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

ACADEMIC STRUCTURE AND SYLLABUS AY 2022-23

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/II (Pattern 2020)

MODULE I

Course Code	Course Title	Course Type	Teaching Scheme			Examination Scheme					Total	Credits
			L	T	P	CE	ISE	SCE	ESE	PR/ OR/ TW		
ES10201A	Linear Algebra	TH	3	1	-	20	30	20	30	25	125	4
CS10202A	Fundamentals of Programming	TH	2	-	2	20	30	20	30	25	125	3
ET10203A	Basic Electrical Engineering	TH	2	-	2	20	30	20	30	25	125	3
ES10204A	Engineering Physics	TH	2	-	2	20	30	20	30	25	125	3
ES10205A	Computational Science	CE	1	1	-	-	-	-	-	25	25	2
ME10206A	Engineering Graphics and Mechanical Workshop	CE	1	-	4	-	-	-	-	50	50	3
ES10207A	Energy, Water, Environment Sustainability	CE	1	1	-	-	-	-	-	25	25	2
ES10208A	Logical Reasoning	CE	1	1	-	-	-	-	-	25	25	2
M1	Induction Program	AU	-	-	-	-	-	-	-	-	-	-
M2	Foreign Language	AU	-	-	-	-	-	-	-	-	-	-
	Total		13	4	10	80	120	80	120	225	625	22

BOS Chairman

Dean Academics

Director

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

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Department of Engineering & Applied Sciences

F.Y. B. TECH. (COMMON TO ALL PROGRAMS) SEMESTER I/II (Pattern 2020)

MODULE II

Course Code	Course Title	Course Type	Teaching Scheme			Examination Scheme					Total	Credits
			L	T	P	CE	ISE	SCE	ESE	PR/ OR/ TW		
ES10201B	Calculus	TH	3	1	-	20	30	20	30	25	125	4
CS10202B	Python for Engineers	TH	2	-	2	20	30	20	30	25	125	3
ET10203B	Basic Electronics Engineering	TH	2	-	2	20	30	20	30	25	125	3
ES10209B	Material Science	TH	2	-	2	20	30	20	30	25	125	3
ES10205B	Smart Sensors	CE	1	1	-	-	-	-	-	25	25	2
CV10206B	Engineering Mechanics	CE	2	1	-	-	-	-	-	50	50	3
ES10207B	Personality Development and Professional Ethics	CE	1	1	-	-	-	-	-	25	25	2
ES10208B	Quantitative Aptitude	CE	1	1	-	-	-	-	-	25	25	2
M1	Induction Program	AU	-	-	-	-	-	-	-	-	-	-
M2	Foreign Language	AU	-	-	-	-	-	-	-	-	-	-
	Total		14	5	6	80	120	80	120	225	625	22

3/1/2020
BOS Chairman

Dean Academics

Director

V.I.I.T. PUNE 48.
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Department of Engineering & Applied Sciences

SEMESTER 1

MODULE I & II

SEMESTER 2

MODULE II & I

Bansilal Ramnath Agarwal Charitable Trust's
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Linear Algebra (ES10201A)

Teaching Scheme	**Examination Scheme**						
Credits: 4 Lecture (L): 3 hrs./week Tutorial (T): 1 hr./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	-	25	125

Prerequisite course(s): Knowledge of matrices and functions.

Course objectives:
It aims to teach mathematical methodologies and models, develop mathematical skills and enhance thinking power of students that would be essential for their disciplines.

Course Outcomes:
Upon completion of course, students will be able to

1. Set up, solve and interpret linear systems.
2. Acquire the knowledge of vector spaces.
3. Demonstrate linear transformations geometrically.
4. Apply knowledge of inner product spaces to compute length of a vector, angle, distance between two vectors, to compute orthogonal basis using Gram-Schmidt process.
5. Compute and apply the knowledge of eigenvalues and eigenvectors in various fields of Engineering.
6. Apply knowledge of quadratic forms.

Unit I – System of Linear Equations

Rank of matrix, Elementary Matrices, System of linear equations, Gauss Jordan Elimination, Applications of System of Linear equations.

Unit II – Vector Spaces

Vector space, subspace, Linear combination, Spanning set,Linear Dependence and Independence of vectors, Basis and dimension of a vector space, Row space,Column Space and null space of a matrix.

Unit III – Linear transformations

Introduction to linear transformations, Matrix of a Linear Transformation, Rank and Nullity of Linear Transformations, Orthogonal Transformation, Geometric applications of Linear transformations.

Unit IV – Inner product spaces

Inner product spaces, Orthogonality, Orthogonal Complement, Gram-Schmidt process of orthogonalization, Applications to least sqaure fiiting to data.

Unit V – Eigen Values and Eigen Vectors

Eigen Values and Eigen Vectors of a matrix, Alegbraic and geometric multiplicity, Cayley-Hamilton Theorem, Diagonalization of a matrix, Orthogonal Diagonalization.

Unit VI – Quadratic forms

Introduction to Quadratic forms, Diagonalization of quadratic form, Definiteness of quadratic form, Sylvester's Criterion, Applications of quadratic forms.

Text Books

1. Elementary Linear Algebra (10^{th} edition) by Howard Anton & Chris Rorres, John Wiley & sons.
2. Linear Algebra: A Modern Introduction (4th Edition) by David Poole,Linear CengageLearning
3. Linear Algebra An Introduction by Ron Larson and David C. Falvo, Cengage Learning
4. Linear Algebra and its Applications by David C. Lay, Pearson.

Reference Books:

1. Schaum's outlines of Linear Algebra (6^{th} edition) by Seymour Lipschutz, Marc Lipson, McGraw-Hill Education (India) Private Limited, New Delhi.
2. Linear Algebra and its applications (4^{th} edition) by Gilbert Strang, Cengage Learning (RS).
3. Advanced Engineering Mathematics, by Erwin Kreyszig, John Wiley & Sons.
4. Higher Engineering Mathematics.by B. V. Ramana., Tata McGraw Hill Publisher

List of Tutorials

1. Rank of matrix, Elementary Matrices
2. System of linear equations, Gauss-Jordan Elimination. Applications of System of Linear equations.
3. Vector Space, Subspace.
4. Linear Dependence, Independence, Basis and dimension of a vector space.
5. Linear transformations, kernel and range of a linear transformation, Matrices for Linear Transformation
6. Inner product Spaces, angle between two vectors & orthogonality, Gram Schmidt Process.
7. Orthogonal Transformation, Geometric properties of linear operators
8. Eigen Values and Eigen Vectors of a matrix
9. Diagonalization of a matrix, Orthogonal Diagonalization.
   Quadratic forms

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Department of Engineering and Applied Sciences

Fundamentals of Programming (CS10202A)

Teaching Scheme	**Examination Scheme**						
Credits: 3 Lecture (L): 2 hrs./week Practical (P): 2 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	-	25	125

Prerequisite course(s): Basic of Computer System.

Course Objective(s):

1. Understand and develop the fundamentals of C programming language.
2. Develop the basic concepts of C++ programming language.
3. Build the concepts of object oriented programming.
4. Apply features of object oriented programming.

Course Outcomes:

Upon completion of the course, students will be able to

1. Acquire fundamental knowledge of C programming.
2. Compare between the top-down and bottom-up programming approach.
3. Apply the concepts of object-oriented programming.
4. Explore the features of object-oriented programming such as Inheritance and Polymorphism.

Unit I: Introduction to C Programming

Introduction to computer program. Types of Programming Languages: Machine-level, Assembly-level, High-level Language and Scripting Language. Features of C language, Character set, Constants, Operators, Variables, Static variable, Keywords and Comments, Data Types, Statements, I/O Operations, Preprocessor Directives. First C Program. Conditional Branching using if..else and switch..case. Iteration and Loops using for, while, and do..while, break and continue statements. Array.

Unit II: Introduction to C++ Programming

How C++ differs from C, C++ character set, C++ Tokens (Identifiers, Keywords, Constants, Operators), Structure of a C++ Program (include files, main function); Header files – iostream.h, namespace; Basics of Console Input and Output :cout, cin; Use of I/O operators (<< and >>), Use of endl, Variables Declaration, Conditional Branching using if..else and switch..case. Iteration and Loops using for, while, and do..while, break and continue statements. Array, function and pointer.

Unit III: 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 IV: Inheritance and Polymorphism

Inheritance – Introduction, single inheritance, multiple inheritance, Static members in C++**,** Scope resolution operator, inline functions, Polymorphism – Introduction, function overloading, function overriding, virtual functions, Friend function.

Laboratory work

Practical Assignments List (Any 6 Lab assignments)

1. Study Assignment- Study of Linux Operating System and Basic Linux Commands.
2. Write c Program to accept 3 sides of triangle and print type of triangle (if….else)
3. Write a C program to print Fibonacci series up to n terms(for loop)
4. Write C program to compute factorial of given positive integer using recursive function
5. Write a C++ program to print Fibonacci series up to n terms.
6. Write a C++ Program to compute factorial of given positive integer using recursive function.
7. Write C++ program to create a class for student to get and print details of a student.
8. Write C++ program using Simple Parameterized Constructor for Find Prime Number.
9. Write C++ program to read and print student's information using two classes and simple inheritance.
10. Write C++ program to add two complex numbers using operator overloading.

Textbooks:

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
4. Herbert Schildt , "C++: The Complete Reference", 4th Edition

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Department of Engineering and Applied Sciences

Basic Electrical Engineering (ET10203A)

Teaching Scheme	Examination Scheme						
Credits: 3 Lecture (L): 2 hrs./week Practical (P): 2 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	--	25	125

Prerequisite course(s):

Course Objective(s): To enable the learner to understand and apply basic concepts of electrical engineering.

Course Outcomes:

Upon completion of the course, students will be able to

1. Calculate current, voltage and power in simple dc circuits using Kirchhoff's laws, Superposition theorem, Thevenin's theorem and Norton's theorem.
2. Solve single phase ac circuits consisting series combinations of resistance, inductance and capacitance along with phasor diagrams.
3. Compute efficiency, voltage regulation, voltage and current ratios in case of a two winding single-phase transformer applying fundamental concepts.
4. Calculate line and phase voltages and currents, active, reactive and apparent power in case of balanced three phase star and delta connected circuits by applying fundamental concepts with relevant phasor diagrams; compute energy consumption in elementary physical systems; identify measures of energy conservation in residential sector.
5. Use wires, wiring components and measuring instruments; identify low voltage switchgear components and types of earthing along with its necessity.
6. Verify theoretical concepts experimentally using components and instruments for simple electrical circuits and single-phase transformer.
7. Demonstrate a sound technical knowledge of selected project topic.

Unit I: DC Circuits

Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff's current and voltage laws, Superposition, Thevenin and Norton Theorems applicable to DC circuits. Time-domain analysis of first-order RC series circuit.

Unit II: Single phase AC Circuits

Representation of sinusoidal waveforms, peak, rms and average values, form factor and peak factor, phasor representation and phasor algebra. Analysis of single-phase ac circuits consisting of R, L, C and their series combinations such as RL, RC, RLC with concept of real power, reactive power, apparent power. Series resonance, Concept of power factor and importance of power factor improvement.

Unit III: Transformers

Magnetic materials, B-H characteristics.

Single phase transformer: - Ideal and practical transformer, emf equation, exact equivalent circuit, losses in transformers, computation of regulation and efficiency.

Single winding transformer (Auto-transformer): - Concept, advantages, limitations and applications.

Unit IV: Three phase AC Circuits and energy computations

Basic concepts in three-phase balanced circuits, voltage and current relations in star and delta connections. Power calculations.
Basics of three-phase transformer connections.
Elementary calculations for energy consumption in physical systems such as electric pump, lift, locomotives, residential appliances and monthly electricity bill calculations based on energy consumption.
Introduction to energy conservation and conservation measures in the residential sector.

Textbooks:

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

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. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
4. H. Cotton, Electrical Technology in MKS Units, 7th Edition, CBS Publishers and Distributors, 2004.

Laboratory work

A) 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. Study of components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, types
   of wires and Cables, necessity and types of earthing.
3. Verification of Kirchhoff's laws and Superposition Theorem.
4. A. Measuring the steady-state and transient time-response of series R-C circuits to a step change in voltage by using a circuit simulation package.
   B. Sinusoidal steady state response and analysis of series R-C circuits.
5. Direct load test on single phase transformer for efficiency and regulation computations and computation of transformation ratio.
6. Three-phase circuits: Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents) in Star and Delta connected balanced loads. Energy conservation in the residential sector.
7. Verification of Thevenin's and/or Norton's Theorem.

B) PBL/Seminars

Students will select a relevant topic for seminar/project from electrical engineering and will be evaluated based on presentation.

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Department of Engineering & Applied Sciences

Engineering Physics (ES10204A)

Teaching Scheme	**Examination Scheme**						
Credits: 3 Lecture (L): 2 hrs./week Practical (P): 2 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	-	25	125

Prerequisite course(s): Physics at the level of Standard XII

Course Objective(s):

1. To teach fundamental principles of Physics
2. Relate the fundamental principles of Physics to laboratory experiments
3. Relate the fundamental principles of Physics to applications

Course Outcomes:

Upon completion of the course, students will be able to

1. Determine displacement characteristics of free and forced oscillator with single degree of freedom
2. Determine electrical characteristics of intrinsic/ extrinsic semiconductor and a p-n junction diode on the basis of position of the Fermi level in their band structures
3. Determine Numerical Aperture (NA), Intermodal dispersion, Material dispersion and attenuation in an optical fibre for optical telecommunication
4. Correlate the characteristics like coherence, monochromaticity, directionality and intensity of a laser in general and Single Heterojunction Laser (SHL) and Optical Fibre Laser in particular, to basic building blocks as well as applications of lasers.
5. Perform experiments and analyse the data to understand underlying Physics
6. Use Project Based Learning (PBL) as a tool to learn Applied Physics

Unit I: Vibrations

Free undamped oscillations, Free damped oscillations, forced damped oscillations, resonance

Unit II - Semiconductor Physics

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

Unit III – Optical Fibre

Propagation of light through an optical fibre, Numerical Aperture, Dispersion: Intermodal dispersion, concept of multi-mode step refractive index, multi-mode graded refractive index, single mode optical fibre, Group velocity and Material Dispersion, Attenuation and selection of wavelength for Optical fibre communication application

Unit IV – Lasers

Building blocks of laser: 1) Meta stable state 2) pumping 3) Population inversion 4) Spontaneous emission 5) Stimulated emission 6) Optical cavity – threshold gain, monochromaticity, coherence, directionality (diffraction limited divergence), Gaussian Optics to determine diameter of the beam at the focal plane of a lens for determining maximum possible intensity.
Single Hetero-junction Laser: Construction, working, characteristics. Applications: Optical fibre communication, pumping for Optical Fibre Laser
Optical Fibre Laser: Construction, working, characteristics of fibre laser, Applications: Industrial laser cutting, drilling, welding of metals and non-metals. Advantage over other lasers like Nd:YAG, CO_2, etc.

Textbooks:

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
4. A Text Book of Physics and Non-linear Optics by B. B. Laud

Reference Books:

1. Dynamics of Structures – A. K. Chopra, Prentice Hall, New Jersey
2. Semiconductor Device Fundamentals – R. F. Pierret, Pearson
3. Fundamentals of Optics – Jenkins and White, Tata McGraw Hill
4. Fundamentals of Fiber Lasers and Fiber Amplifiers, Second Edition, Vartan V. Ter-Mikirtychev, Springer

Laboratory work

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

1. To determine the ultrasonic velocity in a liquid using Ultrasonic interferometer
2. To determine resonance frequency of Aluminium cantilever of different lengths
3. To determine band gap of a semiconductor from temperature dependence of its electrical resistance
4. To determine the Hall coefficient and number density of charge carriers of a semiconductor
5. To determine the beam profile and divergence of a laser beam
6. Damped oscillations - Mechanical
7. Damped oscillations – Electrical
8. NA of Optical fibre
9. Power attenuation in an optical fibre

B) PBL/Seminars

PBL/ Seminar on topics from the syllabus for all students

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Computational Science (ES10205A)

Teaching Scheme	**Examination Scheme**						
Credits: 2 Lecture (L): 1 hr./week Tutorial (T): 1 hr./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	-	-	-	-	-	25	25

Prerequisite course(s): Higher Secondary Level Mathematics

Course Objective(s):

1. Apply knowledge of computing, mathematics, science, and/or engineering appropriate to the discipline
2. Solve computational problems using various problem-solving aspects.

Course Outcomes:

Upon completion of the course, students will be able to

1. Evaluate a computer-based system, process, or program to meet desired needs within realistic constraints
2. Apply mathematical foundations, algorithmic principles, and computer science theory in the modelling and design of computer-based systems.

Unit I - Fundamental Concept

Overview of Computational Science - A view of Science, Birth of hybrid model-Computational Science, models, skills and regimes of Computational Science

Computers and Computational Science – data error and computational error, forward and backward error, conditional numbers and sensitivity, stability and accuracy

Computational Science tools – input-algorithm-output, programming language attributes, interpreted scripting languages, compiled languages.

Algorithm and Flowcharting, Name binding, Selection, Repetition, input-algorithm-output.

Unit II - Overview of problem solving

Introduction to Problem Solving- General Concepts, problem solving in everyday life, types of problems, problems solving with computers, difficulties with problem solving. Problem solving Aspects. Top Down Design, Implementation of Algorithms, Program verification, The Efficiency of Algorithm, The Analysis of algorithms. Fundamental Algorithm
Problem Solving Concepts for the Computer- Constants and variables, data types, functions, operators, expressions and equations.
Planning your solution-Communicating with computer, organizing the solution, testing the solution, coding the solution, software development cycle.

Textbooks:

1. Angela B. Shiflet and George W. Shiflet "Introduction to Computational Science, Modeling And Simulation For The Sciences" Second Edition, Princet on And Oxford Press.

2. Allen Holder and Joseph Eichholz, “An Introduction to Computational Science”, Springer publisher.

Reference Book:

1. Edwin D. Reilly , “Milestones in Computer Science and Information Technology”, Greenwood Publishing Group, 2003.
2. Harry Henderson, “Encyclopedia of Computer Science and Technology” 4th Edition
3. Karl Beecher, “Computational Thinking: A beginner's guide to problem-solving and programming”

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Department of Engineering & Applied Sciences

Engineering Graphics and Mechanical Workshop (ME 10206A)

Teaching Scheme	**Examination Scheme**						
Credits: 3 Lecture (L): 1 hr./week Practical (P): 4 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	-	-	-	-	-	50	50

Prerequisite course(s): Basic Mathematics & Geometry

Course Objective(s): To understand, visualize & able to draw technical drawing with basic understanding of various mechanical manufacturing processes in terms of their characteristics.

Course Outcomes:

Upon completion of the course, students will be able to

1. Interpret 3D object & able to draw it's 2D views.
2. Visualise & Create 3D object from 2D drawing.
3. Understand the basic principle of various manufacturing processes.

Unit I: Orthographic Projections and Sectional Views

Basic of Projections of Line, Plane & Solid, 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 sectional views

Unit II: 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

Textbooks:

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.
3. 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.

Reference Books:

1. "Engineering Drawing", DhananjayJolhe, Tata Mcgraw-Hill Publication.
2. Principals of Engineering Graphics, Frederick E. Giesecke, Alva Mitchell & others, Maxwell McMillan Publication.ISBN-13: 978-0023428203, ISBN-10: 0023428201

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

Content to be covered in Practical's (In 2 Sections)

Five Assignments on A2 (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 two problems on 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.

Mechanical Workshop & Manufacturing processes (Workshop Practical's)

1. Turning Job: One turning job in two students on a lathe machine involving plain turning, taper turning or step turning, Knurling, chamfering and centre drilling operation.

2. Carpentry Job : One job in a group of 4-5 students involving different carpentry joints.

3. Welding Job :One job in a group of 4-5 students involving different welding joint using arc welding machine.

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

5. Demonstration about following processes in a group of 20-25 students.

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

B) Forming: Introduction, hand press, different dies such as simple die, compound die, progressive die and its application.Demonstration of one utility job.

C) Moulding & Casting: Demonstration of mould in group of 4-5 students and one aluminium casting job.

D) Fitting : Demonstration of one fitting job involving 3-4 operations eg.sawing,filing,drilling,tapping etc.

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Energy, Water, Environment Sustainability (ES10207A)

Teaching Scheme	**Examination Scheme**						
Credits: 2 Lecture (L): 1 hr./week Tutorial (T): 1 hr./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	-	-	-	-	-	25	25

Prerequisite course(s): 10 + 2 Syllabus

Course Objective(s): To introduce concepts of energy resources and environmental systems.

Course Outcomes:

Upon completion of the course, students will be able to

1. Understand the resources of energy.
2. Understand the system of environmental engineering.

Unit I: Energy

1) Power Generation: Conventional and Non-conventional Energy Sources, Their Advantages, Disadvantages, Importance and Impact on Environment, Global Scenario, Present Status of Power Generation in India, in Maharashtra, Role of Private and Governmental Organizations.

2) Economics of Power Generation: Cost of Electric Energy, Fixed and Operating Cost, Load Curves.

3) Thermal Power Plant: General Layout of Modern Thermal Power Plant with different Circuits.

4) Hydroelectric Power Plant: Site Selection, Classification of HEPP (based on Head, Nature of Load, Water Quantity), Criteria for Turbine Selection.

5) Solar Power Plant: Based on Flat Plate Collector, Solar Ponds, Parabolic Solar Collector, Working Principal, Applications.

6) Tidal and Wind Power Plant: Components, Working Principle, Power Calculation, Classification of Wind Turbines, Operating Characteristics.

Unit II: Water, Environment Sustainability

1) Sustainability: Introduction, Importance, Sustainability in different Industries related to Power Generation and Environmental Parameters such as Air, Water, Land and Noise etc.

2) Air Pollution: Sources, Causes, Effects and Remedial Measures to control Air Pollution, Discussion on any one case study.

3) Water Pollution: Sources, Causes, Effects and Remedial Measures to control Water Pollution, Discussion on any one case study.

4) Land Pollution: Sources, Causes, Effects and Remedial Measures to control Land Pollution, Discussion on any one case study.

5) Noise Pollution: Sources, Causes, Effects and Remedial Measures to control Noise Pollution. Discussion on any one case study.

List of Tutorials:

1. Assignment on energy resources and applications such as electrical vehicles or hybrid vehicles or electrical batteries etc.
2. Assignment on principle and working of different types of power plants.
3. Assignment on criterion (such as operating cost, site selection etc.) of different types of power plants.
4. Assignment on calculation of electricity bill for small house having 5 tube lights and 5 fans.
5. Numericals on units of measurement of air pollutant for gas and particulate matter BOD calculation.
6. Case Study / Power Point Presentation on Pune city / Local environmental issues such as air pollution control system.
7. Case Study / Power Point Presentation on Pune city / Local environmental issues such as waste water management.
8. Case Study / Power Point Presentation on Pune city / Local environmental issues such as solid / hazardous waste (including e waste) waste management.
9. Case Study / Power Point Presentation on Pune city / Local environmental issues such as noise pollution control system.
10. Poster presentation on any topic related to energy and environmental engineering system.

Textbooks:

1. Domkundwar & Arora, Power Plant Engineering, Dhanpat Rai & Sons, New Delhi

2. R.K. Rajput, Power Plant Engineering, Laxmi Publications New Delhi

3. S.K. Garg, Environmental Engineering (Vol. II), Sewage Disposal and Air Pollution, Khanna Publishers

4. Peavy, Rowe and Tchobanoglous, Environmental Engineering, Tata McGraw-Hill Book Company

Reference Books:

1. E.I. Wakil, Power Plant Engineering, McGraw Hill Publications, New Delhi

2. P.K. Nag, Power Plant Engineering, McGraw Hill Publications, New Delhi

3. Metcalf Eddy, Wastewater Engineering, Treatment and Reuse, McGraw Hill Education

4. A.K. De, Environmental Chemistry 4th Edition, New Age International Publishers

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Department of Engineering and Applied Sciences

Logical Reasoning - (ES10208A)

Teaching Scheme	**Examination Scheme**						
Credits: 2 Lecture (L): 1 hr/week Tutorial (T): 1 hr/week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	-	-	-	-	-	25	25

Prerequisite course(s): Basic mathematics and logical thinking

Course objectives:

To enable the learner to understand and use logical reasoning for competitive exams

Course Outcomes:

Upon completion of course, students will be able to

1. To solve simple problems employing logical reasoning for Series & Analogy, Blood Relations, Directions, Seating Arrangement, Clocks & Calendars
2. To apply basic concepts from scientific methodology on everyday life problems using judgment and choice.

Unit I

Series & Analogy, Blood Relations, Directions, Seating Arrangement (Linear & circular), Clocks & Calendars

Unit II

Venn Diagrams - Two sets, Cubes & Dices, Binary Logic, Statements & Conclusions, Data Sufficiency

Textbooks:

1. R. S. Aggarwal, "A Modern Approach to Logical Reasoning", S. Chand Publication.

Reference Books:

1. 1. Peeyush Bhardwaj, "The Hands-on Guide to Analytical Reasoning and Logical Reasoning", Anhant Publication.
2. Arun Sharma, "How to Prepare for Logical Reasoning", McGraw Hill Publication.
3. Nishit Sinha, "Logical Reasoning and DI', Pearson Publication.
4. Moore, Parker, "Critical Thinking", McGraw Hill Publication..

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Calculus (ES10201B)

Teaching Scheme	**Examination Scheme**						
Credits: 4 Lecture (L): 3 hrs./week Tutorial (T): 1 hr./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	-	25	125

Prerequisite course(s): Basics of derivatives, integration and plane geometry.

Course objectives:

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:

Upon completion of course, students will be able to

1. Apply the knowledge of partial differentiation to find Jacobian, in estimating error and approximation and in finding extreme values of the function of several variables etc.
2. Apply advanced techniques of integration such as Reduction formulae, Beta functions, Gamma functions needed in evaluating integrals of higher level like multiple integrals.
3. Learn the Fourier series representation and harmonic analysis for design and analysis of periodic continuous and discrete systems.
4. Apply the effective mathematical tools for solutions of first order differential equations that model physical processes.
5. Demonstrate the nature of curves like Cardioide, Astroid,Lemniscate, Rose curve by tracing the same and measure arc lengths of various curves.
6. Evaluate multiple integrals and apply the knowledge of multiple integrals in it's various applications.

Unit I – Partial Differentiation

Introduction to functions of several variables, Partial Derivatives, Euler's Theorem on Homogeneous functions, Partial derivative of Composite Function, Total Derivative.

Unit II – Applications of Partial Differentiation

Jacobian and its applications, Errors and Approximations, Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.

Unit III – Integral Calculus and Fourier Series

Reduction Formulae, Gamma and Beta functions, Full range Fourier series, Half range Fourier series, Harmonic analysis.

Unit IV–Differential Equations and their applications

Exact differential equations, Linear differential equations, Equations reducible to linear form, Bernoulli's equation, Applications of first order differential equations.

Unit V – Curve Tracing

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

Unit VI – Multiple Integrals and their applications

Double integration, Change of order of integration, Triple integration, Applications of Multiple Integrals.

Text Books

1. Higher Engineering Mathematics by B.S.Grewal, Khanna Publisher.
2. Higher Engineering Mathematics by B.V.Ramana., Tata McGraw Hill Publisher
3. Higher Engineering Mathematics by H.K.Dass., S.Chand Publication
4. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons.

Reference Books:

1. Advanced Engineering Mathematics by Peter O'Neil, Global Engineering, Publisher.
2. Textbook of Applied Mathematics (Volume I & II), by P.N.Wartikar & J.N. Wartikar Pune Vidhyarthi Griha Publisher.
3. Advanced Engineering Mathematics by C.Ray Wylie and L.Barrett, McGraw Hill Publications.
4. Advanced Engineering Mathematics by M.Greenberg, Wiley Publications.

List of Tutorials

1. Evaluation of partial derivatives, Euler's theorem on homogeneous functions
2. Partial derivative of Composite Function, Total Derivative.
3. Jacobian, Errors and approximations
4. Maxima and minima of functions of two variables, Lagrange's methods of undetermined multipliers
5. Reduction formulae, Gamma function, Beta function
6. Fourier Series and Harmonic analysis
7. Solution of Exact differential equations and Linear differntial equations
8. Solution of Non-linear differential equations and Bernoulli's equations
9. Tracing of cartesian and parametric curves
10. Tracing of polar curves, rectification of curves

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Python for Engineers (CS10202B)

Teaching Scheme	**Examination Scheme**						
Credits: 3 Lecture (L): 2 hrs./week Practical (P): 2 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	-	25	125

Prerequisite course(s): Basic of Coding Syntax.

Course Objective(s):

1) Acquire the knowledge of Python, script programming language.
2) Understand the flow of programming.
3) Acquaint with different tools in python.
4) Understand and implement file handling concept in Python.

Course Outcomes:

Upon completion of the course, students will be able to

1) Understand basics of python programming.
2) Develop and implement control statements, functions with packages.
3) Apply Numpy and plotting tools in python.
4) Create and apply file handling operations.

Unit I: Introduction to python

Script Model Programming, Understanding Python variables, basic Operators, Declaring and using Numeric data types: int, float, complex, Using string data type and string operations, Defining list and list slicing, List manipulation using in build methods, Use of Tuple data type , Dictionary manipulation .

Unit II: Python Program Flow Control, functions and packages

Conditional blocks using if, else and elif, Simple for loops in python ,For loop using ranges, string, list and dictionaries ,Use of while loops in python , Loop manipulation using pass, continue, break and else. Programming using Python conditional and loops block. Programming using string, list and dictionary in build functions. Organizing python codes using functions , Understanding Packages Powerful Lamda function in python Programming using functions, modules and external packages.

Unit III: Numpy and Matplotlib

What is Numpy? How to install Numpy, Arrays, Array indexing, Array Vs Listing Data types, Array math, Broadcasting. Matplotlib -Plotting, subplots and images.

Unit IV: Python file operation

Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(). Understanding write functions, write() and writelines(). Manipulating file pointer using seek. Programming using file operations.

Laboratory work

Practical Assignments List(Any 6 Lab assignments)

1. Install Anaconda and Anaconda Navigators (use of spyder, Jupyter and colab notebook).
2. Implement Basics of python:
    a. Write a program to read (input ()) Celsius temperature and print (print ()) equivalent Fahrenheit temperate on screen.
    b. Write three functions that calculate the remainder of two integers by using: (a)the basic operators of +, -, * and / (why is // not required?)
    (b)the divmod function(c)the % operator
    c. Copy-paste this super-nested Python list-dictionary**:** Test=[{'Arizona': 'Phoenix', 'California': 'Sacramento', 'Hawaii': 'Honolulu'}, 1000,2000,3000,['hat', 't-shirt', 'jeans', {'socks1': 'red', 'socks2': 'blue'}]](a)Return 2000 on your screen. (b)Return the dictionary of the cities and states on your screen. (This=[{'Arizona': 'Phoenix', 'California': 'Sacramento', 'Hawaii': 'Honolulu'}. (c)Return the list of the clothes on your screen! (This,['hat', 't-shirt', 'jeans', {'socks1': 'red', 'socks2': 'blue'}]) (d) Return the word 'Phoenix' on your screen. (e) Return the word 'jeans' on your screen. (f)Return the word 'blue' on your screen.
3. Write a Python program to check whether a character is uppercase or lowercase alphabet.
4. Write a Python program to Print your name 10 times using for loop.
5. Write a Python program to print Fibonacci series up to n terms.
6. Create a Python script that finds out your age in a maximum of 10 tries. The script can ask you only one type of question: guessing your age! (e.g. "Are you 67 years old?") And you can answer only one of these three options: (a)Less (b)More (c)Correct
7. Write a Python program to find factorial of given number (using fact() function).
8. Write a python program to create two 3X3 random matrixes and perform following operation: (a) Addition (b) subtraction (c) multiplication and display shape, dimensions, dtype, Rank and flatten output of every o/p matrix.
9. Write a Python program to plot line chat, bar chart, pi chart, scatter chart, histogram for taking two different arrays as input.
10. Write a Python program to read a given .txt file and count total number of 'the' in the given file, find total words and total lines in the file.

Textbooks:

1. Python Programming, McGraw Hill Education, Ashok and Amit Kamthane.
2. Python Programming by Adam Stewart.
3. Python Programming for the absolute Beginners, Third edition, Michael Dawson.
4. Python programming by Krishna Rungta.
5. Python Crash course, 2nd Edition , Ahands on, project based introduction to programming, Eric Matthes.

Reference Books:

1. Python Data Analytics with Pandas, Numpy and Matplotlib by Fabio Nelli.
2. Dive into Python, Mike
3. Learning Python, 4th Edition by Mark Lutz
4. Programming Python, 4th Edition by Mark Lutz.
5. Python Data Science Handbook: essential Tools for working with data by Jake Vander Plas.

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Basic Electronics Engineering (ET10203B)

Teaching Scheme	**Examination Scheme**						
Credits: 3 Lecture (L): 2 hrs./week Practical (P): 2 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	-	25	125

Prerequisite course(s): Physics

Course Objective(s):

1. To impart knowledge of semiconductor devices such as diode, BJT and MOSFET with their operational characteristics & applications.
2. To introduce electronic circuits using BJT and MOSFET devices for small signal and at low frequency.
3. To simulate electronics circuits using computer simulation software to obtain desired results.
4. To familiarize the students with different linear integrated circuits using operational amplifier.

Course Outcomes:

Upon completion of the course, students will be able to

1. Understand construction and working of diode to analyze diode applications.
2. Explain the construction, working and characteristics of BJT to construct amplifier and switch circuits.
3. Understand the working of MOSFET and power devices for various electronics applications.
4. Illustrate and explain the working of simple Linear Integrated circuits using OP-AMPs

Unit I: Diode Circuits

Working and Characteristics of P-N Junction Diode, Diode applications- Half-wave rectifier, Full-wave rectifiers(center tapped ,Dual complementary bridge rectifier), Zener diode-working, Characteristics, & its applications, Light Emitting Diodes (LED) and Photodiodes & their applications.

Unit II: Bipolar Junction Transistor (BJT) Circuits

BJT types, structure, operation and Characteristics, Transistor configurations- Common-Emitter CE, Common Base CB, Common Collector CC configuration, DC load line, voltage divider biasing, Bias stabilization, Transistor as a CE amplifier, Transistor as a switch, RC and LC oscillators.

Unit III: Field-Effect Transistor (FET) and Power Devices

Introduction of FET, Types of MOSFET, construction and working of n-channel and p-channel E-MOSFET, V-I characteristics. MOSFET biasing circuit, MOSFET amplifier configurations- Common-Source (CS) amplifier, Common-Drain (CD) amplifier (source follower), and Common-Gate (CG) amplifier. Power Devices- Construction, working, characteristics and applications of Silicon-Controlled Rectifier (SCR), TRIAC.

Unit IV: Linear Integrated Circuits

Introduction to operational amplifiers, Block diagram of OP-AMP, Ideal characteristics of OP-AMP, Positive feedback, Negative feedback, Inverting & Non inverting Amplifier, Comparators, Summing amplifier, Difference amplifier. Voltage Regulator – 3 terminal Fixed & variable.

Text books:

1. Floyd, "Electronic Devices and Circuits", Pearson Education.
2. Robert L. Boylestad, Louis Nashelsky-"Electronic Devices and Circuit Theory" -Prentice Hall.
3. David A. Bell, "Electronic Devices and Circuits", 5th Edition, Oxford press.
4. N.P. Deshpande, " Electronic Devices and Circuits", McGraw-Hill Education (India) Pvt Ltd.

Reference Books:

1. Albert Malvino, "Electronic principles",7thEd,TataMc-Graw-Hill.
2. Ramakant Gaikwad, "Linear Integrated Circuits", Pearson Education.
3. Donald Neamen, "Electronic Circuits Analysis and Design", 3rd Edition, TMH.
4. Jacob Millman, Christos C. Halkias, " 5th Edition Integrated Electronics Analog And Digital & System", McGraw-Hill.

Laboratory work

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

1. Demonstration of CRO for its usage in test and measurements.
2. Demonstration of DMM for its usage in test and measurements.
3. Demonstration of Function generator for its usage in test and measurements.
4. Simulate half wave and full wave rectifier circuits using diode and observe input and output waveforms.
5. Simulate BJT as a switch using LED as a display device.
6. Simulate LC/RC oscillator using BJT.
7. Simulate Single Stage MOSFET Common Source amplifier circuit with bypass capacitor.
8. Simulate Inverting and Non Inverting amplifier using Opamp.

B) PBL/Seminars

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Materials Science-[ES10209B]

Teaching Scheme	**Examination Scheme**						
Credits: 3 Lecture (L): 2 hrs./week Tutorial (T): - hr. Practical (P): 2 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	-	25	125

Prerequisite course(s): Chemistry 10+2 level

Course Objective(s):
To provide the students with basic knowledge of materials, to enable them to use structure-property relationship in appropriate engineering applications.

Course Outcomes:
Upon completion of the course, students will be able to

1. Explain science of materials like Portland cement, refractory and fly ash bricks, metal alloys and smart materials
2. Explain polymers and specialty polymers based on structure property correlation and polymer recycling
3. Explain chemical and electrochemical corrosion along with methods used for prevention of corrosion.
4. Explain and identify materials using material characterisation techniques like X ray diffraction, UV and IR spectroscopy, microscopy
5. Use PBL/Seminars as a tool for reinforcing learning of concepts in Material science

Unit I: Science of Engineering Materials

Introduction
Basis of material selection
Materials for construction industry- Portland Cement: Composition of Portland cement, Setting and hardening of cement, ISI specifications of Portland cement
Refractory and Fly ash bricks–
Metal Alloys: Introduction, classification, Engineering applications
Smart materials: Introduction, classification, types of smart material and their applications- Shape memory alloy, Piezoelectric materials, Magnetostrictive Materials, Magneto-Rheological Fluids, Electro-Rheological Fluids, materials for smart pavement

Unit II: Engineering Polymers

Introduction- Some basic definitions, synthesis of polymers, elastomers, fibers, plastics, Thermoplastic, Thermosetting polymers, Vitrimers
Properties of polymers: Molecular weight, Crystallinity, Tg, Tm
Specialty Polymers
Conducting polymers, Liquid Crystal polymers, Electroluminescent polymers, Fiber reinforced plastic (FRP), self-healing polymers
Applications of polymers: applications of polymers in construction industry, electronic industry and mechanical industry
Recycling of plastics

Unit III: Corrosion Science

Corrosion Science: Introduction, Types of corrosion, Mechanism of chemical and electrochemical corrosion, Galvanic corrosion and Concentration cell corrosion
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

Unit IV: Material characterization Techniques

X-ray diffraction technique

Spectroscopic Techniques - Fundamentals of spectroscopy,

a) **Ultraviolet (UV)-Visible spectroscopy**- Principle of UV-Visible spectroscopy, Beer-Lambert's law, Types of electronic transitions, Terms related to UV – Visible spectroscopy, Instrumentation of UV – Visible spectroscopy, Applications of UV-Visible spectroscopy
b) **Infrared (IR) spectroscopy** –Principle of IR spectra, requirements of IR absorption, Calculation of vibrational frequency, Modes of vibration, Factors influencing IR spectra, Instrumentation of IR spectroscopy, Applications of IR spectroscopy

Study of morphology: Optical and Electron microscopy

Textbooks:

1. Materials Science and Engineering: An Introduction. W. D. Callister, D. G. Rethwisch. 10th Ed., Wiley publication
2. Engineering Chemistry- Jain and Jain, Dhanpat Rai and CO.
3. Engineering Chemistry - O. G. Palanna, Tata McGraw Hill Education Pvt. Ltd.
4. A Textbook of Engineering Chemistry – Shashi Chawla, Dhanpat Rai and CO.
5. An introduction to Metallic Corrosion and its prevention – Raj Narayan (Oxford and IBH, 1983)
6. Text Book of Material science and Metallurgy – O P Khanna (Dhanpat Rai & Sons, 1984)

Reference Books:

1. Basic Concept of Analytical Chemistry, 2ed , S. M. Khopkar, New Age-International Publisher

2. Instrumental Methods of Chemical Analysis, G. R. Chatwal& S. K. Anand, Himalaya Publishing House

3. Spectroscopy of organic compounds, 2 ed, P. S. Kalsi, New Age-International Ltd., Publisher

4. Polymers: Chemistry and Physics of modern materials, J.M.G. Cowie, Valeria Arrighi, 3rd edition, CRC press

5. Smart Materials and Structures, M. V. Gandhi and B. S. Thompson, Chapman and Hall, London, First Edition, 1992.

Laboratory work
A) List of experiments (Any 6 out of the following experiments)
1. (A)Chemical safety and disposal (B) Determination of error and error analysis 2. Determination of calcium in cement 3. Determination of loss on ignition of Portland cement 4. Determination of Copper from Brass 5. Determination of Iron from Steel 6. Determination of molecular weight by viscosity of polymer 7. Preparation of polymers 8. Determination of rate of corrosion in different pH media 9. Colorimetric estimation of Fe^{+3} from a given sample 10. Virtual lab experiment- Molecular Absorption Spectroscopy 11. Virtual lab experiment-Basics of Scanning Electron microscopy
B) PBL/Seminars
One project/seminar based on syllabus of Material Science

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Department Engineering & Applied Sciences

Smart Sensors (ES10205B)

Teaching Scheme	**Examination Scheme**						
Credits: 2 Lecture (L): 1 hr./week Tutorial (T): 1 hr./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	-	-	-	-	-	25	25

Prerequisite course(s): Basic concepts of Electronics Devices

Course Objective(s):

1. To introduce fundamentals of sensors and provides essential knowledge about design of signal conditioning circuits for the purpose of interfacing with embedded hardware.
2. To introduce current state of art for SMART materials and Smart sensors, Fabrication techniques and real life examples of current era and future technologies of electronic systems.

Course Outcomes:

Upon completion of the course, students will be able to

1. Explain the process and methodology of sensing physical parameters by using transducers and sensors
2. Explain the best uses of smart sensors in the IOT and Industrial domain.

Unit I: Introduction of Basic Transducers, Sensors and Their Signal Conditioning

Introduction of Basic Transducers and Sensors:

Introduction of Instrumentation systems, Performance terminology, Different Transduction principles,

Transducers for :- Displacement, Velocity and Motion

Sensor Introduction:- Proximity sensors, Temperature sensors, Humidity, Force, Pressure, Flow, Level, pH and Conductivity sensors (*Introduction of Physical parameters and sensing methods*).

B] Op-Amp Based Signal conditioning

Analog signal conditioning for different sensors – Use of bridge circuits and Instrumentation amplifiers

Op-Amp based Signal converters like V/I and I/V converters,

Signal Conditioning of Digital Sensors: proxy, accelerometer, GPS, compass

Unit II: Introduction and Applications of Smart Sensors in IOT and Industry 4.0

A] Smart Sensors:

Architecture of Smart Sensors: Important components, their features, SMART Materials.

Evolution of Smart Sensors, Advantages, Application area of Smart Sensors,

B] Use of Smart Sensors in IOT enabled devices and in Industry 4.0:

Discussion on Fabrication Methods of - CMOS, MEMS , System on Chip (SOC), Micro machined sensors.

Need of Smart Sensors in IOT, ROBOTICS and Modern industrial applications,

Textbooks:

5. David G. Alciatore, Michael B Histand; " Introduction to Mechatronics and Measurement System "; Tata Mc Graw Hill
6. Operational Amplifiers and Analog Integrated Circuits by Franco S. McGraw Hill International Edition, 1988

Reference Books:

1. S.C. Mukhopadhyay · G.S. Gupta: "Smart Sensors and Sensing Technology" Springer
2. Understanding Smart Sensors by Randy Frank, Artech House sensors library 7th Edition

List of Tutorials:

1. A Smart Temperature Sensor

2. A Smart Hall effect based Sensor

3. SMART Streetlights

4. Smart City Applications

5. Smart Fridge

6. Smart Washing Machine

7. Smart Military Applications

8. SMART DUST

9. Non-contact based temperature measurement for COVID-19 patients.

10. COVID-19 patient vicinity detection by smart sensor hubs.

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Department Engineering & Applied Sciences

Engineering Mechanics (CV10206B)

Teaching Scheme	**Examination Scheme**						
Credits: 3 Lecture (L): 2 hrs./week Tutorial (T): 1 hr./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	-	-	-	-	-	50	50

Prerequisite course(s): Physics, Mathematics

Course Objective(s):

To apply the principles of mechanics to practical engineering problems.
To develop simple mathematical model for engineering problems and carry out static analysis.
To carry out kinematic and kinetic analyses for particle.

Course Outcomes: Upon the completion of the course, students will be able to

1. Classify force system and perform resolution and composition of forces.
2. Interpret and apply principles of statics for coplanar force system with and without dry friction on horizontal and inclined plane.
3. Determine centroid and moment of inertia of plane laminae.
4. Apply principles of kinematics and kinetics to determine position, velocity and acceleration of particles in linear and curvilinear motion.

Unit I: Resolution and composition of forces.

Introduction - Fundamental concepts, Laws of mechanics, force and it's characteristics, system of forces, resolution and composition of forces.
Coplanar force system - Moment of a force, couple, Varignon's theorem of moments, resultant of concurrent, parallel and general coplanar forces.

Unit II: Equilibrium of Forces

Free body diagram, equilibrium of Coplanar force systems, two force and three force members Types of supports, Types of loads – (point loads and uniformly distributed loads and moments only) Application of equilibrium equation to simply supported, cantilever beam.
Friction- characteristics and laws of dry friction, friction on horizontal and inclined plane surfaces, wedge friction.

Unit III: Centroid and moment of inertia of plane laminae

First and second moment of area, centroid and moment of inertia of plane laminae , Parallel and perpendicular Axis Theorem, Polar Moment of Inertia – Radius of gyration .

Unit IV: Introduction to Dynamics

Kinematics of Particle : Rectangular co-ordinate system, Normal and Tangent system, relation between rectangular system and normal and tangent components of acceleration.
Rectilinear Motion: uniform acceleration and variable acceleration motion,
Curvilinear Motion: Circular motion, projectile motion on horizontal plane
Kinetics of particle : Newton's second law of motion and it 's application to types of motion mentioned above.

Textbooks:

1. Mechanics for Engineers - Fourth Edition, by F. P. Beer and E. R. Johnson, McGraw-Hill Publication.
2. Engineering Mechanics - S. S. Bhavikatti, K. G. Rajashekharappa, New Age International (P) limited publisher
3. Tayal A. K., Engineering Mechanics- Statics and Dynamics, Umesh Publications

Reference Books:

1. 1. Engineering Mechanics - statics and dynamics by J. L. Meriam and Craige, John Willey and Sons
   Publication.
2. Engineering Mechanics - Statics and dynamics by R. C. Hibbeler, McMillan Publication.

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Department Engineering & Applied Sciences

Personality Development and Professional Ethics (ES10207B)

Teaching Scheme	**Examination Scheme**						
Credits: 02 Lecture (L): 1hr./week Tutorial (T): 1hr./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	-	.	-	-	-	25	25

Prerequisite course(s):-

Course Objective(s):

1. To discuss various aspects of personality development
2. To discuss Professional ethics w.r.t engineering as a profession and its code of ethics

Course Outcomes:

Upon completion of the course, students will be able to

1. Evaluate strength and weakness through SWOT analysis
2. Set personal and professional goals
3. Understand engineering as a profession
4. Understand code of ethics laid by professional body e.g. NSPE

Unit I: Personality Development

The concept of personality, Dimensions of personality, concept of success and failure, SWOT analysis, attitude and motivations, internal and external motives, self-esteem, body language, conflict and stress management, problem solving skills, interpersonal relations, goal setting (SMART), time management, Team building (with perspective of leader and member) , managerial skills

Unit II: Professional Ethics

Profession, Engineering as a profession, Roles and Responsibilities of an engineer, Business Vs Professional model, Ethics, Code of ethics, Code of conduct, Ethics from engineer's perspectives, Professional bodies for engineering ethics, NSPE code of ethics, professional obligations, ethical dilemma, sample cases of dilemma.

Textbooks:

1. Swami Vivekanand, "Personality development" Published by Ramakrishna math and Ramakrishna Mission (2011)
2. Heller, Robert, "Effective leadership. Essential Manager series". Dk Publishing, 2002
3. NSPE code of Ethics: NSPE Open Web source

Reference Books:

1. Charles E. Harris, Michael S. Pritchard, and Michael J. Rabins, "Engineering Ethics concepts and cases", Fourth Edition, Wadsworth, Cengage Learning,2009
2. Engineering ethics in practice: a guide for engineers, Royal Academy of engineering

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Quantitative Aptitude - (ES10208B)

Teaching Scheme	**Examination Scheme**						
Credits: 2 Lecture (L): 1 hr/week Tutorial (T): 1 hr/week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	-	-	-	-	-	25	25

Prerequisite course(s): Basic mathematics

Course objectives:
To enable the learner to understand and use quantitative aptitude for competitive exams

Course Outcomes:
Upon completion of course, students will be able to
1. To solve simple problems employing quantitative aptitude on numbers.
2. To apply basic concepts of time & work, basic physic laws and probability to everyday problems.

Unit I

Numbers - types, divisibility rules, Factors, LCM & HCF, Cyclicity & Remainders, Percentages, Ratio, Proportion

Unit II

Time & Work, Pipes & Cisterns, Time, Speed & Distance, Trains, Boats & Races, Permutation & Combination

Text Books

Dr. R. S. Aggarwal, "Quantitative Aptitude for Competitive Examinations", S. Chand Publications.

Reference Books:

1. Arun Sharma, "How to Prepare for Quantitative Aptitude". Tata McGraw Hill.
2. K. Sarvesh Verma, "Quantitative Aptitude Quantum Cat Common Admission Test" Arihant Publications.
3. Abhijit Guha, "Quantitative Aptitude for Competitive Examinations", Fourth Quarter.

Bansilal Ramnath Agarwal Charitable Trust's
Vishwakarma Institute of Information Technology, Pune-48
(An Autonomous Institute affiliated to Savitribai Phule Pune University)
Department Engineering & Applied Sciences

German (Audit Course)

Teaching Scheme	**Examination Scheme**						
Credits: - Lecture (L): 1hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	-	-	-	-	-	-	-

Prerequisite course(s):-

Course Objective(s):

1. To enable the students to understand the basic language structures in German which are used in everyday context
2. To read, understand & write simple and correct German
3. To be able to communicate in German using simple grammar structures and a core vocabulary

Course Outcomes:

Upon completion of the course, students will be able to

1. able to communicate (read, write and speak) in German
2. aware of the close connection between German and English as well as with Indian languages.
3. able to obtain awareness about various opportunities and career options, as well as provide a 'world view'

Course Content

1. Introduction to German Language : Introduction to script, Ordinal Numbers.
2. Basic vocabulary for self introduction,Greetings and Expression
3. Colors, Days of the week
4. Declension of Nouns
5. Nominative and Accusative cases, Negation with "kein/e/er"
6. Plural/Modal Verbs
7. Personal Pronouns, Prepositions
8. Conjugation of verbs in Present Tense and Present Perfect Tense
9. Separable and Inseparable Verbs
10. Telephone Conversations

Textbooks/ Reference Books:

Netzwerk A1, Goyal Publishers & Distributors Pvt Ltd, Author – Stefanie Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber

Bansilal Ramnath Agarwal Charitable Trust's

Vishwakarma Institute of Information Technology, Pune-48

(An Autonomous Institute affiliated to Savitribai Phule Pune University)

Department Engineering & Applied Sciences

French (Audit Course)

Teaching Scheme	**Examination Scheme**						
Credits: - Lecture (L): 1hr/week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	-	-	-	-	-	-	-

Prerequisite course(s):

Course Objective(s):

1. To enable the students to understand the basic language structures in French which are used in everyday context
2. To read, understand & write simple and correct French.
3. To be able to communicate in French using simple grammar structures and a core vocabulary

Course Outcomes:

Upon completion of the course, students will be able to

1. Communicate (read, write and speak) in French
2. Aware of the close connection between French and English as well as with Indian languages.
3. Obtain awareness about various opportunities and career options, as well as provide a 'world view'

Course Content

1. Introduction to French Language. Introduction to script, Cardinal & ordinal numbers
2. Greetings & Introduction- Self-Introduction, Introducing other person
3. Nationalities
4. Days of the week, months of the year and colors
5. Conjugation of regular verbs in Present Tense
6. Conjugation of irregular verbs in Present Tense
7. Articles, Prepositions
8. Asking and answering the questions
9. Telephone conversation
10. Festivals of France

Textbooks/ Reference Books

Jumelage, Methode de Francais, Niveau 1, Author – Manjiri Khandekar and Roopa Luktuke, Saraswati House Pvt Ltd, New Delhi

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Department Engineering & Applied Sciences

Japanese (Audit Course)

Teaching Scheme	**Examination Scheme**						
Credits: - Lecture (L): 1hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	-	-	-	-	-	-	-

Prerequisite course(s):

Course Objective(s):

1. To meet the needs of ever growing industry with respect to language support.
2. To get introduced to Japanese society and culture through language
3. To develop aptitude for language

Course Outcomes:

Upon completion of the course, students will be able to

1. do basic communication in Japanese Language
2. get acquainted with Japanese script
3. get introduced to reading , writing and listening skills
4. develop interest to pursue professional Japanese Language course

Course Content

1. Introduction to Japanese Language.
2. Self-Introduction, Introducing other person
3. Greetings and expressions
4. Colors, Days of the week
5. Hiragana basic Script, Hiragana : modified Kana, double consonant, Letters combined with ya, yu, yo Long vowels
6. Numbers, Months, Dates, Telephone numbers
7. Stating one's age.
8. Katakana basic Script, Modified kana, double consonant, letters with ya, yu, yo, Long vowels
9. Denoting things (nominal & prenominal demonstratives)
10. Describing time, describing starting & finishing time (kara ~ made) Point in time (denoting the time when any action or the movement occurs)

Textbooks/Reference Books:

1. Minna No Nihongo, “Japanese for Everyone”, Elementary Main Text book 1-1 (Indian Edition), Goyal Publishers & Distributors Pvt.
2. Nihongo shoho,
3. Haru 1 **,**Maharashtra State Bureau of Textbook Production and Curriculum Research, Pune.

Bansilal Ramnath Agarwal Charitable Trust's

Vishwakarma Institute of Information Technology, Pune-48

(An Autonomous Institute affiliated to Savitribai Phule Pune University)

Department Engineering & Applied Sciences

English (Audit Course)

Teaching Scheme	Examination Scheme						
Credits: - Lecture (L): 1hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
Tutorial (T): 0 hr. Practical (P): 0 hrs./week	-	-	-	-	-	-	-

Prerequisite course(s):

Course Objective(s):

4. To acquire strategic competence to use both spoken & written language to excel in competitive examinations
5. To develop student's ability to understand and summarize the given comprehensions and essays

Course Outcomes:

Upon completion of the course, students will be able to

1. express themselves using proper spoken and written communication
2. listen, recite and record the given comprehensions and essays.

Course Content

1. Application Writing
2. Essay Writing
3. Comprehension / Reading
4. Listening Skills (Reading the paragraphs, Listening the audio recordings of lectures and conversations and writing both in brief)
5. Speaking Skills (It can be based on the reading and listening task or prepare and speak)
6. Review Writing (Includes listening and writing)

Textbooks/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