Bansilal Ramnath Agarwal Charitable Trust's

Vishwakarma Institute of Information Technology, Pune-48

(An Autonomous Institute affiliated to Savitribai Phule Pune University)

Department of Electronics and Telecommunication Engineering
F.Y. B. Tech (E &TC), SEMESTER I (PATTERN 2023-NEP)
w. e. f. AY 2023-24

Course Code	Course Title	Course Type	Teaching Scheme			Examination Scheme					Total	Credits
			L	T	P	CIE	ISE	SCE	ESE	Pr/Or /TW		
BS10231	Linear Algebra	TH	3	1	-	20	20	20	40	25	125	4
BS11234ET	Physics	TH	2	-	2	20	20	20	40	25	125	3
ET11235	Basic Electronics Engineering	TH	2	-	2	20	20	20	40	25	125	3
ET11236	Python Programming for Engineers	TH	2	-	2	20	20	20	40	25	125	3
ET11237	Electronic Measurements and Sensor Technology	CE	1	-	2	-	-	-	-	50	50	2
BS11238	Indian Science and Technology	CE	1	1	-	-	-	-	-	50	50	2
BS11239	English for Technical Writing	CE	1	1	-			-	-	50	50	2
	Total		12	3	8	80	80	80	160	250	650	19

Nomenclature:
L- Lecture; T: Tutorial; P: Practical; CIE: Continuous Internal Evaluation; ISE: In Semester Examination; SCE: Skills and Competency Examination; ESE: End Semester Examination; Pr: Practical Examination; Or: Oral Examination; TW: Term work

HOD ETC	Dean Academics	Director
(Dr. Mrs. S.K. Habbu)	(Dr. Abhijit Chitre)	(Dr. Vivek Deshpande)

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Vishwakarma Institute of Information Technology, Pune-48

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Department of Electronics and Telecommunication Engineering
F.Y. B. Tech, SEMESTER II (PATTERN 2023-NEP)
w. e. f. AY 2023-24

Course Code	Course Title	Course Type	Teaching Scheme			Examination Scheme					Total	Credits
			L	T	P	CIE	ISE	SCE	ESE	Pr/Or /TW		
BS10232	Calculus and ordinary Differential equations	TH	3	1	-	20	20	20	40	25	125	4
BS10233	Environmental Science	TH	2	-	2	20	20	20	40	25	125	3
ET12233	Basic Electrical Engineering	TH	2	-	2	20	20	20	40	25	125	3
ET12234	Object Oriented Programming	TH	2	-	2	20	20	20	40	25	125	3
ET12235	Digital Electronics	TH	2	-	2	20	20	20	40	25	125	3
ET12236	Electronics Workshop Practice	CE	1	-	2	-	-	-	-	50	50	2
ME12237	Maker's Lab	CE	-	-	2			-	-	25	25	1
BS12238	Cocurricular activity NSS/Club Activities/Cultural Activities/ Performing Arts	CE	0	-	4	-	-	-	-	50	50	2
BS112310	Yoga and Sports Ethics	CE	-	-	4	-	-	-	-	50	50	2
	Total		12	1	20	100	100	100	200	300	800	23

Nomenclature:
L- Lecture; T: Tutorial; P: Practical; CIE: Continuous Internal Evaluation; ISE: In Semester Examination; SCE: Skills and Competency Examination; ESE: End Semester Examination; Pr: Practical Examination; Or: Oral Examination; TW: Term work

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BS10231 - Linear Algebra

Teaching Scheme	Examination Scheme					
Credits: 04	CIE	ISE	SCE	ESE	TW	Total
Lecture (L): 03 hrs / week **Tutorial (T):** 01 hr / week	20	20	20	40	25	125

Prerequisite: Basics of derivatives, integration, plane geometry and vector algebra

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 & apply the knowledge of eigenvalues & eigenvectors in various fields of Engineering.
6. Analyse transformations and perform contour integration of complex functions required in Image processing, Digital filters and Computer graphics.

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 & Independence of vectors, Basis & dimension of a vector space, Row space, Column Space & 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 fitting to data.

Unit V – Eigen Values and Eigen Vectors

Eigen Values and Eigen Vectors of a matrix, Algebraic and geometric multiplicity, Cayley-Hamilton Theorem, Diagonalization of a matrix, Introduction to Quadratic forms, Definiteness of quadratic form, Sylvester's Criterion, Applications of quadratic forms.

Unit VI – Complex Variables

Functions of Complex Variables, Analytic Functions, Miline Thompson's Method, Cauchy-Riemann Equations, Harmonic Functions, Contour Integral, Cauchy's Integral formula.

Text Books

1. Elementary Linear Algebra by Howard Anton & Chris Rorres, John Wiley & sons.
2. Linear Algebra and its Applications by David C. Lay, Pearson.
3. Linear Algebra and its applications (4^{th} edition) by Gilbert Strang, Cengage Learning.
4. Advanced Engineering Mathematics, by Erwin Kreyszig, John Wiley & Sons.

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: A Modern Introduction (4th Edition) by David Poole, Linear Cengage Learning
3. Linear Algebra: An Introduction by Ron Larson and David C. Falvo, Cengage Learning
4. Higher Engineering Mathematics.by B. V. Ramana., Tata McGraw Hill Publisher

List of Tutorials :

1. Problems on Rank of matrix, Elementary Matrices
2. Problems on system of linear equations, Gauss-Jordan Elimination & Applications of System of Linear equations.
3. Problems on Vector Space, Subspace.
4. Problems on Linear Dependence, Independence, Basis and dimension of a vector space.
5. Problems on Linear transformations, Matrix of Linear Transformation, properties of a linear transformation
6. Problems on Rank -Nullity Theorem, Basis and dimensions of Kernel and Image of linear Transformation
7. Problems on Inner product Spaces, angle between two vectors & orthogonality, Gram Schmidt Process.
8. Orthogonal Transformation, Geometric properties of linear operators
9. Eigen Values and Eigen Vectors of a matrix
10. Diagonalization of a matrix, Orthogonal Diagonalization & quadratic forms
11. Assignment on Analytic Functions, Harmonic Conjugate and Miline Thomson's Method
12. Assignment on Cauchy's Integral formula

BS11234ET: Physics

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	20	20	40	--	25	125

Prerequisite: Basics of Integration and differentiation, Concepts of set theory

Course objectives:

- To provide students with a good understanding of the concepts semiconductor physics.
- To introduce the concept of Optical fiber for telecommunication.
- To help the students develop the ability to solve electric field problems using vector concepts.
- To help the students develop the ability to solve magnetic field problems using vector concepts.

Course Outcomes:

Upon completion of the course, students will be able to

1. Understand basics of Semiconductor Physics and working of diode.
2. Understand the basics of optical fiber and applications in telecommunication.
3. Understand the basics of electrostatic fields related to wave motion.
4. Understand the basics of magneto-static fields related to wave motion.

Unit I– SemiconductorPhysics

Free electron theory, Fermi-Dirac distribution function, band theory, 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, Barrier potential. Working of p-n junction diode in the forward and reverse bias on the basis band structure. V-I characteristics of diode.

Unit II – Optical Fiber

Propagation of light through an optical fiber, Numerical Aperture, Dispersion: Inter-modal and intra-modal dispersion, concept of multi-mode step refractive index, multi-mode graded refractive index, single mode optical fiber, Attenuation, and selection of wavelength for Optical fiber communication application, Optical transmitter: LED and LASER- working and characteristics.

Unit III – Electric Field

Concept of Vectors, Co-ordinate systems, Electric Field due to point and continuous charge Distributions, Coulomb's Law, Gauss's Law and its applications, Energy Density in Electric Field, Electric Potential, Introduction to Maxwell's equations for electrostatic fields.

Unit IV – Magnetic Field

Ampere's Circuital Law and its Applications, Forces due to Magnetic Fields, Energy Density in Magnetic Field, Magnetic Potential, Introduction to Maxwell's equations for magnetostatic fields, Boundary Conditions for electric and magnetic field.

A) List of experiments

1. To find the effect of temperature on band gap energy of a semiconductor diode.
2. To study and interpret the V-I characteristics of P-N junction diode.
3. To study and interpret the V-I characteristics of LED and photodiode.
4. To calculate attenuation for different lengths of fiber.
5. Determination of Numerical Aperture (NA) of an Optical Fiber.
6. To study electric field for series and parallel resistor combinations.
7. To study electromagnetic field using coil and iron core.

B) PBL: To design a simple electronic circuit. (PBL).

Text Books:

1. A Text Book of Engineering Physics – M N Avadhanulu and P G Kshirsagar, S Chand Publishing Ltd, New Delhi.
2. A Textbook of Optics – N Subrahmanyam and BrijLal, S Chand Publications.
3. Elements of Electromagnetics – M.O. Sadiku – Oxford University Press.
4. Electronic Devices-Floyd, Thomas-Global Edition, 10th Edition.

Reference Books:

1. Fundamentals of Physics – Halliday, Resnick and Walker, Wiley Publications.
2. Basic Semiconductor Physics – Chihiro Hamaguchi – Springer Second Edition.
3. Optics – Ajoy Ghatak, Tata McGraw Hill.
4. Fundamentals of Optics – Jenkins and White, Tata McGraw Hill.
5. Electromagnetism for Engineers- P. Hammond – University of Southhampton, UK- Third Edition.

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ET11235: Basic Electronics Engineering

Teaching Scheme	Examination Scheme						
Credits:3 Lecture (L): 2	CIE	ISE	SCE	ESE	PR/OR	TW	Total
Practical (P): 2 hr. Tutorial (T): -- hr./week	20	20	20	40	25	--	125

Prerequisite: Basics of semiconductor materials

Course objectives:

- To impart knowledge of semiconductor devices such as diode, BJT and MOSFET with their operational characteristics & applications.
- To introduce electronic circuits using BJT and MOSFET devices for small signal and at low frequency.
- To simulate electronics circuits using computer simulation software to obtain desired results.
- 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 the working principles of electronic devices and their applications.
2. identify and implement the formulation to solve electronics-related issues and analyze the problems.
3. design/develop/manage/operate and maintenance of sophisticated electronic gadgets/systems/processes that conforms to a given specification within ethical and economic constraints.
4. analyze and interpret the experimental results obtained through hardware setup and using modern tools/techniques.

Unit I: Semiconductor diodes and applications (6 Hrs)

PN junction diode- operation and characteristics, **Rectifiers -** Half-wave rectifier, Full-wave (center tap and bridge) rectifiers expressions for output voltage, ripple factor, and efficiency (mention only), Shunt capacitor filter. Clippers (limiters) and clampers.
Zener diode – working principle, Characteristics, Zener diode as a voltage regulator – circuit diagram, load, and line regulation, disadvantages.
(Numerical examples wherever applicable).

Unit II: Bipolar Junction Transistor (BJT) and applications (6 Hrs)

BJT - Construction, types, CE, CB, and CC configurations, VI characteristics of a transistor in CE mode, Regions of operation, leakage currents (mention only), Current gains α , β, and γ and their inter-relations, dc load line and Q point, Transistor biasing; Fixed Bias and Voltage Divider Bias. Applications of transistors as amplifier and switch-circuit and working.
Phototransistor operation and its application, RC and LC oscillators
(Numerical examples wherever applicable).

Unit III: Field-Effect Transistors (FETs) and MOSFETs (6 Hrs)

FET - Introduction, Construction, and Characteristics of JFET, **MOSFET-** Types of MOSFET, construction and working of n-channel and p-channel E-MOSFET, V-I characteristics. MOSFET biasing circuits, MOSFET amplifier configurations- Common-Source (CS) amplifier, Common-Drain (CD) amplifier (source follower), and Common-Gate (CG) amplifier, Application of MOSFET as an amplifier and its frequency response.
(Numerical examples wherever applicable).

Unit IV: Linear Integrated circuits: Operational Amplifier (Op-Amp) (6 Hrs)

Operational Amplifiers – Introduction, Block diagram of OP-AMP, Ideal characteristics of OP-AMP, Positive feedback, Negative feedback, Inverting Non-inverting Amplifier, fixed-stage amplifier, multiple-stage gain amplifier, voltage buffer (unity-gain), Comparators, Summing amplifier, Difference amplifier. Logarithmic amplifiers **Instrumentation circuits**- DC Millivoltmeter, AC Millivoltmeter, Instrumentation Amplifier, **Active Filters-** Low-Pass Filter, High-Pass Active Filter, Bandpass Filter.
(Numerical examples wherever applicable).

Text Books:

1. Thomas L. Floyd, David M. Buchla, Steven Wetterling, "Electronic Devices (Conventional Current Version)/ (Electron Flow Version)", 10th Edition, Pearson.
2. Boylestad, Robert Nashelsky, "Electronic devices and circuit theory", 11th Edition, Pearson, 2013
3. R S Sedha, "A Textbook of Applied Electronics", 7th Edition., S. Chand and Company Ltd. 2011.
4. A.P. Malvino, "Principles of Electronics", 7th Edition, TMH, 2011.
5. David A. Bell, "Electronic Devices and Circuits", 5th Edition, Oxford University Press, 2015

Reference Books:

Suggested References

1. Robert L Boylestad, "Introductory circuit analysis", 5th Edition., Universal Book 2003.
2. S. Shalivahanan, V. S. K. Bhaaskaran, "Linear Integrated Circuits", 2nd Edition, Mc Graw Hill India Pvt ltd.
3. Ramakant A. Gayakwad, "Op-Amps and Linear Integrated Circuits", 4th Edition, Pearson
4. J. Millman and C. C. Halkias, "Integrated Electronics", Tata McGraw Hill.

List of Practical's
(Hardware implementation and Analysis of Circuit using Simulation Software)

Demonstration Experiments:

Hands-on Experimental Skills and Familiarization with

- **a)** Electronic components
- **b)** Resistance in series, parallel and series-parallel
- **c)** Capacitors and inductors in series and parallel
- **d)** Multimeter and LCR meter – checking of components/measurements.
- **e)** Voltage sources in series, parallel and series-parallel
- **f)** Voltage and current dividers
- **g)** Measurement of Amplitude, Frequency & Phase difference using Oscilloscope

Part – A (Hardware-based experiments)

1. Build and test a Half-wave rectifier with and without shunt capacitor filter, and find the ripple factor for different values of filter capacitors.
2. Build and test a Full-wave bridge rectifier with and without shunt capacitor filter, and find the ripple factor for different values of filter capacitors.
3. Build and test the Zener diode as a Voltage Regulator using a bridge rectifier with a shunt capacitor filter [Load and line regulation].
4. Build and test Clipping and clamping circuits.

Part – B (Simulation/software-based experiments)

5. Simulate a single-stage and two-stage RC-coupled CE amplifiers (AV1, AV2, AV)
6. Simulate a single-stage MOSFET Common Source amplifier circuit with a bypass capacitor.
7. Simulate Inverting and Non-Inverting amplifiers using Op-Amp.
8. Simulate the Instrumentation amplifier.

Part – C (PBL on topics from the syllabus for all students)

ET11236: Python Programming for Engineers

Teaching Scheme	Examination Scheme						
Credits:3 Lecture (L): 2 Practical (P): 2 hr./week Tutorial (T): --	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	20	20	40	--	25	125

Prerequisite: Basic Computer skills and Students are expected to be able to download and install software, and understand basic programming concepts.

Course objectives:

- Acquire the knowledge of Python, script programming language.
- Understand the flow of programming.
- Acquaint with different tools in python.
- 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 Lambda 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. Problem solving using Numpy and Matplotlib functions.

Unit IV - Python file operation

Understanding read functions, read(), readline() and readlines(). Understanding write functions, write() and writelines(). Manipulating file pointer using seek(). Programming for problem solving using file operations.

Text Books:

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 , A hands on, project based introduction to programming, Eric Matthes.
6. Python Programming using Problem solving approach by ReemaThareja OXFORD Higher education
7. Kenneth A. Lambert, ―Fundamentals of Python: First Programs, CENGAGE Learning, 2012.

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.

6. Charles Dierbach, ―Introduction to Computer Science using Python: A Computational Problem Solving Focus, Wiley India Edition, 2013
7. Guido van Rossum and Fred L. Drake Jr, ―An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

Practical Assignments List (Any 6 Lab assignments and PBL)

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 Fibonacci series up to n terms.
5. 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 27 years old?") And you can answer only one of these three options: (a)Less (b)More (c)Correct
6. Write a Python program to find factorial of given number (using fact() function).
7. 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.
8. Write a Python program to plot line chat, bar chart, pi chart, scatter chart, histogram for taking two different arrays as input.
9. 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.

***SCE: Project Based Learning on topics from the syllabus for all the students.**

ET11237: Electronic Measurements and Sensor Technology

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

Prerequisite: ----

Course objectives:

- To study the basic principles of electrical and electronics instruments.
- To study the basic characteristics of transducers and measuring instruments
- To study the use of basic instruments for the measurement of electrical and electronics parameters.
- To study the basic principle of transduces and sensors for the measurement of various physical parameters

Course Outcomes:

Upon completion of the course, students will be able to

1. Describe various types of measuring instruments and their characteristics.
2. Classify various types of transducers and their transduction principle.
3. Measure the electrical and electronic parameters with the help of electronic instruments.
4. Identify a transducer /sensors for a given application.

Unit I– Electronic Measurements and Instruments

Measuring instrument classification: absolute and secondary instruments, Instruments grades, comparison instruments. Digital voltmeter, multimeter and frequency meter. Resistance measurement methods. Inductance and capacitance measurements. AC bridge methods for measurement of capacitance and inductance. Analog oscilloscope, DSO, signal generator, Spectrum analyzer.

Unit II – Transducers and Sensor Technology

Introduction to transducers and measurements of physical parameters. Introduction to Transducers, Sensors and Actuators. Transduction Principles and Classification, Static and Dynamic characteristics of Transducer. Accuracy vs Precision. Errors in Measurement and Instrumentation, Propagation of Errors. Thermal Sensors: Thermocouples, RTDs and Thermistors, LVDT, strain gauge etc. Signal conditioning and data acquisition system (not at circuit level but block schematic level.). Smart sensor concepts.

List of Experiments/practicals

1. Overview of classification of various instruments and equipments used in electronic measurements: Multimeter, CRO, DSO, LCRQ meter, power supply, function generator, spectrum analyzer etc.
2. Demonstrate the use of CRO/DSO along with its various functionalities and capabilities for the measurement and analysis of signals.
3. Use of function generator and its various capabilities/functionalities.
4. Use of digital multimeter for the measurement of various parameters.
5. Measurement of displacement using LVDT.
6. Measurement of temperature using RTD/Thermistor..

Text Books:

1. Electronic Instrumentation and Measurements. David Bell
2. A Course in Elec. & Electronics Measurements & Instrumentation. A K. Sawhney.
3. Modern Electronic Instrumentation and Measurement Techniques. Helfrick & Cooper

Reference Book/s:

1. Process control Instrumentation Technology, By C.D. Johnson

BS11238 - Indian Science and Technology

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

Prerequisite: ----

Course objectives: Development of a holistic perspective about Indian science and technology

Course Outcomes:

Upon completion of the course, students will be able to

1.Understand the modern technological trends through Indian scientific and technological philosophy

2.Understand the development of Mathematics and water management systems in India

Fundamentals

- An overview of Indian contributions to technology
- Technological Innovations

Mathematics

- An overview of the Development of Mathematics in India
- Aryabhatta (discovery of zero)
- Weaving Mathematics into Beautiful Poetry- *Bhaskaracarya*.
- The Evolution of Sine Function in India
- The Discovery of Calculus by Astronomers

Concept of proof in Indian mathematics

Water Management

- Overview
- Harappan and Traditional Water Management System of Gujarat
- Historical Sites- Sringeverpur, South Indian Water Management System, WesternGhats Cave- Kanheri etc.
- Medieval Period

Involvement of peoples in Water Management

List of Tutorial: (Any 7 tutorials can be taken)

1. Practice session to discuss-Contribution and innovation of Indian Science and Technology
2. Practice session to discuss - The Development of Mathematics in India
3. Practice session to discuss -The Evolution of Sine Function in India
4. Practice session to discuss - Harappan and Traditional Water Management System of Gujarat
5. Practice session to discuss-Historical Sites- Sringeverpur, South Indian Water Management System, Western Ghats Cave- Kanheri etc
6. Practice session to discuss – Basic concept of Ayuraveda
7. Practice session to discuss- Forest Management and Urban Planning
8. Practice session to discuss - Ancient ecological and environmental aspects of Tank, Lakes,& Stepwells
9. Practice session to discuss- Development of Trading Techniques
10. Poster presentation on any one of the above topics

Text Books:

1. R.M. Pujari, Pradeep Kolhe, N. R. Kumar, 'Pride of India: A Glimpse into India'sScientific Heritage', Samskrita Bharati Publication.
2. 'Indian Contribution to science', compiled by Vijnana Bharati.
3. 'Knowledge traditions and practices of India',Kapil Kapoor, Michel Danino, CBSE, India.

Reference Books:

1. Dr. Subhash Kak , Computation in Ancient India,Mount, Meru Publishing (2016)
2. Dharampal, Indian Science and Technology in the Eighteenth Century, Academy of Gandhian Studies, Hyderabad, 1971, republ. Other India Bookstore, Goa, 2000
3. Robert Kanigel, The Man Who Knew Infinity: A Life of the Genius Ramanujan, Abacus, London, 1999
4. Alok Kumar, Sciences of the Ancient Hindus: Unlocking Nature in the Pursuit of Salvation, CreateSpace Independent Publishing, 2014
5. B.V. Subbarayappa, Science in India: A Historical Perspective, Rupa, New Delhi, 2013
6. S. Balachandra Rao, Indian Mathematics and Astronomy: Some Landmarks, Jnana Deep Publications, Bangalore, 3rd edn, 2004
7. S. Balachandra Rao, Vedic Mathematics and Science In Vedas, Navakarnataka Publications, Bengaluru, 2019
8. Bibhutibhushan Datta, Ancient Hindu Geometry: The Science of the Śulba, 1932, repr. Cosmo Publications, New Delhi, 1993
9. Bibhutibhushan Datta & Avadhesh Narayan Singh, History of Hindu Mathematics, 1935, repr. Bharatiya Kala Prakashan, Delhi, 2004
10. George Gheverghese Joseph, The Crest of the Peacock, Penguin Books, London & New Delhi, 2000
11. J. McKim Malville & Lalit M. Gujral, Ancient Cities, Sacred Skies: Cosmic Geometries and City Planning in Ancient India, IGNCA & Aryan Books International, New Delhi, 2000).
12. Clemency Montelle, Chasing Shadows: Mathematics, Astronomy and the Early History of Eclipse Reckoning, Johns Hopkins University Press, 2011
13. Anisha Shekhar Mukherji, Jantar Mantar: Maharaja Sawai Jai Singh's Observatory in Delhi, AMBI Knowledge Resources, New Delhi, 2010
14. Thanu Padmanabhan, (ed.), Astronomy in India: A Historical Perspective, Indian National Science Academy, New Delhi & Springer (India), 2010
15. Acharya Prafulla Chandra Ray, A History of Hindu Chemistry, 1902, republ., Shaibya Prakashan Bibhag, centenary edition, Kolkata, 2002
16. R. Balasubramaniam, Delhi Iron Pillar: New Insights, Indian Institute of Advance Study, Shimla & Aryan Books International, New Delhi, 2002
17. R. Balasubramaniam, Marvels of Indian Iron through the Ages, Rupa & Infinity Foundation, New Delhi, 2008
18. Anil Agarwal & Sunita Narain, (eds), Dying Wisdom: Rise, Fall and Potential of India's Traditional Water-Harvesting Systems, Centre for Science and Environment, New Delhi, 1997
19. Fredrick W. Bunce: The Iconography of Water: Well and Tank Forms of the Indian Subcontinent, DK Printworld, New Delhi, 2013

BS11239: ENGLISH FOR TECHNICAL WRITING

Teaching Scheme	Examination Scheme					
Credits: 02	CIE	ISE	SCE	ESE	TW	Total
Lecture (L): 01 hrs / week **Practical (P):** 01hrs / week	--	--	--	--	50	50

Course objectives:

1. Improve grasp of English grammar and punctuation rules
2. Learn to write precise and concise English text
3. Learn to write reader-friendly text, using rules of organizing a document
4. Apply techniques of writing skills in technical writing, through real life examples

Course Outcomes:

After completing this course learners will be able

1. Have clarity and coherence in English
2. Produce concise and precise English text
3. Write reader-friendly well organized text in English
4. Write effective reader-friendly technical documents in English of high-quality

Contents

Unit I – English Language Basics (6 hrs)

English grammar essentials (Parts-of-speech, tense, active, passive, article), use of punctuation, confusing words-Homophones

Unit II – Precise and Concise Writing (6 hrs)

Logically organizing your thoughts, one idea per sentence/paragraph, avoiding repetition and being specific
Using active voice, and strong verbs
Using simple plain language, reducing adjectives and adverbs, avoiding unnecessary words
Rewriting in smaller number of words/sentences
Precise writing through meticulous editing, proofreading
Writing abstracts and conclusions

Unit III – Organizing the Written Document (4 hrs)

Logical organization of text using headings, subheadings, and bullet points.
Writing indexes, and table of content, chapters, paragraphs, references
Structuring of formal and informal letters, technical reports and technical presentations

Unit IV– Technical Writing (8 hrs)

Introduction to technical writing, audience analysis and effectiveness, defining purpose of document
Writing emails, minutes of meeting, user manuals/guides, FAQs , statement of purpose (SOP), reports, research papers and thesis

Tutorial:

Sample List of assignments

1. Edit and proofread the provided technical document, identifying and correcting errors in grammar and punctuation.
2. Write and narrate an article of your choice (like - inventions or discoveries made by any scientist, etc). Note the mistakes you made in grammar, before the final version.
3. Rewrite the assignment in (2) with reduced number of sentences, words, but including all ideas written in the previous assignment. Note the percentage of reduction possible.
4. Write an abstract and conclusion for the given technical document.
5. Read a given unformatted document and organize it into chapters, paragraphs and sub topics. Give necessary heading where required.
6. Write an email to a faculty requesting to work under them as research interns, ensuring clarity, proper etiquette, and concise communication.
7. Prepare a User Manual for a select product. Make it easy to read and informative.
8. Write a precise and accurate technical description of an engineering component, system, or process, focusing on clarity and attention to detail.

9. Prepare a report that identifies and analyzes an engineering problem, proposes potential solutions, and recommends the best course of action

Text/Reference books:

1. English Grammar, Wren and Martin
2. Developing Communication Skills, Krishna Mohan, Meera Banerji, Second Edition, ISBN 10 : 0230-63843-0, ISBN 13: 978-0230-63843-3
3. Technical Communication for Engineers, ShaliniVerma ISBN : 978-93259-9018-0
4. Effective Technical Communication, M Ashraf Rizvi, ISBN-13: 978-0-07-059952- 9, ISBN-10: 0-07-059952-1

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

BS10232 - Calculus and Ordinary Differential Equations

Teaching Scheme	Examination Scheme					
Credits: 04	CIE	ISE	SCE	ESE	TW	Total
Lecture (L): 03 hrs / week **Tutorial (T):** 01 hr / week	20	20	20	40	25	125

Prerequisite: Basics of derivatives, integration, plane geometry and vector algebra

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. deal with derivative of functions of several variables that are essential in various branches of engineering.
2. apply the knowledge of partial derivatives to find extreme values of the function of several variables, to find gradient & directional derivative, Jacobian, approximate values and to estimate errors.
3. learn the Fourier series representation and harmonic analysis for design and analysis of periodic continuous and discrete systems.
4. learn advanced integration techniques such as Reduction formulae, Beta functions, Gamma functions needed in evaluating multiple integrals and their applications.
5. learn evaluation of multiple integrals and its application to find area bounded by curves, volume bounded by surfaces.
6. learn the effective mathematical tools for solutions of first order differential equations that model various physical processes.

Contents

Unit I – Partial Differentiation

Partial Derivatives of first and higher orders, Euler's Theorem on Homogeneous functions, Partial derivative of Composite functions, Total derivative and Implicit differentiation

Unit II – Applications of Partial Differentiation

Maxima and minima of function of two variables, Lagrange's method of undetermined multipliers, Tangent Plane and Normal to a Surface, Gradient and Directional Derivative, Errors & Approximations, Jacobian.

Unit III – Fourier Series

Definition, Dirichlet's conditions, Full range Fourier series, Half range Fourier series, Harmonic analysis, Applications to problems in Engineering.

Unit IV– Integral Calculus & Curve Tracing

Reduction formulae, Beta & Gamma functions, Tracing of standard curves

Unit V – Multiple Integrals and Applications

Double Integration: Double integration in Cartesian & Polar coordinates, Change of order of integration, area bounded by curves

Triple Integration: Triple integral, volume bounded by surfaces

Unit VI – Differential Equations and Applications

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

Textbooks:

1. Higher Engineering Mathematics by B.V.Ramana., Tata McGraw Hill Publisher
2. Higher Engineering Mathematics by B.S.Grewal, Khanna 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 & 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. Maxima and minima of functions of two variables, Lagrange's methods of undetermined multipliers
4. Gradient & Directional Derivative, Errors & Approximations, Jacobian.
5. Full range Fourier series
6. Half range Fourier series & Harmonic analysis
7. Reduction formulae, Gamma function, Beta function
8. Tracing of cartesian and polar curves
9. Double Integration and area
10. Triple Integration and volume
11. Home Assignment on solution of differential equations
12. Home Assignment on applications of differential equations

BS10233 - Environmental Science

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	20	20	40	-	25	125

Prerequisite course(s): 10 + 2 Syllabus

Course Objective(s): To understand the different aspects of environmental science and management.

Course Outcomes:
Upon completion of the course, students will be able to:
1. Explain Conventional and Non-conventional Energy Resources, with respect to their advantages, disadvantages along with Principal, Construction, Working of different power plants.
2. Explain Air, Water, Land and Noise Pollution, suggest remedial measures and calculate particulates and gaseous pollutants in air.
3. Explain water and waste water management, and compute hardness, alkalinity, BOD, COD and total carbon contents.
4. Explain the Municipal and Industrial Wastes management along with its sustainability.
5. Use PBL/Seminars as a tool for reinforcing learning of concepts in Environmental Science.

Unit I: Multidisciplinary Nature of Environmental Studies and Resources

1) Environmental Studies: Definition, Scope, and Importance.
2) Conventional and Non-conventional Energy Resources: Conventional and Non-conventional Energy Resources, their Advantages, Disadvantages, and Impact on Environment.
3) Principal, Construction, Working of Thermal Power Plant, Hydroelectric Power Plant, Solar Power Plant, Wind Power Plant, Tidal Power Plant.

Unit II: Environmental Pollution

1) Air Pollution: Sources, Causes, Effects and Remedial Measures to control Air Pollution, Numerical on measurement of air pollutants for particulates and gaseous pollutants, Discussion on any one case study.
2) Water Pollution: Sources, Causes, Effects and Remedial Measures to control Water Pollution, Discussion on any one case study.
3) Land Pollution: Sources, Causes, Effects and Remedial Measures to control Land Pollution, Discussion on any one case study.
4) Noise Pollution: Sources, Causes, Effects and Remedial Measures to control Noise Pollution. Discussion on any one case study.

Unit III: Water and Waste Water Management

1) Introduction: Water Resources, Impurities in water, Disadvantages of impure water
Analysis of water – physical, chemical (hardness, alkalinity and their numerical) and biological (BOD, COD, total carbon contents – Numerical),
2) Softening of Water: Zeolite process, Demineralization by ion exchangers, Numerical, Desalination methods - Reverse osmosis & Electro dialysis.
3) Municipal water treatment: Specifications for drinking water (IS 10500: 2012)
4) Wastewater: Sources, Necessity of treatment, Primary, Secondary, Tertiary Treatment of waste water

Unit IV: Solid and Industrial Waste and Management and Sustainability

1) Introduction: Sources, Classification, Environmental impact
2) Municipal Waste Management: collection and disposal
3) Industrial Waste Management: Biomedical waste, E- waste and Management
4) Sustainability: Introduction, Importance, Sustainability related to Environmental Parameters, Green computing and sustainable data centre, Importance of E- vehicle

Laboratory work:

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

1. (A)Preparation of chemical solutions and chemical safety and disposal
   (B) Determination of error and error analysis
2. Proximate analysis of coal with determination of calorific value.
3. Estimation of temporary & permanent hardness of water sample by EDTA method.
4. Determination of alkalinity of water sample/To determine the acidity of the given sample of water.
5. To determine the quantity of iron present in the given sample of water by spectrophotometer / colorimeter.
6. Analysis of given soil sample with respect to pH and calcium carbonate content.
7. Field work - visit to a local area to document any one environmental issue and management system.
8. To determine physical parameters of water sample such as turbidity, pH, and conductance - virtual lab experiment
9. To determine chemical oxygen demand of water sample - virtual lab experiment
10. To determine pH and specific conductivity of soil sample - virtual lab experiment

B) PBL/Seminar:

Students will select a relevant topic for seminar/project from Environmental Science and will be evaluated based on presentation

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. Mahua Basu, Fundamentals of Environmental studies,Cambridge publication
5. S M Khopkar, Environmental pollution analysis, New age publication
6. C S Rao, Environmental pollution control Engineering, New age publication
7. J. Mendham, R. C. Denney, J. D. Barnes, M. J. K. Thomas, Vogel's Text book of Quantitative Chemical Analysis, Pearson Education Ltd.
8. Dr. G.Vijaya Pratap, Dr. Manasi Ghamande, Dr Prashant Pangrikar, De. Balaji Rupnar A Text Book of Environmental Pollution and Management ,R .K Publication
9. Dr .Surendrakumar Yadav, Dr. T. Arunkumar, Dr. Khushal Pathade ,Dr .Manasi Vyankatesh Ghamande A Text Book of Environmental Engineering and Sustainable Development, R.K. Publications
10. Dr. Maaz Allah Khan, Dr. Droupti Yadav, Dr. Pratima V. Damre, Dr .Manasi Vyankatesh Ghamande A Text Book of Water and Waste Water Engineering, R.K. Publications

ET12223: Basic Electrical Engineering

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	20	20	40	-	25	125

Prerequisite: Concepts of electromagnetism and electromagnetic induction, simultaneous equations

Course objectives:

- To enable learners to understand and apply basic concepts in 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, maximum power transfer theorem and Norton's theorem.
2. Solve single-phase ac circuits consisting series and parallel combinations of resistance, inductance and capacitance along with phasor diagrams.
3. Compute efficiency, voltage regulation, voltage and current ratios for 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.
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

Classification of electrical networks, voltage and current sources.
Kirchhoff's current and voltage laws, superposition theorem, Thevenin's theorem, maximum power transfer theorem, Norton's Theorem.

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 series and parallel ac circuits with concept of real power, reactive power, apparent power, and power factor.
Series resonance.

Unit III – Single- phase Transformers

Single-phase transformer: Ideal and practical transformer, classification of transformers, emf equation, exact equivalent circuit, losses in transformer, computation of regulation and efficiency, condition for maximum efficiency.
Single winding transformer (autotransformer): - Concept, advantages, limitations and applications.

Unit IV – Three- phase AC Circuits

Basic concepts in three- phase balanced circuits, voltage and current relations in star and delta connections. Phasor diagrams. Methods for measurement of power.

Laboratory Contents:

A) List of experiments (any 6 of the following)

1. Study of safety precautions and measuring instruments.
2. Study of low voltage switchgear components, wires and earthing.
3. Verification of Kirchhoff's laws and superposition theorem.
4. Study of single-phase series R-C circuit.
5. Direct loading test on single-phase transformer.
6. Verification of voltage and current relations and power calculations in three-phase star and delta-

connected balanced loads.
7. Verification of Thevenin's theorem.
8. Study of series resonance in single-phase R-L-C circuit.
9. Study of DC and AC motors.

B) Project- Based Learning (PBL)

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

Text Books:

1. B.L.Theraja, A Textbook of Electrical Technology Volume- I and volume II, S. Chand and Company Ltd., New Delhi.
2. V. K. Mehta, Basic Electrical Engineering, S. Chand and Company Ltd., New Delhi.
3. S. K. Bhattacharya, Basic Electrical and Electronics Engineering, Pearson Education.
4. S. L. Uppal, Electrical Power, 13th Edition, Khanna Publisher, 1988.
5. S.K. Bhattacharya, K.M. Rastogi, Experiments in Basic Electrical Engineering, New age international Pvt. Ltd. Publishers, Delhi, Reprint 2003.
6. S.G. Tarnekar, A Textbook of Laboratory Course in Electrical Engineering, S. Chand Publisher, 2006.

Reference Books:

1. Edward Hughes, Electrical and electronics Technology, Seventh Edition, Pearson Education.
2. I. J. Nagrath and Kothari, Basic Electrical Engineering, 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.

ET12234: Object Oriented Programming

Teaching Scheme	Examination Scheme						
Credits:3 Lecture (L): 2 hr/week Practical (P): 2 hr. Tutorial (T): -- hr./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	20	20	40	--	25	125

Prerequisite: Basics of Integration and differentiation, Concepts of set theory

Course objectives:

- Utilize the object-oriented paradigm for program design.
- Comprehend key object-oriented concepts, including data abstraction, encapsulation, inheritance, packages, and interfaces.
- Cultivate the skill to write Java programs for effective problem-solving.

Course Outcomes:

Upon completion of the course, students will be able to

1. Explain the core principles of Java programming, including data types, variables, and control structures
2. Demonstrate the ability to design and implement object-oriented solutions in Java, including class creation, inheritance, and polymorphism
3. Utilize Java packages and libraries effectively to modularize and enhance code, demonstrating proficiency in importing and using external libraries.
4. Analyze and apply exception handling techniques in Java, including the ability to identify, handle, and throw exceptions appropriately within a program.

Unit I– Fundamental Concepts in JAVA Programming

Introduction to Java: What is Java? History and evolution of Java. Features and advantages of Java. Java Development Environment: Setting up Java Development Kit (JDK). Installing and configuring Integrated Development Environments (IDEs) like Eclipse or IntelliJ IDEA. Basic Syntax: Java program structure. Writing and running a simple Java program. Data types and variables. Comments and conventions. Control Flow: Conditional statements (if, else if, else). Switch statements. Looping constructs (for, while, do-while). Break and continue statements.

Unit II – Object-Oriented Programming Fundamentals

Functions and Methods: Defining methods. Method parameters and return values. Function overloading. Recursion. Object-Oriented Programming (OOP): Introduction to OOP. Classes and objects. Encapsulation, inheritance, and polymorphism. Constructors and destructors**.**

Unit III – Packages and Libraries

Introduction to Packages: What are packages in Java? Why use packages? Benefits of organizing code into packages. Package Structure: How packages are structured in Java. The concept of a package hierarchy. Creating and Using Packages: How to create your own packages? Importing Java standard library packages. Importing user-defined packages. Package Naming Conventions: Naming conventions for packages. Choosing meaningful package names. Package Visibility: Access modifiers in Java (e.g., public, private, protected, default). Controlling visibility within and outside packages.

Unit IV – Exception Handling

Introduction to Exceptions: What are exceptions? Why use exceptions? Types of exceptions (checked and unchecked). Exception Hierarchy: Understanding the Java exception class hierarchy. Throwable, Exception, and Error classes. Handling Exceptions: Using try-catch blocks. Catching specific exceptions. Multiple catch blocks. The finally block and its purpose. Throwing Exceptions: Throwing exceptions explicitly using the throw keyword. Creating custom exceptions.

Text Books:

1. Java: The Complete Reference" by Herbert Schildt
2. Head First Java" by Kathy Sierra and Bert Bates

Reference Books:

1. T. Budd, Understanding OOP with Java, Pearson Education.

2. E Balagurusamy, Programming with Java A Primer, Tata McGraw Hill, 3rd Edition.

List of practicals/experiments

1. Develop a Java program to create an interactive quiz application that helps users learn fundamental concepts of Java programming.
   a. The application should cover the following topics: Java Program Structure, Writing and Running a Simple Java Program, Data Types and Variables, Comments and Conventions
   b. Control Flow: Conditional Statements and Switch Statements, Control Flow: Looping Constructs (for, while, do-while), Control Flow: Break and Continue Statements
2. Develop a Java program to implement a simple Library System using Java, focusing on the fundamental concepts of Functions and Methods, as well as Object-Oriented Programming (OOP) principles
3. Design a Student Information System in Java that incorporates the use of packages to organize code efficiently The system should have the following functionalities: Student Package, Course Package, Main Application, Visibility Control.
4. Develop a Financial Management Application to track income, expenses, and generate financial reports using Java packages. Follow the steps below: Package Structure and Hierarchy, Package Visibility and Access Modifiers, Creating and Using Packages, Importing Java Standard Library Packages.
5. Develop an Online Banking Transaction System in Java, incorporating exception handling concepts. The system should cover the following aspects: Introduction to Exceptions, Exception Hierarchy, Handling Exceptions, Throwing Exceptions, Finally Block
6. Create a Student Grade Calculator Application in Java that calculates the average grade for a student based on their exam scores. The application should cover the following exception handling concepts. Introduction to Exceptions, Exception Hierarchy, Handling Exceptions, Throwing Exceptions, Finally Block.

ET12235: Digital Electronics

Teaching Scheme	Examination Scheme						
Credits: 3 Lecture (L): 2 hr/week Tutorial (T): -- Practical (P):2 hrs/week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	20	20	40	25	--	125

Prerequisite: Students are expected to know the concepts studied in following course:
1. Basic Electronics Engineering

Course Objectives:

- To acquire the basic knowledge of digital logic and application of knowledge to understand digital electronic circuits.
- To prepare students to perform the analysis and design of digital electronic circuits.

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

1. Examine the structure of number systems and perform the conversion among different number systems.
2. Apply minimization techniques to realize combinational logic circuits.
3. Understand and interpret fundamentals of flip-flops and counters.
4. Design basic combinational and sequential circuits using VHDL.

Unit I : Number Systems and Minimization Techniques

Introduction to number systems, conversion, binary arithmetic, digital codes, logic gates, Boolean algebra and logic simplification using Boolean rules and laws.
Standard representations for logic functions, k map representation of logic functions (SOP & POS forms), minimization of logical functions for min-terms and max-terms (up to 4 variables), don't care conditions.

Unit II : Unit II : Combinational Logic Design

Design Examples: Arithmetic Circuits, BCD-to-7 segment decoder, Code converters. Adders and their use as subtractors, look ahead carry, ALU, Digital Comparator, Parity generators/checkers, Multiplexers and their use in combinational logic designs, Demultiplexers and their use in combinational logic designs, Decoders.

Unit III : Sequential Logic Design

Flip-Flops and Latches, Counters, ripple counters, up/down counters, synchronous counters, lock out. Basic design steps- State diagram, State table, State reduction, State assignment, Finite State Machine (Mealy and Moore machines)

Unit IV : Introduction to VHDL

Library, Entity, Architecture, Modeling styles, Data types and objects, Concurrent and sequential statements, Design examples on basic combinational and sequential circuits.

Text Books:

1. R. P. Jain, "Modern Digital Electronics," 4th Edition, TMH Publication.
2. Thomas L. Floyd, "Digital Fundamentals," 11th Edition, Pearson.

Reference Books:

1. A. Anand Kumar, "Fundamentals of Digital Circuits," 4th Edition, PHI Publication.
2. John F. Wakerly, "Digital Design: Principles and Practices," 4th Edition, Pearson.

List of Experiments:

1. Simplify the given Boolean expression and realize it using logic gates.
2. Design and Implement full adder using decoder IC 74138
3. Design and Implement 1 digit BCD adder using IC 7483 (4 bit Adder)
4. Design and Implement the given Boolean function using multiplexer IC 74153
5. Design and Implement MOD-N counter using IC-74LS90 (Decade Counter)
6. Design and Implement Pulse train generator using IC-74HC194/IC74LS95 (Use right shift/left shift).
7. Design of basic ALU using VHDL (Demonstration of implementation on FPGA)
8. Design of counter using VHDL (Demonstration of implementation on FPGA)

ET12236: Electronics Workshop Practice

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

Prerequisite: Basics of Integration and differentiation, Concepts of set theory

Course objectives:

- To make the student familiar with electronic components
- To highlight the importance and teach PCB artwork with an EDA tool.
- To learn the steps in electronic circuit through simulation and hardware implementation
- To imbibe good soldering design practices for robust design of electronic systems.

Course Outcomes:

Upon completion of the course, students will be able to

1. Interpret and summaries the specifications of different passive, active and Integrated components required to build electronic circuit
2. Use skillful an EDA tool in designing of electronic circuit schematic and simulation
3. Select optimal PCB design for building small circuit with skillfully solders any robust design PCB of electronic systems.
4. Elaborate the use of designed circuit in different applications

Unit I : Introduction to Electronic Components and design with simulation of Electronic circuit using EDA Tools

a) Passive Components:

i) Resistor: Types, Standard Values, Tolerance, Wattage, Linear and Log Potentiometer.
ii) Capacitor: Types (Ceramic, Electrolytic, tantalum etc.) Standard Values, Tolerance, WVDC,
iii) Inductor: Core Types, Construction, SWG Table, Transformer: Power Transformer construction, Audio Frequency Transformer, High Frequency Transformer, Relay Types

b) Active Components:

i) Diodes: Types (small signal, rectifier, Switching, zener, Power) study of various parameters
ii) BJT: Types(Small signal, Power), study of various parameters
iii) FET: Types (FET, MOSFET), study of various parameters

c) Integrated Circuits Family : SSI, MSI and LSI, Analog and Digital IC, Hybrid IC, packages

d) EDA Tools : Selecting a small electronic circuit involving discrete devices, op amp, and LSI devices only. Understanding the working of circuit with validating the circuit feasibility, category, component selection. Simulating the selected circuit using EDA tools e.g. Proteus, Multisim, design guidelines for PCB, routing topology, grounding methodologies, generating simple artwork on single sided PCB Software with industrial specific design rules considering EMI/EMC.

Unit II – Design, Development and Testing Report writing for the development of circuit over PCB

a) Design, Development of PCB: Types of PCB, concept of SMT and multilayer PCB boards, electrochemical etching mechanism of PCB board, drilling, automation in PCB design, automatic copper track routing machine, automatic component placer machines, wave soldering, etc.
Solder Iron Types (Wattage), Solder metal types, flux, Types of soldering and soldering process, Disordering. Building own PCB.

b) Testing and Report writing: Bare board testing and final completed PCB testing with the help of various electronic instruments. To prepare report using Latex Tool suit following standard project report format, such as introduction with literature, block diagram to electronic circuit implementation, discussion about circuit simulation and practical circuit testing results, comparison and analysis of circuit, Bill of Materials, future scope and applications, bibliography,

Text Books:

1. Simulation Software's Help Manual (Examples. Multisim, Proteus, Altium Design)
2. Principles of Measurement Systems by John P. Bently (Pearson)
3. "PCB Design and Layout Fundamentals for EMC", by Roger Hu,
4. Magazine (Examples. Everyday Practical Electronics, Elektor, Electronics For You, various online magazines)
5. Electronic Instrumentation; by H. S. Kalsi; McGraw-Hill Education India Pvt. Ltd.

Reference Books:

1. Electrical and Electronic Measurements and Instrumentation by A. K. Sawhney; Dhanpat Rai & Co.
2. "Printed Circuits Handbook, Seventh Edition: 50th Anniversary Edition (ELECTRONICS)", Clyde Coombs , Happy Holden, McGraw-Hill Education India Pvt. Ltd.
3. Instrumentation measurement and Analysis by B.C. Nakra, K.K.Chaudhary
4. D. Roy Choudhury and Shail B. Jain, "Linear integrated Circuits," 5th Edition, New Age International Publishers.

List of Experiments:

1. Study of Electronics Passive Components and their application.
2. Study of Electronics Active Components and their application.
3. Study of Electronics Integrated circuits and their application.
4. Study of Electronics Instruments and their laboratory usage.
5. Searching and collecting information for small electronics circuit (PBL statement)
6. Simulating circuit using open source or licensed EDA tools.
7. PCB Designing using open source or licensed EDA tool
8. PCB etching, components mounting and soldering.
9. Circuit testing, analysis and result presentation
10. Preparing technical report using rich open source document editing tools.

Mini Project/Seminar (SCE)

Students are asked to design a small electronic circuit based on the real world socio problem / any suitable electronic circuit which help them to understand the complete electronics circuit design and implementation process through different open source or licensed EDA tools.

Bansilal Ramnath Agarwal Charitable Trust's

Vishwakarma Institute of Information Technology, Pune-48

(An Autonomous Institute affiliated to Savitribai Phule Pune University)

ME12237: Makers Lab

Teaching Scheme	Examination Scheme					
Credits: 1 Lectures (L): -- Tutorials (T): --hrs. Practical (P): 2 hrs/week	CIE	ISE	SCE	ESE	TW	Total
	-	-	-	-	25	25

Prerequisites: Engineering Mathematics, Python programming

Course Objectives:

Demonstrate specific use and safe operation of specific tools/machines

Show documentation of work products and prototypes that clearly demonstrates safety and knowledge of specific tools/machines.

Course Outcomes:

Upon completion of the course, students will be able to

1. Develop products from concept to drawing to prototype by comprehending the theory of development of surfaces.
2. Apply the BIS conventions and specifications for engineering drawing.
3. Demonstrate various tools, machines, and operations widely used in sheet metal shops

Course Contents:

This course encompasses several maker's lab areas, focused on safety, basic machine usage, hand/power tool safety, and prototyping.

1. Basic machine usage
   a. Knowledge of tool usage and work products that can be created
   b. Basic safety precautions while operating the machine
   c. Knowledge and ability to use digital tools and files to create work products
   d. Demonstration of basic machine operation in the presence of makerspacestaff
   e. Maker's lab equipment, including, but not limited to: laser cutters, vinyl/paper cutters, power tools, hand tools, sewing/embroidery machines.
   f. Sample project ideas and demonstrations
2. Prototyping
3. Development of work products from concept to drawing/digital file
4. Development of low/no cost prototype to develop a proof of concept

Documentation of products created, demonstrating safety and proper techniques for usage

Practicals:

1. Introduction to engineering drawing, BIS conventions
2. Development of lateral surfaces of solids (Cylinder, Cone).
3. Development of lateral surfaces of solids (Prism, and Pyramid).
4. Demonstration of tools and different manufacturing processes
5. Conceptualization of any product by sketch.
6. Practice using basic maker's lab machines and tools for different projects and purposes
   Practice design thinking and prototyping to meet varying needs and goals

Bansilal Ramnath Agarwal Charitable Trust's

Vishwakarma Institute of Information Technology, Pune-48

(An Autonomous Institute affiliated to Savitribai Phule Pune University)

BS112310– Yoga & Sports Ethics

Teaching Scheme	Examination Scheme					
Credits: 02	CIE	ISE	SCE	ESE	TW	Total
Practical (P): 04 hrs / week	-	-	-	-	**50**	50

Course objectives:

1. To motivate the students for higher education in Yogasana & Sports
2. To motivate the students for higher education in Yogasana / Pranayam and Kriya
3. Relate the fundamental principles of Yoga & sports to applications.
4. To developed Physical & mental fitness, remove stress, frustration and take some ethical knowledge about Yoga and Sports activities.
5. To motivate the students for higher education in Yogvidya & To acquire subject knowledge of Yogvidya
6. To developed skills of game and yogasana pranayama and kriy

Course Outcomes:

After completing this course learner will be able

1. Explain the Yoga & Sports ethics as an Indian culture.
2. Explain the basic concept of Physical, Mental fitness and Social awareness or responsibilities.
3. Explain the team work, Yogic Science, the effect on our Mind & Body. And he effect of our lifestyle.
4. Explain the practical of asana like back bending. Front bending, twisting, standing, balancing etc.
5. Explain and practice of Spiritual asana & physical fineness related asana, Pranayama, kriya etc.
6. Check Performance as per practice base Sports Games and yogasana, pranayama and kriya.
7. Well understanding of sports games, yoga ethics as a physical fitness, mental fitness, recreation and refresh of mind and body, as well as healthy lifestyle in daily routine.

Unit I – Introduction of Sports Games Yogasana (4 hrs)

1) The Basic Exercises, game wise different Rhythmic Exercises, various sports events Introduction & playing methods. Rule regulation of overall events. Athletics events training introduction and practice.
2) Introduction of Yogashastra, Loosening Exercises, Suryanamaskar and its practice in same reputations. Practice of basic and simple healthy asanas.

Unit II – (4hrs)

1) Practice session for Outdoor Games, event wise practice and team game organized on the spot. Game wise practice as per student's interest.
2) Standing Asana Practice & method of practice as well as time , steps and other precautions'
3) Event wise Measurement and team selection process and practice for recreation and teamwork building.

Unit III – Various types of Asana, pranayama and sports practice cum Introduction (4 hrs)

Selected simple types Sitting asana Practice ,Pro down and laydown position practice, twisting asana and pranayama practice
Selected basic indoor and outdoor sports events (team event individual events) measurement practice and game practice for physical fitness.

Unit IV– Yoga and sports Practice and matches for etch other (4 hrs)

1) All the sports games practice as per the rule as well as yoga practice as per the previous learning based revision.
2) Finalize the best for revision and as per the importance of physical fitness awareness and selected yogic practice like asana pranayama and kriya for spiritual base, physical and mental wellness base as per capacity.

Textbooks:

1. Athletic Track and court marking Handbook of Games & Sports – Rajesh Agola.
2) Asana, Pranayama & Kriyas by Swami satyanand Swami.Munger.
3) Sports Game and its rule, regulation.

Reference books:

1)Yogic prakriyanche margdarshan – Dr.M.L.Gharote - (The Lonavala Yoga Research Institute,Lonavala)
2)Yogabhyas Ek Sukhi Jivan – Dr.Shripad Jarde (Chandrama Prakashan,Kolhapur)
3)Patanjal Yogsutra Ek Abhyas – Anand Rishi (Rajhans Prakashan,Pune)
4)Yog Ani Arogya – Dr.R.R.Waman (Tilak Maharashtra University,Pune)
5) Textbook of Yoga – Dr.Limbaji Pratale & Dr.Namdev Phatangare.