PMMA, Polyester, Teflon, Urea-formaldehyde resin and Epoxy resins, Elastomers: Natural rubber, vulcanization of rubber, BUNA-S, BUNA-N, Silicone rubber and reclaimed rubber, Engineering polymers and their applications: Conducting polymers, LCP and Biodegradable polymers, polymer membrane, compounding of plastics, Composite: Fibre reinforced plastics.

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III. CHEMISTRY OF FUELS AND COMBUSTION MECHANISM (9)

Types of fuels, calorific value and its determination, Solid Fuel: Proximate and ultimate analysis of coal, Liquid Fuel: Refining of Petroleum, Octane number and Cetane number, Gaseous fuels: CNG, LPG, Nonconventional fuels: Power alcohol, Biodiesel, and Hydrogen gas, Fuel cells: alkaline fuel cell, PAFC and PEMFC, Combustion mechanism.

IV. CHEMICAL BASIS OF CORROSION: PREVENTION MECHANISM AND APPLICATIONS (9)

Types of corrosion: Dry and electrochemical corrosion and their mechanism, Factors affecting corrosion: nature of metal and environmental factors, Control of corrosion: cathodic protection, anodic protection, Metallic coatings: Hot dipping (galvanizing and tinning), Electroplating, Cladding, and Cementation, Non-metallic coatings: Surface conversion techniques, Powder coating and Electroless coating.

V. ADVANCE ANALYTICAL TECHNIQUES: SPECTROSCOPIC, MICROSCOPIC TECHNIQUES AND THEIR APPLICATIONS (9)

Mass Spectroscopy: Principle and instrumentation, Principles of spectroscopy and selection rules. UV-Visible absorption and emission (fluorescence) spectroscopy and its applications, Woodward-Fieser rule, Nuclear magnetic resonance: ^{1}H NMR, Surface characterization techniques: SEM, TEM, Chromatography: Thin layer chromatography and applications.

Course Outcomes:

After learning this course, students shall be able to,

1. Apply the knowledge of chemistry to solve problems related to water and its applications in diverse fields.
2. Identify or develop suitable polymer based novel composite materials to explore synthetic processes for various engineering applications.
3. Acquire knowledge related to various fossil fuels and their effective utilization to solve real world problems.
4. Understand the kinematics of corrosion and related problems to explore the anti-corrosion process and alternate materials/solutions to increase the durability of various machinery and functional devices.
5. Apply the knowledge of various advanced spectroscopic techniques and understand structure-property relationship to characterize novel materials for various engineering applications.

TEXTBOOKS

1. S. S. Dara, "A Textbook of Engineering Chemistry", S. Chand and Company Ltd.,15th edition, New Delhi.
2. O. P. Virmani and A. K. Narula, "Applied Chemistry Theory & Practical".

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3. P. C. Jain, M. Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company (P) Ltd.,17th edition, New Delhi.
4. R. Gopalan, D. Venkappayya, S. Nagarajan, "Textbook of Engineering Chemistry", 4th Edition, Vikas Publishing.
5. D. L. Pavia, G. M. Lapman and G. S. Kriz, "Introduction to spectroscopy", Stamford CT: Cengage Learning, 5th Edition, 2015.

REFERENCES

1. N. F. Gray, "Water Technology: An Introduction for Environmental Scientists and Engineers", 3rd Edition, Iwa Publishing, London UK.
2. V. Gowarikar, N.V. Vishwanathan and Jaydev Shreedhar, "Polymer Science", Wiley Publications.
3. H.H. Uhlig and R.W. Revie, "Corrosion and its Control", 4th Edition, Wiley Publications.
4. A. I. Vogel, "A Textbook of Quantitative Inorganic Analysis", 4th Edition, Longman Publication Ltd, 2000.
5. Shashi Chawla, "Essentials of Experimental Engineering Chemistry", Dhanpat Rai publishing Co. Delhi, 2001.
6. L. D. Field, S. Sternhell, and J. R. Kalman, "Organic structures from spectra", John Wiley & Sons, 5th Edition, 2012.
7. O. P. Agarwal, "Engineering Chemistry", 3rd Edition, KHANNA PUBLISHERS
8. For online content: https://nptel.ac.in, https://www.swayam.gov.in, https://www.youtube.com/user/nptelhrd

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Course Code	Course Title				Category
20BTCH013	Chemistry Laboratory				Basic Science
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
0	0	2	40	60	1
Prerequisite: Chemistry at 10+2 level.					

Course Objectives:

1. Techniques for identifying different impurities present in water and technology involved in improving the quality of water for its industrial use
2. Chemical structure of polymers and its effect on their various properties when used as engineering material. To lay foundation for the application of polymers for specific applications and composite materials.
3. Study of fossil fuels, synthesize biodiesel and study its properties and applications.
4. An insight into electroplating and composite materials aspect of modern chemistry. The principles of chemical and electrochemical reactions causing corrosion and methods used for minimizing corrosion.
5. Basic concepts of electro analytical and spectroscopic techniques that facilitate rapid and reliable measurements for characterization of novel compounds and materials.

List of experiments (any eight experiments)

1. Determination of hardness of given water sample by EDTA method.
2. Determination of alkalinity of water sample by volumetric method.
3. Perform volumetric analysis using pH meter.
4. Synthesis and Characterization of polymer (i) Urea-Formaldehyde Resin, (ii) Polystyrene.
5. Determination of Viscosity Average Molecular Weight of a polymer
6. Perform Proximate analysis of given coal sample
7. Electroplating of Zinc (Zn) over Copper (Cu)
8. Separation of components of an organic mixture by Thin Layer Chromatography
9. Synthesis and characterization of biodiesel from vegetable oil and its characterization.
10. Quantitative determination of metals colorimetrically.
11. Preparation of Hand Sanitizer in lab.
12. Detection of adulteration in routine food products like milk, ghee, honey, etc.

Course Outcomes:

1. Students should be able to apply knowledge of chemistry to solve problems related to water and electrochemical techniques for its use in various related fields.

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2. Students should able to develop skills in applying modern materials and synthetic polymers for engineering applications.
3. Students should able to apply knowledge related to fuels towards its use in current era and develop an insight into advanced materials like nanomaterials and composite materials to solve modern day problems like alternate energy sources.
4. Students should be able to understand the theory behind corrosion and apply acquired knowledge to solve problems related to it.
5. Student should able to characterize novel compounds, materials applying fundamental spectroscopic knowledge.

References:

1. Practical Engineering Chemistry by K. Mukkanti, *et al*, B. S. Publications, Hyderabad.
2. Inorganic Qualitative Analysis, Vogel, latest edition.
3. A text book on experiments and calculation Engg. S. S. Dara.
4. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications.
5. Laboratory manual on engineering Chemistry by S. K. Bhasin *et al*, Dhanpat Rai publishing Co.
6. Virtual labs: http://www.vlab.co.in/broad-area-chemical-sciences, http://icv-au.vlabs.ac.in/inorganic-chemistry/index.html

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Course Code	Course Title				Category
20BTEG104	English Communication for Engineers				HSM
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
2	-	-	50	-	2

Prerequisite: Basic Proficiency in English at the Higher Secondary School Level

Course Objectives: (3 to 5):

1. To acquire social understanding and develop social skills and be able to greet and talk about likes and dislikes in formal as well as informal situations.
2. To enrich the vocabulary of the students with the help of various word games and dictionary.
3. To teach basic English grammar
4. To familiarize the students with various sounds and sound patterns in English.
5. To help students develop various strategies of reading, such as, skimming, scanning, analyzing, criticizing and to help them write effective texts.

Unit I: Basics of Communication Skills: Communication Skills, Types of Communication, Process of Communication, Importance of Communication, Barriers to Effective Oral Communication, Cross-cultural Communication, Listening effectively, Types of Listening, Importance and Barriers to Listening. Tele-Video Conferencing

Unit II: Enriching Phonetics Skills: Basics of Phonology, 44 Sounds of English, Word Stress, Intonation, Basics of Conversational Skills.

Unit III : Vocabulary Building: Lexical Sets, Word Games, Synonyms and Antonyms, Activators, Use of Dictionary, ESP

Unit IV: Functional Grammar: Parts of Speech, Tenses, Active and Passive Voice, Modal Auxiliaries, Reported Speech, Articles, Question Tags, Common Errors.

Unit V: Reading and Writing for Engineering Students: Types of Reading Techniques, Reading Comprehensions, Essentials of Writing, Paragraph Writing, Essay Writing, Letter and E-mail Writing.

~~Course Outcomes: (3 to 5)~~

1. Students should be able to communicate fluently within and off campus. They should be able to implement the social skills, learnt in the classroom, in outside world.
2. Students should be able to choose and employ suitable words of English language in day to day communication effectively.
3. Students should be able to apply English Grammar rules correctly and effectively for error less communication.
4. Students should be able to recognize and reproduce sounds of English and master the sound patterns in English to maintain the rhythm of the language.
5. Students should be able to use the strategies of reading in their respective academic reading as well as writing.

Text Books:

1. Nitin Bhatnagar and Mamta Bhatnagar: Communicative English for Engineers and Professionals, Uttar Pradesh: Pearson.

References:

1. Dutt et.al. : A Course in Communication Skills, Foundation, 1st Edition
2. Lynch: Listening, Cambridge, 1st edition, ISBN- 0521707757
3. S. Aggarwal: Essential Communication Skills, Ane Books pvt. Ltd, ISBN- 8180522806
4. Jennings: Communication Basics, Cengage Learning, 1st edition, ISBN- 8131515206

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Course Code	Course Title				Category
20BTEG114	English Communication for Engineers (Laboratory)				HSM
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
-	-	2	50	-	1

Prerequisite: Basic Proficiency in English at the Higher Secondary School Level

Course Objectives: (3 to 5):

1. To help students master the various techniques of communicating in professional world and enhance their listening skills.
2. To help students use the knowledge of grammar and vocabulary of different varieties of English to communicate in their day to day life.
3. To introduce students to the phonemic transcription of English sounds.
4. To help students apply various techniques of reading to read comprehensions, reports, news articles, scientific texts, etc and write effective texts.

Practical 1: Role Plays

A task of handling social interactions, acting out scenarios to problem solve, story making through dramatic play and practice team building and group dynamics, decision making, leadership, analytical and creative thinking, group presentation while coping with real life situations.

Practical 2: Grammar/Common Errors

To provide opportunities to students to familiarize them with the grammar of English and help them in understanding grammatically correct sentences, phrases, words, etc.

Practical 3: Listening

Active Listening to Various Audio-Video clips with the use of Language software

Practical 4: Extempore

To test the knowledge of the students as well as their ability to express themselves in good words in a framed manner within a limited time.

Practical 5: Reading Comprehension

Reading Texts from GRE, TOFEL, IELTS texts by using skimming, scanning, intensive, extensive, analytical, critical reading techniques.

Practical 6: Writing Skills

Writing Paragraphs, Essays and Letters

Practical 7:Pronunciation and Phonemic Transcription

Identification of correct pronunciation of words by decoding phonemic scripts; writing phonemic transcriptions of the given words

Practical 8: Public Speaking

To provide students a platform to develop their confidence and communication skills for public speaking.

Practical 9: Film Review

Reviewing short Films shown in the language lab.

Practical 10: Tele-Video Conferencing

Tele-Video conferencing will help students to conduct meetings, presentations, etc. at their workplace.

Practical 11: Vocabulary Enrichment

Enriching their vocabulary for special purposes.

Practical 12: Riddles and Games

Course Outcomes:

1. Students should be able to take part in various discussions and put forth their knowledge by communicating effectively.
2. Students should be able to choose and apply suitable words from different varieties of English language and apply grammar rules for effective communication.

3. Students should be able to pronounce all words correctly with the help of phonetic transcriptions.
4. Students should be able to read, interpret and reproduce texts effectively.

Text Books:

1. Raymund Murphy: Essential Grammar in Use, Cambridge, 3rd Edition

References:

1. Michael Swan: Practical English Usage, Oxford, 3rd Edition, ISBN-13: 978-0194420983

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Course Code	Course Title				Category
20BTEC005	Basics of Electrical and Electronics Engineering				ESC
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
03	00	00	40	60	03

Prerequisite:
The Students should have knowledge of Mathematics, Physics and fundamentals of semiconductor physics.

Course Objectives:
1. To understand fundamental operational concepts of DC and AC circuits along with various laws and theorems.
2. To study electrical motor, generator and transformer.
3. To study the characteristics and working of diode and transistor circuit.
4. To study logic gates and their applications in combinational and sequential logic circuits.
5. To understand working of transducers and their applications.

COURSE CONTENTS

Unit I

D.C. CIRCUITS AND A.C. CIRCUITS (9)

Classification of network, Ohm's law, KCL, KVL, network simplification using star-delta / delta-star transformations, mesh analysis, network theorems (Superposition and Thevenin).

Generation of alternating voltages, fundamentals of ac circuits, behaviour of pure R, L, C in ac circuits, concept of phasor and its representation, series RL, RC and RLC circuits.

Unit II

ELECTRICAL MACHINES (9)

Electromechanical energy conversion: Types of ac and dc motors, Characteristics and applications, ac generators. Single phase transformer: Construction, principle of working, emf equation, ratios, regulation, losses, efficiency, condition for maximum efficiency, Introduction to O.C & S.C. test, Introduction to auto-transformer and instrument transformer.

Unit III

DIODES AND DIODE CIRCUITS (9)

PN Junction diode: characteristic and analysis, Types of diodes – Zener diodes, Photodiodes, Light emitting diodes (LED's), Rectifiers: Half wave, Full wave and Bridge rectifier circuits and their analysis, BJT, types, construction, configurations and characteristics.

Unit IV

DIGITAL ELECTRONICS (9)

Introduction, digital signals, Basic logic gates and universal gates: AND, OR, NOR, NOT, NAND, EX-OR, EX-NOR, Boolean laws, Arithmetic circuits: Half Adder, Full Adder, Flip flops: Basic latch, Gated SR, JK flip flop, D flip flop, T flip flop, Introduction to Shift registers and Counters.

Unit V

TRANSDUCERS **(9)**

Classification, Selection criteria, Sources of error for parameter under measurement, Transducer specifications, Temperature transducer, Linear variable differential transducer, Strain gauge. Various applications of transducers.

Course Outcomes:

1. Understand and apply knowledge of circuit laws and network theorems to solve electrical networks.
2. Understand fundamental concepts of electromechanical energy conversion for operation of electrical machines.
3. Identify and describe electronic components and circuits with their applications (Diodes, BJT, and Rectifier).
4. Design logic circuits and its implementation using logic gates.
5. Understand working principle and applications of various types of transducer.

Text Books:

1. V. N. Mittle and Arvind Mittal "Basic Electrical Engineering" Tata McGraw Hill, (Second Edition)
2. Edward Hughes "Electrical and Electrical Technology", Pearson Education (Tenth edition)
3. S. K. Bhattacharya "Basic Electrical and Electronics Engineering", Pearson Publication (Second Edition)

References:

1. V.K.Mehta and Rohit Mehta, "Principles of Electronics", S.Chand Publication
2. R.P.Jain, "Modern Digital Electronics" Tata McGraw Hill (Second edition).
3. A.P. Malvino, D.P. leach, G. Saha, "Digital principles and Applications", Tata McGraw Hill, (Seventh edition).
4. H. S. Kalsi, "Electronics Instrumentation" Tata McGraw Hill.
5. B.L.Theraja "Fundamentals of Electrical Engineering and Electronics", S.Chand (Reprint 2015)

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Course Code	Course Title				Category
18BTEC015	Basics of Electrical and Electronics Engineering Lab.				ESC
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
00	00	02	40	60	01
Prerequisite: Basic Electrical and Electronics Circuits					

Course Objectives:

1. To provide solution for the network by applying various laws and theorems.
2. To study electrical device like transformer.
3. To understand application of diode and transistor circuits.
4. To study logic gates and their application.
5. To understand the working of transducer and its application.

COURSE CONTENT

List of Experiments (Minimum 8)

1. Verification of KCL and KVL in DC circuit.
2. Verification of Thevenin's theorem in DC circuit.
3. To study different types of transformer.
4. To find efficiency and regulation of single phase transformer using O.C. & S.C. test.
5. To study behavior of RLC series circuit.
6. Study of Regulated power supply.
7. Study of characteristics of BJT Common Emitter configuration.
8. Design & implementation of half adder and full adder circuit using logic gates.
9. Design & test simple application circuit using logic gates ICs.
10. Study of RTD sensor.
11. Measurement of strain using strain gauge.

Course Outcomes:

1. Apply knowledge of network laws and theorems to solve electrical circuits.
2. Apply the concepts of electromagnetic circuits for operation of transformer.
3. Understand the functioning of power supply and amplifier.
4. Implementation of digital circuits using basic gates.
5. Demonstrate the working of various transducer.

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Course Code	Course Title				Category
18BTCS006	Programming for Problem Solving (Theory)				ESC
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
2	-	2	40	60	3
Prerequisite: Computer Fundamentals					

Course Objectives:

1. To develop abilities to understand computer system and algorithmic requirements.
2. To learn the fundamental programming concepts and methodologies which are essential to build good programs.
3. To develop an ability to write a computer program with reusable modules for solving specified problems.
4. To learn the good practices to build a robust program.

COURSE CONTENTS

Unit I Introduction to Programming **(4)**

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

Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples.

From algorithms to programs; source code, variables (with data types) variables and memory locations, How a Program Works, Input- Processing –Output.

Unit II Program Development Cycle **(3)**

Understanding the Problem, Planning the Logic, Coding the Program, Translate into Machine Language (difference between compiler and interpreter)- Syntax and Logical Errors in compilation, object and executable code, Test the Program, Publishing & Maintaining the Program,

Unit III Elements of High-Quality Programs **(5)**

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Datatypes and Variables, Operators, Features of Good Program, Using Comments, Choosing Identifiers, Writing Prompts & Echoing Inputs, Design Clear Statements, Good Housekeeping and EndOfTask, Using Proper Indentation, decision and repetition structures

Unit IV Modules **(8)**

An Overview of Modules, Benefits of Modularisation, Modules in Flowchart, Modules in Pseudocode, Arrays, Structures, Introduction to pointers, Advanced Modularisation: Passing Data to Modules, Module Returning a Value, Variable Types & Scopes, Passing Arrays to Modules, Module Overloading, In-built or Pre-written Modules, Recursion

Unit V System- Design and Integration **(4)**

Introduction to file handling, Use Case Modelling, User Interface Design, Event handling, integrating front end and back end.

Course Outcomes:

1. Students will be able to understand the programming tasks using concepts learned and write pseudo-code.
2. Students will be able to use pseudo-code and visual modeling to prepare clear and accurate program documentation and models.
3. Students will be able to identify concepts applicability and apply them to write optimized programs, and hence use computers effectively to solve the task.
4. Students will be able to use common developer tools effectively and implement best practices to write professional-quality code.

Text Books:

4. Brian W. Kernighan, Dennis M. Ritchie, "The C Programming Language", Prentice Hall, ISBN 0131103628, Second Edition.
5. E. Balguruswamy, "Programming in ANSI C", Tata Mc-Graw Hill

References:

11. Joyce Farell, "Programming Logic and Design- Comprehensive", Sixth Edition, Cengage Learning.
12. Tony Gaddis, "Programming Logic & Design", Third Edition, Pearson Education.
13. Herbert Schildt, "C – The Complete Reference", Tata McGraw Hill Publishing Company,Fourth Edition,New Delhi, 2010.

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Course Code	Course Title				Category
18BTCS016	Programming for Problem Solving (Laboratory)				ESC
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
2	-	2	40	60	3

Prerequisite: Computer Fundamentals

Course Objectives:

5. To develop an ability to frame algorithm/ pseudo code/ flowchart for given requirements.
6. To use the fundamental programming concepts which are essential to build good programs.
7. To develop an ability to write a computer program with reusable modules for solving specified problems.
8. To use all programming concepts to build a robust program from given scenarios.

COURSE CONTENTS

1. **Assignments on printing, scanning, data types, variables (Any one)**
2. **Assignments on Operators (Any one)**
3. **Assignments on Conditions logic (Any two -assignment)**
4. **Assignments on Repetition (Any two)**
5. **Assignments on Array (Any one)**
6. **Assignments on Modular Programming (Any one)**
7. **Assignments on Use Defined Data Type(Any one)**
8. **Assignments on Referencing(Any one)**
9. **Assignments on File Handling (Any one)**
10. **Miscellaneous Assignments: (For practice – no lab hours)**
11. **Case Studies: (Any one -1 lab session)**

Course Outcomes:

1. Students will be able to understand the programming tasks using concepts learned and write algorithm/ pseudo-code/ flowchart.
2. Students will be able to use visual modeling to prepare clear and accurate program models.
3. Students will be able to implement and demonstrate a optimized and modular code for given problem statement.
4. Students will be able to use all programming concepts and implement best practices to write professional-quality code for given scenarios.

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Text Books:

14. Brian W. Kernighan, Dennis M. Ritchie, "The C Programming Language", Prentice Hall, ISBN 0131103628, Second Edition.

15. E. Balguruswamy, "Programming in ANSI C", Tata Mc-Graw Hill

References:

5. Joyce Farell, "Programming Logic and Design- Comprehensive", Sixth Edition, Cengage Learning.
6. Tony Gaddis, "Programming Logic & Design", Third Edition, Pearson Education.
7. Herbert Schildt, "C – The Complete Reference", Tata McGraw Hill Publishing Company,Fourth Edition,New Delhi, 201

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Course Code	Course Title				Category
18BTMT201	Ordinary Differential Equations and Advanced Calculus				BSC
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
3	1	-	40	60	4

Prerequisite: Basics of limit, differentiability and integrability, tangent and normal. Simple curves.

Course Objectives:

The main purpose of this course is to:

- Understand solution of differential equations and its applications.
- Study partial differentiation and its applications.
- Trace the curve of any function and use it for different applications.
- Evaluate multiple integrals and applying them to compute area and volume.
- Incorporate the knowledge of Differential equations and calculus to study engineering applications.

Unit I

Differential Equations **(9)**

Order and Degree, Formation of Ordinary Differential Equation, Exact, Reducible to Exact, Linear, Bernoulli's Differential Equations, Orthogonal Trajectory.

Unit II

Applications of Differential Equations **(9)**

Newton's law of cooling , Kirchhoff's law of electrical circuits, Motion under gravity, Rectilinear motion, Simple Harmonic motions, One Dimensional conduction of heat.

Unit III

Partial Differentiation and Applications **(9)**

Partial Derivatives, Homogeneous functions, Euler's Theorem, Implicit Functions, Composite Functions, Total derivatives, Change of Independent Variables. Jacobian and their applications, Maxima and Minima of function of two variables, Lagrange's method of undetermined multipliers.

Unit IV

Integral Calculus and Tracing of curves **(9)**

Differentiation under integral sign, Error Function, Cartesian, polar and parametric curves. Rectification of curves.

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Unit V

Multiple Integrals **(9)**

Double integrals, change of order of Double integrals, Change of variables (Cartesian to polar), Triple integrals, orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds

Applications: Mass, Areas, Volumes, Centre of Gravity, Momenta of Inertia.

Note: Every student should make one Mathematical Model and submit it as a part of Tutorial.

Course Outcomes:

After learning this course, students shall be able to:

- Apply concept of differential equations in daily life.
- Understand partial differentiation and apply to technical applications.
- Trace curve of any equation and also find its arc length.
- Evaluate multiple integrals and apply these concepts to find area, volume, moment of inertia and centre of gravity.
- Embrace the concepts of differential equations and calculus in different fields.

Text Books:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley Eastern Ltd, 10th edition.
2. Maurice D. Weir, Joel Hass, Frank R. Giordano, "Thomas' Calculus", Pearson Education, 12th edition.
3. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication.

REFERENCE BOOKS

1. K.D Joshi, "Calculus for Scientists and Engineers", CRC Press.
2. Sudhir Ghorpade and Balmohan Limaye, "A Course in Calculus and Real Analysis" (1st edition) Springer-Verlag, New York.
3. C.R. Wylie, "Advanced Engineering Mathematics", McGraw Hill Publications, New Delhi.
4. Peter V. O' Neil, "Advanced Engineering Mathematics (7th edition)", Thomson Brooks / Cole, Singapore.
5. Shanti Narayan, "Differential Calculus", S. Chand and company, New Delhi
6. George Simmons, "Differential Equation with Applications", (2nd edition) McGraw-Hill Education (India) Private Limited, New Delhi.

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Course Code	Course Title				Category
19BTCS202	Digital Electronics & Logic Design				DCC
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
3	0	0	40	60	3

Prerequisite: Basic Electrical & Electronics Engineering (BEEE).

Course Objectives:

1. **To make the students to build basic foundation about number system and Boolean algebra**
2. **To understand the functionality of the combinational logic circuits.**
3. **To study and understand the functionality of the Sequential logic design.**
4. **To understand various memory design of a digital computer.**
5. **To understand and compare the functionalities, properties of digital logic families.**

COURSE CONTENT

I. Fundamentals of digital and Number systems (9)

Number system: Introduction, types, conversion of a number from one base to another, negative binary numbers using two's complement method, weighted codes- Binary Coded Decimal (BCD), Excess- 3 codes, gray codes, Parity generator/ checker.
Boolean algebra: Boolean algebra rules and Boolean laws, DeMorgen's theorem.

II. Combinational Logic Design (9)

Introduction to combinational logic.
Logical functions (SOP/POS): Standard/ canonical form, simplifications of logic functions using Karnaugh map (up to 4 variables), realization using logic gates.
Design of combinational logic circuits: Multiplexers (MUX), Demultiplexers (DEMUX), MUX/ DEMUX tree, code convertors, decoders, encoders, 4 bit magnitude comparators, 4 bit parallel adder.

III. Sequential Logic Design (9)

Flip flops: Review of triggering and types, latches, flip flops and types, master-slave JK flip flop, introduction of excitation tables of flip flops.
Counters: concept of modulus counters, 3 bit asynchronous up/down counters, 3 bit synchronous up/down counters.
Registers, Shift registers: SISO, SIPO, PISO, PIPO shift registers, ring counter, Johnson counter, universal 4-bit shift register and applications.

IV. Memory and Programmable Logic Devices (9)

Introduction, classification and characteristics of memories, Read/ Write operations, operation, memory decoding and expansion.
Simple Programmable logic devices (SPLD): PAL, PLA, architecture of PLDs, designing combinational circuits using PLDs.

V. Digital Logic Families (9)

Introduction to Integrated circuit technologies TTL, ECL, CMOS.
Characteristics of digital logic families: Logic levels, switching speed, propagation delay, power dissipation, current and voltage parameters, noise margins, fan in and fan out of TTL and CMOS.
TTL as an inverter, NAND and NOR gates.
CMOS as an inverter, NAND and NOR gates.

Text Book:

1. Morris Mano. M, "Digital Design ", Prentice-Hall of India, New Delhi, 2006.
2. R. P. Jain, "Modern Digital Electronics", 4th edition, Tata McGraw Hill Publication, 2010.

References:

1. Tokheim R L., "Digital Electronics - Principles and Applications ", Tata McGraw Hill Publishing Company, New Delhi, 2001.
2. William I Fletcher, "An Engineering Approach to Digital Design ", Prentice-Hall of India, New Delhi, 1996.
3. Floyd. T. L, "Digital Fundamentals ", Pearson Education, Eighth Edition, New Delhi, 2009.

Course outcomes:

Students will be able to,

1. Understand the concept of number system.
2. Understand and design basic combinational logic circuits.
3. Understand and design basic sequential logic circuits.
4. Understand the concept of memory and SPLDs.
5. Recognize the importance of various

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Course Code	Course Title				Category
19BTCS212	Digital Electronics & Logic Design				DCC
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
0	0	2	40	60	1

Prerequisite: Basic Electrical & Electronics Engineering (BEEE).

Course Objectives:

1. **To understand the design of code convertors using basic logic gates.**
2. **To understand and develop the design logic of combinational logic circuits.**
3. **To develop skills required for the Sequential logic design.**
4. **To study various operating parameters of semiconductor devices.**

COURSE CONTENT

List of Experiments: (Perform atleast any 8)

1. Design and testing of code converters for BCD to Gray conversion.
2. Design and testing of BCD to Excess- 3 code converters.
3. Implementation of the Given Boolean Function using Logic Gates in Both SOP and POS Forms.
4. Design and testing of magnitude comparator.
5. Design and testing of Multiplexers/ Demultiplexers.
6. Design and testing of shift registers using D flip flops.
7. Design and testing of ring counter and Johnson counter.
8. Design and testing of Asynchronous counter.
9. Design and testing of Synchronous counter.
10. To conduct an experiment to store a set of data in a RAM using IC2114.
11. Verify four voltage and current parameters for TTL and CMOS.

Text Book:

1. Morris Mano. M, "Digital Design ", Prentice-Hall of India, New Delhi, 2006.
2. R. P. Jain, "Modern Digital Electronics", 4th edition, Tata McGraw Hill Publication, 2010.

References:

1. Tokheim R L., "Digital Electronics - Principles and Applications ", Tata McGraw Hill Publishing Company, New Delhi, 2001.
2. William I Fletcher, "An Engineering Approach to Digital Design ", Prentice-Hall of India, New Delhi, 1996.

3. Floyd. T. L, "Digital Fundamentals ", Pearson Education, Eighth Edition, New Delhi, 2009.

Course outcomes:

Students will be able to,

1. Understand and design code converters using basic logic gates.
2. Understand the design of basic combinational logic circuits using basic logic gates.
3. Understand the design of basic sequential logic circuits using basic logic gates.
4. Understand various operating parameters of semiconductor devices.

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Course Code	Course Title				Category
18BTEC202	Electronic Devices & Circuits (Theory)				DCC
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
3	0	0	40	60	3
Prerequisite: Basic Electronics					

Course Objectives:

1. To study the behavior of BJT and small signal analysis.
2. To study JFET with its characteristics and various biasing schemes as a foundation of JFET amplifier and DC analysis.
3. To study MOSFET device and its various configurations and fundamentals of MOSFET amplifier.
4. To study operational amplifier and its linear, non-linear applications.
5. To study different operational modes of multivibrators and their applications.

COURSE CONTENTS

Unit I BJT **(9)**

Transistor Construction, Transistor Operation, I/O characteristics, Operating regions, CE, CB & CC configurations, DC load line and Operating Point, Fixed-Bias Circuit, collector to base bias Circuit, Voltage-Divider Bias, DC Bias with Voltage Feedback. Bias Stabilization and compensation circuit

Unit II Small Signal Analysis of BJT **(9)**

Transistor amplifying action, General amplifying characteristics, Hybrid equivalent model of transistor, H-parameters, CE hybrid equivalent circuit, Basic common emitter amplifier: with and without emitter resistor and emitter bypass capacitor, AC load line, Working of CC & CB amplifiers with small signal voltage and current gain, input and output impedance.

Unit III JFET **(9)**

Introduction to JFET: Types, Construction, Operation, JFET Volt-Ampere characteristics, JFET Configurations, Biasing of JFET: Fixed-Bias Configuration, Self-Bias Configuration, Voltage-Divider Biasing, Applications of JFET.

Unit IV MOSFET **(9)**

Enhancement MOSFET: symbols, types, construction, working, I-V characteristics, load line and operating modes. MOSFET amplifier: small signal parameters, small signal equivalent circuit,

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common source amplifier, common drain and common gate configurations. Applications of MOSFET.

Unit V OP-AMP & MULTIVIBRATOR BASICS **(9)**

Block diagram of OP-AMP, Virtual short and Virtual ground, Ideal and Practical OPAMP, OPAMP Parameters, OPAMP applications: Inverting and Non-Inverting Amplifier, Adder, Subtractor, Instrumentation amplifier and Comparator. Timer IC 555: block diagram, working, multivibrators, Introduction of ADC & DAC.

Course Outcomes:

Successful completion of the course leads to:

1. Comprehensive understanding of transistor basics and small signal parameters.
2. Understanding of difference between BJT and JFET, effects of various biasing arrangements on device parameters.
3. Insight of construction, working, device parameters and merits of MOSFET with its equivalent circuit and configurations.
4. Understanding OPAMP construction, differential mode operations in linear and non linear areas. Acquaintance with timer IC's operational modes and applications.

Text Books:

1. R. L. Boylestad, L. Nashelsky, "Electronic Devices and Circuits Theory", 9th Edition, Prentice Hall of India, 2006.
2. Thomas Floyd, "Electronic Devices", Prentice Hall, 9th Edition 2012
3. Ramakant A. Gaikwad, "Op Amps and Linear Integrated Circuits", Pearson Education 2000

References:

1. David A. Bell, "Electronic Devices and Circuits", 5th Edition, Oxford press.
2. Albert Paul Malvino, "Electronic Principles", 8th Edition, McGraw Hill Publication.
3. Anil K. Maini and Varsha Agarwal "Electronic Devices and Circuits", Wiley India
4. Millman, Halkias, "Integrated Electronics-Analog and Digital Circuits and Systems", Tata McGrawHill, 2000.

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Course Code	Course Title				Category
18BTEC212	Electronic Devices & Circuits Lab				DCC
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
0	0	2	40	60	1

Prerequisite: Basic Electronics

Course Objectives:

1. To study construction, operation, and characteristics of semiconductor devices.
2. To study DC analysis and its requirements.
3. To study linear integrated circuit and its applications.
4. To introduce operating parameters of basic semiconductor device circuits.

COURSE CONTENT

List of Experiments (Minimum 8)

1. To plot transistor I/O characteristics in CE, CB, and CC configurations.
2. To study and comparison of transistor biasing circuit.
3. To plot V-I characteristics of JFET.
4. To calculate A_V, R_I, R_{out} of CE amplifier with and without C_E.
5. To study Transistor as a Switch.
6. To compare biasing circuits of JFET.
7. To plot V-I characteristics and DC load line of MOSFET.
8. To study inverting and non-inverting amplifier using OPAMP.
9. To study summing and difference amplifier using OPAMP.
10. To study Astable multi-vibrator using IC 555 and calculate duty cycle and frequency of output.
11. To study instrumentation amplifier.

Course Outcomes:

Successful completion of the course leads to:

1. The understanding of operation, and relationship between input and output signals.
2. Insight of biasing requirements and its types of semiconductor devices for various applications.
3. Learning the need and working of operational amplifier circuit in various applications. They will also get an insight of working, construction of timer IC.

Understanding basic analysis in terms of various circuit parameters of semiconductor devices.

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Course Code	Course Title				Category
18BTIT202	Digital Electronics and Microprocessors				DCC
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
3	0	2	40	60	4

Prerequisite: Basics of Electrical and Electronics Engineering

Course Objectives:

1. To learn and understand basic digital design techniques.
2. To develop design and implementation skills of combinational and sequential logic circuits
3. To understand the basic functioning of microprocessor and to learn assembly language programming.

COURSE CONTENTS

I. Logic Families And Number System **(8)**

TTL: Standard TTL characteristics- Speed, power dissipation, fan-in, fan-out, current and voltage parameters, noise margin, operating temperature etc. Operation of TTL NAND gate. Binary, Hexadecimal, Octal number systems and conversion. Signed Magnitude, 1's complement and 2's complement representation and arithmetic.

II. Combinational and Sequential Logic **(8)**

BCD, Excess-3, Gray code, Binary Code and their conversion. Multiplexer, De-multiplexer, Implementation of expressions using MUX and DEMUX, JK Flip-Flop, Asynchronous counter. Synchronous counter, Universal Shift Register.

III. 8086 Microprocessor **(6)**

Introduction to a Microprocessor. 16-bit microprocessors. Register Organization of 8086. 8086-Architecture, Signal descriptions of 8086. Physical Memory Organization, General Bus Operation and I/O Addressing Capability.

IV. 8086 Assembly Language Programming **(10)**

8086 addressing modes. Instruction Set of 8086, Assembler directives and Operators, Introduction to Assembly Language Programming. Structure of an assembly language program in 8086. Assembler, Linker, Loader, Debugger, Simulator & Emulator concepts. Programming with an assembler, Assembly Language Example Programs, Sample examples of 8086 from each types of instructions from the instruction set.

V. 8086 Interfacing With I/O Devices and Introduction to Microcontroller **(8)**

Minimum and Maximum modes of 8086. An introduction to I/O interfacing with 8086, Programmable Input-Output Port-8255. Case study: Interfacing of an LED and simple Switch with 8086.
An introduction to Microcontroller, difference between Microprocessor and Microcontroller. Case study: Interfacing of an LED and simple Switch with 8051.

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Course Outcomes:

1. Spectacle an awareness and apply knowledge of TTL and number systems.
2. Understand codes and the functioning of Mux and Demux.
3. Analyse as well as design Combinational and sequential logic circuits.
4. To demonstrate the use various system programs such as an assembler, linker and loader.
5. Ability to program the microprocessor using an assembly language

TEXT BOOKS

1. R.P. Jain, "Modern Digital Electronics" , Tata McGraw-Hill, 3rd Edition, ISBN: 0–07–049492–4.
2. Douglas V Hall, "Microprocessors and Interfacing".
3. A.Ray, K.Bhurchandi, "Advanced Microprocessors and peripherals: Arch, Programming &Interfacing",Tata McGraw Hill,2004 ISBN 0-07-463841-6

REFERENCE BOOKS

1. Flyod, "Digital Principles", Pearson Education, ISBN: 978-81- 7758-643-6.
2. M Morris Mano, "Digital Design", Prentice Hall, 3rd Edition, ISBN: 0130621218.
3. A.P. Malvino, D.P. leach, G. Saha, "Digital principles and Applications", Tata McGraw Hill, (Seventh edition).
4. Walter A .Tribel, Avtar Singh, "The 8088 And 8086 Microprocessors Programming. Interfacing, Software, Hardware Applications", PHI Pulication, 4th Edition.
5. Barry B Brey, The Intel Microprocessors .Pearson, Eight Ed. 2009

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Course Code	Course Title				Category
18BTIT212	Digital Electronics and Microprocessors Lab				DCC
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
3	0	2	40	60	4

Digital Electronics and Microprocessor Lab

Assignment List

Sr. No.	Assignment
1.	Study of BCD and Excess-3 codes and their conversion.
2.	Study of IC 7474 and 7476
3.	Design & Implement MOD –N counter and draw Timing diagram.
4.	Design & Implement 4 bit Shift register.
5.	Write an Assembly Language Program (ALP) to add *ten* numbers stored in memory at consecutive locations.
6.	Write an Assembly Language Program (ALP) to compare and concatenation strings
7.	Write an Assembly Language Program (ALP) for reversing the strings/numbers
8.	Study of 8086 interfacing with 8255

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Course Code	Course Title				Category
18BTME202	BASIC MECHANICAL ENGINEERING				Program Core
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
3	0	0	40	60	3

Prerequisite: Engineering Mathematics, Engineering Science

Course Objectives:

The student will able to;

1. Conversant with engineering knowledge of various mechanical elements, mechanism and different power transmission systems
2. Study and understanding of various manufacturing processes.
3. Study and understanding of various machine tools operations.
4. Develop fundamental concepts of thermodynamics and its applications.
5. Extend analytical competency in various material testing methods.

Unit I. BASICS OF MECHANICAL ENGINEERING **(9 hrs)**

Mechanical Elements: Introduction to Shafts, Axle, Key (Parallel key), Couplings (rigid flange coupling), Bearing (Ball bearing), Clutch (Single plate), Brake (disc brake), (functions, sketches, description and uses)

Mechanism: Introduction to kinematic link, kinematic pair, kinematic chain, Mechanism and machine, Four bar chain mechanism, Slider-crank mechanism. (Descriptive only)

Power Transmission: Introduction to Belt drives, Chain drives, Spur gear drives, Numerical on drive ratios calculation (Construction, working, comparison and applications)

Unit II. MANUFACTURING PROCESSES **(9 hrs)**

Introduction and applications of; Casting, types of casting (Sand casting, die casting), Forging, types of forging (Open Dies & Closed dies), Sheet metal working, types (shearing, bending and drawing). Metal Joining (Electric arc welding, soldering, brazing,)

Unit III. MACHINE TOOLS **(9 hrs)**

Basic elements, working principle, types of operation with block diagram: Types of lathe (Centre Lathe machine), Drilling machine, Grinding machine, Milling machine, and operations on machine tools.

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Unit IV. BASIC THERMODYNAMICS AND APPLICATIONS **(9 hrs)**

Definition of Thermodynamics, thermodynamic Systems, surrounding, universe, types of systems, state of system, properties- intensive and extensive, thermodynamic equilibrium, process and cycle, Zeroth Law of thermodynamics, Introduction to First law of thermodynamics & limitations, Numerical on First law of Thermodynamics.

Concept of Refrigeration, Air conditioner. Introduction of boilers, types (water tube and fire tube) & applications, I. C. Engines- types (two stroke and four stroke) and principle of working.

Unit V. MECHANICAL BEHAVIOUR AND MATERIALS TESTING **(9 hrs)**

Mechanical behavior and properties of materials, Tensile test, Stress-strain curve, True stress & True strain, hardness, toughness, malleability, ductility, stiffness, modulus of rigidity, modulus of resilience,

Fatigue, Creep, Impact, Hardness testing- Brinell, Rockwell tests (working principle, procedure, advantages and disadvantages).

Non Destructive testing (NDT) - Principle & working, advantages, disadvantages and Industrial applications of - Visual Inspection, Liquid /dye penetrate test, Magnaflux test, Eddy current test, Sonic & Ultrasonic testing and Radiography testing.

Course Outcomes:

The student will be;

1. Conversant with engineering knowledge of various mechanical elements, mechanism and different power transmission systems
2. Study and understanding of various manufacturing processes.
3. Study and understanding of various machine tools operations.
4. Develop fundamental concepts of thermodynamics and its applications.
5. Extend analytical competency in various material testing methods.

TEXT BOOKS:

1. Elements of Mechanical Engineering, D.S Kumar, S.K Kataria and Sons.
2. Basics of Mechanical Engineering, R.K Rajput Laxmi Publications, Delhi.
3. Basic Mechanical Engineering, Shanmugam, Ravindran, Tata-McGraw Hill Publications.
4. Elements of Workshop Technology, Vol. I & II, Hajra & Chaudhari, Media Promoters & Publishers Pvt. Ltd.
5. Design of Machine Elements, V.B. Bhandari, Tata-McGraw Hill Publications.
6. Material Science and Metallurgy for Engineers, V.D. Kodgire, Everest Publishing House.
7. A Course in Thermal Engineering, Domkundwar, Kothandaraman, Dhanpat Rai& Co.

REFERENCE BOOKS:

1. Engineering Thermodynamics, P. K. Nag, Tata-McGraw Hill Publications
2. Mechanical Engineering Design, Joseph E Shigley, Charles R Mischke, Tata-McGraw Hill Publications

3. Workshop Technology Vol. I, II & III, Chapman A.J.
4. Manufacturing Engineering & Technology, Kalpakjian & Schmid, Pearson
5. Theory of Machines, S S Ratan, Tata-McGraw Hill Publications
6. Material Science and Engineering, William D Callister, John Wiley and sons.

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Course Code	Course Title				Category
18BTME212	BASIC MECHANICAL ENGINEERING LAB				Program Core
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
0	0	2	40	60	1

List of Experiments:

1. Study of four bar mechanism/slider crank mechanism through lab demonstration.
2. Study of the practical application of specific machine element/power transmission drive (Visit Report).
3. Dismantling and Assembly of specific mechanical device.
4. Study of any one machining operation through workshop demonstration.
5. Prepare and present any one machining operation through PPT.
6. Study of I.C. Engine (SI and CI Engine) through lab demonstration.
7. Determine Hardness of given material using Brinell and Poldi hardness test.
8. Determine Toughness of given material using impact test.

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Course Code	Course Title				Category
18BTCE202	Applied Mechanics				DCC
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
3	0	0	40	60	3

Prerequisite: Basic Physics and Mathematics

Course Objectives:
1. To study force and its characteristics.
2. To study applications of statics in trusses and friction.
3. To study applications of mechanics in surfaces and volumes properties such as Centroid, CG, MI etc.
4. To study dynamics of particles and rigid bodies.

COURSE CONTENTS

I. Resultant of Coplanar Force System **(10)**

Introduction, basic concept, principles of mechanics, force, types of force system, composition and resolution of forces, resolution of concurrent force system in plane, moment couple, Varignon's theorem, equivalent force system, resultant of non-concurrent force system in plane

II. Equilibrium of Force System **(08+06)**

Introduction, body constraints, type of supports & loads, free body diagram, conditions of equilibrium, equilibrium of two, three forces in plane, Lami's theorem, equilibrium of forces in plane, reaction of determinate beam (simple and compound beam).

Friction - Laws of friction-coefficient of friction-problems involving dry friction – wedge, belt & ladder friction.

III. Centre of Gravity and Moment of Inertia **(12)**

Introduction, center of gravity/centroid of composite plane figures and curves. Introduction, radius of gyration, polar moment of inertia, moment of inertia of composite plane figures

IV. Analysis of Truss Structure **(12)**

Analysis of simple plane trusses, Method of joints, Method of sections

V. Kinematics and Kinetics of Rectilinear Motion of Particle **(12)**

Introduction, basic concept, equations of motion, variable acceleration, motion under gravity, motion curves, relative motion. Introduction, basic concept, Newton's second law, work energy principle. D'Alembert principles, impulse momentum principle, direct central impact.

Course Outcomes:

1. Students will be able to understand characteristics of forces and moments and some fundamental theorems of mechanics.
2. Students will be able to draw free body diagrams of the system.
3. Students will get insight of trusses and friction and their analysis.
4. Students will get understanding of properties of surface and volume.
5. Student will understand dynamics of particles and rigid bodies.

Text Books:

1. Timoshenko, and Young, Engineering Mechanics, Tata Mc-Graw Hill Book Company, Edition 4, New Delhi, 1988
2. Ferdinand P. Beer, E. Russell Johnston Jr., David Mazurek, Philip J Cornwell, Vector Mechanics for Engineers: Statics and Dynamics , McGraw - Hill, New Delhi, Tenth Edition 2013
3. Palanichamy, M. S., and Nagan, S., Engineering Mechanics (Statics and Dynamics), Tata McGraw Hill, New Delhi Eighth reprint 2011(Third edition)
4. R. C. Hibbeler, Engineering Mechanics: Statics, Pearson, 2013 - Technology & Engineering.

References:

1. Mclean, and Nelson, Theory and problems of Engineering Mechanics (Statics and Dynamics), 3rd Edition Schaum Series, 1980
2. Rajasekaran, S., &Sankarasubramanian, G., Engineering Mechanics, Vikas Publishing House Pvt Ltd, 2011
3. Shames, I.H., and Krishna Mohana Rao, G., Engineering Mechanics (Statics and Dynamics), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), 2006

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Course Code	Course Title				Category
18BTCE212	Applied Mechanics Lab				DCC
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
0	0	02	40	60	1

It is a representative list of practical with minimum seven experiments and minimum three graphical solutions. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise.

1. Determination of resultant of coplanar concurrent force system by law of polygon of forces.
2. Determination of reactions at the supports of simple supported beam.
3. Determination of forces in the members of Jib crane.
4. Determination of coefficient of friction between inclined glass planes and different blocks.
5. Determination of coefficient of friction between belt and fixed drum.
6. Determination of 'g' by compound pendulum.
7. Determination of moment of inertia of flywheel.
8. Demonstration of direct central impact
9. Verification of Virtual Work Principle
10. Determination of Beam Reactions of a compound beam
11. Study of curvilinear motion
12. Determination of coefficient of restitution

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B.Tech (F.Y.) Aerospace Engineering

Course Code	Course Title				Category
18BTAE107	Thermodynamics				DCC
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
2	-	0	40	60	2
Prerequisite: Basic Physics					

Course Objectives:

1. To study the basic laws of thermodynamics.
2. To study heat and work interaction.
3. To study applications of laws of thermodynamics in air standard cycles.
4. To study the applications of thermodynamics in refrigeration and air condition.
5. To study thermodynamics of fuels and combustion.

COURSE CONTENTS

Unit I BASIC THERMODYNAMICS (5)

Systems, Zeroth Law of thermodynamics, First Law of thermodynamics, Ideal gas and its processes, Application of first law to various ideal gas processes, Second law, Kelvin- Planck statement - Clausius statement - concept of entropy - Clausius inequality - entropy change for any thermodynamic process.

Numericals on Heat and work transfer in flow and non-flow processes, second law of thermodynamics and entropy change

Unit II AIR STANDARD CYCLES (5)

Concept of air standard cycle, Assumptions of air standard cycle, basic terminologies related with air standard cycle – clearance volume, swept volume, compression ratio, efficiency and work ratio, Otto cycle, Diesel cycle and Dual cycle – derivation of efficiency and mean effective pressure, Comparison of Otto, Diesel and Dual cycle.

Numericals on Otto, Diesel and Dual cycle.

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Unit III PROPERTIES OF PURE SUBSTANCE AND POWER CYCLE (6)

Formation of steam, Phase changes, Properties of steam, Use of Steam Tables, Study of P-v, T-s and Mollier diagram for steam, Non-flow and Steady flow vapour processes, Change of properties, Work and heat transfer. Carnot cycle, Rankine cycle, Comparison of Carnot cycle and Rankine cycle, Efficiency of Rankine cycle.
Numericals on properties of steam, processes of steam and Rankine cycle

Unit IV REFRIGERATION AND AIR CONDITIONING (5)

Fundamentals of refrigeration, Simple vapour compression system, Vapour absorption system and their comparison, Coefficient of performance, Properties of refrigerants. Introduction to air conditioning, factors affecting air conditioning, Classification of air conditioning system, Psychrometry and Psychrometric Properties, Psychrometric Chart, Psychrometric Processes.
Numericals on vapour compression system and air conditioning system

Unit V FUELS AND COMBUSTION (5)

Introduction to fuels, Theoretical amount of Oxygen / Air required for combustion. Stoichiometric Air: Fuel ratio, Excess air, lean and rich mixtures, Flue gas analysis by mass and volume, Higher and lower calorific value and its determination.
Numerical on mass and volumetric analysis of flue gas, calorific value.

Course Outcomes:

1. Students will get comprehensive understanding laws of thermodynamics.
2. Students will understand difference between heat and work and its interaction.
3. Students will get insight about thermodynamics law by means of its applications.
4. Students will understand refrigeration and air condition concepts. They will also be acquainted with knowledge of fuels and combustion.

Text Books:

1. R. K. Rajput, Engineering Thermodynamics, EVSS Thermo Laxmi Publications
2. P. K. Nag, Engineering Thermodynamics, Tata McGraw Hill Publications
3. R.S. Khurmi, J. K. Gupta, A textbook of Thermal Engineering, S. Chand & Company Publication
4. R.S. Khurmi, A textbook of Refrigeration and Air conditioning, S. Chand & Company Publication

References:

1. Y. Cengel & Boles: Thermodynamics – An Engineering Approach,
2. P. L Ballany: Thermal Engineering, Khanna Publishers
3. C.P. Arora: Engineering Thermodynamics, Tata McGraw Hill.
4. S. Domkundwar, C. P. Kothandaraman, Anand Domkundwar, Thermal Engineering, Dhanpat Rai Publishers.

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Course Code	Course Title				Category
18BTAE251	Materials Engineering and Aerospace Materials				DAC Audit
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
2	0	0			0
Prerequisite: Chemistry and Physics					

Course Objectives:

1. To understand the knowledge of phase diagram of metals.
2. Evaluate and classify iron carbon alloy system and its applications.
3. Identify the suitable heat treatment processes for different steels.
4. Identify the suitable destructive test to select proper material for specific application.
5. To understand the basic knowledge of magnetic material.
6. To study modern materials used in aerospace sector and their properties.

COURSE CONTENTS

Unit I PHASE DIAGRAMS (5)

Solid solutions - Hume Rothery's rules - The phase rule - single component system – one component system of iron - binary phase diagrams - isomorphous systems - the tie-line rule – the lever rule - application to isomorphous system - eutectic phase diagram - peritectic phase diagram

Unit II FERROUS ALLOYS AND HEAT TREATMENT (6)

The iron-carbon equilibrium diagram - phases, invariant reactions - microstructure of slowly cooled steels- eutectoid steel, hypo and hypereutectoid steels - effect of alloying elements on the Fe-C system - Phase transformations - T-T-T-diagram for eutectoid steel– pearlitic, baintic and martensitic transformations - Heat treatment of steels - annealing - normalizing - quenching and tempering - case hardening - carburizing, carbonitriding and nitriding, Induction, flame hardening.

Unit III MECHANICAL PROPERTIES (5)

Tensile test - plastic deformation mechanisms - slip and twinning - role of disiocations in slip - strengthening methods - strain hardening - solid solution strengthening - precipitation

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hardening - creep resistance - creep curves - mechanism of creep -creep-resistant materials - Fatigue failure - fatigue tests - methods of increasing fatigue life - hardness -Rockwell and Brinell hardness - Knoop and Vickers microhardness.

Unit IV MAGNETIC, DIELECTRIC AND SUPERCONDUCTING MATERIALS **(5)**

Ferromagnetism – Domain theory – types of energy – hysteresis – hard and soft magnetic materials – ferrites - dielectric materials – types of polarization – frequency effects on polarization - dielectric breakdown – insulating materials – Ferroelectric materials - superconducting materials, properties, types and applications.

Unit V AEROSPACE MATERIALS **(5)**

Aluminum alloys: alloy designation and tempers, Al-Cu alloys, Al-Li alloys, Al-Mg alloys, nanocrystalline aluminum alloys – Titanium alloys:α-β Alloys, superplasticity, structural titanium alloys,intermetallics – Magnesium alloys: Mg-Al and Mg-Al-Zn alloys – Superalloys:

Course Outcomes:

1. Students will be able to get insight of phase diagram of metals.
2. Student will be able to get understanding of iron carbon alloy system and various heat treatment methods.
3. Students will be able to select proper materials for different applications by means of various test.
4. Students will get understanding of magnetic materials.
5. Students will understand the material requirement in aerospace field and properties of various modern materials.

Text Books:

1. Raghavan, V. "Physical Metallurgy: Principles and Practice", Phi Learning (2009).

2. Balasubramaniam, R. "Callister's Materials Science and Engineering", Wiley India Pvt. Ltd.(2014).

3. Palanisamy P.K., "Materials Science", Scitech (2013).

4. Polmear, I. J., Light Alloys: From Traditional Alloys to Nanocrystals, 4th ed., Elsevier (2005).

References:

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1. Raghavan, V. "Materials Science and Engineering", Printice Hall of India (2007).

2. Shackelford, J.F. "Introduction to Materials Science for Engineers". Pearson India (2006).

3. Donald Askeland. "Materials Science and Engineering", Brooks/Cole (2010).

4. Smith, W.F., Hashemi, J. and R.Prakash. "Materials Science and Engineering",TataMcgrawHill Education Private Limited (2014).

5. Cantor, B., Assender, H., and Grant, P. (Eds.), Aerospace Materials, CRC Press (2001).

ASM Speciality Handbook: Heat Resistant Materials, ASM International (1997).

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Course Code	Course Title				Category
18BTAE202	Engineering Mechanics				DCC
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
3	-	0	40	60	3
Prerequisite: Basic Physics and Mathematics					

Course Objectives:

1. To study force and its characteristics.
2. To study applications of statics in trusses and friction.
3. To study applications of mechanics in surfaces and volumes properties such as Centroid, CG, MI etc.
4. To study dynamics of particles and rigid bodies.

COURSE CONTENTS

Unit I STATICS OF PARTICLES (9)

Forces on Particles, Resultant of concurrent forces, parallel forces, non-concurrent Non-parallel system of forces, Resolution of forces, Free body diagram, Forces in space, Moment of force about a point, Couples, Varignon's Theorem. Force couple system. Distributed Forces in plan, Centroid for plane Laminas , Types of supports and corresponding reactions, Equilibrium of rigid bodies in two dimensions, Equilibrium of a two force body, Statistically determinate and indeterminate structures

Unit II TRUSSES AND FRICTION (9)

Definition of truss, Simple trusses, Analysis of trusses, Method of joints, Method of sections Introduction to Laws of friction, Cone of friction, Equilibrium of bodies on inclined plane, Application to problems involving wedges, ladders. Rolling friction, Belt friction, Thrust and Journal bearings

Unit III PROPERTIES OF SURFACES AND VOLUMES (9)

Centroids of lines, areas and volumes, Determination of centroids by integration, Pappus Guldinus theorem, Moment of inertia of area and determination by integration, Radius of Gyration, Parallel and Perpendicular axis theorems, polar moment of inertia, Mass moment of inertia

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Unit IV DYNAMICS OF PARTICLES **(11)**

Rectilinear motion- uniform velocity and uniformly accelerated motion, Rectangular components of velocity & acceleration, Motion along plane curved path, Tangential & Normal component of acceleration, Motion curves (a-t, v-t, s-t curves),Newton's second law, D Alembert's principle, Principle of Work and Energy, Law of Conservation of Energy, Principle of Linear Impulse and Momentum, Law of Conservation of momentum, Impact and collision, Collision of elastic bodies, direct central impact, oblique impact, coefficient of restitution, loss of kinetic energy.

Unit V DYNAMICS OF RIGID BODIES **(7)**

Introduction to general plane motion, Absolute and relative velocity in plane motion, Translation and rotation of rigid bodies, Fixed axis rotation, Instantaneous centre of rotation in plane motion, velocity diagrams for bodies in plane motion, (up to 2 linkage mechanism)

Course Outcomes:

1. Students will be able to understand characteristics of forces and moments and some fundamental theorems of mechanics.
2. Students will be able to draw free body diagrams of the system.
3. Students will get insight of trusses and friction and their analysis.
4. Students will get understanding of properties of surface and volume.
5. Student will understand dynamics of particles and rigid bodies.

Text Books:

1. Timoshenko, and Young, Engineering Mechanics, Tata Mc-Graw Hill Book Company, Edition 4, New Delhi, 1988
2. Ferdinand P. Beer, E. Russell Johnston Jr., David Mazurek, Philip J Cornwell, Vector Mechanics for Engineers: Statics and Dynamics , McGraw - Hill, New Delhi, Tenth Edition 2013
3. Palanichamy, M. S., and Nagan, S., Engineering Mechanics (Statics and Dynamics), Tata McGraw Hill, New Delhi Eighth reprint 2011(Third edition)
4. R. C. Hibbeler, Engineering Mechanics: Statics, Pearson, 2013 - Technology & Engineering

References:

1. Mclean, and Nelson, Theory and problems of Engineering Mechanics (Statics and Dynamics), 3rd Edition Schaum Series, 1980
2. Rajasekaran, S., &Sankarasubramanian, G., Engineering Mechanics, Vikas Publishing House Pvt Ltd, 2011
3. Shames, I.H., and Krishna Mohana Rao, G., Engineering Mechanics (Statics and Dynamics), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), 2006.

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Course Code	Course Title				Category
18BTAE212	Engineering Mechanics Lab				LTPC
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
-	-	2	40	60	1

Any eight experiments

1. Verification of triangle law and parallelogram law of forces
2. Verification of law of polygon of forces
3. Support reactions of simple / compound beam
4. Determination of coefficient of friction of inclined plane / belt
5. Study of curvilinear motion
6. Determination of coefficient of restitution
7. To verify principle of moments using bell crank lever apparatus
8. To estimate the value of gravitational acceleration using compound pendulum
9. To determine moment of inertia of fly wheel
10. Verification of Centroid of Different Laminae
11. Verification of Conditions of Equilibrium for A System Of Forces
12. Verification of Axial Forces In The Members of a Truss
13. Verification of Newton's Law of Motion
14. Verification of Angular Acceleration of A Rolling Disc on an Inclined Plane

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B. Tech (First Year Common)

SEMESTER I / II

Course Code	Course Title				Category
18BTME011	Engineering Graphics				Program Core
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
01	00	04	50	50	3
Prerequisites: Geometry, Mathematics, Elementary Drawing					

Course Objectives:

Sr. No.	Course Objectives
The main purpose of this course is to:	
01	Develop imagination of Physical Objects to be represented on Paper for Engineering Communication.
02	Develop the drawing Skills, drawing interpretation Skills by using Modern Engineering tools required for industrial practice.
03	Develop the physical realization of the dimensions of the objects

COURSE CONTENT

NOTE – Only first angle method of projections is to be used in all the units.

(Except the basic essential concepts, most of the teaching part can happen concurrently in the laboratory during practical session by using drafting tool and traditional methods)

Note: Figure to the right in bracket, indicates total sessions for respective unit.

Unit I

DRAFTING TECHNOLOGY AND INTRODUCTION TO ANY DRAFTING SOFTWARE/PACKAGE [10]

Importance of Engineering Drawing, layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.

Advantages of Computer Aided Drafting (CAD) packages, Introduction to any drafting package, use of various commands for drawing, dimensioning, editing, modifying, saving and printing/plotting the drawings.

Unit II

PROJECTIONS OF LINES & PLANES [14]

Introduction of points, lines & planes of projection, Reference planes, projections of points, Projections of Lines, traces, inclinations, and true lengths of the lines.

Introduction of perpendicular and oblique planes, Different cases of plane figures (different shapes), Projection of planes making different angles with one or both reference planes.

Unit III

PROJECTION OF SOLIDS & DEVELOPMENT OF SOLID [14]

Introduction of solids, different types of solids, Projection of solid inclined to both references plane, *(Simple cases when solid is placed in different positions)*

Development of all types of prism, pyramid, cylinder and cone and their cut portions.

Unit IV

ORTHOGRAPHIC PROJECTIONS & ISOMETRIC PROJECTIONS [14]

Reference planes, types of orthographic projections – First angle projections, Methods of obtaining orthographic views by First angle method, Sectional orthographic projection.

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Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, Construction of Isometric view from given orthographic views.

Unit V

CURVES USED IN ENGINEERING PRACTICE [8]

Conic section- like ellipse, parabola & hyperbola by diretrix-focus method only, Archimedean spiral, helix, involute of circle, cycloid of circle.

PRACTICAL CONTENT

Practical assignments should be sketched on computer by using any one drafting package and printouts on A3 size paper should be submitted at the end of semester as a part of Continuous Assessment.

Assignment No. – 1 Projection of lines and planes (2 problems of each)

Assignment No. – 2 Projections of solids and development of solids (2 problems of each)

Assignment No. – 3 Orthographic projections (2 Problems)

Assignment No. – 4 Isometric projections (2 Problems)

Assignment No. – 5 Engineering Curves (any 4 curve problems)

Important Note: *The problems solved by students of each batch should be preserved batch wise in soft form.*

Course Outcomes:

After learning this course, students shall be able to:

1. Imagine physical objects represented on paper.
2. Apply knowledge of drawing Skill, drawing interpretation Skill for engineering communication.
3. Use modern engineering tools required for engineering practices.
4. Represent the physical objects by its shape, size and position.

TEXT BOOKS

1. N. D. Bhatt, "Elementary Engineering Drawing", Chartor Publishing house, Anand, India.
2. D. N. Johle, "Engineering Drawing", Tata McGraw-Hill Publishing Co. Ltd.

Rachdo

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3. K. L. Narayana and P. Kannaiah,"Textbook on Engineering Drawing", Scitech Pub, 2010.
4. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education

REFERENCE BOOKS

1. P. S. Gill, "Engineering Graphics", S K Kataria and Sons, Reprint 2013 edition (2013)
2. N. D. Bhatt, "Machine Drawing", Chartor Publishing House, Anand, India.
3. Warren J. Luzzader, "Fundamentals of Engineering Drawing", Prentice Hall of India, New Delhi.
4. (Corresponding set of) CAD Software Theory and User Manuals

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B.Tech (FY) SEMESTER I / II

Course Code	Course Title				Category
19BTME17	Engineering Workshop				ESC
Contact Hours per Week			CA	FE	Credits
L	T	D/P			
0	0	4	50	-	2
Prerequisite: Electrical & Electronics Engineering					

Course Objectives:

1. **Create awareness of all Engineering Branches.**
2. **Students could do troubleshooting and maintenance of Electronics and Computer hardware on their own.**
3. **Create inclination of students in project development.**

COURSE CONTENT

ECE, CSE and IT Branches

PART A) COMPUTER

Activity I: Introduction to PC Hardware Components (2hrs)

1. Student or group of students have to study and identify different types of Mouse, Keyboard, LCD/LED Monitor, VGA, HDMI, CAT5, CAT6, Fiber Cable, Hard Disk, RAM, CMOs Battery, SMPS, Cache, ROM, BIOS.
2. Assemble a Desktop PC from its components.

Activity II: Introduction to Softwares (6hrs)

1. Student or group of students have to study Various Operating Systems, Various Text Editors, Various Internet Browsers, Linux Commands, Photoshop.
2. Install above mentioned softwares in Windows and Ubuntu.
3. Install any two latest version of the operating system on a PC and make it dual boot.

ActivityIII: Proper typing with all fingers for good speed (2hrs)

Introduction to keys on keyboard, position and fingers used to press keys. Students have to practice typing to achieve speed up to 30 words/min.

Activity IV: Introduction to Networking **(4hrs)**

4. Study of types of Networks, LAN, DNS, Server-Client, Router, Hub, Switch, Website, Web Server.
5. Study and check the output of various Network Commands, Application of ssh, telnet, ftp, winscp, ping, http, https, Various Search Engines.
6. Prepare patch Cable using a crimping tool.
7. Prepare a Small Network of 4-5 PCs using switch, LAN cable and crimping tool.

Activity V: Use of Development Platform for Project **(4hrs)**

1. Setup working desktop system using any development board.
2. Download the OS image from the web. Install operating system on board.

PART B) ELECTRONICS

A group of students have to select one activity from the list given below. Every activity consists of 4 Assignments. Students have to perform each assignment in the lab session. At the end of semester group of students have to submit a prototype of Project as a part of the final submission.

Project I:Water Level Indicator

1.To build and test 9v DC regulated power supply on beard board. **(4hrs)**

2.To build and test water level indicators using BJT on beard board. **(4hrs)**

3.To build printed circuit board for RPS and water level indicator. **(4hrs)**

4.Assemble of complete circuit of water level indicator. **(6hrs)**

Project II: Soil condition monitoring (Temperature) sensors for agriculture.

1.To build and test 5V DC regulated power supply on beard board. **(4hrs)**

2.To build printed circuit board for RPS. **(4hrs)**

3.Write and test code in Ardino for temperature sensor. **(4hrs)**

4.Interface LCD with Ardino and assemble of complete circuit of temperature sensor for agriculture. **(6hrs)**

Project III: Moisture condition monitoring for agriculture.

1.To build and test 5V DC regulated power supply on beard board. **(4hrs)**

2.To build printed circuit board for RPS. **(4hrs)**

3.Write and test code in Ardino for moisture sensor. **(4hrs)**

4.Interface LCD with Ardino and Assemble of complete circuit of moisture condition monitoring for agriculture on plywood. **(6hrs)**

Project IV: Intruder alarm system

1.To build and test 9v DC regulated power supply on beard board. **(4hrs)**

2.To build and test alarm circuit using LDR & IC555 on beard board. **(4hrs)**

3.To build printed circuit board for RPS and Alarm circuit. **(4hrs)**

4.Assemble of complete circuit of intruder alarm system. **(6hrs)**

Project V: Student can select any day to day life problem statement with the proper knowledge of that scenario and prior approval of instructor/ Course coordinator. Instructor/ course coordinator will approve problem statement after checking feasibility of problem statement, technology support, applicability and students approach. Instructor/ Course coordinator have to distribute problem statement into 4 clear assignments as mentioned in Project I to IV. **(18hrs)**

PART C) Workshop

Activity I: Plastic Machine **(4hrs)**

Student or group of students have to prepare plastic wheels, gears, assembly platforms, etc.

Activity II: Carpentry and Electrical **(6hrs)**

Students or group of students have to prepare an electrical switch board. This activity includes:

1. Cutting and pasting wooden sheet to prepare a board.
2. Cutting squares and making holes.
3. Fitting electric switches, sockets, dimmer, voltage indicator, fuse, etc.
4. Connecting wires to make working electric switch board.

Activity III: Tin Smithy **(6hrs)**

Students or group of students have to prepare tin base platform for assembling electrical, electronics and computer components to make working project prototype.

Hardware and Software Resource:

Computer Workshop:

PC Hardware Components: Motherboard, Processor, SMPS, RAM, DVD-RW drive, Hard Disk, Power Cables, Data Cables, VGA/HDMI connectors, keyboard, Mouse(PS2/USB), Cabinet, LED Display.

IoT Kit: Raspberry Pi, Micros SD card, Plastic case, Power Adapter, HDMI Cable, RCA Video/Audio Cable, Cat5 Cable

Network Tools: Hub (4/8 ports), CAT 5/6 cable, Crimper, Cable Tester, Wire Stripper.

List of Major Equipment/ Instrument

i. Function Generator
ii. Multimeter, Transformer, fuses, Auto transformer
iii. Cathode Ray Oscilloscope
iv. D.C. Power supplies
v. Digital trainer Kits
vi.DSO
vii. Consumable materials (Bread board Wire, resister, capacitor,inductor,ICs etc.)

Course Outcomes:

Students will demonstrate the ability to :

1. Identify, handle and use various electronic components, devices and instruments with "What it is" and "How it works" insight, towards skill development.
2. Build and test a hobby class electronic circuit, with flavor of small real life application, on printed circuit board.
3. Get introduced to various computer system hardware components, peripherals and terminologies frequently used in software and software world and acquire proficiency in handling them.
4. Build a dual boot machine by installing different operating systems on it and install software on various operating systems including GNU/Linux and Microsoft Windows.
5. Create basic networking steps using 2-4 PCs and networking hardware.
6. Troubleshoot day to day life problems on personal computers, including issues related to: Network connection, display, Power-on, Software configuration, Software Network setup, etc.

TEXT BOOKS

Electronics Workshop:

1.Other Learning Resources Practical Semiconductor Data manuals: BPB Publications; New Delhi

2.Some electronics engineering magazines.

REFERENCES

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CIVIL, MECHANICAL & AEROSPACE

Workshop

Practicals: (10 hours)

Detailed contents

1. Fitting operations & power tools (10 lecture)

2. Carpentry (10 lecture)

3. Tin Smithy (10 lecture)

Course Outcomes:

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

1. Fitting shop (10 hours)

2. Carpentry Shop (10 hours)

3. Tin Smithy Shop(10 hours)

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

Laboratory Outcomes:

Upon completion of this laboratory course, students will be able to fabricate components with their own hands. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes. By assembling different components, they will be able to produce small devices of their interest.

Suggested Text/Reference Books:

(i) Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.

(ii) Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.

(iii) Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.

(iv) Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.

(v) Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

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18BTME017 **Engineering Workshop [[L : 0; T:0; P : 4 (2 credit)]**

Practicals: (10 hours)

Detailed contents

1. Fitting operations & power tools (10 lecture)
2. Carpentry (10 lecture)
3. Tin Smithy (10 lecture)

Suggested Text/Reference Books:

(i) Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.

(ii) Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.

(iii) Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.

(iv) Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.

(v) Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

Course Outcomes:

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

1. Fitting shop (10 hours)
2. Carpentry Shop (10 hours)
3. Tin Smithy Shop(10 hours)

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

Laboratory Outcomes:

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

They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.

By assembling different components, they will be able to produce small devices of their interest.

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Assessment Method:

CA: 50 Marks

Activity	**Marks**
Carpentry shop	10
Tin Smithy shop	10
Fitting Shop	10
Viva	10
Journal	05
Attendance	05

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