ACADEMIC STRUCTURE AND SYLLABUS AY 2018-19

FIRST YEAR BACHELOR OF TECHNOLOGY

BRACT's

VISHWAKARMA INSTITUTE OF INFORMATION TECHNOLOGY, PUNE-48

(AN AUTONOMOUS INSTITUTE AFFILIATED TO SAVITRIBAI PHULE PUNE UNIVERSITY)

DEPARTMENT OF ENGINEERING & APPLIED SCIENCES

Bansilal Ramnath Agarwal Charitable Trust's

Vishwakarma Institute of Information Technology, Pune-48

(An Autonomous Institute affiliated to Savitribai Phule Pune University)

Department of Engineering & Applied Sciences

F. Y. B. TECH. (COMMON TO ALL PROGRAMS) SEMESTER I (Pattern 2018)

MODULE I

Course Code	Course Title	Course Type	Teaching Scheme			Examination Scheme					Total	Credits
						Formative Assessment			Summative Assessment			
			L	T	P	ISE		CE	ESE	PR/ OR		
						T1	T2					
ES11181	Engineering Mathematics –I	TH	3	1	-	20	10	20	50	-	100	4
ET10182A	Basic Electrical Engineering	TH	3	1	-	20	10	20	50	-	100	4
ET10183A	Basic Electrical Engineering Lab	CE	-	-	2	-	-	50	-	-	50	1
ES10184A-CB/ ES10184A-NCB	Engineering Physics (CB)*/ Engineering Physics (NCB)*	TH	3	1	-	20	10	20	50	-	100	4
ES10185A -CB / ES10185A-NCB	Engineering Physics Lab (CB)*/ Engineering Physics Lab (NCB)*	CE	-	-	2	-	-	50	-	-	50	1
ME10186A	Engineering Graphics and Design	CE	1	-	4	-	-	100	-	-	100	3
ES10187	English	CE	2	-	2	-	-	100	-	-	100	3
M1	Induction Program	-	-	-	-	-	-	-	-	-	-	-
	Total		**12**	**3**	**10**	**60**	**30**	**360**	**150**	**-**	**600**	**20**

**CB-Circuit branches-Computer, IT, E&TC Engineering*

**NCB-Non-circuit branches-Mechanical & Civil Engineering*

BOS Chairman

Dean Academics

Director

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F.Y. B. TECH. (COMMON TO ALL PROGRAMS) SEMESTER I (Pattern 2018)

MODULE II

Course Code	Course Title	Course Type	Teaching Scheme			Examination Scheme					Total	Credits
			L	T	P	Formative Assessment			Summative Assessment			
						ISE		CE	ESE	PR/ OR		
						T1	T2					
ES11181	Engineering Mathematics –I	TH	3	1	-	20	10	20	50	-	100	4
CS10182B-CB/ CS10182B-NCB	Computer Fundamentals (CB)*/Computer Fundamentals (NCB)*	TH	3	-	-	20	10	20	50	-	100	3
CS10183B- CB/ CS 10183B-NCB	Computer Fundamentals Lab (CB)*/Computer Fundamentals Lab (NCB)*	CE	-	-	4	-	-	50	-	-	50	2
ES10184B	Engineering Chemistry	TH	3	1	-	20	10	20	50	-	100	4
ES10185B	Engineering Chemistry Lab	CE	-	-	2	-	-	50	-	-	50	1
ME10186B	Workshop practice	CE	1	-	4	-	-	100	-	-	100	3
M1	Induction Program	-	-	-	-	-	-	-	-	-	-	-
	Total		**10**	**2**	**10**	**60**	**30**	**260**	**150**	**-**	**500**	**17**

**CB-Circuit branches-Computer, IT, E&TC Engineering*

**NCB-Non-circuit branches-Mechanical & Civil Engineering*

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F.Y. B. TECH. (COMMON TO ALL PROGRAMS), SEMESTER II (Pattern 2018)

MODULE III

Course Code	Course Title	Course Type	Teaching Scheme			Examination Scheme					Total	Credits
			L	T	P	Formative Assessment			Summative Assessment			
						ISE		CE	ESE	PR/ OR		
						T1	T2					
ES12181	Engineering Mathematics –II	TH	3	1	-	20	10	20	50	-	100	4
CS10182B-CB/ CS10182B-NCB	Computer Fundamentals (CB)*/Computer Fundamentals (NCB)*	TH	3	-	-	20	10	20	50	-	100	3
CS10183B-CB/ CS 10183B-NCB	Computer Fundamentals Lab (CB)*/Computer Fundamentals Lab (NCB)*	CE	-	-	4	-	-	50	-	-	50	2
ES10184B	Engineering Chemistry	TH	3	1	-	20	10	20	50	-	100	4
ES10185B	Engineering Chemistry Lab	CE	-	-	2	-	-	50	-	-	50	1
ME10186B	Workshop practice	CE	1	-	4	-	-	100	-	-	100	3
	Total		**10**	**2**	**10**	**60**	**30**	**260**	**150**	-	**500**	**17**

**CB-Circuit branches-Computer, IT, E&TC Engineering*
**NCB-Non-circuit branches-Mechanical & Civil Engineering*

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Department of Engineering & Applied Sciences

F.Y. B. TECH. (COMMON TO ALL PROGRAMS) SEMESTER II (Pattern 2018)

MODULE IV

Course Code	Course Title	Course Type	Teaching Scheme			Examination Scheme					Total	Credits
			L	T	P	Formative Assessment			Summative Assessment			
						ISE		CE	ESE	PR/ OR		
						T1	T2					
ES12181	Engineering Mathematics –II	TH	3	1	-	20	10	20	50	-	100	4
ET10182A	Basic Electrical Engineering	TH	3	1	-	20	10	20	50	-	100	4
ET10183A	Basic Electrical Engineering Lab	CE	-	-	2	-	-	50	-	-	50	1
ES10184A-CB/ ES10184A-NCB	Engineering Physics(CB)*/ Engineering Physics (NCB)*	TH	3	1	-	20	10	20	50	-	100	4
ES10185A -CB/ ES10185A-NCB	Engineering Physics Lab (CB)*/ Engineering Physics Lab (NCB)*	CE	-	-	2	-	-	50	-	-	50	1
ME10186A	Engineering Graphics and Design	CE	1	-	4	-	-	100	-	-	100	3
ES10187	English	CE	2	-	2	-	-	100	-	-	100	3
	Total		**12**	**3**	**10**	**60**	**30**	**360**	**150**	**-**	**600**	**20**

**CB-Circuit branches-Computer, IT, E&TC Engineering*

**NCB-Non-circuit branches-Mechanical & Civil Engineering*

BOS Chairman **Dean Academics** **Director**

V.I.I.T. PUNE 48. Vishwakarma Institute of Information Technology * B.R.A.C.TRUST *

SEMESTER 1

MODULE I & II

SEMESTER 2

MODULE III & IV

Engineering Mathematics – I [ES11181]

Teaching Scheme
Credits : 4
Lectures : 3 Hrs/week
Tutorial : 1 Hour/week

Examination Scheme
F. A. : 50 Marks
S. A. : 50 Marks

Course objectives

1. The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra.
2. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful.

Course Outcomes

After successful completion of the course, student will be able to

1. Apply essential tools of matrices and linear algebra in a comprehensive manner
2. Apply Rolle's Theorem that is fundamental to application of analysis to Engineering problems.
3. Understand power series and Fourier series for learning advanced Engineering Mathematics.
4. Understand functions of several variables that are essential in most branches of Engineering.
5. Apply the knowledge of partial differentiation to Engineering problems.
6. Understand Beta and Gamma functions, DUIS, Error functions and their use.

Unit I - Matrices

Rank of a matrix, Normal form, System of linear equations; Symmetric, skew-symmetric and Linear & orthogonal Transformations; Eigen values and eigenvectors; Cayley-Hamilton Theorem.

Unit II - Differential Calculus

Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin's series;
Indeterminate forms and L 'Hospital's rule.

Unit III – Infinite series and Fourier Series

Infinite series**,** Convergence of series, Tests for convergence, Alternating series ,Power series;
Fourier series: Half range sine and cosine series.

Unit IV - Multivariable Calculus (Partial Differentiation

Partial Derivatives, Homogenous functions, Euler's Theorem, Total derivative, Change of independent variables.

Unit V – Applications of Partial Differentiation

Maxima and minima of functions of two variables, Lagrange's Methods of undetermined multipliers, Jacobeans and their applications, Errors and approximation.

Unit VI - Integral Calculus

Reduction Formulae; Beta, Gamma functions and their properties, Differentiation under Integral Sign, Error functions.

Text Books

1. Advanced Engineering Mathematics, by Erwin Kreyszig, John Wiley & Sons.
2. Higher Engineering Mathematics, by B.S. Grewal , Khanna Publisher.

Reference Books
1. Advanced Engineering Mathematics by Peter O'Neil, Global Engineering, and Publisher. 2. Higher Engineering Mathematics by B. V. Ramana., Tata McGraw Hill Publisher 3. Textbook of Applied Mathematics (Volume I & II), by P. N. Wartikar & J.N. Wartikar Pune Vidhyarthi Griha Publisher.

Engineering Mathematics – II [ES12181]

Teaching Scheme
Credits : 4
Lectures : 3 Hrs/week
Tutorial : 1 Hour/week

Examination Scheme
F. A. : 50 Marks
S. A. : 50 Marks

Course objectives

1) The objective of this course is to familiarize the prospective engineers with techniques in multivariate integration, ordinary and partial differential equations and complex variables.
2) It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

Course Outcomes

After successful completion of the course, student will be able to

1) Apply the effective mathematical tools for solutions of first order differential equations that model physical processes.
2) Demonstrate the nature of curves like Cardioide, Astroid, Lemniscate, Rose curve by tracing the same and measure arc lengths of various curves.
3) Apply knowledge of solid geometry in various fields of Engineering.
4) Evaluate multiple integrals and apply the knowledge of multiple integrals in it's various applications.
5) Understand aspects of vector differential calculus which include physical phenomenon such as gradient, divergence, curl.
6) Understand applications of vector integral calculus such as work done, electric flux..

Unit I - First order & First degree differential equations and Applications

Exact differential equations, Linear and Bernoulli's equations. Applications of differential equations: Orthogonal Trajectory, Newton's law of cooling, Electrical Circuits.

Unit II - Curve Tracing & Rectification

Tracing of Curves, Cartesian, Polar, Parametric Curves and Rectifications of curves.

Unit III – Solid Geometry

Cartesian, Spherical, Polar and Cylindrical coordinate systems. Sphere, Cone and Cylinder.

Unit IV - Multivariable Calculus (Integration)

Multiple Integration: Double integrals (Cartesian), Change of order of integration in double integrals, Change of variables (Cartesian to polar),Triple integrals (Cartesian), Change of variables (Cartesian to Spherical polar) Applications: areas and volumes.

Unit V –- Vector Differentiation

Gradient, Directional derivatives, Divergence and Curl. Solenoidal, Irrotational and Conservative vector fields.

Unit VI - Vector Integration

Line integrals, Surface integrals, Volume integrals, Green's Lemma for plane lamina, Gauss Divergence Theorem and Stoke's Theorem.

Text Books

(i)Advanced Engineering Mathematics, by Erwin Kreyszig, John Wiley & Sons.
(ii) Higher Engineering Mathematics, by B.S. Grewal, Khanna Publisher.

Reference Books
(i) Advanced Engineering Mathematics by Peter O'Neil, Global Engineering, and publisher.
(ii) Higher Engineering Mathematics.by B. V. Ramana., Tata McGraw Hill Publisher
(iii)Textbook of Applied Mathematics (Volume I & II), by P. N. Wartikar& J.N. Wartikar Pune Vidhyarthi Griha Publisher.

Basic Electrical Engineering – [ET10182A]

Teaching Scheme
Credits : 4
Lectures : 3 Hrs/week
Tutorial : 1 Hour/week

Examination Scheme
F. A. : 50 Marks
S. A. : 50 Marks

Course Objectives
To enable the learner to understand and apply basic concepts of electrical engineering.

Course Outcomes
After completing this course learners will be able
1. To understand and analyze basic electric and magnetic circuits.
2. To study the working principles and operating characteristics of electrical machines.
3. To familiarize with the components of low voltage electrical installations and understand energy calculations.

Unit 1 - DC Circuits

Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff's current and voltage laws, Superposition, The venin and Norton Theorems. Time-domain analysis of first-order RL/RC circuits.

Unit 2 - AC Circuits

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series), series resonance, power factor improvement. Three-phase balanced circuits, voltage and current relations in star and delta connections.

Unit 3 - Transformers

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Unit 4 –Electrical Installations

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Elementary calculations for energy consumption.

Unit 5 - D.C. Machines

Working principle: generating and motoring action, constructional features of a dc machine, action of commutator and types of dc machines. Emf equation, Concept of back e.m.f., Characteristics and applications of dc motors.

Unit 6 - A.C. Machines

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Types of rotor. Significance of torque-slip characteristic. Loss components and efficiency. Introduction to single-phase induction motor and its applications. Construction and working principle of synchronous generators.

Text Books

1. A Textbook of Electrical Technology Volume- I and volume II –B. L. Theraja, S. Chand and Company Ltd., New Delhi.
2. Basic Electrical Engineering - V. K. Mehta, S. Chand and Company Ltd., New Delhi.
3. Basic Electrical and Electronics Engineering - S. K. Bhattacharya, Pearson Education.
4. Electrical Power – S. L. Uppal, 13th Edition, Khanna Publisher, 1988.

Reference Books
1. Electrical and electronics Technology- Edward Hughes, Seventh Edition, Pearson Education. 2. Basic Electrical Engineering- I. J. Nagrath and Kothari, Tata McGraw Hill, 2010. 3. Electric Machines - I.J. Nagrath and D.P. Kothari, Third Edition, McGraw-Hill. 4. Electrical Machines - R.K. Rajput 4th Edition, Laxmi Publications. 5. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.

Basic Electrical Engineering Lab– [ET10183A]

Teaching Scheme
Credits : 1
Laboratory Work: 2 hrs/week

Examination Scheme
F. A. : 50 Marks

Course Objectives :-
To enable the learner to understand and relate practically basic concepts studied in electrical engineering.

Course Outcomes :-
After completing this course learners will be able
1. To understand various components used in electrical systems.
2. To verify experimentally different concepts learnt in electrical engineering.

Laboratory Work

List of experiments (Any 6 out of the following experiments)

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope). Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
3. Transformers: Observation of the no-load current waveform on an oscilloscope (non-sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
4. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents). Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.
5. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winding - slip ring arrangement) and single-phase induction machine.
6. Torque Speed Characteristic of separately excited dc motor.
7. Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections. Torque-Slip Characteristic of an induction motor. Generator operation of an induction machine driven at super-synchronous speed.
8. Synchronous Machine operating as a generator: stand-alone operation with a load. Control of voltage through field excitation.

Text Books

1. Experiments in Basic Electrical Engineering, S. K. Bhattacharya, K. M. Rastogi, New age international pvt. Ltd. Publishers, Delhi, Reprint 2003.
2. A Textbook of Laboratory Course in Electrical Engineering, S. G. Tarnekar, S. Chand Publisher, 2006

Department of Engineering & Applied Sciences

Engineering Physics – [ES10184A] (CB)

Teaching Scheme
Credits : 4
Lectures : 3 Hrs/week
Tutorial : 1 Hour/week

Examination Scheme
F. A. : 50 Marks
S. A. : 50 Marks

Course Objectives
To teach fundamental principles in Physics and relate the understanding to applications

Course Outcomes
The student will be able to
1. Explain basics of wave optics (interference and diffraction) and use them in engineering applications
2. Explain basics of Semiconductor Physics and use them in understanding of working of diodes
3. Explain the basics of opto-electronics
4. Explain the basics of lasers, working of diode lasers and their applications
5. Explain the basics of optical fibres and their applications in telecommunication
6. Explain the Physics of select sensors and their applications

Unit I - Wave Optics

(a) Interference – Conditions for steady interference pattern, Temporal coherence for division of amplitude, spatial coherence for division of wave front, concept of thin film, interference due to thin film of uniform thickness (with derivation), applications: in-situ thickness measurement and anti-reflection coating using interference of light, Interference due to wedge shaped film (qualitative discussion), band width of fringes (derivation).Applications: Flatness of surface, thickness of film on substrate.

(b) Diffraction – Definition, types of diffraction, Fraunhofer's diffraction at single slit, conditions for maxima and minima, intensity pattern (derivation using phasor diagram), Rayleigh's criterion for resolution of 2 point objects, resolving power of slit and aperture. Fraunhofer diffraction from a diffraction grating, Conditions for Principal Maxima, minima, intensity pattern (derivation), resolving power and dispersion of diffraction grating.

UV-Vis-IR Spectrometer using diffraction grating, Source of light, Collimator, Grating, Focusser, Array light detector,

Unit II - Semiconductor Physics

Free electron theory, opening of band gap due to internal electron diffraction from lattice, band theory, Density of states, Fermi-Dirac distribution function, Carrier density in intrinsic semiconductors, position of Fermi energy, Effective density of states, Carrier density in extrinsic semiconductor, position of Fermi energy, Effective density of states

p-n junction diode. Charge density, potential and electric around the junction, and band structure of unbiased diode. Barrier potential, Working of p-n junction diode in the forward and reverse bias on the basis band structure, Ideal diode equation, Zener/ Avalanche mechanisms on the basis of band picture

Unit III - Opto-electronics

Opto-electronics: Introduction, Spectral response of human eye, radiative transition, non-radiative transition, electron-hole pair creation efficiency, electron-hole recombination probability, LED (Theory, Construction, Applications), Solar cell, Photo-diode (p-n ad p-i-n and avalanche), CCD and CMOS light array detector, optical coupler

Unit IV – Lasers
Understanding working of laser in terms of meta stable state, pumping, population inversion, spontaneous emission, stimulated emission and resonance cavity. Laser parameters: divergence, power, intensity, monochromaticity, coherence Construction and working of hetero-structure diode laser, Intensity versus threshold current, ac operation for generation of digital data.
Unit V - Optical fibre communication
Basics of propagation of light through Optical fibre, attenuation, dispersion, bandwidth, Numerical Aperture, Coupling of light source to optical fibre, and converting light from optical fibre to electrical signal, Comparison of optical fibre communication with wired and Radio communication.
Unit VI –Physics of Sensors and Measurements
Hall sensor, accelerometer, temperature sensor, strain gauges, Measurements - Accuracy, Precision, resolution, errors, error propagation, Calibration of sensors, noise, signal to noise ratio
Text Books
1. A text Book of Engineering Physics – M N Avadhanulu and P G Kshirsagar, S Chand & Co. Ltd. 2. Sears and Zemansky's University Physics – Hugh D Young and Roger A Freedman, Pearson Education 3. A Textbook of Optics – N Subrahmanyam and BrijLal, S Chand Publications
Reference Books
1. Fundamentals of Physics – Halliday, Resnick and Walker, Wiley Publications 2. Optics – AjoyGhatak, Tata McGraw Hill 3. Fundamentals of Optics – Jenkins and White, Tata McGraw Hill 4. Introduction to Solid State Physics - C. Kittel, Wiley Publications 5. Principles of Solid State Physics – H V Keer, New Age International 6. Semiconductor Device Fundamentals – R F Pierret, Pearson 7. Physics of Semiconductor Devices – S M Sze and K K Ng, Wiley 8. Integrated Electronics J Millman, C Halkias, McGraw Hill 9. Solar Photovoltaic - C S Solanki, PHI Learning 10. A course on Experiments with He-Ne Laser – R S Sirohi, New Age International Publishers 11. Practical Physics (3rd Ed.) G L Squires, Cambridge University Press

Department of Engineering & Applied Sciences

Engineering Physics Lab – [ES10185A](CB)

Teaching Scheme
Credits : 1
Laboratory Work: 2 hrs/week

Examination Scheme
F. A. : 50 Marks

Course Objectives

To teach fundamental principles in Physics and relate the understanding to applications and laboratory experiments

Course Outcomes

The student will be able to

1. determine basic parameters of a semiconductor like band gap and charge carrier density
2. determine and analyze I-V characteristics of a solar cell
3. characterize a laser beam through beam profile and wavelength measurement
4. analyze thin film interference through Newton's rings experiment
5. determine characteristics of sensors and analyze it through experiments on light and temperature sensors
6. Collate and present information on a given topic and built a small working or demonstration model, if necessary

Laboratory Work

A) List of experiments (8 out of the following experiments)

1. To determine band gap of a semiconductor from temperature dependence of its electrical resistance
2. To determine the I-V characteristics and parameters of a Solar cell
3. To determine the Hall coefficient and number density of charge carriers of a semiconductor
4. To determine the beam profile and divergence of a laser beam
5. To determine radius of curvature of plano-convex lens by Newton's rings method
6. To determine the wavelength of light using diffraction grating and compare diffraction pattern for green and red laser
7. To calibrate light sensor BPW34 against a Lux meter
8. To determine the temperature using Pt100 and/or semiconductor temperature sensor and calibrate a carbon resistor
9. To determine the Photoconductivity of Si and Ge
10. To determine the Planck's constant using photocell

B) Project based learning

Reference Books

1. A course on Experiments with He-Ne Laser – R S Sirohi, New Age International Publishers
2. Practical Physics (3rd Ed.) G L Squires, Cambridge University Press

Department of Engineering & Applied Sciences

Engineering Physics – [ES10184A] (NCB)

Teaching Scheme
Credits : 4
Lectures : 3 Hrs/week
Tutorial : 1 Hour/week

Examination Scheme
F. A. : 50 Marks
S. A. : 50 Marks

Course Objectives
To teach fundamental principles in Physics and relate the understanding to applications

Course Outcomes
The student will be able to
1. Explain the phenomenon of vibration, its analysis and suppression
2. Explain creation and detection of sound and ultrasound and their applications
3. Explain material characterization using X-Ray Diffraction, optical microscopy, Scanning Electron Microscopy
4. Explain the basic tenets of experimental observations and errors
5. Explain Physics of select sensors and their applications
6. Explain Physics of lasers in general and CO_2/ Nd:YAG lasers in particular and their applications

Unit I - Vibrations

Free, forced and damped oscillations, resonance, time domain and frequency domain analysis

Unit II –Sound and Ultrasound

Sound, Ultrasound - propagation, absorption, dispersion,
Echo, reverberation, noise, acoustics of auditorium, noise pollution
Generation and detection of ultrasound and Non-Destructive Testing

Unit III - Material Characterization

X-ray diffraction – Bragg's law, Miller indices and determination of lattice parameter, Particle size determination using Scherrer formula, Optical Microscope – Magnification, Numerical aperture and resolution, scanning electron Microscope – deBroglie wavelength, magnification, resolution, Energy Dispersive analysis of X-rays (EDAX) for elemental analysis

Unit IV - Measurements and errors

Accuracy, Precision, resolution, errors, error propagation, noise, signal to noise ratio, Calibration of sensors, temperature sensor and light sensors as case studies

Unit V – Physics of Sensors

Flow sensors, pressure sensors, vacuum sensors, vibration sensor, accelerometer, strain gauge, etc.

Unit VI - Lasers

Understanding working of laser in terms of meta stable state, pumping, population inversion, spontaneous emission, stimulated emission and resonance cavity. laser parameters: divergence, power, intensity, monochromaticity, coherence Construction and working of CO_2 laser, Nd:YAG laser
Applications: alignment, ranging, displacements, determination of tolerances, calibrating slip gauges, cutting, welding, etc.

Text Books

1. A text Book of Engineering Physics – M N Avadhanulu and P G Kshirsagar, S Chand & Co. Ltd.
2. Sears and Zemansky's University Physics – Hugh D Young and Roger A Freedman, Pearson Education
3. A Textbook of Optics – N Subrahmanyam and Brij Lal, S Chand Publications

Reference Books

1. Fundamentals of Physics – Halliday, Resnick and Walker, Wiley Publications
2. Acoustics – S N Sen, New Age International Publisher
3. Introduction to Acoustics – R D Finch, Prentice-Hall of India
4. Acoustics – Heinrich Kuttruff, CRC Press
5. Fundamentals of Physics - Alan Giambattista, Betty Richardson and Robert Richardson Tata McGraw Hill
6. A course on Experiments with He-Ne Laser – R S Sirohi, New Age International Publishers
7. Practical Physics (3rd Ed.) G L Squires, Cambridge University Press
8. Engineering Physics – P K Basu and H Dhanmana, Ane Books Pvt. Ltd.
9. Mechanical Vibrations – G K Grover and S P Nigam, Nem Chand & Bros, Roorkee
10. Dynamics of Structures – A K Chopra, Prentice Hall, New Jersey

Engineering Physics Lab – [ES10185A] (NCB)

Teaching Scheme
Credits : 1
Laboratory Work: 2 hrs/week

Examination Scheme
F. A. : 50 Marks

Course Objectives

To teach fundamental principles in Physics and relate the understanding to applications and laboratory experiments

Course Outcomes

The student will be able to

1. Determine basic parameters of a semiconductor like band gap
2. Validate natural frequency of a strip of material as predicted by theory
3. Characterize a laser beam through beam profile and wavelength measurement and use it an application
4. Determine characteristics of sensors and analyze it through experiments on light and temperature sensors
5. Measure and correlate ultrasonic velocity in a liquid with its bulk modulus and compressibility
6. Characterize sound in terms of its absorption in materials and intensity levels
7. Collate and present information on a given topic and built a small working or demonstration model, if necessary

Laboratory Work

A) List of experiments (8 out of the following experiments)

1. To determine band gap of a semiconductor from temperature dependence of its electrical resistance
2. To determine resonance frequency of strips of different materials
3. To determine the beam profile and divergence of a laser beam
4. To calibrate light sensor BPW34 against a Lux meter
5. To determine the temperature using Pt100 and/or semiconductor temperature sensor and calibrate a carbon resistor
6. To determine the ultrasonic velocity in a liquid using Ultrasonic interferometer
7. To determine lattice parameters and particle size from a given X-Ray diffraction pattern
8. To align objects using a laser
9. To determine sound absorption coefficient of materials
10. To determine sound pressure level.

B) Project based learning

Books

1. A course on Experiments with He-Ne Laser – R S Sirohi, New Age International Publishers
2. Practical Physics (3rd Ed.) G L Squires, Cambridge University Press

Engineering Graphics & Design – [ME10186A]

Teaching Scheme
Credits : 3
Lectures : 1Hrs/week
Laboratory Work: 4 hrs/week

Examination Scheme
F. A. : 100 Marks

Course Objectives:

1. Introduction to engineering design and its place in society
2. Exposure to the visual aspects of engineering design
3. Exposure to engineering graphics standards
4. Exposure to solid Modelling
5. Exposure to computer-aided geometric design
6. Exposure to creating working drawings
7. Exposure to engineering communication

Course Outcomes:

Upon learning the course, the student will be able to

1. Design a system, component, or process to meet desired needs within realistic constraints
2. Communicate effectively through graphics language
3. Use the techniques, skills, and modern engineering tools necessary for engineering practice

Unit I : Projections of Lines and Planes

Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes

Unit II :Projections of Regular Solids

Projection of solids such as tetrahedron, cube, right regular prism and pyramid, cylinder, cone, axis of the solid inclined to HP and VP (Solid resting on HP only) Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids

Unit III : Orthographic Projections and Sectional Views

Principal planes of Projection – Horizontal plane or horizontal reference plane, vertical plane or frontal reference plane, profile planes of projection, first and third angle methods of projection. Orthographic projections on principal planes. Sectional views: - full, half, partial (broken or local), offset, revolved, removed sections

Unit IV: Isometric Projections

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views, Simple Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions

Unit V : Development of lateral Surfaces

Development of lateral surfaces – Prisms (maximum six sides), Cone, Pyramid, Cylinder with AIP Cutting plane only.

Content to be covered in Practical

1) Overview of Computer Graphics

Introduction to CAD software such as: The Menu System, Toolbars, Drawing Area, Dialog boxes and windows, Shortcut menus, Status Bar, Different methods of zoom as used inCAD, Isometric Views of

lines, Planes, Simple Solids

2) Customization & CAD Drawing

Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically.

3) Annotations, layering & other functions

Dimensioning to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation

Computer-aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two dimensional documentation of models. Planar projection theory, including sketching of isometric, section views.

Dimensioning guidelines, tolerancing techniques

Text Books :

1. "Elementary drawing", N. D Bhatt, Charotar Publishing house, Anand India, ISBN 978-93-80358-96-3
2. "Text Book on Engineering Drawing", K. L. Narayana & P. Kannaiah, Scitech Publications, Chennai.

Reference Books

1. Fundamentals of Engineering Drawing, Warren Luzzader, Prentice Hall of India, New Delhi. ISBN 13: 978-1-259-06288-9
2. "Engineering Graphics", P. S. Gill, S.K. Kataria & Sons, New Delhi, ISBN: 81-85749-61-2
3. Principals of Engineering Graphics, Frederick E. Giesecke, Alva Mitchell & others, Maxwell McMillan Publication.ISBN-13: 978-0023428203, ISBN-10: 0023428201.
4. AutoCAD Instant Reference George Omura, BPB Publications.
5. "Engineering Drawing", Dhananjay Jolhe, Tata Mcgraw-Hill Publication.

Laboratory Work

A) Any Four SheetsA2 (420×594 mm) size-drawing sheets as given below

1. Sheet No .1: Minimum four problems on Projection of lines and Planes
2. Sheet No. 2: Minimum three problems Projection of Solid
3. Sheet No. 3: Minimum two problems on orthographic projections.
4. Sheet No. 4: Minimum two problems on Isometric projections.
5. Sheet No. 5: Minimum two problems on Development of Lateral Surfaces.

B) Any Four Sheets using CAD software

1. Sheet No .1: Minimum four problems on Projection of lines and Planes
2. Sheet No. 2: Minimum three problems Projection of Solid
3. Sheet No. 3: Minimum two problems on orthographic projections.
4. Sheet No. 4: Minimum two problems on Isometric projections.
5. Sheet No. 5: Minimum two problems on Development of Lateral Surfaces.

C) Solid Modelling one sheet on CAD software

1. Sheet No. 1: Solid modeling

English - [ES10187]

Teaching Scheme
Credits : 3
Lectures : 2Hrs/week
Laboratory Work : 2Hrs/week

Examination Scheme
F. A. : 100 marks

Course Objectives :

1. To maintain good linguistic competence- through accuracy in grammar, pronunciation and vocabulary.
2. To acquire strategic competence to use both spoken & written language to use in a wide range of communication strategies.
3. To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.

Course Outcome :

Students will be able to

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

Unit I : Vocabulary Building

1.1 The concept of Word Formation
1.2 Root words from foreign languages and their use in English
1.3 Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.
1.4 Synonyms, antonyms, and standard abbreviations.
1.5 Sentence Structures
1.6 Importance of proper punctuation
1.7 Organizing principles of paragraphs in documents
1.8 TOEFL/ GRE/ IELTS level vocabulary usage

Unit II : Literature

2.1 Story formation , narrating
2.2 Poem formation, recitation
2.3 Autobiographies
2.4 Summary writing
2.5 Book review / Movie Review
2.6 Précis Writing

Unit III : Identifying Common Errors in Writing

3.1 Subject-verb agreement
3.2 Misplaced modifiers
3.3 Articles
3.4 Prepositions
3.5 Redundancies
3.6 Clichés

Unit IV: Nature and Style of sensible Writing

4.1 Describing
4.2 Defining
4.3 Classifying

4.4 Providing examples or evidence 4.5 Writing introduction and conclusion
Unit V: Writing Practices
5.1 Comprehension 5.2 Précis Writing 5.3 Essay Writing
Unit VI: Oral Communication (This unit involves interactive practice sessions)
• Listening Comprehension • Pronunciation, Intonation, Stress and Rhythm • Common Everyday Situations: Conversations and Dialogues • Communication at Workplace • Interviews • Formal Presentations
Reference books: (i) *Practical English Usage.* Michael Swan. OUP. 1995. (ii) *Remedial English Grammar.* F.T. Wood. Macmillan.2007 (iii)*On Writing Well.* William Zinsser. Harper Resource Book. 2001 (iv) *Study Writing.* Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006. (v) *Communication Skills*. Sanjay Kumar and PushpLata. Oxford University Press. 2011. (vi) *Exercises in Spoken English.* Parts. I-III. CIEFL, Hyderabad. Oxford University Press
List of Assignments: **1.** Self-Introduction with SWOT analysis **2.** Group Discussion **3.** Power-point Presentation **4.** Extempore **5.** Verbal and non-verbal role play **6.** Listening Skills **7.** Team Building activities **8.** Time and Stress Management

Computer Fundamentals–[CS10182B] (CB)

Teaching Scheme
Credits : 3
Lectures : 3 Hrs/week

Examination Scheme
F. A. : 50 Marks
S. A. : 50 Marks

Course Objectives :
Students should be able to:
1) Design and develop the art of computer programming using program planning tools.
2) Learn fundamentals of C programming language.
3) Develop program using C language to solve the given problem statement.
4) Use open source operating system – Linux.

Course Outcomes:
On completion of this course, student will learn
1) To formulate simple algorithms and translate into C programs for arithmetic and logical problems.
2) To test and execute the programs and correct syntactical and logical errors.
3) To implement conditional branching, iteration, function and recursion.
4) To use arrays, pointers and structures to solve relevant problems.
5) To use programming skills to solve complex problems such as matrix operations and searching & sorting algorithms.
6) To implement the concept of file and different file handling operations.
7) To use open source operating system- Linux

Unit I - Introduction to Programming

Introduction to components of a computer system (disks, memory, processor etc.), Operating System- Introduction, Different functions of O/S Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/ Pseudocode with examples. Introduction to computer program. Types of Programming Languages: Machine-level, Assembly-level, High-level Language and Scripting Language, From algorithms to programs- source code, variables (with data types) and memory locations, Syntax and Logical Errors in compilation, object and executable code, First C Program. System software Vs Application software, Introduction to Compiler, Interpreter ,Assembler, Linker

Unit II - Introduction to C Programming

Features of C language ,Character set, Constants, Variables, Keywords and Comments, Data Types, Statements, I/O Operations, Preprocessor Directives Arithmetic expressions and precedence. Conditional Branching using if..else and switch..case. Iteration and Loops using for, while, and do..while, break and continue statements.

Unit III - Array , Structure and Basic Algorithms

Arrays (1-D, 2-D), Character arrays and Strings, Structures- Defining structures and Array of Structures, Searching and Basic Sorting Algorithms- Binary Search ,Bubble Sort , Insertion Sort, and Selection Sort, Notion of order of complexity –Introduction, Find complexity of binary search and selection sort

Unit IV – Function
Definition of function, built in functions and user defined functions, Parameter passing in functions, call by value. Pointers- Defining pointers, idea of call by reference .Use of Pointers in self-referential structures, notion of linked list , Recursion -Finding Factorial and Fibonacci series using recursion
Unit V - Introduction to Object Oriented Programming
Concept of class and object, Procedure oriented programming Vs Object oriented programming, Examples of OOP languages, Features of OOP-Encapsulation, Inheritance, Polymorphism , Beginning OOP with C++- Defining class ,member functions, member data ,access specifier , First C++ program with class, Creating object of class- memory allocation for object, array of object, access member functions and member data through object, Constructor and Destructor-Introduction, default constructor, parameterized constructor,
Unit VI - Inheritance and Polymorphism using C++
Inheritance – Introduction, single inheritance , multiple inheritance, Scope resolution operator, inline functions, Polymorphism – Introduction, function overloading, function overriding, virtual functions, Introduction to Embedded C
Text Books: 1. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill 2. Yashavant Kanetkar, "Let Us C" , BPB Publications 3. E. Balaguruswami, "Object Oriented Programming with C++", Tata McGraw-Hill Publishing Company Limited 4. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
Reference Books : 1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India 2. Pradeep K. Sinha and Priti Sinha, "Computer Fundamentals", BPB Publications 3. Richard Petersen, "The Complete Reference Linux", McGraw-Hill Publications

Computer Fundamentals–[CS10182B] (NCB)

Teaching Scheme
Credits : 3
Lectures : 3 Hrs/week

Examination Scheme
F. A. : 50 Marks
S. A. : 50 Marks

Course Objectives :
Students should be able to:
1) Design and develop the art of computer programming using program planning tools.
2) Learn fundamentals of C programming language
3) Develop program using C language to solve the given problem statement.
4) Use important tools such as MATLAB and Excel
5) Use the open source operating system-Linux

Course Outcomes:
On completion of this course, student will learn
1) To formulate simple algorithms and translate into C programs for arithmetic and logical problems.
2) To test and execute the programs and correct syntactical and logical errors.
3) To implement conditional branching, iteration, and function
4) To use programming skills to solve complex problems such as matrix operations
5) To use importance tools such as MATLAB and Excel
6) To use markup language HTML for Web Design
7) To use open source operating system-Linux

Unit I –Introduction to Computer Fundamentals

Introduction to components of a computer system (disks, memory, processor etc.) ,Operating System-Introduction, Different functions of O/S, Introduction to networking-LAN, WAN, MAN, Types of Programming Languages: Machine-level, Assembly-level and High-level Language, Scripting Language, Introduction to Compiler, Interpreter ,Assembler, Linker

Unit II - Introduction to Programming

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) and memory locations, Syntax and Logical Errors in compilation, object and executable code. Introduction to computer program. First C Program

Unit III - Introduction to C Programming

Character set, Constants, Variables, Keywords and Comments, Data Types, Statements, I/O Operations, Preprocessor Directives Arithmetic expressions and precedence. Conditional Branching using if..else and switch..case. Iteration and Loops using for, while, and do..while, break and continue statements

Unit IV– Array and Function

Arrays (1-D, 2-D), Character arrays and Strings, Definition of function, built in functions and user defined functions, Parameter passing in functions, call by value. Pointers- defining pointers, Introduction to embedded C

Unit V - Introduction to MATLAB and HTML

What is MATLAB, MATLAB Environment-Command Window, Command History, Workspace,

Current Directory, Defining Variables, Matrices and Vectors, useful commands related to matrices and vectors Introduction to World Wide Web, HTML**:** Basic structure of an HTML document, creating an HTML document, Introduction to elements of HTML, working with text , lists, hyperlinks and images.
Unit VI - Introduction to Excel
Pivote table, pivote chart, graph, curve fitting, template creation, conditional formatting, mathematical functions-ROUND,FLOOR, LOG, POWER, logical functions- IF, AND, OR, TRUE FALSE, statistical functions-Median, Mode, Standard Deviation, Average, Min. Max
Text Books: 1. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill 2. Yashavant Kanetkar, "Let Us C" , BPB Publications 3. E. Balaguruswami, "Object Oriented Programming with C++", Tata McGraw-Hill Publishing Company Limited 4. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
Reference Books : 1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India 2. Pradeep K. Sinha and PritiSinha, "Computer Fundamentals", BPB Publications **3.** Richard Petersen, "The Complete Reference Linux", McGraw-Hill Publications

Computer Fundamentals Lab – [CS10183B] (CB)

Teaching Scheme
Credits : 2
Laboratory Work: 4 hrs/week

Examination Scheme
F. A. : 50 Marks

Course Objectives :
Students should be able to:

1) Design and develop the art of computer programming using program planning tools.
2) Learn fundamentals of C programming language.
3) Develop program using C language to solve the given problem statement. Use open source operating system – Linux.

Course Outcomes:
On completion of this course, student will learn

1) To formulate simple algorithms and translate into C programs for arithmetic and logical problems.
2) To test and execute the programs and correct syntactical and logical errors.
3) To implement conditional branching, iteration, function and recursion.
4) To use arrays, pointers and structures to solve relevant problems.
5) To use programming skills to solve complex problems such as matrix operations and searching and sorting algorithms.
6) To implement the concept of file and different file handling operations.
7) To use open source operating system Linux

Conduction of Lab Practice Sessions

- Student should maintain a journal consisting of 12 exercises/ assignments on programming in C that includes flowchart, algorithm and handwritten/printout of the program and necessary theory for the exercises/assignments
- There will be 2 turns of practical for each batch.
- First turn will be Guided Practice wherein concept will be explained (in brief) and students will complete 3-4 sample programs based on the concept.
- Second turn will be Unguided Practice wherein problem statement will be given and students will solve it(write algorithm and program , compile it , rectify the errors and show the output to faculty. Faculty will assess this assignment). During this turn, no or little guidance will be provided to students in order to make them solve the problem on their own. This will help students to develop problem solving ability (develop the program logic)

Practical Assignment List

1) Study Assignment- Study of Linux Operating System and Basic Linux Commands

Group A (Any 6)

1) Write c Program to accept 3 sides of triangle and print type of triangle
2) Write c Program to accept 3 sides of triangle and print type of triangle
3) Write c Program to simulate calculator using switch case
4) Write a C program to print Fibonacci series up to n terms
5) Write C program to accept two integers and print x^y using function
6) Write C program to accept CET score of ten students and print lowest and highest CET score using array

7) Write C program to accept two integers and swap them . Use function (Call by value and call by reference)
8) Write embedded C program for blinking LED
9) Write a C program to enter any number and print its reverse.
10) Write C program to accept an alphabet and print whether it is an upper case or lower case alphabet
Group B (Any 6)
1) Write a program in C to carry out following operations on strings- a. To concatenate a string S2 to string S1. b. To find the length of a given string c. To compare two strings S1 and S2. d. To copy a string S2 to another string S1.
2) Create a student database (roll number, name, marks etc.). Perform following operations (Use structure): a. Add Record b. Display Record c. Search Record.
3) Write C program to compute factorial of given positive integer using recursive function
4) Write C program to sort n integers using selection sort
5) Write C program to perform following Matrix operations- a. Addition of two matrices b. Subtraction of two matrices c. Multiplication of two matrices
6) Write C program to write data to a file and read data from a file using file handling functions.
7) Write C++ program to perform following operations on a linked list for a library database (Book Title, Author Name, Publication, Genre, Number of Pages, Price)- a. Create and add book record at the end of the list b. Modify a record c. Delete a record d. Display all records

Computer Fundamentals Lab – [CS10183B] (NCB)

Teaching Scheme
Credits : 2
Laboratory Work: 4 hrs/week

Examination Scheme
F. A. : 50 Marks

Course Objectives :
Students should be able to:

1) Design and develop the art of computer programming using program planning tools.
2) Learn fundamentals of C programming language
3) Develop program using C language to solve the given problem statement.
4) Use important tools such as MATLAB and Excel
   Use the open source operating system-Linux

Course Outcomes:
On completion of this course, student will learn

1) To formulate simple algorithms and translate into C programs for arithmetic and logical problems.
2) To test and execute the programs and correct syntactical and logical errors.
3) To implement conditional branching, iteration, and function
4) To use programming skills to solve complex problems such as matrix operations
5) To know importance tools such as MATLAB and Excel
6) To know markup language HTML for Web Design
7) To use open source operating system Linux

Conduction of Lab Practice Sessions

- Student should maintain a journal consisting of 12 exercises/ assignments on programming in C that includes flowchart, algorithm and printout of the program and necessary theory for the exercises/assignments
- There will be 2 turns of practical for each batch.
- First turn will be Guided Practice wherein concept will be explained (in brief) and students will complete 3-4 sample programs based on the concept.
- Second turn will be Unguided Practice wherein problem statement will be given and students will solve it(write algorithm, write program , compile it , rectify the errors and show the output to faculty. Faculty will assess this assignment). During this turn, no or little guidance will be provided to students in order to make them solve the problem on their own. This will help students to develop problem solving ability (develop the program logic)

Practical Assignment List

1) Study Assignment- Study of Linux Operating System and Basic Linux Commands
2) Installation of OS(Linux and Windows)

Group A (Any 6)

1) Write c Program to accept 3 sides of triangle and print type of triangle
2) Write c Program to simulate calculator using switch case
3) Write a C program to print Fibonacci series up to n terms
4) Write C program to accept two integers and print x^y using function
5) Write C program to accept CET score of ten students and print lowest and highest CET score using array

6) Write C program to accept two integers and swap them . Use function (Call by value and call by reference)
7) Write embedded C program for blinking LED
8) Write a C program to enter any number and print its reverse.
9) Write C program to accept an alphabet and print whether it is an upper case or lower case alphabet
Group B (Any 2)
1) Write a program in C to carry out following operations on strings using built-in functions- a. To concatenate a string S2 to string S1. b. To find the length of a given string c. To compare two strings S1 and S2. d. To copy a string S2 to another string S1.
2) Write C program to perform following Matrix operations- a. Addition of two matrices b. Subtraction of two matrices c. Multiplication of two matrices
3) Design web pages for promoting a city as a tourist destination using images, tables and hyperlinks etc.
Group C (All)
1) The excel sheet contains a bank employment data such as employee name, employee ID, address, job category, salary, and gender . Create pivote table for given data to produce table of mean current salary, classified by job category and gender. (Data will be provided to students in the form of excel sheet)
2) An excel sheet contains data about amount of precipitation from month of January to December. For the given data, find average, median and mode of given precipitation values. (Data will be provided to students in the form of excel sheet)
3) Any one Mathematics problem will be solved using MATLAB
4) MATLAB assignment based on matrices and vectors.

Engineering Chemistry-[ES10184B]

Teaching Scheme
Credits : 4
Lectures : 3Hrs/week
Tutorial : 1 Hr/week

Examination Scheme
F. A. : 50 Marks
S. A. : 50 Marks

Course objectives:

1. To understand water technology for water softening/ purification
2. To study UV- Visible, IR and NMR spectroscopy for determination of molecular structures
3. To understand fundamental concepts of fuel and to study liquid fuels, hydrogen as a fuel and combustion calculations
4. To understand setting and hardening of cement, explain chemical structure and properties of polymers and relate them to their applications.
5. To study analysis of chemical solutions using conductometry, potentiometryand pH metry. Explain types of batteries and fuel cells and the electrochemical process involved in them
6. To understand chemical and electrochemical corrosion and describe methods used for prevention of corrosion.

Course Outcomes:

Students will be able to

1. Calculate amount of impurities like hardness, alkalinity in water and explain water softening methods and domestic water and sewage water treatment.
2. Apply concepts in UV-Visible, IR and NMR spectroscopy for determination of molecular structures
3. Explain fundamental concepts of fuel, liquid fuels, hydrogen as a fuel and compute air required for combustion of fuel.
4. Explain setting and hardening of cement, explain chemical structure and properties of polymers and relate them to their applications.
5. Explain electrolysis, electrochemical cells and analysis of chemical solutions using conductometry, potentiometry and pH metry also explain types of batteries and fuel cells and the electrochemical process involved in them.
6. Explain chemical and electrochemical corrosion and describe methods used for prevention of corrosion.

Unit I- Water Technology

Impurities in water, Hardness of water, estimation of hardness by EDTA method, Alkalinity of water, Ill effects of hard water on boiler, Softening of water - zeolite process, demineralization by ion exchangers, reverse osmosis &electrodialysis ,Municipal water treatment, Specifications for drinking water (BIS & WHO standards), sewage water treatment

Unit II - Spectroscopy

Fundamentals of spectroscopy, Types of spectroscopy, UV-Visible spectroscopy, IR spectroscopy, Basic concepts of NMR spectroscopy.

Unit III –- Fuels and Combustion

Introduction: Characteristics of good fuel, Calorific values, Measurement of calorific value by Bomb calorimeter and Boy's gas calorimeter, Liquid fuels – Petroleum- composition and refining, Octane number of petrol, Cetane number of Diesel, Power alcohol, Biodiesel
Hydrogen gas as a future fuel-manufacturing, storage and transportation
Combustion: chemical reactions, calculations for air required.

Unit IV – Chemistry of Engineering Materials
Cement: Classification, Composition of Portland cement, Setting and hardening of cement, ISI specifications **Polymers:** Introduction, Functionality of monomer, Degree of polymerization, Concept and significance of —average molecular weight, Crystallinity, T_g and T_m, Thermoplastics and Thermosetting polymers Commodity plastics, Engineering plastics, Specialty plastic Specialty polymers: Biodegradable polymers, Conducting polymers, Liquid crystal polymers, Polymer composites— fiber reinforced plastic (FRP) Recycling of plastic
Unit V – Electrochemistry, Batteries and Fuel cells
Introduction, Electrolysis- Faraday's laws, Electrolytic conduction, conductometric titration Electrochemical cells, Cell potentials, Nernst equation, Potentiometric and pH metric titrations Batteries- Introduction and important terms, classification-primary and secondary batteries, Dry cell, Lead-acid cell, Nickel-Cadmium cell, Modern batteries-Lithium batteries, Nickel- metal hydride batteries. Fuel cells- definition, advantages and limitations, Solid oxide fuel cell, Polymer electrolyte membrane fuel cell
Unit VI - Corrosion Science
Introduction: Types of corrosion- dry corrosion- mechanism, wet corrosion-mechanism, Factors influencing corrosion- nature of metal, nature of environment, Methods of corrosion control: cathodic and anodic protection, Protective coatings: surface preparation, types of protective coatings: a) metallic coatings: types of coatings, methods of applications, (hot dipping, cladding ,electroplating & cementation), electro less coatings, b) non-metallic coatings: chemical conversion coatings, powder coatings
Text Books
1. Engineering Chemistry- Jain and Jain 2. Engineering Chemistry – Wiley India 3. Engineering Chemistry - 0. G. Palanna, Tata McGraw Hill Education Pvt. Ltd. 4. A Textbook of Engineering Chemistry – Dr .S .S. Dara and Dr. S. S. Umare, S. Chand publication
Reference Books
1. Instrumental methods of analysis- Willard Meritte Dean Settle, CBS Publishers 2. Instrumental methods of chemical analysis-Gurdeep Chatwal and Sham Anand, Himalaya publishing home 3. Basic Concepts of Analytical Chemistry - S. M. Khopkar, New Age International Publishers. 4. Polymer science - V. R. Gowarikar, New Age International Publishers 5. A textbook of Engineering Chemistry – Shashi Chawla, DhanpatRai Publications

Department of Engineering & Applied Sciences

Engineering Chemistry Lab-[ES10185B]

Teaching Scheme
Credits : 1
Laboratory work : 2Hrs/week

Examination Scheme
F. A. : 50 Marks

Course objectives: To give the students a glimpse of analytical chemistry and supplement the learning with hands on experience in the Chemistry laboratory

Course Outcomes:
Students will be able to

1. Prepare chemical solutions of required strength and know chemical safety and disposal
2. Estimate temporary & permanent hardness of water sample by EDTA method
3. Determine alkalinity of water sample
4. Estimate Fe^{+3} from a given sample by colorimetric measurement
5. Determine molecular weight of polyvinyl alcohol by viscosity measurement
6. Determine calcium in cement
7. Titrate acid versus base and mixture of acids versus base using conductometer
8. Determine dissociation constant of acetic acid using pH meter
9. Collate and present information on a given topic

Laboratory work

A. List of experiments (Any 8 out of the following experiments)

1. Preparation of chemical solutions and chemical safety and disposal
2. Estimation of temporary & permanent hardness of water sample by EDTA method.
3. Determination of alkalinity of water sample
4. Colorimetric estimation of Fe^{+3} from a given sample
5. Determination of molecular weight of polyvinyl alcohol by viscosity measurement.
6. Determination of calcium in cement
7. (A)Titration of acid with base using conductometer
   (B)Titration of mixture of weak acid and strong acid with strong base using conductometer
8. Determination of dissociation constant of weak acid (acetic acid) using pH meter.
9. Study of batteries
10. Determine rate of corrosion of metal in the solution of different pH

B. Project based learning

Reference Books:

1. Vogel's Text book of Quantitative Chemical Analysis - J. Mendham, R. C. Denney, J. D. Barnes, M. J. K. Thomas, Pearson Education Ltd.
2. Applied Chemistry Theory and Practice - 0. P. Virmani and A. K. Narula, New Age International (P) Ltd.

Workshop Practice – [ME10186B]

Teaching Scheme
Credits : 3
Lectures : 1 Hrs/week
Practical : 4 Hrs/week

Examination Scheme
F. A. : 100 Marks

Course Objective:
To give the students hands on experience on different operations such as welding, turning, drilling, cutting and moulding etc with clear understanding of process characteristics and dimensional accuracies.

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

1) To fabricate components with their own hands.
2) To get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
3) To produce small devices of their interest by assembling different componenets.

Laboratory Work

1) Machine shop: Working principle of lathe machine, different parts of centre lathe ,tools used, different lathe operations, various lathe accessories, drawing reading and dimensional tolerances, safety precautions to be taken in machine shop.

Turning Job: One turning job on a lathe machine involving plain turning, taper turning or step turning, center drilling operation

2) Fitting Shop : Introduction, use of marking tools and measuring instruments such as scribers, punch, try square, vernier caliper, vernier height gauge, micrometer, dial test indicator, bevel protractor, surface plate etc. Use of hand tools such as hacksaw, chisel, files, hammers, drills, taps etc.

Job: One fitting job involving 3-4 operations eg. sawing, filing, drilling, tapping etc

3) Carpentry Shop: Introduction, use of carpentry tools such as marking gauge, try square, steel rules, saws, jackplane, chisels etc. Use of power tools and demonstration of glass cutting. Safety precautions to be taken in carpentry shop.

Job : One job involving simple joint and wood turning operation

4)Electrical & Electronics : Fabrication of PCB using soldering &brazing operation

5)Welding shop: Introduction, principal of manual metal are welding, gas welding, equipment , welding electrodes, welding joints, welding symbols, safety precautions.

Job : One job involving simple joint using arc welding machine.

6)Tin Smithy : Use of marking , measuring and cutting tools such as scribers, steel rules, standard wire gauge, scissors , mallets etc. Types of metallic sheets, use of power tools, introduction of soldering, types of solders, use of flux, soldering iron. Development of joints, safety precautions to be taken in the sheet metal shop.

Job: One utility job involving different operations such as cutting, marking, notching, folding, bending, spot welding, riveting and soldering or brazing .

7) Demonstration: Demonstration about following processes in a group of 20 students.

A) **Plastic Injection Moulding & Glass cutting :** Introduction, principle, equipment & it's operation, die introduction & setting, safety precautions.
Demonstration of one utility job.

B) **Black smithy:** Introduction, smithy tools & its application.
demonstration of one simple job

C) **Casting:** Introduction and uses of different foundry tools, sand preparation, preparation of mould, gates, runner & riser. Furnaces used for melting material, safety precautions to be taken in foundry shop.
Demonstration of one aluminium casting job

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.

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