COEP Technological University Pune

(A Unitary Public University of Govt. of Maharashtra)

School of Computational Sciences

Curriculum Structure
All Four Years

B. Tech. Program
in
Computer Science and Engineering

List of Abbreviations

Abbreviation	Title
BS	Basic Science Course
ESC	Engineering Science Course
PCC	Programme Core Course (PCC)
PEC	Programme Elective Course (PEC)
OE/SE	Open/School Elective (OE/SE) other than particular program
MD M	Multidisciplinary Minor (MD M)
VSEC	Vocational and Skill Enhancement Course (VSEC)
HSMC	Humanities Social Science and Management
IKS	Indian Knowledge System (IKS)
VEC	Value Education Course (VEC)
RM	Research Methodology (RM)
--	Internship
--	Project
CEA	Community Engagement Activity (CEA)/Field Project
CCA	Co-curricular & Extracurricular Activities (CCA)

F.Y. B. Tech.
Computer Science and Engineering
[Level 4.5, UG Certificate] Semester -I

Sr. No.	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Weightages in %)				
									Theory			Laboratory	
									MSE	TA	ESE	ISE	ESE
01	BSC	<tbd>	Engineering Physics	2	0	2	1	3	30	20	50	CIE: 100	
02	BSC	<tbd>	Linear Algebra	2	1	0	1	3	30	10	60	--	--
03	BSC	<tbd>	Biology for Engineers	2	0	0	1	2	30	20	50	--	--
04	ESC	<tbd>	Basic Electrical & Electronics Engineering	3	0	2	1	4	30	20	50	CIE: 100	
05	ESC	<tbd>	Engineering Graphics and Design	1	0	4	1	3	CIE: 100			CIE: 100	
06	ESC	<tbd>	Computer Lab	0	0	2	0	1	--	--	--	CIE: 100	
07	AEC	<tbd>	IKS	2	0	0	0	2	CIE: 100			--	--
08	CCA	<tbd>	Liberal Learning -1	0	0	2	0	1	--	--	--	CIE: 100	
			Total	**12**	**01**	**12**	**05**	**19**					

[Level 4.5, UG Certificate] Semester -II

Sr. No.	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Weightages in %)				
									Theory			Laboratory	
									MSE	TA	ESE	ISE	ESE
01	BSC	<tbd>	Probability and Statistics	2	0	2	1	3	30	20	50	CIE: 100	
02	BSC	<tbd>	Quantum Physics	2	0	2	1	3	30	20	50	CIE: 100	
03	ESC	<tbd>	Digital Logic Design	3	0	2	1	4	30	10	60	CIE: 100	
04	ESC	<tbd>	Problem Solving using Procedural Programming	3	0	2	1	4	30	10	60	CIE: 100	
05	PCC	<tbd>	Discrete Structures	2	0	0	1	2	30	20	50	--	--
06	VSEC	<tbd>	Web Design	1	0	2	1	2	CIE: 100			CIE: 100	
07	IKS	<tbd>	Communication Skills	2	0	0	0	2	CIE: 100			--	--
08	CCA	<tbd>	Liberal Learning -2	0	0	2	0	1	--	--	--	CIE: 100	
			Total	**15**	**00**	**12**	**06**	**21**					

Legends: **L**-Lecture, **T**-Tutorial, **P**-Practical, **S**-Self Study, **Cr**-Credits
ISE-In-Semester-Evaluation, **ESE**-End-Semester-Evaluation , **MSE**-Mid-Semester Evaluation, **TA**-Teachers' Assessment, **CIE**-Continuous-Internal-Evaluation

Exit option to qualify for Certification: 2 Courses on Web Technologies

S.Y. B. Tech.
Computer Science and Engineering
[Level 5, UG Diploma] Semester -III

Sr. No.	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Weightages in %)				
									Theory			Laboratory	
									MSE	TA	ESE	ISE	ESE
01	PCC	<tbd>	Microprocessors	3	0	2	1	4	30	10	60	CIE: 100	
02	PCC	<tbd>	Principles of Programming Languages	3	0	0	1	3	30	10	60	--	--
03	PCC	<tbd>	Data Structures and Algorithms	3	0	2	1	4	30	10	60	CIE: 100	
04	OE	<tbd>	Open Elective-1	2	0	0	1	2	30	20	50	--	--
05	AEC	<tbd>	Indian language	2	0	0	0	2	CIE: 100			--	--
06	VEC	<tbd>	Environment Studies	2	0	0	0	2	CIE: 100			--	--
07	CEA	<tbd>	Community Engagement Activity (CEA)/Field Project	--	--	--	0	2	--	--		CIE: 100	
08	HSMC	<tbd>	Entrepreneurship	2	0	0	0	2	CIE: 100			--	--
			Total	**17**	**00**	**04**	**04**	**21**					

[Level 5, UG Diploma] Semester -IV

Sr. No.	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Weightages in %)				
									Theory			Laboratory	
									MSE	TA	ESE	ISE	ESE
01	PCC	<tbd>	Object Oriented Programming & Design	3	0	2	1	4	30	10	60	CIE: 100	
02	PCC	<tbd>	Computer Organization	3	0	0	1	3	30	10	60	--	--
03	PCC	<tbd>	Theory of Computation	2	1	0	1	3	30	10	60	--	--
04	VEC	<tbd>	Constitution of India	2	0	0	0	2	CIE: 100			--	--
05	HSMC	<tbd>	Economics	2	0	0	0	2	CIE: 100			--	--
06	OE	<tbd>	Open Elective-2	2	0	0	1	2	30	20	50	--	--
07	VSEC	<tbd>	Development Tools Laboratory	0	0	2	0	1	--	--		CIE: 100	
08	MDM	<tbd>	Multidisciplinary Minor-1	3	0	0	1	3	30	10	60	--	--
			Total	**18**	**00**	**04**	**04**	**20**					

T.Y. B. Tech.
Computer Science and Engineering
[Level 4.5, UG Certificate] Semester -V

Sr. No.	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Weightages in %)				
									Theory			Laboratory	
									MSE	TA	ESE	ISE	ESE
01	PCC	<tbd>	Design and Analysis of Algorithms	3	0	2	1	4	30	10	60	CIE: 100	
02	PCC	<tbd>	Computer Networks	3	0	2	1	4	30	10	60	CIE: 100	
03	PCC	<tbd>	Operating Systems	3	0	2	1	4	30	10	60	CIE: 100	
04	PEC	<tbd>	DE-1	3	0	0	1	3	CIE: 100			--	--
05	OE	<tbd>	Open Elective-3	2	0	0	1	2	30	20	50	--	--
06	OJT	<tbd>	Internship	--	--	--	0	3	--	--	--	CIE: 100	
07	MDM	<tbd>	Multidisciplinary Minor-2	4	0	0	1	4	30	10	60	--	--
			Total	**18**	**00**	**06**	**06**	**24**					

[Level 4.5, UG Certificate] Semester -VI

Sr. No.	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Weightages in %)				
									Theory			Laboratory	
									MSE	TA	ESE	ISE	ESE
01	PCC	<tbd>	Database Management Systems	3	0	2	1	4	30	10	60	CIE: 100	
02	PCC	<tbd>	Artificial Intelligence	3	0	2	1	4	30	10	60	CIE: 100	
03	PCC	<tbd>	Cryptography and Network Security	3	0	0	1	3	30	10	60	--	--
04	PCC	<tbd>	DE-2	3	0	2	1	4	30	10	60	CIE: 100	
05	VSEC	<tbd>	Full stack development / Devops / Automation Testing	0	0	4	0	2	--	--	--	CIE: 100	
06	MDM	<tbd>	Multidisciplinary Minor-3	4	0	0	1	4	30	10	60	--	--
			Total	**16**	**00**	**10**	**05**	**21**					

Exit option to qualify for B.Voc.: Mini Project / Internship

Final Year B. Tech.
Computer Science and Engineering
[Level 4.5, UG Certificate] Semester -VII

Sr. No.	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Weightages in %)				
									Theory			Laboratory	
									MSE	TA	ESE	ISE	ESE
01	PCC	<tbd>	Compiler Construction	3	0	2	1	4	30	10	60	CIE: 100	
02	PCC	<tbd>	Software Engineering	3	0	2	1	4	30	10	60	CIE: 100	
03	PEC	<tbd>	DE-3	3	0	0	1	3	30	10	60	--	--
04	PEC	<tbd>	DE-4	3	0	0	1	3	30	10	60	--	--
05	RM	<tbd>	Research Methodology	2	0	0	0	2	CIE: 100			--	--
06	OJT	<tbd>	Internship	-	-	-	-	3	--	--	--	CIE: 100	
07	MDM	<tbd>	Multidisciplinary Minor-4	3	0	0	1	3	30	10	60	--	--
			Total	**18**	**00**	**04**	**05**	**22**					

[Level 4.5, UG Certificate] Semester -VIII

Sr. No.	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Weightages in %)				
									Theory			Laboratory	
									MSE	TA	ESE	ISE	ESE
01	PEC	<tbd>	DE-5	3	0	0	1	3	30	10	60	--	--
02	PEC	<tbd>	DE-6	3	0	0	1	3	30	10	60	--	--
03	OJT/VSEC	<tbd>	Internship/ Project	-	-	-	-	6				CIE: 100	
			Total	**18**	**00**	**04**	**05**	**23**					

MULTIDISCIPLINARY MINORS

Semester	Course Code	Course Title	L	T	P	Cr
IV	MD M-01	Data Structures, Files and Algorithms	3	0	0	3
V	MD M-02	Object Oriented Programming	4	0	0	4
VI	MD M-03	Fundamentals of Database Management Systems	4	0	0	4
VII	MD M-04	Fundamentals of Data Science	3	0	0	3
					Total	14

OPEN ELECTIVES LIST
(offered to other departments)

Semester	Course Code	Course Title	L	T	P	Cr
III	OE-01	Data Analytics	2	0	0	2
IV	OE-02	Fundamentals of Operating Systems/ Fundamentals of Algorithms	2	0	0	2
V	OE-03	Fundamentals of Machine Learning	2	0	0	2
					Total	6

DEPARTMENT ELECTIVES

	DE-1	DE-2	DE-3	DE-4	DE-5	DE-6
Tracks	**Sem-5**	**Sem-6**	**Sem-7**	**Sem-7**	**Sem-8**	**Sem-8**
System Software/ Hardware	Cloud Computing PCAP: Parallel Computer Architecture and Programming	POSIX programming	SA: System Administration GPU Computing	MT: Multicore Technology ADBMS: Advanced Database Management Systems	ES: Embedded Systems DS: Distributed Systems	S&V: Storage and Virtualization
Networking and Security	MAN: Mobile and Ad-hoc Networks Remote Sensing	BCT: BlockChain Technologies GIS	IOT: Internet of Things	DS: Distributed Systems	CFLP: Computer Forensics and Data Recovery	CS: Cyber Security
Artificial Intelligence	Data-Science	ML: Machine Learning	Data Visualization Techniques	NLP: Natural Language Processing	DL: Deep Learning	Generative AI
Algorithms and Programming	ADS: Advanced Data Structures	FP: Functional Programming	OOMD: Object Oriented Modeling and Design	Parallel Algorithms	G&M: Graphics and Multimedia	SDP: Software Design Patterns

BS-01: Engineering Physics (EP)

Teaching Scheme:

Lectures:	2 Hrs./Week
Self-study:	1 Hrs./Week
Credit:	2

Evaluation Scheme:

Theory: MSE:	30 Marks
TA:	20 Marks
ESE:	50 Marks
Laboratory:	CIE:100 Marks

Course Objectives:

CO1: Apply the concepts of Quantum mechanics to one dimensional motion of electrons.
CO2: Classify solids on the basis of Band theory and to calculate carrier concentrations.
CO3: Evaluate the electrical conductivity and identify the type of semiconductor.
CO4: Implement the fundamentals of LASER for different applications.

Syllabus:

Unit	Contents	Lecture
1	**Quantum Mechanics**: Matter waves, Properties of matter waves, Physical significance of wave function. Schrödinger's time dependent and time independent equations, Operators, Eigen values and Eigen functions, Expectation values, Applications of Schrödinger's equation; Motion of a free particle, Electron in an infinite deep potential well (rigid box), Electron in a finite deep potential well (non-rigid box)	08
2	**Solid State Physics:** lattice parameters, Miller indices, inter planer distance of lattice plane, density of crystals (linear, planar and volume), S*ö*mmerfield's free electron theory, Density of states (3D), Fermi-Dirac probability function, Nearly free electron theory (E-k curve), classification of solids on the basis of band theory.	07
3	**Semiconductor Physics:** Electron and hole concentrations in semiconductors, intrinsic density, intrinsic and Extrinsic conductivity, Position of Fermi level in intrinsic and extrinsic semiconductors, Law of mass action, Temperature variation of carrier concentration in extrinsic semiconductors, Electrical conduction in extrinsic semiconductor, Hall Effect.	08
4	**Laser Physics:** Introduction to laser, Spontaneous and stimulated emission of radiations, Thermal equilibrium, Condition for Light amplification, Population inversion, Pumping (Three level and four level pumping), Optical resonator, Laser beam characteristics, Ruby laser, Nd-YAG Laser, He-Ne Laser, Semiconductor Laser, Engineering applications of Laser (Fiber optics, Laser material interaction).	07

Suggested learning resources:

1. Introduction to quantum mechanics / David J. Griffiths
2. A textbook of Engineering physics, Avadhanulu and Kshirsagar, S. Chand Pub.
3. Concepts of Modern Physics, Arthur Beiser; Tata McGraw – Hill Edition.
4. Introduction to Solid State Physics, Charles Kittel, Wiley.
5. Solid State Physics, S. O. Pillai, New Age International Publishers.
6. Solid state electronic devices, Ben G. Streetman, Sanjay Banerjee Pearson Prentice-Hall.
7. LASERS Theory and Applications, K. Thyagarajan, A. K. Ghatak; Macmillan India Ltd.

8. Mechanical Vibrations Theory and Applications, Francis S. Tse, Ivan E Morse, Rolland T. Hinkle

BS-01: Engineering Physics Laboratory

Teaching Scheme:

Practical: 2 Hrs./Week
Credit: 1

Evaluation Scheme:

Theory: MSE: 30 Marks
TA: 20 Marks
ESE: 50 Marks
Laboratory: CIE:100 Marks

Course Objectives:

CO1: To provide an experimental foundation for the theoretical concepts introduced.
CO2: To achieve hands-on experimental skills and the study of practical applications will bring more confidence.

Course Outcomes:

Students should be able to:

1. Calculate energy gap, carrier concentration and mobility of the given material.
2. Verify quantum mechanical phenomena.
3. Estimate the size of the object using Laser diffraction.
4. Determine the magnetic susceptibility and dielectric constant of the material.

List of Experiments:

1. Frank-Hertz Experiment
2. Planck's Constant
3. To determine the wavelengths of light of a given source using diffraction grating
4. Band gap of a semiconductor by four probe method
5. Hall effect in Semiconductor
6. Magnetoresistance measurement of semiconductor
7. To determine the reverse saturation current and material constant of PN Junction
8. To determine the dielectric constant of material
9. Study of Biot-Savart's law
10. Measurement of magnetic susceptibility by Quinke's method

BS-02: Linear Algebra

Teaching Scheme:

Lectures:	2 Hrs./Week
Tutorial:	1 Hrs./Week
Self-Study	1 Hrs./Week
Credit:	3

Evaluation Scheme:

Theory: MSE:	30 Marks
TA:	10 Marks
ESE:	50 Marks

Course Objectives:

Students will be able to:

CO1: Define matrices, linear equations, and determinants, recall basic vector algebra.
CO2: Understand basic concepts such as vector spaces, linear dependence / independence of vectors, basis, and linear maps.
CO3: Analyze and calculate eigen values, eigen vectors, rank nullity of a matrix / linear map.
CO4: Prove theorems, apply Gram-Schmidt process on inner product spaces, diagonalize special matrices.
CO5: Apply concepts of linear algebra to various problems including real life problems.

Syllabus:

Unit	Contents	Lecture
1	Matrices and linear equations: basic properties of matrices, row operations and Gauss elimination, Determinants, and their basic properties. Basic concepts in linear algebra: vector spaces, subspaces, linear independence and dependence of vectors, bases, dimensions. Row and Column spaces, rank. Applications to systems of linear equations.	**10**
2	Linear mappings, representation by matrices, rank-nullity theorem, Eigen values, Eigen vectors and their basic properties.	**08**
3	Inner product spaces, orthogonality, Gram-Schmidt process, Diagonalization of special matrices, Geometric applications of Linear transformation, quadratic forms: positive definiteness.	**08**

Suggested learning resources:

Textbook:

1. Elementary Linear Algebra (Sixth Edition) by R. Larson and D. Falvo, Houghton Mifflin Harcourt Publishing company, Boston, New York.

Reference Books:

1. Advanced Engineering Mathematics (10^{th} edition) by Erwin Kreyszig, Wiley Eastern Ltd.
2. Linear Algebra (3^{rd} edition) by Serge Lang, Springer.
3. Linear Algebra and its applications (4^{th} edition) by Gilbert Strang, Cengage Learnings (RS).
4. Elementary Linear Algebra (10^{th} edition) by Howard Anton and Chris Rorres, John Wiley, and sons.

Note:

1. To measure CO1, questions may be of the type- define, identify, state, match, list, name etc.
2. To measure CO2, questions may be of the type- explain, describe, illustrate, evaluate, give examples, compute etc.
3. To measure CO3, questions will be based on applications of core concepts.
4. To measure CO4, questions may be of the type- true/false with justification, theoretical fill in the blanks, theoretical problems, prove implications or corollaries of theorems, etc.

5. To measure CO5, some questions may be based on self-study topics and also comprehension of unseen passages.

All the Course outcomes 1 to 3 will be judged by 75% of the questions and outcomes 4 and 5 will be judged by 25 % of questions.

BS-03: Biology for Engineers (BFE)

Teaching Scheme:

Lectures: 2 Hrs./Week
Self-study: 1 Hrs./Week
Credit: 2

Evaluation Scheme:

Theory: MSE: 30 Marks
TA: 20 Marks
ESE: 50 Marks

Course Outcomes:

Students will be able to:

CO1: Understand the overlapping areas between biology and engineering.
CO2: Observe the principles of biological organization with lessons of increasing efficiency of engineered technologies.
CO3: Analyze the analogies between biological and engineering processes.
CO4: Explore the basic biological principles as guiding elements for engineering structures and processes.
CO5: Appreciate the technological optimization of living systems.

Syllabus:

Unit	Contents	Lecture
1	**Crosstalk between Biology and Engineering:** a) Biologically inspired technologies: Case studies of designs in nature and inspired technologies, Biomemetics: Nature inspired material and mechanisms, Self-cleaning surfaces; Self-healing Bioconcrete, Biomining, Algorithms in nature, b) Contribution of engineering in biological domain: Contribution of Microscope, Imaging techniques, Bio-medical Instruments, Mechanisms (Ergonomics)	04
2	**Organization of Living Machines:** Biomolecules and manufacturing of Biopolymers: • Carbohydrates (structure-based function and engineering applications) • Lipids (structure-based function and engineering applications) • Proteins (structure-based function and engineering applications) • Nucleic Acids (structure-based function and engineering applications) Organization of life forms: Cell to organism Bioenergetics- Energy dynamics in biological system- principles of energy conservation and optimization	08
3	**Analogy of biological organ/system and engineering Device/Mechanism:** Organ & system: Brain & CPU, Eye & Camera, Kidney & Filtration system, Lungs & purification system, Heart & Pumping system Process: Photosynthesis & solar cells, Xylem & plumbing, Thermoregulation in human body & heat transfer in machine, Defense mechanism in organism, signaling processing in biology and electronics	06
4	**Concepts in Bioengineering** Biomechanics: Mechanical properties of tissues, Prosthesis and rehabilitation Bioprinting: 3D printing of biological tissues and organ engineering and transplanting Biomaterials: Types, properties and applications	06

Tissue Engineering: Principle, Components, Methods of Scafold synthesis, properties and applications

5 Application areas of Bioengineering: 06

Databases & Biocomputing: Acquisition, storage, processing and transmission of biological data and its applications like PCR
Bioinstrumentation: Diagnostic and Therapeutic devices
Bioimaging: Principle, types, and examples
Biosensors: Principle, types, and examples
Computational biology and application of Artificial Intelligence in bio-medical field

Suggested learning resources:

1. Lodish H, Berk A, Zipursky SL, et al. (2000) Molecular Cell Biology. W. H. Freeman.
2. Lehninger, A. L., Nelson, D. L., & Cox, M. M. (2000). Lehninger principles of biochemistry. New York: Worth Publishers.
3. Lewin B. (2000) Genes VII. Oxford University Press..
4. Rao CNR, et.al. Chemistry of Nanomaterials: Synthesis, Properties and Applications.
5. Eggins BR. (1006) Biosensors: An Introduction. John Wiley & Sons Publishers.
6. Palsson B.O. and Bhatia S.N. (2009) Tissue Engineering. Pearson.

ES-01: Basic Electrical and Electronics Engineering

Teaching Scheme:

Lectures:	2 Hrs./Week
Practical:	2 Hrs./Week
Self-study:	1 Hrs./Week
Credit:	3

Evaluation Scheme:

Theory: MSE:	30 Marks
TA:	20 Marks
ESE:	50 Marks
Laboratory:	CIE:100 Marks

Course Outcomes:

Students will be able to:

CO1: Analyze AC and DC circuits.
CO2: Use relevant protective devices for electrical installations.
CO3: Analyze the characteristics of PN junction diode and bipolar junction transistor.
CO4: Design basic circuits using IC741 and IC555.

Syllabus:

Unit	Contents	Lecture
1	**DC and AC Circuits:** DC Circuits: Kirchhoff laws, Mesh and Node analysis, Superposition, Thevenin and Norton Theorems, Star-Delta transformation, Maximum Power Transfer theorem. Single-Phase **AC Circuits:** Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R-L, R-C, R-L-C series combinations, series resonance.	**06**
2	**Electrical Machines:** Single-phase Transformer: Construction, principle of working and types, ideal and practical transformer, losses in transformers, efficiency, and regulation of transformer. Rotating machines: Construction, types, characteristics and applications of DC motors, three-phase induction motors.	**06**
3	**Electrical Wiring and Safety:** Types of wires and cables, Copper conductor sizes and rating, earth wires, Switch Fuse Unit (SFU), Miniature Circuit Breaker (MCB), Earth Leakage Circuit Breaker (ELCB), Lightning protection, Batteries-types, Characteristics, elementary calculations for energy consumption, battery backup, inverter, UPS types and specifications. **Electrical safety:** Electrical safety, Earthing, first aid treatment after electrical shock.	**Self-study**
4	**Semiconductor Devices and Applications:** Semiconductor theory: Intrinsic and extrinsic semiconductors, Introduction to P-N Junction Diode, Forward and Reverse biasing, V-I characteristics, Breakdown phenomenon in PN Junction diodes; Full wave rectifiers, capacitor filter; Zener diode and its V-I characteristics, Zener diode as a voltage regulator; Introduction to BJT,	**06**

Types of Biasing, DC load line concept, I/O characteristics, transfer characteristics.

5	**Integrated Circuits and Applications:** OPAMP - Block diagram of OPAMP, Schematic symbol and Pin configuration, Characteristics of the ideal OPAMP, OPAMP without feedback, Effect of negative feedback on amplifier, Virtual ground concept, OPAMP with feedback, IC 741 Linear applications: Difference amplifier, and Schmitt Trigger. 555 Timer - Functional diagram of IC 555 and its applications as Astable and Monostable Multivibrator.	**06**

List of Experiments:

Overview of the Basic Electrical Engineering Lab (Equipment available: universal trolley, meters, transformers, loads, etc.) and safety precautions.

1. Verification of Network Theorems:
    a. Connect a simple DC circuit with two loops and more than one source and measure all the branch currents and node voltages.
    b. Solve the same circuit applying Thevenin's, Norton's, and Superposition Theorems.
2. Measure the voltage, current, and power in the R-L, R-C, and R-L-C series circuits and observe the phase difference between voltage and current using CRO.
3. Connect the three-phase induction motor in star and delta and measure the line and phase voltages and currents to verify the relationship between line and phase quantities.
4. Determine the efficiency and regulation of a single-phase transformer by direct loading.
5. Connect the single-phase load bank through a switch-fuse unit, MCB and ELCB and check their operation in case of overload, short circuit and earth leakage.
6. Observe the output voltage of a half wave rectifier and center tapped full wave rectifier with and without capacitor filter. Calculate V_{dc} and I_{dc}
7. Observe the performance of single stage BJT CE Amplifier and find gain and bandwidth of it.
8. To study Op-Amp and its applications

Measure the duty cycle and free running frequency of astable multivibrator.

Suggested learning resources:

Textbooks:

1. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2nd Edition 2019.
2. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition, 2019.
3. E. Hughes, "Electrical and Electronics Technology", Pearson, 10th Edition, 2010.
4. Malvino, "Electronic Principles", Tata McGraw Hill, 7th edition, 2017.
5. R.P. Jain, "Modern Digital Electronics", Tata McGraw Hill, 3rdedition, 2005.

Reference Book:

1. Vincent Del Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 2nd Edition, 2015.
2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2nd Edition, 2003.
3. Boylestead & Nashelsky, "Electronic devices and Circuits Theory", 8th edition, PHI
4. M Morris Mano, "Digital Design", 4th edition, Pearson.

ES-02: Problem Solving using Procedural Programming

Teaching Scheme:

Lectures:	3 Hrs./Week
Practical:	2 Hrs./Week
Self-Study:	1 Hrs./Week
Credit:	4

Evaluation Scheme:

Theory: MSE:	30 Marks
TA:	10 Marks
ESE:	60 Marks
Laboratory:	CIE :100

Course Objectives:

Students will be able to:

- CO1: Represent real life data using data types and variables provided by programming language.
- CO2: Write flow chart, using standard notation, for given problems.
- CO3: Solve a given problem using expressions, conditional statements, arrays and loops.
- CO4: Design a modular solution using functions, by breaking down the problem into parts, using programming language.
- CO5: Demonstrate the ability to process files of various types.

Syllabus:

Unit	Contents	Lecture
1	**Basic programming constructs:** Understanding a problem: Framing a problem in simple terms – mathematical, graphical, other abstractions. Number systems. Syntax errors and runtime errors. Manual solutions to real life problems. Algorithms, Properties/characteristics of Algorithms, Flowchart and Pseudo code, Algorithmic representation of the solutions Basic steps in program execution: Editing, compiling/interpreting/running programs, OS view and programmer's view.	4
2	**Introduction to problem solving using computers:** Basic Problems. Basic Data types (Numerical, String). Variables. Expressions. Statements. I/O statements for keyboard handling. Decision Making Statements (if-Statements, if-else Statements, Nested if Statements, Multi-way if-elif-else Statements), Conditional statements, Exchange values of two variables. Finding maximum of three numbers.	8
3	**Iterative problems** Problems without arrays: Introduction to iterative constructions in language. Find Sum, average of a given set of numbers. Loop design techniques: While loop - *body, iterative step, loop condition.* Emphasis on while loop against for loop. Factorial. Sine function computation. Fibonacci sequence generation. Some problems to read data from files. Array techniques: Arrays as homogenous collection of elements. Array properties. Reversing elements of an array. Finding maximum. Finding second maximum. Algorithms for substring search. Search problems: linear search. linear search in sorted array. binary search.	8
4	**Modular solutions** Functions Introduction to functions. Importance of design of functions. Rewriting earlier solutions using functions. Taking care of all possible values of arguments. Parameters, return values, signature, local and global scope. Modular code. Reusability. Recursion. Basic rules of recursion: recursive formulation, terminating case, handle all cases, recursion leading to terminating case. Factorial: iterative vs. recursive.	8

	Recursive formulation for: multiplication, gcd, towers of Hanoi, binary search. Recursion vs. iteration in general. When to use recursion.	
5	**Files:** I/O functions to transfer data from file to variables. Comparison of keyboard and file I/O functions. operations to read, write, close, open files.	**4**
6	**Advanced Problems:** Convert a number into one with digits reversed. Convert decimal to binary. Generating prime numbers. Generating random numbers. Computing x power y. Partitioning an array. Finding the kth smallest element of an array. Sorting: Selection sort. Insertion sort. bubble sort.	**8**

Suggested learning resources:

Textbook:

1. R. G. Dromey, "How to solve it by Computer", Pearson Education, ISBN 0-13-433995-9.
2. Maureen Sprankle, "Problem Solving and Programming Concepts", Pearson Education, ISBN-978-81-317-0711-1.

Reference Books:

1. Stephen G. Krantz, "Problem Solving Techniques", Universities Press.
2. Kernighan and Ritchie, "The 'C' programming language", Prentice Hall.
3. Reema Thareja, "Python Programming: Using Problem Solving Approach", Oxford University Press; First edition, 978-0199480173.

Laboratory Course Outline

The course involves writing code for solved, unsolved and practice programming problems given in the lab manual.

List of Experiments:

1. Write a program to enter two numbers and perform all arithmetic operations.
2. Program to find the area of a triangle using Heron's Formula.
3. Take two integers as input and divide the first by the second. Prevent division by zero.
4. Write a program to print `n' terms of an Arithmetic series, with the first term `a' and a constant difference `d'. Take `a,d,n' from user.
5. Take a real value `x' from the user and find the value of tan (x), log (x), square root of x.
6. Write a program to display all the prime numbers between 1 and 100.
7. Write a program to take as input, 10 integers and put them in an array and display their values. Then, find the sum of all elements in the array and the position of the largest element. (Hint: use the logic of the algorithm to find maximum)
8. Declare a 3x3 matrix. Initialise it to zero using nested loops. Then fill some user-given values into it. Print the matrix in proper format to make sure the inputs are correctly taken.
9. Write your own function to find the minimum element of an array of integers. (Input to the function is integer array, output is the position number of the minimum element)
10. Declare an array of 10 integers. Declare a pointer and point it to the base of the array. Print all the elements of the array using this pointer and not using the original name of the array.

ES-03: Computer Lab

Teaching Scheme: **Evaluation Scheme:**

Course Outcomes: **Laboratory:** CIE: 100 Marks

Students will be able to:

CO1: Demonstrate the use of various scientific computational tools for the purpose of numeric computations, plotting, and visualization.

CO2: Demonstrate the knowledge of basic computer components, ability to assemble, and install/setup a PC and make it available in network.

CO3: Demonstrate the ability to solve real life problems using computational tools.

List of Activities:

Activity I: Basics

Name and identify various PC hardware components: USB Mouse, PS/2 Mouse, Keyboard, LCD/LED Monitor, VGA, HDMI, CAT5, CAT6, server, routers, fibre cable, Hard disk, RAM, CMOS battery, SMPS, cache, ROM, BIOS

Type using all your fingers and achieve a speed of 30 words per minute.

Activity II: Assemble a PC

Assemble a Desktop PC from its components.

Install any two operating systems on a PC making it dual boot, including latest version of Ubuntu Linux, Windows.

Activity III: Setting up LAN

Connect 2-4 computers together using a network hub to create a LAN. Setup network on both computers for communication in LAN and over internet (IP, Masks, DNS, Gateway, Proxy). Transfer files between two computers using ftp and scp. Remotely connect to other computer using telnet and ssh.

Activity IV: Spreadsheets

Design a spreadsheet to facilitate grading of students, given their names and marks as two columns. The user should be able to enter grade ranges, and the spreadsheet should enter the grades automatically in front of each student, prepare a detailed chart showing grade ranges, number of students in each range and also create a line-chart for the same.

Activity V: GNUPlot

Demonstrate use of a plotting tool like GNUPlot to plot a given set of functions with a given domain, a given set of data on X-Y axis and save the result to a file format as specified.

Activity VI: Scientific Computational Tools

1. Demonstrate the use of matrix computational framework (e.g. Scilab, or Matlab) to solve a set of linear simultaneous equations.
2. Demonstrate the use of matrix computational framework (e.g. Scilab, or Matlab) to find Eigen vectors for a given data.
3. Demonstrate the use of a programming language like Python to compute multiplication of a sequence of matrices.
4. Demonstrate the use of a programming language like Python to compute various statistics about given set of data and plot the data as instructed.
5. Demonstrate the use of Numpy in Python for code optimization

6. Demonstrate file handling using Numpy in Python for performing indexing and slicing required for effective data retrieval
7. The instructor is encouraged to update the list of assignments on a regular basis.

Hardware Resources

1. PC Hardware components: Motherboard, processor, SMPS, RAM, DVD-RW drive, Hard disk drives, power cables, VGA/HDMI connectors, Keyboard, Mouse (PS2/USB), Cabinet, LED displays
2. Network Hub (4/8 ports)

Suggested learning resources:

1. V. Rajaraman, "Fundamentals of Computers", Fifth Edition, Prentice Hall India, ISBN-978-81-203-4011-4
2. Excel Exercises http://web.utk.edu/~dhouston/excel/exercise.html
3. Introduction to Scilab https://wiki.scilab.org/Tutorials, Introduction to Matlab https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-094-introduction-to-matlab-january-iap-2010/assignments/
4. Introduction to GNUPlot http://people.duke.edu/~hpgavin/gnuplot.html ,http://gnuplot.info/docs/tutorial.pdf
5. Introduction to Numpy https://sites.engineering.ucsb.edu/~shell/che210d/numpy.pdf

HSMC-01: Indian Knowledge System

Teaching Scheme: Lectures: 2 Hrs./Week

Evaluation Scheme: **Laboratory:** CIE : 100 Marks

Course Outcomes:

Students will be able to:

CO1:

Syllabus:

Unit	Contents	Lecture
1	Basics of Ancient Indian Knowledge and diverse fields from health (Yoga), Agriculture, performing arts etc.	4
2	Ancient Indian Knowledge in various Science streams like physics, chemistry, biology, forestry, mathematics etc.	8
3	Ancient Indian Knowledge in Civil Engineering, Metallurgy, Mechanical Sciences, Textile Technology etc.	8
4	Ancient Indian Knowledge in Electrical, Electronics, Computational Studies, Instrumentation etc.	8

Suggested learning resources:

CCA-01: Liberal Learning - 1

Teaching Scheme: **Evaluation Scheme:**

Course Outcomes: **Laboratory:** CIE : 100 Marks

Students will be able to:

CO1:
CO2:
CO3:
CO4:

Syllabus:

Unit	Contents	Lecture
1		
2		
3		
4		
5		

Suggested learning resources:

BS-04: Probability and Statistics

Teaching Scheme:		**Evaluation Scheme:**	
Lectures:	2 Hrs./Week	MSE:	30 Marks
Practical:	2 Hrs./Week	TA:	20 Marks
Self-Study	1 Hrs./Week	ESE:	50 Marks
Credit:	3	**Laboratoy** :CIE:100	Marks

Course Objectives:

Students will be able to:

CO1: Recall and know basics of probability theory, R software, probability distribution, statistical inference, linear regression.

CO2: Understand concepts of probability, probability distributions, estimation, regression, and use of R software.

CO3: Evaluate probability of compound events, find probabilities using standard distributions, test for basic statistical inference (t-test, z-test, F-test, $\chi 2$ –test, confidence interval, non-parametric tests), Use of statistical tables and data sets in R, solve problems on simple linear regression.

CO4: Prove theorems / statements, run standard programs on R, solve problems on multiple regression.

CO5: apply concepts of probability and statistics to various problems including real life problems.

Syllabus:

Unit	Contents	Lecture
1	Introduction to 'R': Introductory R language fundamentals and basic syntax, major R data structures, Using R to perform data analysis, creating visualizations using R.	**06**
2	Descriptive statistics: Measures of location and variation. Visualization of data: Frequency tables, bar diagrams, histograms, heat maps, other visualization tools. Review on introduction to combinatorics and probability theory.	**06**
3	Some of the basic probability distributions: Binomial, Poisson, Exponential, and Normal. Central limit theorem.	**06**
4	Basic statistical inference and hypothesis testing: Estimation, basic tests such as t-test, z-test, F-test, χ^2 –test, Nonparametric tests: Sign test, Wilcoxon signed rank test.	**08**

Assignments List:

1. **Data representation tools using R:** Histogram, Bar plot and pie chart (for inbuilt dataset, for external dataset, Data.csv and for data vector added to R.)
2. **Probability using R:** calculations in R for eg. choose(n,p)command to calculate ways to select p objects out of n, Defining a function PDF/CDF in R, plotting the function in R and finding probabilities
3. **Finding probabilities using standard distributions:** finding probabilities on Bernoulli distribution using statistical tables and using R, finding probabilities on Poisson and Normal distribution using statistical tables and using R
4. **Finding probabilities using sampling distributions:** Finding probabilities on Exponential distribution using R, Chi-squared distribution T-distribution and F distribution using statistical tables and using R
5. **Testing of hypothesis using statistical tables and using R**

Note:

1. To measure CO1, questions may be of the type- define, identify, state, match, list, name etc.
2. To measure CO2, questions may be of the type- explain, describe, illustrate, evaluate, give examples, compute etc.

3. To measure CO3, questions will be based on applications of core concepts.
4. To measure CO4, questions may be of the type- true/false with justification, theoretical fill in the blanks, theoretical problems, prove implications or corollaries of theorems, etc.
5. To measure CO5, some questions may be based on self-study topics and also comprehension of unseen passages.

All the Course outcomes 1 to 3 will be judged by 75% of the questions and outcomes 4 and 5 will be judged by 25 % of questions.

Suggested learning resources:

Textbook:

1. Christian Heumann, Michael Schomaker, Shalabh, Introduction to Statistics and Data Analysis, ISBN: 978-3-319-46160-1, DOI: 10.1007/978-3-319-46162-5, Publisher: Springer, Year: 2016

Reference Books:

1. Ross S.M., Introduction to probability and statistics for Engineers and Scientists (8th Edition), Elsevier Academic press, 2014.
2. Ronald E, Walpole, Sharon L. Myers, Keying Ye, Probability and Statistics for Engineers and Scientists (9th Edition), Pearson Prentice Hall, 2007.
3. Tilman M. Davies, The book of R: A first course in Programming and Statistics (1st Edition), No Starch Press, USA, 2016.
4. S. P. Gupta, Statistical Methods, S. Chand & Sons, 37th revised edition, 2008.
5. Kishor S. Trivedi, Probability and Statistics with Reliability, Queuing and Computer Science Applications (2nd Edition), Wiley Student edition, 2008.
6. Stephens L.J., Schaum's outline of statistics for Engineers, Latest edition, 2019.
7. The practice of Business Statistics by Manish Sharma and Amit Gupta, Khanna Publishing Company Private Limited, New Delhi, 2014.

References for R Software:

1. Norman Matloff, The Art of R Programming - A Tour of Statistical Software Design, (1st Edition), No Starch Press, USA, 2011.
2. Sudha Purohit, Sharad Gore, Shailaja Deshmukh, Statistics using R (2nd Edition), Narosa Publications, 2019.
3. Randall Pruim, Foundations and Applications of Statistics - An introduction using R (2nd Edition), American Mathematical Society, 2018.
4. Hadley Wickham and Garrett Grolemund, R for Data Science: Import, Tidy, transform, Visualize and Model Data, (1st Edition), O'Reilly Publications, 2017.

BS-05: Quantum Physics

Teaching Scheme:

Lectures: 2 Hrs./Week
Self-Study: 1 Hrs./Week
Credit: 2

Evaluation Scheme:

MSE: 30 Marks
TA: 20 Marks
ESE: 50 Marks
Laboratory : CIE :100

Course Objectives:

Students will be able to:

CO1: To understand the role of uncertainty principle in quantum physics.
CO2: To apply the Schrodinger equation to solve 1D quantum mechanical system.
CO3: To apply operators to obtain physical properties of particle's.
CO4: To understand the role of degeneracy in the occurrence of electron shell structure in atoms.

Syllabus:

Unit	Contents	Lecture
1	**Wave properties of particles:** Wave packets, the motion of wave packets, phase velocity, group velocity, relation between phase and group velocity, Heisenberg uncertainty principle, ϒ (Gamma) ray microscope.	06
2	**Applications of the Schrodinger's wave equation:** Potential barrier, barrier penetration, quantum tunneling Effect, Harmonic oscillation (1D)	06
3	**Operators in Quantum Mechanics:** Hermitian operator, position, momentum operator, angular momentum operator, total energy operator (Hamiltonian), commutator brackets – simultaneous Eigen function, commutator algebra, commutator brackets using position, momentum, and angular momentum operator, raising and lowering angular momentum operator, concept of parity, parity operator and its Eigen values.	06
4	**Many Electrons Atoms:** Electron spin, exclusion principle, Stern - Gerlach experiment, symmetric and antisymmetric wave function, fermions, and bosons.	08

@ 13-15 lectures per credit per course

Suggested learning resources:

Textbook:

1. Modern Physics, 6th Edition, Arthur Beiser, Shobhit Mahajan, S Rai Choudhury
2. Introduction to Quantum Mechanics, 2nd Edition, David J. Griffiths
3. A Textbook of Quantum Mechanics, 2nd Edition, P. M. Mathews, K. Venkatesan
4. Quantum Mechanics – Theory and Applications, 3rd Edition, A. K. Ghatak, S. Lokanathan
5. Quantum Mechanics by L. I. Schiff
6. Modern Quantum mechanics by J. J. Sakurai

BS-05: Quantum Physics Laboratory

Teaching Scheme:

Practical: 2 Hrs./Week
Credit: 1

Evaluation Scheme:

MSE: 30 Marks
TA: 20 Marks
ESE: 50 Marks

Course Objectives:

CO1: To understand the basic concepts and principles in quantum mechanics.
CO2: To verify quantum mechanical phenomena.

Course Outcomes:

Students should be able to:

1. Understand the central concepts and principles in quantum mechanics.
2. Verify quantum mechanical phenomena.

List of Experiments:

1. Stefan's law
2. Photoelectric effect
3. G. M. Counter
4. Stern Gerlach experiment
5. Davisson and Germer experiment
6. ɣ (Gamma) ray microscope experiment
7. Electron diffraction experiment.
8. Zeeman effect
9. Frank Hertz
10. Planck's Constant

ES-04: Digital Logic Design

Teaching Scheme:

Lectures:	3 Hrs./Week
Practical:	2 Hrs./Week
Self-Study:	1 Hrs./Week
Credit:	4

Evaluation Scheme:

MSE:	30 Marks
TA:	10 Marks
ESE:	60 Marks
Laboratory:	CIE : 100 Marks

Course Objectives:

Students will be able to:

CO1: Apply the knowledge of number systems and codes in problem solving related to code conversion and number system.
CO2: Optimize circuit design.
CO3: Explain the fundamental concepts of combinational logic devices and design them.
CO4: Explain fundamentals of sequential logic devices and design them.
CO5: Analyze and design algorithmic state machines.

Syllabus:

Unit	Contents	Lecture
1	**Number systems and codes :** Binary number systems, Octal number system, hexadecimal number system, Signed binary numbers, Binary arithmetic, 1‟s and 2‟s complement, Introduction to gates, Review of Boolean algebra and DeMorgan's law, Minimization of Boolean function using Karnaugh Map (up to four variable), SOP-POS, Code conversions- Binary code to gray code and gray to binary, BCD to Excess – 3, Excess – 3 to BCD code etc. Introduction to Hardware Description Language	**08**
2	**Combinational Logic Circuits:** Integer adder/subtractors, Ripple carry adder and Carry look ahead adder, Integer subtractions using adders, Programmable Read Only Memories (PROMs), RAM, EPROM, EEROM and MOS-static RAM cell, multiplexer/ demultiplexer, Implementation of Combinational Logic Circuits using mux/demux, Decoders, Encoders, Priority encoders.	**08**
3	**Sequential Logic Circuits:** RS latch and JK latch, Flip-flops-RS, JK, T and D flip flops, Master-slave flip flops, Edge-triggered flip-flops. Analysis and Design of Synchronous Sequential Circuits: Introduction to sequential circuits, Characteristic table, Characteristic equation and Excitation table.	**08**
4	**Modular sequential logic circuits:** Registers, Shift Registers, Design of Synchronous / Asynchronous counter. Up down counter.	**08**
5	**Algorithmic State Machines:** ASM charts, notation, RTL notation and implementation design of simple controller, multiplexer controller method.	**08**

List of Experiments:

1. Verify the truth table of various logic gates (NOT, AND, OR, NAND, NOR, EX-OR, & EX-NOR).
2. Simplify Boolean function using K-map method and implement using basic gate.
3. Design and implement following code conversion a. Binary to Gray b. Gray to Binary c. Excess – 3 code to BCD d. BCD to Excess – 3 code.
4. Design and verify a half adder and full adder.
5. Design and verify a half subtracter and full subtracter.
6. Design a combinational circuit whose output is the 2‟s complement of the input number.
7. Design and implement a 4-bit adder/subtractor circuit with ADD/SUB control line using 4 bit adder IC. 8. Implement BCD adder using 4 bit adder IC.
8. Implementation of Multiplexer, Demultiplexer, Encoder and Decoder.
9. Design and verify the operation of RS, D, JK and T flip-flops using logic gates.
10. Design synchronous and asynchronous up down counter.

11. Design Mod counter.
12. Design sequence generator using JK, T and D flop-flop.
13. Implement and verify operation of ring and Johnson counter.
14. Design and verify the various operations of shift registers.

Suggested learning resources:

Textbook:

1. "Digital Design" M Morris Mano, 5th Edition, 2013, Pearson Education, ISBN-10: 0-13-277420-8 / ISBN-13: 978-0-13-277420-8.
2. "Modern Digital Electronics", R.P. Jain, 4th Edition, 2009, Tata McGraw-Hill, ISBN 10: 0070669112 / ISBN 13: 9780070669116.

ES-05: Engineering Drawing and Computer Graphics

Teaching Scheme:		**Evaluation Scheme:**	
Lectures:	1 Hrs./Week	MSE:	15 Marks
Practical:	4 Hrs./Week	TA:	15 Marks
Self-Study	1 Hrs./Week	ESE:	50 Marks
Credit:	3	Practical:	20 Marks

Course Objectives:

Students will be able to:

CO1: Familiarize with different drawing tools, technical standards and procedures for construction of different geometries and engineering objects.

CO2: Develop the ability to visualize and communicate three dimensional shapes and their sections by representing three-dimensional objects into two-dimensional views using the concept of orthographic projection.

CO3: Apply visualization practices to draw isometric projection from a given orthographic views.

CO4: Draw the development of lateral surfaces of assembly and cut sections of different geometrical solids for engineering applications.

CO5: Draw 2D and 3D drawings using computer aided drafting tool.

Syllabus:

Unit	Contents	Lecture
1	**Introduction to Engineering Drawing:** Drawing tools, drawing standards, line conventions, lettering, systems and rules of dimensioning.	02
2	**Orthographic Projections:** Principles of Orthographic Projections, types of orthographic projections–First angle and third angle projections, obtaining orthographic projections of given solids and machine elements by using first angle projection method along with sectional views. Basic drawing commands and its applications to draw 2D views using CAD software.	04
3	**Isometric Projections:** Principles of Isometric projection – Isometric and natural Scale, Isometric views of simple and compound solids, drawing isometric views from given orthographic views. Basic drawing commands and its applications to draw 3D views using CAD software	04
4	**Development of lateral surfaces (DLS) of solids:** Industrial applications of development of lateral surface, methods of development, development and antidevelopment of lateral surfaces for cut section of Prism, Pyramid, and Cone.	04

practical's:

Draw 2 examples on each assignment on A3 size drawing sheet:

Assignment 1: Draw orthographic views of any machine elements along with sectional view.

Assignment 2: Draw isometric view for given orthographic views.

Assignment 3: Draw the development and antidevelopment of lateral surfaces of solids.

Assignment 4: (Programme specific assignment. One example only)

- Draw a plan, elevation, section of single storey building. (For Civil Engineering)
- Conventional representation of piping layouts, pipe fittings, valves, joints. Stuffing box & glands, Expansion joints etc. (For mechanical, Manufacturing, Metallurgy

and Robotics and Automation) (For Electrical, Electronics and Instrumentation Engineering)

Complete the following assignment by using CAD software (04 example each):

Assignment 1: Draw orthographic views of any machine elements along with sectional view.

Assignment 2: Draw isometric view for given orthographic views. (3D drawings)

Assignment 3: (Programme specific assignment. One example only)

- Draw a plan, elevation, section of single storey building. (For Civil Engineering)
- Conventional representation of piping layouts, pipe fittings, valves, joints. Stuffing box & glands, Expansion joints etc. (For mechanical, Manufacturing, Metallurgy and Robotics and Automation) (For Electrical, Electronics and Instrumentation Engineering)

Suggested learning resources:

Textbook:

1. N.D.Bhatt, "Elementary Engineering Drawing", Charotar Publishing House, Anand (India)
2. M.L.Dabhade, "Engineering Graphics" I, Vision Publications, Pune
3. Dhananjay Jolhe, "Engineering Drawing", Tata McGraw Hill publishing company Ltd., New Delhi.

Reference Books:

1. Warren Luzzader, "Fundamentals of Engineering Drawing", Prentice Hall of India, New Delhi.
2. Shah, M.B. & Rana B.C.), "Engineering Drawing and Computer Graphics", Pearson
3. Education
4. Agrawal B. & Agrawal C. M., "Engineering Graphics", Tata McGraw Publication
5. Suraj Singh, "Civil Engineering Building Practice"

PCC-01: Discrete Structures

Teaching Scheme:

Lectures: 2 Hrs./Week
Self-Study: 1 Hrs./Week
Credit: 2

Evaluation Scheme:

Theory: MSE: 30 Marks
TA: 20 Marks
ESE: 50 Marks

Course Objectives:

Students will be able to:

CO1: Explain formal logic and different proof techniques.
CO2: Recognize relation between different entities using sets, functions, and relations.
CO3: Solve problems related to counting.
CO4: Relate, interpret, and apply the concepts to various areas of computer science.

Syllabus:

Unit	Contents	Lecture
1	**Set Theory, Logic and Proofs**: Propositions, Conditional Propositions, Logical Connectivity, Propositional calculus, predicates and Quantifiers, First order logic, Proofs: Proof Techniques, Mathematical Induction, Set, Combination of sets, Finite and Infinite sets, countable and Uncountable sets, Principle of inclusion and exclusion	8
2	**Relations, Functions, Recurrence Relations:** Definitions, Properties of Binary Relations, Equivalence Relations and partitions, Partial ordering relations and lattices, Chains and Anti chains. Theorem on chain, Warshall's Algorithm & transitive closure, Recurrence relations. Functions: Definition, Domain, Range, Image, etc. Types of functions: Surjection, Injection, Bijection, Inverse, Identity, Composition of Functions, Generating Function	8
3	**Counting:** Basic Counting Techniques (sum, product, subtraction, division, exponent), Pigeonhole and Generalized Pigeonhole Principle with many examples, Permutations and Combinations and numerical problems, Binomial Coefficients Pascal's, Identity and Triangle	6
4	**Algebraic Systems**: Algebraic Systems, Groups, Semi Groups, Monoids, Subgroups, Permutation Groups, Codes and Group codes, Isomorphism and Automorphisms, Homomorphism and Normal Subgroups, Ring, Field.	6

Suggested learning resources:

Textbook:

1. "Discrete Mathematics and Its Applications", Kenneth H. Rosen, 7th Edition, Tata McGraw-Hill, 2017, ISBN: 9780073383095.
2. "Elements of Discrete Mathematics", C. L. LIU, 4th Edition, Tata McGraw-Hill, 2017, ISBN-10: 1259006395 ISBN-13: 978125 9006395.

Reference Books:

1. "Discrete Mathematical Structures", G. Shanker Rao, 2nd Edition2009, New Age International, ISBN-10: 8122426697, ISBN-13: 9788122426694
2. "Discrete Mathematics", Lipschutz, Lipson, 2nd Edition, 1999, Tata McGraw-Hill, ISBN: 007 463710X.
3. "Graph Theory", V. K. Balakrishnan, 1st Edition, 2004, Tata McGraw-Hill, ISBN-10: 0-07-058718-3, ISBN-13: 9780070587182.

4. "Discrete Mathematical Structures", B. Kolman, R. Busby and S. Ross, 4th Edition, Pearson Education, 2002, ISBN: 8178085569
5. "Discrete Mathematical Structures with application to Computer Science", J. Tremblay, R. Manohar, Tata McGraw-Hill, 2002, ISBN: 0070651426

VSEC-01: Web Design

Teaching Scheme:

Lectures: 1 Hrs./Week
Self-Study: 1 Hrs./Week
Credit: 2

Evaluation Scheme:

Laboratory: CIE : 100 Marks

Course Objectives:

Students will be able to:

CO1: Demonstrate ability to install and configure a web server.
CO2: Design a specified webpage using HTML and CSS.
CO3: Demonstrate the ability to manipulate DOM objects using JavaScript.

Syllabus:

Unit	Contents	Lecture
1	**Web Essentials:** Clients, servers, communication, basic Internet protocols, HTTP Request message, HTTP response message, web clients, generations of web applications, Web server configuration, Debugging tools like Postman.	2
2	**Markup languages, HTML:** HTML: fundamental HTML elements, head, body etc., basic XHTML syntax and semantics, document publishing; HTML4 and HTML5.	3
3	**Design of web pages:** CSS3: introduction, features, syntax, style properties of text, box, layout, list, table, cursor, background, block, list, border, positioning etc.; CSS Selectors: ID, tag, class, sub, child combinatory, adjacent, attribute, group, first-line, before and after.	4
4	**Client-Side Programming:** JavaScript: basic syntax, variables and data types, statements, operators, literals, functions; JavaScript Objects: properties, references, methods, arrays, other built-in objects, debugging, host objects, document object model (DOM) , document tree, DOM event handling, Basic introduction to AJAX.	5

Suggested List of Assignments:

1. Write a HTML page by hand which looks like the homepage of this website: https://www.freecodecamp.org/ or any specified page.
2. Install, configure, compare and discuss features of any open-source web server.
3. Demonstrate use of CSS on any HTML page. Include elements to handle: page resize, changing color of clicked links.
4. Write a web page which displays a slide show of images. The page should allow changing the timing for the slideshow, automated slideshow, and clicking next/previous buttons. All code should be in one single file.

This list is a guideline. The instructor is expected to improve it continuously.

Suggested learning resources:

Textbook:

1. Jeffrey C. Jackson, "Web Technologies: A Computer Science Perspective", Second Edition, Pearson Education, 2007, ISBN 978-0131856035.

Reference Books:

1. Marty Hall, Larry Brown, "Core Web Programming", Second Edition, Pearson Education, 2001, ISBN 978-0130897930.
2. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007, ISBN 978-0321489692.
3. H.M. Deitel, P.J. Deitel and A.B. Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education, 2006, ISBN 978-0131752429.

Online References:

1. https://www.w3.org/html/
2. HTML, The Complete Reference http://www.htmlref.com/
3. http://w3schools.org/
4. http://php.net/
5. https://jquery.com/
6. https://developer.mozilla.org/en-US/docs/AJAX
7. http://www.tutorialspoint.com/css/

HSMC-02: Communication Skills

Teaching Scheme:

Lectures: 2 Hrs./Week

Credit: 2

Evaluation Scheme:

MSE: 30 Marks

TA: 20 Marks

ESE: 50 Marks

Course Objectives:

Students will be able to:

Syllabus:

Unit	Contents	Lecture
1	**Introduction to English for Engineers** Varieties and Registers of English English for Specific Purposes (ESP): Business English	2
2	**Foundation of Communicative and Linguistic Ability Development** Types of Communication, Process of Communication, Barriers, and ways to overcome them, Common Challenges: Phonological, Syntactic, Semantic and Pragmatic Errors.	4
3	**Advanced Speaking Skills** Nuances of Speaking Skills/ Public Speaking, Group Communication, Presentation Skills: The 4 P's of Presentation, Do's and Don'ts, Techniques for Effective Delivery.	4
4	**Business Writing Development** Techniques of Writing: Note-making, Drafting, Editing, Paraphrasing and Proof-reading, Business Letters, Emails and Brief Reports.	4

Suggested learning resources:

Textbook:

[Course Code]: Server Side Programming
(Exit option course I on Web Technologies)

Teaching Scheme:

Lectures:	2 Hrs./Week
Practical:	2 Hrs./Week
Self-Study:	1 Hrs./Week
Credit:	

Evaluation Scheme:

Lab Assignments:	50 Marks
ESE:	50 Marks

Course Outcomes:

Students will be able to:

CO1: Demonstrate the ability to write server side scripts.

CO2: Demonstrate the ability to configure web and database servers.

Syllabus:

Unit	Contents	Lecture
1	**SQL:** Database, Tables, Views, Basics of SQL: CREATE, SELECT, JOIN, INSERT, DELETE queries.	**06**
2	Server-Side Programming (using PHP/NodeJS): client request, form data, request headers, server response, HTTP status codes, HTTP response headers, sessions, cookies, URL rewriting, separating programming and presentation, connection to databases.	**14**
3	**Web Services:** basic concepts, creating, publishing, testing and describing a web service, WSDL, XML services, communicating object data, REST API, using Google/Twitter Web APIs.	**08**

Suggested List of Assignments:

1. Install MySQL-server on your laptop and run SQL queries to do the following: create a database, create a table, insert rows in a table, fetch rows from a table, delete a row, update a row.
2. Write an HTML page with login/password fields. Write server-side code to validate the login-id and password for the following: both are properly formed and at least 6 bytes long; the password contains at least one special case, one capital and one numeric character.
3. Write a program to fetch tweets with given hash tags, using twitter API.

This list is a guideline. The instructor is expected to improve it continuously.

Suggested learning resources:

Textbook:

1. Jeffrey C. Jackson, "Web Technologies: A Computer Science Perspective", Second Edition, Pearson Education, 2007, ISBN 978-0131856035.

Reference Books:

1. Marty Hall, Larry Brown, "Core Web Programming", Second Edition, Pearson Education, 2001, ISBN 978-0130897930.
2. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007, ISBN 978-0321489692.
3. H.M. Deitel, P.J. Deitel and A.B. Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education, 2006, ISBN 978-0131752429.

Online References:

1. https://www.w3.org/html/
2. HTML, The Complete Reference http://www.htmlref.com/
3. http://w3schools.org/
4. http://php.net/
5. https://jquery.com/

6. https://developer.mozilla.org/en-US/docs/AJAX
7. http://www.tutorialspoint.com/css/

[Course Code]: Client Side Programming
(Exit option course II on Web Technologies)

Teaching Scheme:

Lectures: 2 Hrs./Week
Practical: 2 Hrs./Week
Self-Study: 1 Hrs./Week
Credit:

Evaluation Scheme:

Theory: MSE: 30 Marks
TA: 20 Marks

Course Outcomes:

Students will be able to:

CO1: Demonstrate the ability to write Client-side scripts.
CO2: Demonstrate the ability to handle complex JavaScript frameworks.
CO3: Design a responsive web page.

Syllabus:

Unit	Contents	Lecture
1	**Responsive Design Basics:** Mobile first design concepts, Common device dimensions, View-port tag, media queries, Basic Custom Layout	08
2	**Bootstrap**: Grid System, layouts, Containers, Typography, Colours, Tables, Images, Jumbotron, Alerts, Buttons, Button Groups, Badges, Progress Bars, Spinners, Pagination, List Groups, Cards, Dropdowns, Collapse, Navs, Navbar, Carousel, Modal, Tooltip, Popover, Toast, Scrollspy, Offcanvas, Utilities, Dark Mode, Flex	08
3	**jQuery:** Features, Syntax, Ready Function, Selectors, Actions, plugins, Validation plugin, Slideshow, Dropdown, UI, jQueryUI, Accordions, Tabs, Tooltips, Autocomplete, AJAX using JQuery; Any of the JavaScript frameworks: ReactJS, Vue.js, AngularJS, Express.js, etc.	12

Suggested List of Assignments:

1. Develop interactive multiple-choice quiz using HTML, JavaScript, AJAX and PHP.
2. Demonstrate checking of form input data using jQuery.
3. Design an interactive, responsive website for managing a student event at COEP Tech, with the support to do user registration, event registration, notifications to the users, administrative interface for accessing participant data.

This list is a guideline. The instructor is expected to improve it continuously.
A combination of assignments and/or mini project can be offered by the instructor, combining both the exit courses together.

Suggested learning resources:

Textbook:

1. Jeffrey C. Jackson, "Web Technologies: A Computer Science Perspective", Second Edition, Pearson Education, 2007, ISBN 978-0131856035.

Reference Books:

1. Marty Hall, Larry Brown, "Core Web Programming", Second Edition, Pearson Education, 2001, ISBN 978-0130897930.
2. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007, ISBN 978-0321489692.

3. H.M. Deitel, P.J. Deitel and A.B. Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education, 2006, ISBN 978-0131752429.

Online References:

1. https://www.w3.org/html/
2. HTML, The Complete Reference http://www.htmlref.com/
3. http://w3schools.org/
4. http://php.net/
5. https://jquery.com/
6. https://developer.mozilla.org/en-US/docs/AJAX
7. http://www.tutorialspoint.com/css/