RAJALAKSHMI ENGINEERING COLLEGE
CURRICULUM AND SYLLABUS

B. E. COMPUTER SCIENCE AND DESIGN
REGULATION 2019

<u>Vision</u>

To promote highly Ethical and Innovative Computer Professionals through excellence in teaching, training and research.

<u>Mission</u>

- To produce globally competent professionals, motivated to learn the emerging technologies and to be innovative in solving real world problems.

- To promote research activities amongst the students and the members of faculty that could benefit the society.

- To impart moral and ethical values in their profession.

<u>PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)</u>

PEO 1: To equip students with essential background in computer science, basic electronics and applied mathematics.

PEO 2: To prepare students with fundamental knowledge in programming languages, and tools and enable them to develop applications.

PEO 3: To develop professionally ethical individuals enhanced with analytical skills, communication skills and organizing ability to meet industry requirements.

PROGRAMME OUTCOMES (POs)

PO1: **Engineering knowledge:** Apply the knowledge of Mathematics, Science, Engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4: **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6: **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8: **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

A graduate of the Computer Science and Design Program will have an

PSO 1: Ability to understand, analyze and develop efficient software solutions using suitable algorithms, data structures, and other computing techniques.

PSO 2: Ability to independently investigate a problem which can be solved by a Human Computer Interaction (HCI) design process and then design an end-to-end solution to it (i.e., from user need identification to UI design to technical coding and evaluation). Ability to effectively use suitable tools and platforms, as well as enhance them, to develop applications/products using for new media design in areas like animation, gaming, virtual reality, etc.

PSO 3: Ability to apply knowledge in various domains to identify research gaps and to provide solution to new ideas, inculcate passion towards higher studies, creating innovative career paths to be an entrepreneur and evolve as an ethically social responsible computer science and design professional.

CURRICULUM

B. E. COMPUTER SCIENCE AND DESIGN
Regulation 2019 | Total Credits: 165

SEMESTER I								
SI. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1.	HS19151	Technical English	HS	3	2	1	0	3
2.	MA19156	Linear Algebra and Calculus	BS	4	3	1	0	4
LAB ORIENTED THEORY COURSES								
3.	CD19141	Design Drawing and Visualization	BS	5	3	1	0	4
4.	GE19141	Programming using C	ES	6	2	0	4	4
5.	GE19122	Engineering Practices-Electrical and Electronics	ES	2	0	0	2	1
6.	PH19241	Physics for Information Science	BS	5	3	0	2	4
NON CREDIT COURSES								
7.	MC19102	Indian Constitution and Freedom Movement	MC	3	3	0	0	0
			TOTAL	**28**	**16**	**4**	**8**	**20**

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SEMESTER II								
SI. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1.	MA19255	Transforms and Partial Differential Equations	BS	4	3	1	0	4
2.	CD19201	Visual Design and Communication	ES	4	2	0	2	3
LAB ORIENTED THEORY COURSES								
3.	EE19242	Basic Electrical and Electronics Engineering	ES	5	3	0	2	4
4.	EC19243	Principles of Digital Electronics	ES	5	3	0	2	4
5.	CS19241	Data Structures	PC	7	3	0	4	5
LABORATORY COURSES								
6.	GE19121	Engineering Practices-Civil & Mechanical	ES	2	0	0	2	1
NON CREDIT COURSES								
7.	MC19101	Environmental Science and Engineering	MC	3	3	0	0	0
			TOTAL	**30**	**17**	**1**	**12**	**21**

SEMESTER III

SI. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1.	MA19154	Discrete Mathematics	BS	4	3	1	0	4
2.	GE19301	Life Science for Engineers	BS	3	3	0	0	3
3.	CD19301	Computer Design	HS	3	2	1	0	3
LAB ORIENTED THEORY COURSES								
4.	CB19343	Software Engineering	PC	5	3	0	2	4
5.	CD19342	Design Processes & Perspectives	PC	5	3	0	2	4
6.	CS19342	Object Oriented Programming Paradigm	PC	5	3	0	4	5
NON CREDIT COURSES								
7.	MC19301	Essence of Indian Traditional Knowledge	MC	3	3	0	0	0
			TOTAL	**28**	**20**	**2**	**8**	**23**

SEMESTER IV

SI. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1.	MA19453	Probability and Statistics	BS	4	3	1	0	4
2.	CD19401	Strategic Design Management	HS	3	3	0	0	3
LAB ORIENTED THEORY COURSES								
3.	CS19441	Operating Systems	PC	7	3	0	4	5
4.	CS19341	Design and Analysis of Algorithms	PC	5	3	0	2	4
5.	CS19P06	Human Computer Interaction	PC	4	2	0	2	3
LABORATORY COURSE								
6.	CD19411	Python Programming for Design	PC	4	0	0	4	2
EMPLOYABILITY ENHANCEMENT COURSES								
7.	GE19421	Soft Skills – I	EEC	2	0	0	2	1
			TOTAL	**29**	**14**	**1**	**14**	**22**

		SEMESTER V						
SI. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1.	CS19501	Theory of Computation	PC	3	3	0	0	3
2.		Professional Elective-I	PE	4	2	0	2	3
3.		Open Elective – I	OE	3	3	0	0	3
LAB ORIENTED THEORY COURSES								
4.	CS19541	Computer Networks	PC	7	3	0	4	5
5.	CS19443	Database Management Systems	PC	7	3	0	4	5
6.	CD19541	Animation & Graphics	PC	5	3	0	2	4
EMPLOYABILITY ENHANCEMENT COURSES								
7.	GE19521	Soft Skills – II	EEC	2	0	0	2	1
			TOTAL	**31**	**17**	**0**	**14**	**24**

		SEMESTER VI						
SI. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1.	CD19601	Fundamentals of Artificial Intelligence	PC	3	3	0	0	3
2.		Professional Elective-II	PE	4	2	0	2	3
LAB ORIENTED THEORY COURSES								
3.	CD19641	Game Design and Development	PC	5	3	0	2	4
4.	CD19642	Data Visualization	PC	5	3	0	2	4
5.	CD19643	Web Essentials	PC	5	3	0	2	4
LABORATORY COURSES								
6.	CD19606	Mobile Application Design and Development Laboratory	PC	2	0	0	2	1
EMPLOYABILITY ENHANCEMENT COURSES								
7.	CD19651	Mini Project	EEC	4	0	0	4	2
8.	GE19621	Problem Solving Techniques	EEC	2	0	0	2	1
			TOTAL	**30**	**14**	**0**	**16**	**22**

SEMESTER VII

SI. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1.		Professional Elective-III	PE	4	2	0	2	3
2.		Professional Elective-IV	PE	4	2	0	2	3
3.		Professional Elective-V	PE	4	2	0	2	3
4.	CD19701	Fundamentals of Video for Engineers	PC	3	3	0	0	3
5.	CD19721	Introduction to 3D Animation	PC	1	1	0	0	1
LAB ORIENTED THEORY COURSES								
6.	CD19741	3D Printing and Design	PC	7	3	0	4	5
LABORATORY COURSES								
7.	CD19711	Project-I	EEC	6	0	0	6	3
			TOTAL	**29**	**13**	**0**	**16**	**21**

SEMESTER VIII

SI. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1.		Professional Elective-VI	PE	4	2	0	2	3
2.		Open Elective-II	OE	3	3	0	0	3
LABORATORY COURSES								
3.	CD19811	Project-II	EEC	12	0	0	12	6
			TOTAL	**19**	**5**	**0**	**14**	**12**

TOTAL NO. OF CREDITS: 165

PROFESSIONAL ELECTIVES (PE)

SI. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
1	CD19P01	Design of Interactive systems	PE	4	2	0	2	3
2	CS19P09	C# and .Net Programming	PE	4	2	0	2	3
3	CD19P02	Computer Security	PE	4	2	0	2	3
4	CD19P03	Fundamentals of Image Processing	PE	4	2	0	2	3
5	CD19P04	Spatial Computing	PE	4	2	0	2	3
6	CD19P08	Mobile Computing Architecture	PE	4	2	0	2	3
7	CS19741	Cloud Computing	PE	4	2	0	2	3
8	AI19P77	Information Retrieval	PE	4	2	0	2	3
9	CD19P06	Innovation in Design Thinking	PE	4	2	0	2	3
10	CD19P07	Computer Vision and Image Analysis	PE	4	2	0	2	3
11	CS19P17	Foundations of Machine Learning	PE	4	2	0	2	3
12	AI19P61	GPU Programming	PE	4	2	0	2	3
13	CD19P09	Digital audio design and synthesis	PE	4	2	0	2	3
14	CD19P10	Aesthetics and Art	PE	4	2	0	2	3
15	CD19P11	Design for Usability	PE	4	2	0	2	3
16	AI19P62	AI Techniques in Data Mining	PE	4	2	0	2	3
17	CS19P20	Social, Text and Media Analytics	PE	4	2	0	2	3
18	CS19P19	Cognitive Science	PE	4	2	0	2	3
19	CD19P12	Foundations of Data Science	PE	4	2	0	2	3
20	CD19P21	Virtual Reality and Augmented Reality	PE	4	2	0	2	3
21	CD19P13	Quantum Computing Techniques	PE	4	2	0	2	3
22	AI19P82	Business Intelligence and Analytics	PE	4	2	0	2	3
23	CD19P14	Design for User Experience	PE	4	2	0	2	3
24	CD19P15	Wearable Applications	PE	4	2	0	2	3
25	CD19P16	Film Making and Radio Podcasting	PE	4	2	0	2	3
26	CD19P17	Visual Communication	PE	4	2	0	2	3
27	CD19P18	Introduction to Motion Graphics	PE	4	2	0	2	3

SUMMARY OF ALL COURSES

S.NO	Course Category	I	II	III	IV	V	VI	VII	VIII	Total Credits
		Credits per Semester								
1	HS	3		3	3					9
2	BS	12	4	7	4					27
3	ES	5	12							17
4	PC		5	13	14	17	16	9		74
5	PE					3	3	9	3	18
6	OE					3			3	6
7	EEC				1	1	3	3	6	14
8	MC	0	0	0						0
	Total	20	21	23	22	24	22	21	12	165

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
HS19151	TECHNICAL ENGLISH	HS	2	1	0	3

Objectives:
● To enable learners to acquire basic proficiency in English reading and listening.
● To write in English precisely and effectively.
● To speak flawlessly in all kinds of communicative contexts.

UNIT-I	VOCABULARY BUILDING	9

The concept of word formation - Root words from foreign languages and their use in English - Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives - Synonyms, antonyms, and standard abbreviations. Compound words – abbreviation – single word substitution – Listening: Listening comprehension, listening to motivational speeches, podcasts and poetry. Speaking: Short talks on incidents - place of visit – admiring personalities, etc.

UNIT-II	BASIC WRITING SKILLS	9

Sentence structures - Use of phrases and clauses in sentences - punctuation - coherence - Organizing principles of paragraphs in documents - Techniques for writing precisely. **Reading & Writing** – Free writing – paragraphs - article reading and writing criticism - change of tense forms in short text or story – inferential reading – rewrite or interpret text - prepare questions based on the text. **Speaking:** Everyday situations – conversations and dialogues, speaking for and against.

UNIT-III	GRAMMAR AND LANGUAGE DEVELOPMENT	9

Subject-verb agreement- Noun-pronoun agreement - Articles – Prepositions – Redundancies. Reading & Writing: Read from innovation and ideas that changed the world, newspaper column writing – Speaking: Demonstrative speaking practice using visual aids (charts, graphs, maps, pictures, etc.)

UNIT-IV	WRITING FOR FORMAL PRESENTATION	9

Nature and Style of sensible Writing - Describing – Defining – Classifying - Providing examples or evidence - Writing introduction and conclusion. Reading & Writing – Read from Literary pieces – identify different parts text – Difference between print and digital writing. Writing: Recommendations - Foreword - Review of book. Speaking-Formal Presentations – Debate on social issues/taboos and solutions.

UNIT-V	EXTENDED WRITING AND SPEAKING	9

Writing: Précis writing – Essay writing – workplace communication: Resume – Business letters and emails – Proposals. Speaking: Panel discussion – reporting an event – mock interview – Master Ceremony.

	Total Contact Hours	:	45

Course Outcomes:
On completion of the course students will be able to
● Discuss and respond to the listening content.
● Read and comprehend different texts and appreciate them.
● Understand structures and techniques of precise writing.
● Analyze different genres of communication and get familiarized with new words, phrases, and sentence structures.
● Write and speak appropriately in varied formal and informal contexts.

Text Book(s):
1	English for Technologists & Engineers, Orient BlackSwan Publications, Chennai, 2012.

Reference Books(s):
1	Meenakshi Raman & Sangeeta Sharma, Technical Communication, Oxford University Press.
2	Bushan Kumar, Effective Communication Skills, Khanna Publishing House, Delhi.
3	Pushplata, Sanjay Kumar, Communication Skills, Oxford University Press.
4	Michael Swan, Practical English Usage, Oxford University Press, 1995.
5	F.T. Wood, Remedial English Grammar, Macmillan, 2007.

6	William Zinsser, On Writing Well, Harper Resource Book, 2001.
7	Liz Hamp-Lyons and Ben Heasly, Study Writing, Cambridge University Press, 2006.
8	Exercises in Spoken English, Parts I-III, CIEFL, Hyderabad, Oxford University Press.

CO - PO – PSO matrices of course

PO/PSO \ CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
HS19151.1	1	-	-	-	-	-	1	-	2	3	1	3	-	2	-
HS19151.2	-	3	-	2	-	-	-	-	-	2	1	1	2	-	-
HS19151.3	-	-	-	1	-	-	-	-	-	3	-	-	2	-	-
HS19151.4	-	1	-	1	-	-	-	-	-	3	-	2	3	-	1
HS19151.5	1	1	1	1	1	1	1	1	2	3	1	1	1	-	-
AVERAGE	1.0	1.7	1.0	1.3	1.0	1.0	1.0	1.0	2.0	2.8	1.0	1.8	2.0	2.0	1.0

Correlation levels 1, 2 or 3 are as defined below:
1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)
No correlation : "-"

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
MA19156	LINEAR ALGEBRA AND CALCULUS	BS	3	1	0	4

Objectives:	
●	To gain knowledge in using matrix algebra techniques and the concepts of basis and dimension in vector spaces.
●	To understand the techniques of calculus those are applied in the Engineering problems.

UNIT-I	MATRICES AND QUADRATIC FORMS	12
Symmetric and skew – symmetric matrices, Hermitian matrix, Unitary matrix and Orthogonal matrices – Eigen values and Eigen vectors - Cayley – Hamilton theorem (statement only) and applications - Similarity transformation - Orthogonal transformation and quadratic forms to canonical forms - Nature of quadratic forms.		
UNIT-II	**VECTOR SPACES**	12
Vector spaces – Subspaces – Linear combinations and system of Linear equations – Linear independence and Linear dependence – Bases and Dimensions – Linear Transformation – Matrix representation of Linear Transformation - Null space, Range and dimension theorem.		
UNIT-III	**INNER PRODUCT SPACES**	12
Inner product and norms - Gram Schmidt orthonormalization process - Modified Gram Schmidt orthonormalization process - QR Factorization-Singular value decomposition.		
UNIT-IV	**DIFFERENTIAL CALCULUS- FUNCTIONS OF SEVERAL VARIABLES**	12
Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.		
UNIT-V	**MULTIPLE INTEGRAL**	12
Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.		
	Total Contact Hours :	60

Course Outcomes:	
On completion of the course students will be able to:	
●	Apply the concept of Eigen values and eigen vectors, diagonalization of a matrix for solving problems.
●	Use concepts of basis and dimension in vector spaces in solving problems.
●	Construct orthonormal basis using inner products and decompose matrices.
●	Analyze, sketch and study the properties of different curves and to handle functions of several variables and problems of maxima and minima.
●	Evaluate surface area and volume using multiple integrals.

Text Book(s):	
1	Grewal B.S., Higher Engineering Mathematics, 44th Edition, Khanna Publishers, New Delhi, 2015.
2	Gilbert Strang, Introduction to linear algebra, 6th Edition, Wellesley Publishers, 2016

Reference Books(s):	
1	Friedberg, A.H., Insel, A.J. and Spence, L., Elementary Linear Algebra, a matrix approach, 2nd edition, Pearson, 2019.
2	Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, 10th Edition, New Delhi, 2016.
3	Bali, N.P. and Manish Goyal, A Text Book of Engineering Mathematics, Lakshmi Publications Pvt. Ltd., New Delhi, 2006.
4	T Veerarajan, Engineering Mathematics –I, McGraw Hill Education, 2018
5	Ramana. B.V., Higher Engineering Mathematics, McGraw Hill Education Pvt. Ltd, New Delhi, 2016.

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
MA19156.1	3	3	2	2	2	1	-	-	-	-	1	2	2	3	2
MA19156.2	3	3	2	2	2	1	-	-	-	-	1	2	3	3	2
MA19156.3	3	3	2	2	2	1	-	-	-	-	1	2	3	3	2
MA19156.4	3	3	2	2	3	1	-	-	-	-	1	2	2	3	2
MA19156.5	3	3	1	2	1	1	-	-	-	-	1	2	1	2	2
Average	3	3	1.9	2	2	1	-	-	-	-	1	2	2.2	2.8	2

Correlation levels 1, 2 or 3 are as defined below:
1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)
No correlation: "-"

Subject Code	Subject Name	Category	L	T	P	C
CD19141	**DESIGN DRAWING AND VISUALIZATION**	**BS**	**3**	**2**	**0**	**4**

Objectives:	
●	To enable drawing as a medium for observing, representing, conceptualizing, visualizing and communicating design ideas.
●	To develop an understanding of spatial concepts and the critical ability to think and visualize in three dimensions through the tactile nature of drawing.
●	To develop observational skills through the study of the environment and as a tool for visual representation, ideation/conceptualization, visualization and communication or presentation of design ideas through sketching and drawing from both observation and memory.

UNIT-I	INTRODUCTION TO DESIGN DRAWING	9

Introduction to Materials, Tools & Methods - different grades of pencils & exploring- Developing free finger, wrist, hand & arm movement and initiate muscle- Introduction to Observation – Scrutinize, Examine, Study, Inspect, Perceive, Sense, Feel, Notice, Identify, Understand- Training the eye to observe accurately to educate the visual sense-Introduction to Perception – View, Opinion, Insight, Discernment- Introduction to Perspective – Eye level, Vanishing Point

UNIT-II	DRAWING OF CUBES and PERSPECTIVES	9

Introduction to Vanishing Points, View Point, Eye Level, Horizon, Parallel & Converging Lines-One Point Perspective- Two Point Perspective-Three Point Perspective-Perspective in the Environment, Interior Spaces and Objects.

UNIT-III	OBJECT DRAWING and HUMAN FORM DRAWING	9

Introduction to other geometric forms like cylinder, cuboids etc.- Introduction to Object Drawing-How to observe – shape, proportions, effect of light on the objects etc.- Introduction to Human Form proportions-Human Form – Object Relationships

UNIT-IV	GEOMETRY & STRUCTURE	9

Construction of Basic Polygons-Proportioning Systems: Golden Proportion- Interrelation of Polygons- Orthographic Projection of Planes and Solids-. Isometric Projection-Architectonic Drawing - Isometric Circles-Architectonic Planes with rounded surfaces, tube with square cross section with ellipse at different planes and tube with circular cross-section.

UNIT-V	VISUALISATION DRAWING	9

Introduction to Mental Imagery- Compositions inclusive of human forms, object, perspective etc- Sketching a mini environment outside the campus from memory- Sketching a visualised composition from imagination

	Total Contact Hours	**:**	**45**

Course Outcomes:	
On completion of the course students will be able to	
●	Develop the skill & ability to observe and visually represent all the elements in their environment with a focus on human forms, objects and nature and the way they interact.
●	inculcate skills and develop the ability to explain the importance of precision in design through drawings using instruments/tools and concept of figures/configuration through basic geometrical patterns on 2D surfaces..
●	Develop the ability to discuss orthographic and isometric projections as fundamental tools of technical drawing and use technical drawings as a tool for visual communication.
●	Develop the ability to analyse visual structure of 3D forms on 2D surfaces with an exposure to the complexities of imagination and visualization.
●	Develop the ability to analyse complex images and in turn develop the ability to create mental imageries and visualise concepts.

Text Book(s):	
	1. Erik Olofsson, Klara Sjolen, Design Sketching, KEEOS Design Books.
	2. K . Morling, Geometric and Engineering Drawing, Third Edition, Graduate of the Institution of Mechanical

Engineers, SI Units, Elsevier, 2010.

	Reference Books(s):
1	Flint, Tom, Anatomy for the Artist: The Dynamic of the Human Form, London, Arcturus Publishing.
2	Koos Eissen, Roselien Steur, Sketching: The Basics, BIS Publishers
3	Edwards, Betty, Drawing on the Artist Within : An Inspirational and Practical Guide to Increasing Your Creative Powers, Simon & Schuster Inc., New York
4	Michael Swan, Practical English Usage, Oxford University Press, 1995.
5	F.T. Wood, Remedial English Grammar, Macmillan, 2007.
6	William Zinsser, On Writing Well, Harper Resource Book, 2001.
7	Liz Hamp-Lyons and Ben Heasly, Study Writing, Cambridge University Press, 2006.
8	Exercises in Spoken English, Parts I-III, CIEFL, Hyderabad, Oxford University Press.

Subject Code	Subject Name (Lab oriented Theory Courses)	Category	L	T	P	C
PH19241	PHYSICS FOR INFORMATION SCIENCE	BS	3	0	2	4

Objectives:	
●	To understand the principles of laser and fibre optics in engineering and technology.
●	To understand the advanced concept of quantum theory and applications.
●	To study the properties and applications of semiconducting, magnetic, superconducting and optical materials.

UNIT-I	QUANTUM PHYSICS	9

Introduction- Quantum free electron theory-De Broglie's concept-Schrodinger wave equation-Time independent and time dependent equations-Physical significance of wave function - Particle in a one dimensional box – electrons in metals - degenerate states – Fermi - Dirac statistics – Density of energy states – Size dependence of Fermi energy – Quantum confinement – Quantum structures – Density of states in quantum well, quantum wire and quantum dot structure - Band gap of nanomaterials.

UNIT-II	SEMICONDUCTOR PHYSICS	9

Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap - semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type and P-type semiconductors – Variation of carrier concentration with temperature – variation of Fermi level with temperature and impurity concentration – Carrier transport in Semiconductor: random motion, drift, mobility and diffusion – Hall effect.

UNIT-III	OPTICAL PROPERTIES OF MATERIALS	9

Classification of optical materials – carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and semiconductors (concepts only) - photo current in a P-N diode – Photo transistor-solar cell - LED – Organic LED- Optical data storage techniques-Non Linear Optical materials-properties and applications.

UNIT-IV	LASERS AND FIBRE OPTICS	9

Lasers: Population of energy levels, Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative) - Semiconductor lasers: homojunction and heterojunction- Applications. Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibers (material, refractive index, and mode) –Double crucible method-splicing technique- losses associated with optical fibers -Fiber optic communication system - fiber optic sensors: pressure and displacement.

UNIT-V	MAGNETIC AND SUPERCONDUCTING MATERIALS	9

Magnetic dipole moment – atomic magnetic moments- magnetic permeability and susceptibility -Magnetic material classification: diamagnetism – paramagnetism – ferromagnetism – antiferromagnetism – ferrimagnetism – Domain Theory- M versus H behaviour – Hard and soft magnetic materials – examples and uses-– Magnetic principle in computer data storage – Magnetic hard disc (GMR sensor). Introduction of Superconductivity, Properties of Superconductors, BCS theory (Qualitative), Type-I and Type II Superconductors -Magnetic Levitation-SQUIDS- An overview of High temperature superconductors.

	Contact Hours	:	45

List of Experiments (Any 10 experiments)	
1	Determine the wavelength and angle of divergence of laser beam and numerical aperture using fiber cable.
2	Determine the wavelength of spectrum by using spectrometer.
3	Determine of refractive index of a given prism by using spectrometer.
4	Determine specific resistance of the material of given wires using metre bridge.
5	Verify Ohm's law - series and parallel.
6	Determine the value of Planck's constant using photo electric effect.
7	Determine the band gap of given semiconductor.
8	Determination of Hall coefficient of semiconducting materials.
9	Study the magnetic field produced by current carrying coils by using Helmoltz coil.
10	Study the resonance frequency in series connected LCR circuits.

11	Determine the wavelength of given source by using Newton's ring Experiment.		
12	Determine the thickness of the given specimen by using air wedge method.		
		Contact Hours :	**30**
		Total Contact Hours :	**75**

Course Outcomes:

On completion of the course, the students will be able to:

- Apply the concepts of electron transport in nanodevices.
- Analyze the physics of semiconductor devices
- Analyze the properties of optical materials for optoelectronic applications.
- Use the concepts of Laser and Fiber optics in communication.
- Use the properties of magnetic and superconducting materials in data storage devices.

Text Book(s):

1	Bhattacharya, D.K. & Poonam, T. Engineering Physics, Oxford University Press, 2015.
2	Jasprit Singh, Semiconductor Devices: Basic Principles, Wiley 2012.
3	Kasap, S.O. Principles of Electronic Materials and Devices, McGraw-Hill Education, 2007.
4	Kittel, C. Introduction to Solid State Physics, Wiley, 2005.

Reference Books(s):

1	Garcia, N. & Damask, A., Physics for Computer Science Students, Springer Verlag, 2012.
2	Hanson, G.W. Fundamentals of Nanoelectronics, Pearson Education, 2009.
3	Rogers, B., Adams, J. & Pennathur, S. Nanotechnology: Understanding Small Systems, CRC Press, 2014.
4	S. O. Pillai, Solid state physics, New Age International, 2015.
5	Serway, R.A. & Jewett, J.W, Physics for Scientists and Engineers, Cengage Learning.

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
PH19241.1	3	3	2	2	2	1	-	1	1	2	1	2	1	1	2
PH19241 .2	3	3	3	2	3	1	1	-	1	2	1	2	1	1	2
PH19241 .3	3	3	3	2	3	1	1	-	1	2	1	2	1	1	1
PH19241 .4	3	3	2	2	3	1	1	-	1	2	1	2	1	-	1
PH19241 .5	3	3	2	2	3	1	1	-	1	2	1	2	1	1	1
Average	3.0	3.0	2.4	2.0	2.8	1.0	1.0	1.0	1.0	2.0	1.0	2.0	1.0	1.0	1.4

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

No correlation: "-"

Subject Code	Subject Name (Lab oriented Theory Courses)	Category	L	T	P	C
GE19141	PROGRAMMING USING C	ES	2	0	4	4

Objectives:	
●	To develop simple algorithms for arithmetic and logical problems.
●	To develop C Programs using basic programming constructs
●	To develop C programs using arrays and strings
●	To develop applications in C using functions, pointers and structures
●	To do input/output and file handling in C

UNIT-I	GENERAL PROBLEM SOLVING CONCEPTS	6
	Computer – components of a computer system-Algorithm and Flowchart for problem solving with Sequential Logic Structure, Decisions and Loops.	
UNIT-II	C LANGUAGE - TYPES OF OPERATOR AND EXPRESSIONS	6
	Introduction- C Structure- syntax and constructs of ANSI C - Variable Names, Data Type and Sizes, Constants, Declarations - Arithmetic Operators, Relational Operators, Logical Operators, Type Conversion, Increment and Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation, proper variable naming and Hungarian Notation.	
UNIT-III	I/O AND CONTROL FLOW	6
	Standard I/O, Formatted Output – Printf, Variable-length argument lists- Formatted Input – Scanf, Statements and Blocks, If-Else-If, Switch, Loops – while, do, for, break and continue, GoTo Labels.	
UNIT-IV	FUNCTIONS AND PROGRAM STRUCTURE	6
	Basics of functions, parameter passing and returning type, External, Auto, Local, Static, Register Variables, Scope Rules, Block structure, Initialisation, Recursion, C Pre-processor, Standard Library Functions and return types.	
UNIT-V	POINTERS, ARRAYS AND STRUCTURES	6
	Pointers and addresses, Pointers and Function Arguments, Pointers and Arrays, Address Arithmetic, character Pointers and Functions, Pointer Arrays, Pointer to Pointer, Multi-dimensional arrays, Strings, Initialisation of Pointer Arrays, Command line arguments, Pointers to functions, complicated declarations. Basic Structures, Structures and Functions, Array of structures, Pointer of Structures, Self-referential Structures, Table look up, Typedef, Unions, Bit-fields, File Access -Error Handling, Line I/O, Miscellaneous Functions.	
	Contact Hours :	**30**

	List of Experiments	
1	Algorithm and flowcharts of small problems like GCD.	
	Structured code writing with:	
2	Small but tricky codes	
3	Proper parameter passing	
4	Command line Arguments	
5	Variable parameter	
6	Pointer to functions	
7	User defined header	
8	Make file utility	
9	Multi file program and user defined libraries	
10	Interesting substring matching / searching programs	
11	Parsing related assignments	

	Contact Hours	:	**60**
	Total Contact Hours	:	**90**

Course Outcomes:	
On completion of the course, the students will be able to	
●	Formulate simple algorithms for arithmetic and logical problems.
●	Implement conditional branching, iteration and recursion.
●	Decompose a problem into functions and synthesize a complete program using divide and conquer approach.

●	Use arrays, pointers and structures to formulate algorithms and programs.
●	Apply programming to solve matrix addition and multiplication problems and searching and sorting problems.

Text Books:

1	Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Pearson Education India; 2nd Edition, 2015.
2	Byron Gottfried, Programming with C, Second Edition, Schaum Outline Series, 1996.

Reference Books:

1	Herbert Schildt, C: The Complete Reference, Fourth Edition, McGraw Hill, 2017.
2	YashavantKanetkar, Let Us C, BPB Publications, 15th Edition, 2016.

Web links for virtual lab:

1	https://www.tutorialspoint.com/compile_c_online.php
2	https://www.codechef.com/ide
3	https://www.jdoodle.com/c-online-compiler
4	https://rextester.com/l/c_online_compiler_gcc

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
GE19141.1	1	2	2	2	1	-	-	-	1	2	1	1	2	3	-
GE19141.2	1	1	1	1	1	-	-	-	-	-	1	1	2	2	-
GE19141.3	1	1	2	1	1	-	-	-	-	-	1	1	2	2	-
GE19141.4	2	2	3	2	1	-	-	-	1	-	2	1	2	2	2
GE19141.5	2	2	3	2	1	-	-	-	-	-	2	1	2	2	2
Average	1.4	1.6	2.2	1.6	1.0	-	-	-	1.0	2.0	1.4	1.0	2.0	2.2	2.0

Correlation levels 1, 2 or 3 are as defined below:
1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)
No correlation: "-"

Subject Code	Subject Name (Laboratory Course)	Category	L	T	P	C
GE19122	**ENGINEERING PRACTICES - ELECTRICAL AND ELECTRONICS**	**ES**	**0**	**0**	**2**	**1**

Objectives:
● To provide hands on experience on various basic engineering practices in Electrical Engineering.
● To impart hands on experience on various basic engineering practices in Electronics Engineering.

List of Experiments	
A. ELECTRICAL ENGINEERING PRACTICE	
1	Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2	Fluorescent lamp wiring.
3	Stair case wiring.
4	Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5	Measurement of resistance to earth of electrical equipment.
B. ELECTRONICS ENGINEERING PRACTICE	
1	Study of Electronic components and equipment's – Resistor, colour coding, measurement of AC signal parameter (peak-peak, RMS period, frequency) using CRO.
2	Study of logic gates AND, OR, XOR and NOT.
3	Generation of Clock Signal.
4	Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5	Measurement of ripple factor of HWR and FWR.
	Total Contact Hours : 30

Course Outcomes:
On completion of the course, the students will be able to
● Fabricate electrical and electronic circuits
● Formulate the house wiring
● Design the AC-DC converter using diode and passive components

REFERENCE	
1	Bawa H.S., Workshop Practice, Tata McGraw – Hill Publishing Company Limited, 2007.
2	Jeyachandran K., Natarajan S. &Balasubramanian S., A Primer on Engineering Practices Laboratory, Anuradha Publications, 2007.
3	Jeyapoovan T., Saravanapandian M. &Pranitha S., Engineering Practices Lab Manual,Vikas Publishing House Pvt.Ltd, 2006.
4	Rajendra Prasad A. &Sarma P.M.M.S., Workshop Practice,SreeSai Publication, 2002.

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
GE19122.1	3	3	3	3	3	1	1	-	2	1	3	3	-	-	-
GE19122.2	3	3	3	3	2	2	2	-	2	1	3	3	-	-	-
GE19122.3	3	3	3	3	3	1	1	-	2	1	3	3	-	-	-

| Average | 3 | 3 | 3 | 3 | 2.67 | 1.33 | 1.33 | - | 2 | 1 | 3 | 3 | - | - | - |

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

No correlation: "-"

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
MC19102	INDIAN CONSTITUTION AND FREEDOM MOVEMENT	MC	3	0	0	0

Objectives:	
●	To inculcate the values enshrined in the Indian constitution
●	To create a sense of responsible and active citizenship
●	To know about Constitutional and Non- Constitutional bodies
●	To understand sacrifices made by the freedom fighters

UNIT-I	INTRODUCTION	9
Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens. Constitution meaning of the term, Indian Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.	
UNIT-II	STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT	9
	Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.	
UNIT-III	STRUCTURE AND FUNCTION OF STATE GOVERNMENT AND LOCALBODY	9
	State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts- Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Panchayat Raj: Introduction, Elected officials and their roles, ,Village level: Role of Elected and Appointed officials,	
UNIT-IV	CONSTITUTIONAL FUNCTIONS AND BODIES	9
	Indian Federal System – Center – State Relations – President's Rule – Constitutional Functionaries – Assessment of working of the Parliamentary System in India- CAG, Election Commission, UPSC, GST Council and other Constitutional bodies-. NITI Aayog, Lokpal, National Development Council and other Non –Constitutional bodies.	
UNIT-V	INDIAN FREEDOM MOVEMENT	9
	British Colonialism in India-Colonial administration till 1857- Revolt of 1857- Early Resistance to British Rule-Rise of Nationalism in India-Indian Freedom Struggle under Mahatma Gandhi-Non- Cooperation Movement-Civil Disobedience Movement- Quit India Movement-British Official response to National movement- Independence of India Act 1947-Freedom and Partition.	
	Total Contact Hours **:**	**45**

Course Outcomes:	
On completion of the course, the students will be able to
●	Understand the functions of the Indian government
●	Understand and abide the rules of the Indian constitution.
●	Gain knowledge on functions of state Government and Local bodies
●	Gain Knowledge on constitution functions and role of constitutional bodies and non-constitutional bodies
●	Understand the sacrifices made by freedom fighters during freedom movement

Text Book(s):	
1	Durga Das Basu, Introduction to the Constitution of India, Lexis Nexis, New Delhi., 21st edition, 2013.
2	BipanChandra,History of Modern India, Orient Black Swan, 2009.
3	Bipan Chandra, India's Struggle for Independence, Penguin Books, 2016.
4	Maciver and Page, Society: An Introduction Analysis, MacMilan India Ltd., New Delhi.2nd edition, 2014.
5	P K Agarwal and K N Chaturvedi, PrabhatPrakashan Constitution of India, New Delhi, 1st edition, 2017.

Reference Books(s) / Web links:	

1	Sharma, Brij Kishore, Introduction to the Constitution of India, Prentice Hall of India, New Delhi.
2	U.R.Gahai, Indian Political System, New Academic Publishing House, Jalandhar.

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
MC19102.1	-	-	-	-	-	1	1	3	2	-	-	1	-	-	-
MC19102.2	-	-	-	-	-	1	1	3	2	-	-	1	-	-	-
MC19102.3	-	-	-	-	-	1	1	3	2	-	-	1	-	-	-
MC19102.4	-	-	-	-	-	1	1	3	2	-	-	1	-	-	-
MC19102.5	-	-	-	-	-	1	1	3	2	-	-	1	-	-	-
Average	-	-	-	-	-	1.0	1.0	3.0	2.0	-	-	1.0	-	-	-

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

No correlation: "-"

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
MA19255	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	BS	3	1	0	4

Objectives:	
●	To introduce the effective mathematical tools for solving partial differential equations that model several physical processes.
●	To introduce Fourier series which is central to many applications in engineering apart from its use in solving boundary value problems.
●	To learn the techniques of solving problems using Laplace transforms.
●	To acquaint the student with Fourier transform techniques used in wide variety of situations.
●	To introduce Z transform techniques to solve problems involving discrete time systems.

UNIT-I	PARTIAL DIFFERENTIAL EQUATIONS	12
Formation of partial differential equations – Singular integrals - Solutions of standard types of first order PDE:$f(p,q) = 0, f(z,p,q) = 0, z = px + qy + f(p,q), f(x,p) = f(y,q)$ - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of homogeneous type.		
UNIT-II	FOURIER SERIES	12
Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series –Half range cosine series – Parseval's identity – Harmonic analysis.		
UNIT-III	LAPLACE TRANSFORM	12
Laplace transform – Sufficient condition for existence – Transform of elementary functions – Basic properties – Transforms of derivatives and integrals of functions - Derivatives and integrals of transforms - Transforms of unit step function and impulse functions, periodic functions. Inverse Laplace transform – Problems using Convolution theorem – Initial and final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.		
UNIT-IV	FOURIER TRANSFORMS	12
Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity - Application to boundary value problems.		
UNIT-V	Z - TRANSFORMS AND DIFFERENCE EQUATIONS	12
Z- transforms - Elementary properties – Inverse Z - transform (using partial fraction and residues) –Convolution theorem - Formation of difference equations – Solution of difference equations using Z- transform.		
	Total Contact Hours :	60

Course Outcomes:	
On completion of course students will be able to	
●	solve different types of partial differential equations.
●	construct Fourier series for different periodic functions and to evaluate infinite series.
●	use Laplace transform and inverse transform techniques in solving differential equations.
●	solve Engineering problems using Fourier transform techniques.
●	solve difference equations using Z – transforms that arise in discrete time systems.

Text Book (s):	
1	Erwin Kreyszig ," Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2	Veerarajan. T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt.Ltd.,New Delhi, Second reprint, 2012.

	Reference Books(s):
1	Grewal B.S., "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, Delhi, 2014.
2	Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3	Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2007.
4	Ray Wylie C and Barrett.L.C, "Advanced Engineering Mathematics" Tata McGraw Hill Education Pvt Ltd, Sixth Edition, New Delhi, 2012.
5	Datta K.B., "Mathematical Methods of Science and Engineering", Cengage Learning IndiaPvt. Ltd, Delhi, 2013.

Subject Code	Subject Name	Category	L	T	P	C
CD19201	**VISUAL DESIGN AND COMMUNICATION**	ES	2	0	2	3

Objectives:	
●	To understand the principles of the visual language and their semantic use. A multi- disciplinary domain, design consists of, aesthetics, architecture, products, communication, processes, systems, technology, business/commerce, ramification on environment and society and demands
●	To communicate more concisely and in a visually appropriate manner, it is necessary to use commonly understood principles, perspective and design layout standards.
●	To understand the fundamentals of Typography and Photography.

UNIT-I	**INTRODUCTION TO VISUAL DESIGN**	**9**
importance of understanding visual language-its relation in context to nature and environment-Exploring and understanding Dots, Lines, Forms, Space, Pattern, Texture and Colour as an elements of visual language		

UNIT-II	**INTRODUCTION TO THE PRINCIPLES OF VISUAL LANGUAGE**	**9**
Visual explorations and experiments with Form, Colour, and Space, Texture, in relation to the context and environments – Concepts of harmony, balance, contrast, proportion, order, symmetry, asymmetry, rhythm, tension, juxtaposition, proximity, size, scale, proportion, orientation, alignment, variety, gradation, dominance, subordination, transition etc.		

UNIT-III	**. INTRODUCTION TO FUNDAMENTALS OF TYPOGRAPHY**	**9**
Introduction to Type and its History-Type as a form and means of communication in our environment-Introduction to Indian type: Vernacular letter-forms-Classification of types: Typefaces, type families and type designers-Anatomy of the type: x-height, ascenders, descenders, counter, cap-height, baseline, etc-Typographic variables: Kerning, tracking, leading, spacing etc.-Semantics of type: Legibility & readability issues in type and meaning attributed to type. 4h. Expressive Typography-Introduction to printing techniques		

UNIT-IV	**INTRODUCTION TO PHOTOGRAPHY**	**9**
Introduction and Orientation: Art and Science of Photography. Drawing out parallels / differences between the EYE and the CAMERA-Camera: Understanding the various controls on a Digital SLR Camera Features and Details. Shooting Modes. Aperture and Depth of Field. Shutter Speed. Critical Shutter Speeds and Effects- Exposure: Exposure as function of Quantity of Light and Time. Getting used to shooting in Manual Mode and learning to measure light using the camera's built-in exposure meter-Film Speed/Sensor Sensitivity: Understanding the role of sensitivity in Exposure. ISO/ASA and Digital Noise-Lenses: Different Types of Lenses. Classification of Lenses by Focal Lengths. Angle of View. Fixed Focal Length and Zoom Lenses. Close up and Macro Lenses-Light and Color Temperature- Digital Post-Production: Introduction to File-Formats. RAW vs.JPG. Understanding resolution, resizing and basic image post processing using Photoshop. Exploring the software to visualize and create digital mosaics.		

UNIT-V	**INTRODUCTION TO VIDEOGRAPY**	**9**
Concept development 8b. Storyboarding-Video Shooting - Framing, Camera movement etc 8d. Video Editing-Defining communication-Sender, Channel and Receiver-Semiotics - Study of sign process (semiosis), meaning-making and meaningful communication. 9c. Sign, Signifier, Signified-Denotation and Connotation-10a. Story, narrative and see different perspectives-Identifying problems, opportunities and improvements. 10c. Differentiating problem, need and conflict-Persona study-Scenario study		

	Total Contact Hours	**:**	**45**

Course Outcomes:	
On completion of the course students will be able to	
●	Develop the ability to create visual compositions using basic elements and by appyling appropriate principles of visual composition to communicate
●	Develop the ability to perceive, visualize, and communicate visual elements as visual narratives.
●	Develop the ability to apply the dynamics of visual design in Typography and Photography.
●	Develop the ability to address simple communication problems through a visualization process and construct mental imageries
●	Demonstrate the ability to plan, develop, design and execute communication products

Text Book(s):

9	Wallschlaeger, Charles, &Busic-Synder, Cynthia, Basic Visual Concepts and Principles for Artists, Architects and Designers, McGraw-Hill, (1992).

Reference Books(s):

9	Buxton, Bill, Sketching User Experience: Getting the Design Right and the Right Design (Interactive Technologies), Morgan Kaufmann, (2007).
10	Caplin, Steve; Banks, Adam,The Complete Guide to Digital Illustration, Publisher: Watson - Guptill Publications, (2003).

Subject Code	Subject Name (Lab oriented Theory Courses)	Category	L	T	P	C
EE19242	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	ES	3	0	2	4

Objectives:	
●	To introduce electric circuits and provide knowledge on the analysis of circuits using network theorems.
●	To impart knowledge on the phenomenon of resonance in RC, RL and RLC series and parallel circuits.
●	To provide knowledge on the principles of electrical machines and electronic devices.
●	To learn the concepts of different types of electrical measuring instruments and transducers.
●	To teach methods of experimentally analyzing electrical circuits, electrical machines, electronic devices and transducers.

UNIT-I	DC CIRCUITS	9
Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff's current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.		
UNIT-II	AC CIRCUITS	9
Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections		
UNIT-III	ELECTRICAL MACHINES	9
Construction, Principles of operation and characteristics of; DC machines, Transformers (single and three phase), Synchronous machines, three phase and single-phase induction motors.		
UNIT-IV	ELECTRONIC DEVICES & CIRCUITS	9
Types of Materials – Silicon & Germanium- N type and P type materials – PN Junction –Forward and Reverse Bias – Semiconductor Diodes –Bipolar Junction Transistor – Characteristics –Field Effect Transistors – Transistor Biasing – Introduction to operational Amplifier –Inverting Amplifier –Non Inverting Amplifier.		
UNIT-V	MEASUREMENTS & INSTRUMENTATION	9
Introduction to transducers - Classification of Transducers: Resistive, Inductive, Capacitive, Thermoelectric, piezoelectric, photoelectric, Hall effect - Classification of instruments - PMMC and MI Ammeters and Voltmeters – Multimeter -Digital Storage Oscilloscope.		
	Contact Hours :	45

	List of Experiments		
1	Verification of Kirchhoff's Laws.		
2	Load test on DC Shunt Motor.		
3	Load test on Single phase Transformer.		
4	Load test on Single phase Induction motor.		
5	Characteristics of P-N junction Diode.		
6	Half wave and Full wave Rectifiers.		
7	Characteristics of CE based NPN Transistor.		
8	Inverting and Non- Inverting Op-Amp circuits.		
9	Characteristics of LVDT, RTD and Thermistor.		
		Contact Hours :	30
		Total Contact Hours :	75

Course Outcomes:	
On completion of the course, the students will be able to	
●	Analyse DC and AC circuits and apply circuit theorems.
●	Realize series and parallel resonant circuits.
●	Understand the principles of electrical machines.
●	Understand the principles of different types of electronic devices, electrical measuring instruments and transducers.

●	Experimentally analyze the electric circuits, electrical machines, electronic devices, and transducers.														

Text Book(s):

1	J.B.Gupta, Fundamentals of Electrical Engineering and Electronics,S.K.Kataria& Sons Publications, 2002.
2	D P Kothari and I.J Nagarath, Basic Electrical and Electronics Engineering, McGraw Hill Education (India) Private Limited, Third Reprint,2016
3	Thereja .B.L., Fundamentals of Electrical Engineering and Electronics, S. Chand & Co. Ltd., 2008

Reference Books(s):

1	Del Toro, Electrical Engineering Fundamentals, Pearson Education, New Delhi, 2007
2	John Bird,Electrical Circuit Theory and Technology, Elsevier, First Indian Edition, 2006
3	Allan S Moris, Measurement and Instrumentation Principles, Elsevier, First Indian Edition, 2006
4	Rajendra Prasad, Fundamentals of Electrical Engineering, Prentice Hall of India, 2006
5	A.E.Fitzgerald, David E Higginbotham and Arvin Grabel, Basic Electrical Engineering, McGraw Hill Education(India) Private Limited, 2009

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
EE19242.1	2	2	2	3	3	2	1	-	-	-	-	3	2	2	2
EE19242.2	1	2	2	3	2	2	3	-	-	-	-	-	1	-	1
EE19242.3	2	3	2	1	2	2	2	-	2	-	-	1	2	2	2
EE19242.4	3	3	2	3	1	2	2	-	-	-	2	2	2	1	2
EE19242.5	3	3	2	2	2	1	2	1	2	1	2	1	2	3	2
Average	2.2	2.6	2.0	2.4	2.0	1.8	2.0	1.0	2.0	1.0	2.0	1.8	1.8	2.0	1.8

Correlation levels 1, 2 or 3 are as defined below:
1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)
No correlation: "-"

Subject Code	Subject Name (Lab oriented Theory Courses)	Category	L	T	P	C
EC19243	**PRINCIPLES OF DIGITAL ELECTRONICS**	ES	3	0	2	4

Objectives:	
●	To learn the basic postulates of Boolean algebra and infer the methods for simplifying Boolean expressions
●	To understand the design of various Combinational circuits.
●	To extrapolate the design of Synchronous Sequential circuits using Flip-Flops.
●	To know the design procedure of Asynchronous Sequential circuits and its problems.
●	To understand the concept of Programmable Logic Devices for the design of digital circuits and Familiar with Verilog HDL.

UNIT-I	**BOOLEAN ALGEBRA AND LOGIC GATES**	9
Fundamentals: Boolean postulates and laws, De-Morgan's Theorem, Principle of Duality, Boolean expression, Minterm, Maxterm, Sum of Products (SOP), Product of Sums (POS). **Minimization Techniques:** Minimization of Boolean expressions using Boolean Laws, Karnaugh map, Quine McCluskey method of minimization, don't care conditions. Logic Gates: NAND– NOR implementations.		
UNIT-II	**COMBINATIONAL CIRCUITS**	9
Half adder, Full Adder, Half subtractor, Full subtractor, Carry Look Ahead adder, Parallel Binary Adder/Subtractor, BCD adder, Binary Multiplier, Parity generator, Parity checker, Magnitude Comparator, Encoder, Decoder, Multiplexer-Logic function implementation, Demultiplexer. Code converter- Binary to Gray and Gray to Binary		
UNIT-III	**SYNCHRONOUS SEQUENTIAL CIRCUITS**	9
Memory elements: Latches, Flip-flops: RS, JK, D, T, Master-Slave, Triggering of Flip Flops, Realization of one flip flop using other flip flop. **Design:** Synchronous and Asynchronous counters - Up/Down counter, Modulo–N counter. Shift Registers - SISO, SIPO, PISO, PIPO, Universal Shift Registers. Shift Register Counters - Ring counter, Shift counter. Design of synchronous sequential circuits using Moore and Mealy model		
UNIT-IV	**ASYNCHRONOUS SEQUENTIAL CIRCUITS**	9
Design and analysis of asynchronous sequential circuits using Fundamental and pulse mode, Problems in Asynchronous sequential Circuits- Races, Cycles and Hazards.		
UNIT-V	**PROGRAMMABLE LOGIC DEVICES**	9
Programmable Logic Array (PLA), Programmable Array Logic (PAL), Field Programmable Gate Arrays (FPGA), Implementation of Combinational Logic Circuits using PROM, PLA, PAL. Implementation of basic combinational circuits using Verilog HDL.		
	Contact Hours :	**45**

List of Experiments	
1	Implementation of Binary to Gray and Gray to Binary code converters
2	Logic function implementation of Multiplexer and De-multiplexer using logic gates.
3	Implementation of SISO, SIPO, PISO and PIPO shift registers using Flip- Flop.
4	Design and Implementation of 4-bit Asynchronous and BCD Synchronous counters.
5	Implementation of Adder and Subtractor using Verilog HDL.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS
- ❖ IC Trainer Kit – 15 Nos
- ❖ Bread Boards – 15 Nos
- ❖ ICs each 50 Nos – 7400,7402, 7404, 7486, 7408, 7432, 7411, 74151, 74150, 7474, 7476
- ❖ System with HDL

	Contact Hours	:	**30**
	Total Contact Hours	:	**75**

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

	Simplify the Boolean expressions using basic postulates of Boolean algebra with suitable minimization techniques.
●	Design and Implement Combinational circuits.
●	Construct Synchronous Sequential circuits using Flip-Flops.
●	Design Asynchronous Sequential circuits and analyse its problems.
●	Implement digital circuits using Programmable Logic Devices and Familiar with Verilog HDL.

Text Books:

1	Morris Mano & Michael D Ciletti, "Digital Design: With an Introduction to Verilog HDL, 5th Edition, Pearson Education ,2013.
2	Charles H.Roth. "Fundamentals of Logic Design", 7th Edition, Thomson Learning, 2014.

Reference Books:

1	John F.Wakerly, "Digital Design", Fourth Edition, Pearson/PHI, 2008
2	John.M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2006.
3	Donald P.Leach and Albert Paul Malvino, "Digital Principles and Applications", 6th Edition, TMH, 2006.
4	Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011.
5	Donald D.Givone, "Digital Principles and Design", TMH, 2003.

Web links for virtual lab:

1	http://vlabs.iitkgp.ernet.in/dec/#

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
EC19243.1	2	2	1	2	2	-	-	-	-	-	-	1	1	2	-
EC19243.2	1	1	2	1	1	-	-	-	-	-	-	2	2	2	-
EC19243.3	1	1	2	1	1	-	-	-	-	-	-	2	2	2	-
EC19243.4	1	1	2	1	1	-	-	-	-	-	-	2	2	2	-
EC19243.5	1	1	2	1	1	-	-	-	-	-	-	1	1	2	-
Average	1.2	1.2	1.8	1.2	1.2	-	-	-	-	-	-	1.6	1.6	2.0	-

Correlation levels 1, 2 or 3 are as defined below:
1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)
No correlation: "-"

Subject Code	Subject Name (Lab oriented Theory Courses)	Category	L	T	P	C
CS19241	DATA STRUCTURES	PC	3	0	4	5

Objectives:	
●	To apply the concepts of List ADT in the applications of various linear and nonlinear data structures.
●	To demonstrate the understanding of stacks, queues and their applications.
●	To analyze the concepts of tree data structure.
●	To understand the implementation of graphs and their applications.
●	To be able to incorporate various searching and sorting techniques in real time scenarios.

UNIT-I	**LINEAR DATA STRUCTURES – LIST**	**9**
Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation — singly linked lists- circularly linked lists- doubly-linked lists – applications of lists –Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal).		
UNIT-II	**LINEAR DATA STRUCTURES – STACKS, QUEUES**	**9**
Stack ADT – Operations - Applications - Evaluating arithmetic expressions- Conversion of Infix topostfix expression - Queue ADT – Operations - Circular Queue –DEQUE –applications of queues.		
UNIT-III	**NON LINEAR DATA STRUCTURES – TREES**	**9**
Tree Terminologies- Binary Tree–Representation-Tree traversals – Expression trees – Binary Search Tree–AVL Trees –Splay Trees - Binary Heap – Applications.		
UNIT-IV	**NON LINEAR DATA STRUCTURES – GRAPHS**	**9**
Graph Terminologies – Representation of Graph – Types of graph - Breadth-first traversal - Depth-first traversal – Topological Sort - Shortest path - Dijikstra's Algorithm - Minimum Spanning Tree- Prim's Algorithm.		
UNIT-V	**SEARCHING, SORTING AND HASHING TECHNIQUES**	**9**
Searching- Linear Search - Binary Search. Sorting - Bubble sort - Selection sort - Insertion sort – Shell sort – Quick sort - Merge Sort. Hashing- Hash Functions –Collision resolution strategies- Separate Chaining – Open Addressing – Rehashing.		
	Contact Hours :	**45**

List of Experiments	
1	Array implementation of Stack and Queue ADTs
2	Array implementation of List ADT
3	Linked list implementation of List, Stack and Queue ADTs
4	Applications of List, Stack and Queue ADTs
5	Implementation of Binary Trees and operations of Binary Trees
6	Implementation of Binary Search Trees
7	Implementation of AVL Trees
8	Implementation of Heaps using Priority Queues
9	Graph representation and Traversal algorithms
10	Applications of Graphs
11	Implementation of searching and sorting algorithms
12	Hashing –any two collision techniques
	Contact Hours : **60**
	Total Contact Hours : **105**

Course Outcomes:	
On completion of the course, the students will be able to	
●	Analyze the various data structure concepts.
●	Implement Stacks and Queue concepts for solving real-world problems.
●	Analyze and structure the linear data structure using tree concepts.

●	Critically Analyse various non-linear data structures algorithms.	
●	Apply different Sorting, Searching and Hashing algorithms.	

Text Books:

1	Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education, 2002.
2	ReemaThareja, Data Structures Using C, Second Edition, Oxford University Press, 2014.

Reference Books:

1	Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest and Clifford Stein, Introduction to Algorithms, Second Edition, McGraw Hill, 2002.
2	Aho, Hopcroft and Ullman,Data Structures and Algorithms, Pearson Education, 1983.
3	Stephen G. Kochan, Programming in C, 3rd edition, Pearson Education.
4	Ellis Horowitz, SartajSahni and Susan Anderson Freed,Fundamentals of Data Structures in C, 2ndEdition, University Press, 2008.

Web links for virtual lab (if any)

1	http://vlabs.iitb.ac.in/vlab/labscse.html

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS19241.1	1	2	1	2	1	-	-	-	-	-	-	1	1	2	-
CS19241.2	1	1	2	1	1	-	-	-	-	-	-	2	2	2	-
CS19241.3	1	1	2	1	1	-	-	-	-	-	-	2	2	2	-
CS19241.4	1	1	2	1	1	-	-	-	-	-	-	2	2	2	-
CS19241.5	1	1	2	1	1	-	-	-	-	-	-	1	1	2	-
Average	1.0	1.2	1.8	1.2	1.0	-	-	-	-	-	-	1.6	1.6	2.0	-

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

No correlation: "-"

Subject Code	Subject Name (Laboratory Course)	Category	L	T	P	C
GE19121	**ENGINEERING PRACTICES – CIVIL& MECHANICAL**	**ES**	**0**	**0**	**2**	**1**

Objectives:
• To provide exposure to the students with hands on experience on various basic engineering practices in Civil and Mechanical Engineering.

List of Experiments

CIVIL ENGINEERING PRACTICE

1.	Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, and elbows in household fittings.
2.	Preparation of basic plumbing line sketches for wash basins, water heaters, etc.
3.	Hands-on-exercise: Basic pipe connections –Pipe connections with different joining components.

Carpentry Works:

4.	Study of joints in roofs, doors, windows and furniture.
5.	Hands-on-exercise: Woodwork, joints by sawing, planning and chiseling.

MECHANICAL ENGINEERING PRACTICE

6.	Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
7.	Gas welding practice.

Basic Machining:

8.	Simple Turning and Taper turning
9.	Drilling Practice

Sheet Metal Work:

10.	Forming & Bending:
11.	Model making – Trays and funnels
12.	Different type of joints.

Machine Assembly Practice:

13.	Study of centrifugal pump
14.	Study of air conditioner

	Total Contact Hours	:	30

Course Outcomes:
On completion of the course, the students will be able to
● Perform plumbing activities for residential and industrial buildings considering safety aspects while gaining clear understanding on pipeline location and functions of joints like valves, taps, couplings, unions, reducers, elbows, etc.
● Perform wood working carpentry activities like sawing, planning, cutting, etc. while having clear understanding of the joints in roofs, doors, windows and furniture.
● Produce joints like L joint, T joint, Lap joint, Butt joint, etc. through arc welding process while acquiring in depth knowledge in the principle of operation of welding and other accessories
● Perform operations like Turning, Step turning, Taper turning, etc. in lathe and Drilling operation in drilling machine
● Perform sheet metal operations like Forming, Bending, etc. and fabricating models like Trays, funnels, etc.

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
GE19121.1	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-
GE19121.2	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-
GE19121.3	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-
GE19121.4	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-
GE19121.5	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-
Average	-	-	-	-	-	-	-	1.0	1.0	-	-	-	-	-	-

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

No correlation: "-"

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
MC19101	**ENVIROMENTAL SCIENCE AND ENGINEERING**	MC	3	0	0	0

Objectives:	
●	To understand the importance of natural resources, pollution control and waste management.
●	To provide the students awareness on the current social issues and environmental legislations.

UNIT-I	NATURAL RESOURCES	9

Environment -definition - scope and importance - forest resources -use and overexploitation -water resources -use and over utilization - dams - benefits and problems - water conservation -energy resources - growing energy needs - renewable and non-renewableenergy sources - use of alternate energy sources -land resources -land degradation - role of an individual in conservation of natural resources

UNIT-II	ENVIRONMENTAL POLLUTION	9

Definition - causes, effects and control measures of air pollution -chemical and photochemical reactions in the atmosphere - formation of smog, PAN, acid rain, and ozone depletion- noise pollution -mitigation procedures - control of particulate and gaseous emission (Control of SO_2, NO_X, CO and HC). Water pollution - definition-causes-effects of water pollutants–marine pollution-thermal pollution-radioactive pollution-control of water pollution by physical, chemical and biological processes–waste water treatment-primary, secondary and tertiary treatment. Soil pollution: definition-causes-effects and control of soil pollution.

UNIT-III	SOLID WASTE MANAGEMENT	9

Solid wastes - sources and classification of solid wastes -solid waste management options - sanitary landfill, recycling, composting, incineration, energy recovery options from wastes. Hazardous waste -definition -sources of hazardous waste-classification (biomedical waste, radioactive waste, chemical waste, household hazardous waste)-characteristics of hazardous waste ignitability (flammable) reactivity, corrosivity, toxicity -effects of hazardous waste -case study-Bhopal gas tragedy - disposal of hazardous waste-recycling , neutralization, incineration, pyrolysis, secured landfill - E-waste management -definition-sources-effects -electronic waste recycling technology.

UNIT-IV	SOCIAL ISSUES AND THE ENVIRONMENT	9

Sustainable development -concept, components and strategies - social impact of growing human population and affluence, food security, hunger, poverty, malnutrition, famine - consumerism and waste products - environment and human health - role of information technology in environment and human health -disaster management– floods, earthquake, cyclone and landslide.

UNIT-V	TOOLS FOR ENVIRONMENTAL MANAGEMENT	9

Environmental impact assessment (EIA) structure -strategies for risk assessment–EIS-environmental audit-ISO 14000-precautionary principle and polluter pays principle- constitutional provisions- - pollution control boards and pollution control acts- environmental protection act1986- role of non-government organizations- international conventions and protocols.

	Total Contact Hours	:	45

Course Outcomes:	
On completion of the course, the students will be able to	
●	Be conversant to utilize resources in a sustainable manner.
●	Find ways to protect the environment and play proactive roles.
●	Apply the strategies to handle different wastes
●	Develop and improve the standard of better living.
●	Be conversant with tools of EIA and environmental legislation.

Text Book(s):	
1	Benny Joseph, "Environmental Science and Engineering", 2nd edition, Tata McGraw-Hill, New Delhi, 2008.
2	Gilbert M.Masters, "Introduction to Environmental Engineering and Science", 2ndedition, Pearson Education, 2004.

Reference Books(s):	
1	Dharmendra S. Sengar, "Environmental law", Prentice hall of India Pvt. Ltd, New Delhi, 2007.

2	ErachBharucha, "Textbook of Environmental Studies", 3rd edition, Universities Press, 2015.
3	G. Tyler Miller and Scott E. Spoolman, "Environmental Science", 15thedition,CengageLearning India, 2014.
4	Rajagopalan, R, "Environmental Studies-From Crisis to Cure", 3rdedition, Oxford UniversityPress, 2015.
5	De. A.K., "Environmental Chemistry", New Age International, New Delhi, 1996.
6	K. D. Wager, "Environmental Management", W. B. Saunders Co., USA, 1998.

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
MC19101.1	3	2	3	2	1	3	3	2	1	1	1	1	1	1	1
MC19101.2	3	3	3	2	2	3	3	3	2	1	2	2	1	2	2
MC19101.3	3	3	3	2	2	3	3	3	2	1	2	1	1	2	1
MC19101.4	3	3	3	2	2	3	3	2	2	1	2	2	1	2	2
MC19101.5	2	2	3	1	1	3	3	1	1	2	1	1	1	1	1
Average	2.8	2.6	3.0	1.8	1.6	3.0	3.0	2.2	1.6	1.2	1.6	1.4	1.0	1.6	1.4

Correlation levels 1, 2 or 3 are as defined below:
1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)
No correlation : "-"

Subject Code	Subject Name (Theory Course)	Category	L	T	P	C
MA19154	**DISCRETE MATHEMATICS**	BS	3	1	0	4

Objectives:
• To extend student's Logical and Mathematical maturity and ability to deal with abstraction.
• To understand discrete structures of many levels and to know the principle of counting.

UNIT-I	MATHEMATICAL LOGIC	12
Propositional calculus - propositions and connectives, syntax; Semantics - truth assignments and truth tables, validity and satisfiability, tautology; Adequate set of connectives; Equivalence and normal forms; Compactness and resolution; Formal reducibility - natural deduction system and axiom system; Soundness and completeness		
UNIT-II	COMBINATORICS	12
Basic counting, balls and bins problems, generating functions, recurrence relations. Proof techniques, principle of mathematical induction, pigeonhole principle.		
UNIT-III	GRAPH THEORY	12
Graphs and digraphs, complement, isomorphism, connectedness and reachability, adjacency matrix, Eulerian paths and circuits in graphs and digraphs, Hamiltonian paths and circuits in graphs and tournaments, trees; Planar graphs, Euler's formula, dual of a planer graph, independence number and clique number, chromatic number, statement of Four- color theorem.		
UNIT-IV	ABSTRACT ALGEBRA	12
Set, relation – Algebraic System: Groups, sub groups, homomorphism, cosets, Lagrange's theorem – Ring and Field (definition).		
UNIT-V	BOOLEAN ALGEBRA	12
Introduction of Boolean algebra, truth table, basic logic gate, basic postulates of Boolean algebra, principle of duality, canonical form, Karnaugh map.		
	Total Contact Hours :	**60**

Course Outcomes:
On completion of the course, students will be able to
• Apply the concepts of logic to test the validity of a program and to arrive at inferences on logical structures.
• Use the counting principles in implementing various programmes.
• Handle a class of functions which transform a finite set into another finite set which relates to input and output
• Apply the concepts and properties of algebraic structures such as semi groups, monoids and groups.
• Apply the concepts of Boolean algebra in analyzing logic gates.

Text Books:	
1	M. Morris Mano, "Digital Logic & Computer Design", Pearson.
2	C. L. Liu, "Elements of Discrete Mathematics", (Second Edition) McGraw Hill, New Delhi

Reference Books / Web links:	
1	Gilbert Strang, "Introduction to linear algebra".
2	R. A. Brualdi, "Introductory Combinatorics", North-Holland, New York.

3	N. Deo, "Graph Theory with Applications to Engineering and Computer Science", Prentice Hall, Englewood
4	E. Mendelsohn, Van-Nostrand, "Introduction to Mathematical Logic", (Second Edition), London.
5	J. A. Bondy and U. S. R. Murty, "Graph Theory with Applications", Macmillan Press, London.
6	L. Zhongwan, "Mathematical Logic for Computer Science", World Scientific, Singapore.
7	I. N. Herstein, John Wiley and Sons, "Topics in Algebra"

CO - PO – PSO MATRICES OF THE COURSE

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
MA19154.1	3	3	3	2	2	1	1	-	-	-	2	1	3	3	2
MA19154.2	3	3	3	2	2	1	1	-	-	-	2	1	3	3	2
MA19154.3	3	3	3	2	2	1	1	-	-	-	-	1	3	2	2
MA19154.4	3	3	3	2	1	1	1	-	-	-	-	1	3	2	2
MA19154.5	3	3	3	2	1	1	1	-	-	-	-	1	3	2	2
Average	3.0	3.0	3.0	2.0	1.6	1.0	1.0	-	-	-	2.0	1.0	3.0	2.4	2.0

Correlation levels 1, 2 or 3 are as defined below: 1:Slight(Low)   2: Moderate (Medium) 3: Substantial

(High) No correlation:"-"

Subject Code	Subject Name(Theory course)	Category	L	T	P	C
GE19301	**LIFE SCIENCE FOR ENGINEERS**	BS	**3**	**0**	**0**	**3**

Objectives:

- Broad objective of this course is to give an introduction of life science to engineering students.
- The course helps students to familiarize with human physiology, life style diseases and their management and basic diagnostic aspects.

UNIT-I	OVERVIEW OF CELLS AND TISSUES	9
	Introduction to Bacteria, virus, fungi and animal cells. Organization of cells into tissues and organs. Functions of vital organs.	
UNIT-II	HEALTH AND NUTRITION	9
	Balanced diet, Importance of RDA, BMR, and diet related diseases. Role of antioxidants PUFA, DHA, Essential amino acids, Essential fatty acids in diet. Water and its significance for human health. Physical and Mental health – Significance of exercise and yoga.	
UNIT-III	UNHEALTHY PRACTICES AND THEIR IMPACT ON HEALTH	9
	Drug induced toxicity, Unhealthy practices - Drug abuse/Narcotics/Smoking/Alcohol/Self-medication/Undue usage of electronic gadgets.	
UNIT-IV	COMMON DISEASES AND LIFESTYLE DISORDERS	9
	Prevention and management of food, water and airborne illness (Common cold, dehydration, food poisoning etc). Lifestyle disorders – obesity, diabetes, stroke, heart attack, ulcer, renal calculi, cancer, AIDS, hepatitis- prevention and management.	
UNIT-V	DIAGNOSTIC TESTS AND THEIR RELEVENCE	9
	Normal range of biochemical parameters, significance of organ function tests, organ donation.	
	Total Contact Hours	**: 45**

Course Outcomes:

On completion of the course, the students will be able to

- Classify the living organisms and relate the functions of vital organs.
- Demonstrate the importance of balanced diet and plan methods for healthy living.
- Analyze the hazards of unhealthy practices and take preventive measures.
- Categorize the various life style disorders and recommend ways to manage the common diseases.
- Evaluate and interpret biochemical parameters and their significance.

Text Books:

1	Carol D. Tamparo PhD CMA-A (AAMA), Marcia (Marti) A. Lewis EdD RN CMA-AC (AAMA), "Diseases of human body , F.A Davis Company, 2011
2	Textbook of Medical Biochemistry, Chatterjea and Rana shindaeJaypee Brothers Medical Publishers, 2011.

Reference Books

1	ArthurT.Johnson, "Biology for Engineers", CRC Press, Taylor and Francis, 2011.
2	Cecie Starr, Ralph Taggart, Christine Evers and Lisa Starr, "Cell Biology and Genetics", Cengage Learning, 2008.

Web links for Theory & Lab:

1	https://nptel.ac.in/courses/122103039/

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
GE19301.1	3	1	2	2	2	3	1	1	1	2	1	3	-	-	-
GE19301.2	3	1	2	2	2	3	1	1	1	2	1	3	-	-	-
GE19301.3	3	1	2	2	2	3	1	3	1	2	1	3	-	-	-
GE19301.4	3	1	2	2	2	3	1	1	1	2	1	3	-	-	-
GE19301.5	3	1	2	2	3	3	1	1	1	2	1	3	-	-	-
Average	3.0	1.0	2.0	2.0	2.2	3.0	1.0	1.4	1.0	2.0	1.0	3.0	-	-	-

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low)   2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Subject Code	Subject Name (Theory Course)	Category	L	T	P	C
CD19301	**Computer Design**	HS	**2**	**1**	**0**	3

Objectives:		
●	Learn Data Representation concept along with Register transfer and Micro-Operation	
●	Understand the Basic Computer Organization and its design	
●	Learn Micro Programmed control instructions, program and Different CPU Design	
●	Understand the Pipelining concept and how the computer arithmetic is carried out	
●	Learn the Input and output and Memory organization	
UNIT – I	**Data Representation & Register Transfer and Micro operations**	**9**
Data Representation - Register Transfer and Micro operations –   Data representation: Data types, Complements, Fixed Point Representation and Floating Point Representation.   **- Register Transfer and Micro operations**   Micro operation, Register Transfer Language,- Register Transfer - Bus and Memory Transfer - Arithmetic Micro operations:. Logic Micro operations - Shift Micro operations:- , Arithmetic Shift Unit
UNIT – II	**Basic Computer Organization and Design**	**9**
Instruction Code – Computer Registers – Computer Instructions – Timing and Control – Instruction Cycle-Memory Reference Instruction – Input-Output Interrupt – Complete Computer Description – Design of Basic Computer-Design of Accumulator Logic
UNIT – III	**Micro programmed Control and CPU**	**9**
Control Word - Address Sequencing: Conditional Branch, Mapping of Instructions, Subroutines- Micro program example: Microinstruction Format, Symbolic Microinstruction -. Design of Control Unit   **Central Processing Unit :** General Register Organization – Stack Organization – Instruction Format – Addressing Modes – Data Transfer and Manipulation - Program Control – RISC
UNIT – IV	**Pipelining & Computer Arithmetic**	**9**
Pipelining : Parallel Processing, Pipelining: - Arithmetic Pipeline - Instruction Pipelining: RISC Pipeline – Vector Processing- Array Processor   **Computer Arithmetic :** Addition and Subtraction – Multiplication Algorithms- Division algorithms –Float Point Arithmetic Operations – Decimal Arithmetic Unit – Decimal Arithmetic Operations
UNIT – V	**Input Output and Memory Organization**	**9**
Input Output Organization : Input-Output Interface: I/O Bus and Interface Modules, I/O vs. Memory Bus, Isolated vs. Memory-Mapped I/O - . Asynchronous Data Transfer: Strobe, Handshaking - Modes of Transfer: Programmed I/O, Interrupt-Initiated I/O, Direct memory Access - . Priority Interrupt: Polling, Daisy-Chaining, Parallel Priority Interrupt - Direct Memory Access, Input-Output Processor, DMA vs. IOP **Memory Organization :** Memory Hierarchy, Main Memory, RAM and ROM Chips, Memory address Map,Memory Connection to CPU, Auxiliary Memory (magnetic Disk, Magnetic Tape) - Associative Memory: Hardware Organization, Match Logic, Read Operation, Write Operation - Cache Memory: Locality of Reference, Hit & Miss Ratio, Mapping, Write Policies – Virtual Memory
	Contact Hours :	**60**
	Total Contact Hours :	**60**

Course Outcomes: On completion of the course students will be able to:	
●	Understand how the data is represented and how it is transferred via register and how microoperation is carried out
●	Know the function of different part of the computer and also different instruction set
●	Apply the Microinstruction to write the program and also different computer architecture instructions
●	Know and apply the pipelining concept to write the program and also performs the computer arithmetic operation
●	Understand the different mode of i/o operations and also memory organization and its related operations
Text Book(s):	
1	Computer System Architecture, M.Morris Mono, Third Edition , 2016
2	Dr.M.Usha, T.S.Srikanth, "Computer System Architecture and Organization", Wiley Publications
	Web Link of the E-book

	https://www.pdfdrive.com/computer-system-architecture-3rd-edition-e184573355.html
Reference Books	
1	William Stallings, "Computer Organization and Architecture: Designing for the performance", 10th Edition, 2015 , Pearson Publication
2	Dr. SPS Saini and Anish Saini, "Computer System Architecture and Organization", SK Kataria & sons Publications, 2007

CO-PO-PSO matrices of course

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CD19301.1	1	2	1	2	2	1	1	-	1	1	1	1	2	2	1
CD19301.2	2	2	2	2	2	1	1	-	1	1	1	1	2	3	1
CD19301.3	2	2	1	2	2	2	1	-	1	1	1	1	2	2	2
CD19301.4	2	1	2	1	1	2	1	-	1	1	1	1	2	2	2
CD19301.5	2	2	2	2	1	2	1	-	1	1	1	1	2	2	2
Average	**1.8**	**1.8**	**1.6**	**1.8**	**1.8**	**1.6**	**1**	**0**	**1**	**1.6**	**1**	**1**	**2**	**2.2**	**1.8**

Correlation levels 1, 2 or 3 are as defined below:
1: Slight (Low)   2: Moderate (Medium)   3:
Substantial (High) No correlation: "*"

Subject Code	Subject Name (Lab oriented Theory Course)	Category	L	T	P	C
CB19343	**SOFTWARE ENGINEERING**	PC	3	0	2	4

Objectives:
• Understand the phases in a software project.
• Gain knowledge in fundamental concepts of software project management and quality.
• Obtain knowledge on requirements engineering and Analysis Modelling.
• Learn various testing and maintenance measures

UNIT-I	**INTRODUCTION**	9

Programming in the small vs. programming in the large; software project failures and importance of software quality and timely availability;
of software engineering towards successful execution of large software projects; emergence of software engineering as a discipline, Software Engineering Historical Development from Jackson Structured Programming to Agile Development.

UNIT-II	**SOFTWARE PROJECT MANAGEMENT**	9

Basic concepts of life cycle models – different models and milestones; software project planning –identification of activities and resources; concepts of feasibility study; techniques for estimation of schedule and effort; software cost estimation models and concepts of software engineering economics; techniques of software project control and reporting; introduction to measurement of software size; introduction to the concepts of risk and its mitigation; configuration management. Agile Software Engineering: Concepts of Agile Methods, Extreme Programming; Agile Process Model - Scrum, Feature; Scenarios and Stories

UNIT-III	**SOFTWARE QUALITY AND RELIABILITY**	9

Software quality; Garvin's quality dimensions, McCall's quality factor, ISO 9126 quality factor; Software Quality Dilemma; Introduction to Capability Maturity Models (CMM and CMMI); Introduction to software reliability, reliability models and estimation.

UNIT-IV	**SOFTWARE REQUIREMENTS AND OO ANALYSIS, DESIGN AND CONSTRUCTION**	9

Introduction to Software Requirements Specifications (SRS) and requirement elicitation techniques; techniques for requirement modelling – decision tables, event tables, state transition tables, Petri nets; requirements documentation through use cases; introduction to UML, introduction to software metrics and metrics-based control methods; measures of code and design quality. Concepts -- the principles of abstraction, modularity, specification, encapsulation and information hiding; concepts of abstract data type; Class Responsibility Collaborator (CRC) model; quality of design; design measurements; concepts of design patterns; Refactoring; object-oriented construction principles; object oriented metrics.

UNIT-V	**SOFTWARE TESTING**	9

Introduction to faults and failures; basic testing concepts; concepts of verification and validation; black box and white box tests; white box test coverage – code coverage, condition coverage, branch coverage; basic concepts of black-box tests – equivalence classes, boundary value tests, usage of state tables; testing use cases; transaction based testing; testing for non-functional requirements – volume, performance and efficiency; concepts of inspection; Unit Testing, Integration Testing, System Testing and Acceptance Testing.

	Contact Hours	:	45

List of Experiments	
1	Development of requirements specification.
2	Function oriented design using SA/SD.
3	Object-oriented design using UML.
4	Test case design.
5	Implementation using JAVA.

6	Testing.
7	Use of CASE tools and other tools such as configuration management tools.
8	Program analysis tools.

		Contact Hours	:	30
		Total Contact Hours	:	75

LAB EQUIPMENT:	
1	**Hardware**: Standalone desktops with minimum desktop configuration.
2	**Software**: System loaded with windows or Linux to run Java , UML, CASE and Testing tools.

Course Outcomes:	
On completion of the course, students will be able to	
•	Work in software projects.
•	Identify the key activities in managing a software project.
•	Know the various quality models and reliability in software.
•	Make analysis, modelling and coding for software projects.
•	Perform the various testing methods for software projects

Text Books:	
1	Ian Sommerville, "Software Engineering ", Ninth edition, Pearson Education, 2010.
2	Roggers S. Pressman and Bruce R. Maxim., "Software Engineering A Practitioner's Approach", McGraw Hill Education,2009.

Reference Books:	
1	Roger S. Pressman," Software Engineering – A Practitioner's Approach", Seventh edition, 2010.
2	Carlo Ghezzi, Jazayeri Mehdi, Mandrioli Dino," Fundamentals of Software Engineering", second edition, Pearson publication.
3	Michael Jackson," Software Requirements and Specification: A Lexicon of Practice, Principles and Prejudices", first edition, ACM Press.
4	Ivar Jacobson, Grady Booch, James Rumbaugh,"The Unified Development Process", Addison-Wesley, 1999.
5	Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, "Design Patterns: Elements of Object-Oriented Reusable Software", First edition.
6	Norman E Fenton, Shari Lawrence Pfleeger," Software Metrics: A Rigorous and Practical Approach", Second edition, International Thomson Computer Press, 1997.
7	Shari Lawrence Pfleeger and Joanne M. Atlee, "Software Engineering: Theory and Practice", fourth edition, Pearson.
8	Bertrand Meyer, second edition," Object-Oriented Software Construction", Prentice-hall International Series, 1997.
9	Ivar Jacobson, "Object Oriented Software Engineering: A Use Case Driven Approach", First edition, ACM Press.
10	Bertrand Meyer, "Touch of Class: Learning to Program Well with Objects and Contracts ", First edition, Springer-Verlag Berlin Heidelberg.
11	Martin Fowler, "UML Distilled: A Brief Guide to the Standard Object Modeling Language ", Third edition, Addison Wesley, 2003.
12	Manoj Kumar Lal, "Introduction to Business Domains for Software Engineers", Kindle Edition, 2021.
13	Manoj Kumar Lal, "Knowledge Driven Development – Bridging Waterfall and Agile Methodologies", Kindle

Edition, 2018.

CO - PO – PSO MATRICES OF THE COURSE

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CB19343.1	3	2	2	2	2	2	2	2	2	2	2	1	2	2	1
CB19343.2	2	2	2	2	2	2	1	1	3	2	3	1	2	1	1
CB19343.3	1	1	1	1	1	2	2	1	3	1	2	1	1	1	1
CB19343.4	2	2	3	2	2	1	1	1	3	3	2	1	2	2	1
CB19343.5	2	2	2	3	2	1	1	2	3	3	1	2	2	2	1
Average	2.0	1.8	2.0	2.0	1.8	1.6	1.4	1.4	2.8	2.2	2.0	1.2	1.8	1.6	1.0

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low)   2: Moderate (Medium) 3: Substantial (High) No correlation: "-"

Subject Code	Subject Name (Lab oriented Theory Course)	Category	L	T	P	C
CD19342	Design Process and Perspectives	PC	3	0	2	4

Objectives:
● Understand design thinking for visual communication
● Understanding to decide on visual compositions
● Learn the concepts to communicate created design
● Understand the Media Design and Digital Image Printing
● Learn the concepts of Design for Interactive Media.

UNIT – I	Design thinking for Graphics	7
Role of Graphic Design in Society-Elements of Graphic design: Basic elements-relational elements- Intentional Elements–Principles of Graphic Design-Implications and Impact of Graphic Design –Graphic Design Process: Design thinking Definition – Design thinking stages		
UNIT – II	Inspecting and deciding visual elements for design thinking	10
Define the problem – Research the problem:Identifying drivers - Information gathering-Target groups – Idea Generation for the problem - Basic design directions-Questions and answers-Themes of thinking - Brainstorming-Deciding elements to design - Sketching and Drawing - Lines, shapes, Negative space/white space, Volumes, Value, Color, Texture- Color: Colors Theories-Color wheel - Color Harmonies or Color Schemes- Color Symbolism – Font - Layout		
UNIT – III	Refinement and prototyping design	8
Refinement of Design : Thinking in images - Thinking in signs - Appropriation - Humor- Personification - Visual metaphors - Modification - Thinking in words- Thinking in technology – Prototyping - Developing designs - 'Types' of prototype- Vocabulary – Risk management – Implementation: Format - Materials- Finishing – Case study		
UNIT – IV	Media and Digital Image Printing	10
Digital Imaging and Printing - Advertising Design - Integrated Methods of Advertising -Visuals and Their Voice in Advertising - The Stages of Advertising Design - Logo, and Package Development - Campaign Design–Newspaper Design: Newspaper's Role in Modern Advertising: When to Use Newspaper - The Effect of Newsprint on Design- Sizing Up Newspaper Columns -Say and look of newspaper - Magazine Design		
UNIT – V	Graphic Design for Interactive Media	10
Graphic Design for Interactive Media - Graphic Design approach - The Design Components That Make Up a Website - Breaking Down the Parts of a Website - Elements to develop website -Designing with HTML- Creating a simple page – Marking up text and tables – Adding links and images – Creating Forms - Basic concept of CSS: Introduction-Formatting text-colors-background – Responsive Web Design – Web Image Basics - SVG		

		Contact Hours	:	45
	List of Experiments			
	Design the given experiments using five phases of design thinking principles. (Max 4 people in a group). Implement various Font, Color, Layout and Typographic design elements in each experiment.		

1	Design an UI that can teach mathematics to children of 4-5 years age in school in Rural sector.
2	Design an UI that can help people to sell their handmade products in metro cities.
3	Design an UI for a social media website and chat.
4	Design a publication that support different languages.
5	Design a publication that tells comic stories
6	Design an advertisement for mobile company
7	Design an advertisement for any political party with images
8	Design an advertisement for electronic products
9	Design an advertisement for food products
10	Design anInteractive website for a new Institution.
11	Design a Blog that publish educational posts.
12	Design an interactive website for hospital management system.
13	Design an interactive website for food selling app.

		Contact Hours :	**30**
		Total Contact Hours :	**75**

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

●	Understand the various graphic design thinking process and phases
●	Analyze and choose between various visual compositions
●	Designing and communicating visual components
●	Apply design concepts for media publishing and advertisement
●	Create website using different design concepts

LAB EQUIPMENT:	
1	**Hardware Requirements:** Intel® or AMD processor with 64-bit support; 2 GHz or faster processor with SSE 4.2 or later - 8 GB RAM - Windows 10 64-bit (version 1909) or later - 1.5 GB of GPU memory-4 GB of available hard-disk space;
2	**Software Requirements:** Adobe Photoshop – Adobe Illustrator – HTML – CSS

Text Book(s):	
1	Design Thinking for Visual Communication, Gavin Ambrose, Bloomsbury Publishing, Edition 1, 2017
2	Advertising Design by MediumA Visual and Verbal Approach, Robyn Blakeman, Taylor and Francis, Edition 1 , 2022
3	Learning Web Design,Jennifer Niederst Robbins, O' Reilley, 5th Edition,2018

Reference Book(s):	
1	David Raizman; History of Modern Design, Prentice Hall,2004

2	Handbook of Design Thinking, Christian Mueller-Roterberg, Amazon kindle, 2018

Web links for Theory & Lab:

1.	https://www.aicte-india.org/sites/default/files/bvoc/Graphics%20&%20Multimedia.pdf
2.	https://www.interaction-design.org/literature/topics/visual-design https://www.interaction-design.org/literature/topics/design-thinking
3,	https://ncert.nic.in/textbook.php?kegd1=1-8 https://ncert.nic.in/textbook.php?legd1=0-12

CO-PO-PSO matrices of course

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CD19341.1	3	1	3	2	3	2	3	1	1	1	1	3	1	3	1
CD19341.2	3	-	3	-	3	-	-	-	-	-	1	1	1	3	1
CD19341.3	3	3	3	2	3	-	-	-	-	-	-	1	1	3	2
CD19341.4	1	3	3	3	3	3	2	2	2	2	2	2	1	3	3
CD19341.5	1	3	3	3	3	3	2	2	2	2	2	2	1	3	3
Average	**2.2**	**2**	**3**	**2**	**3**	**1.6**	**1.4**	**1**	**1**	**1**	**1.2**	**1.8**	**1**	**3**	**2**

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low)   2: Moderate (Medium) 3:
Substantial (High) No correlation: "-"

Subject Code	Subject Name (Lab Oriented Theory Course)	Category	L	T	P	C
CS19342	OBJECT ORIENTED PROGRAMMING PARADIGM	PC	3	0	4	5

Objectives:
- To understand Object Oriented Programming concepts and characteristics of Java
- To know the principles of classes, abstraction and inheritance
- To create packages, define exceptions and use strings
- To use I/O streams and collections in applications
- To design and build simple GUI programs using generics, AWT, Swings and JDBC

UNIT-I	INTRODUCTION TO OOP AND JAVA FUNDAMENTALS	9

Introduction to Object Oriented Programming – Basic concepts of OOP - An overview of Java - Java Architecture - Data Types - Variables- Arrays- Operators - Control Statements - Command Line Arguments.

UNIT-II	CLASSES AND INHERITANCE	9

Defining Classes in Java: Methods, Constructors, Garbage Collection - Access Specifiers - Method Overloading – Inheritance: Super keyword, this keyword, Method Overriding, Abstract Classes – Static Members -Final Method and Class.

UNIT-III	PACKAGES, EXCEPTION HANDLING AND STRINGS	9

Packages – Interfaces - Exceptions – Exception Hierarchy – Throwing and Catching Exceptions – Built-in Exceptions, User defined Exceptions, Stack Trace Elements – Strings - String Buffer.

UNIT-IV	I/O AND COLLECTIONS	9

Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files – Collection Interfaces – Collection Classes.

UNIT-V	GENERIC PROGRAMMING, MULTITHREADING AND EVENT DRIVEN PROGRAMMING	9

Generic Programming – Generic Classes – Generic Methods - Multithreading: Thread Life Cycle, Thread Creation, Thread Synchronization- Swings – Layout Management - Accessing Databases with JDBC.

	Total Contact Hours	:	45

	List of Experiments
1	Simple programs using command line arguments
2	Programs using control structures
3	Programs using arrays
4	Programs using classes and objects.
5	Programs using inheritance and interfaces
6	Programs using packages and abstract class
7	Programs to handle different types of exceptions
8	Programs using strings and string buffer
9	Programs using I/O streams
10	Programs using files
11	Programs using collections
12	Programs using multithreading
13	Programs using Generics
14	Programs using swings
15	Simple applications using database connectivity

	Contact Hours	:	30
	Total Contact Hours	:	75

Course Outcomes:
On completion of the course, the students will be able to
- Develop Java programs using OOP principles.
- Develop Java programs with the concepts inheritance.

- Build Java applications using exceptions and strings.
- Develop Java applications using I/O and collections.
- Develop interactive Java applications using GUI components.

	LAB EQUIPMENT:
1	**Hardware**: Standalone desktops with minimum desktop configuration.
2	**Software**: System loaded with windows or Linux to run JAVA and JDBC. IDE like Netbeans, Eclipse etc., are preferable.

Text Book (s):

1	Herbert Schildt, "Java The complete reference", 8th Edition, McGraw Hill Education, 2011.
2	Cay S. Horstmann, Gary cornell, "Core Java Volume –I Fundamentals", 9th Edition, Prentice Hall, 2013.

Reference Books(s):

1	Paul Deitel, Harvey Deitel, "Java SE 8 for programmers", 3rd Edition, Pearson, 2015.
2	Steven Holzner, "Java 2 Black book", Dreamtech press, 2011.
3	Timothy Budd, "Understanding Object-oriented programming with Java", Updated Edition, Pearson Education, 2000.
4	SCJP Sun Certified Programmer for Java 6 Study Guide. 6th edition, McGrawHill, 2008.

Web links for Theory & Lab:

1	https://www.javatpoint.com/java-tutorial

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS19342.1	3	2	1	-	1	-	-	-	1	-	-	1	1	1	1
CS19342.2	3	1	1	-	1	-	-	-	1	-	-	1	2	1	1
CS19342.3	3	1	1	-	1	-	-	-	2	-	-	1	2	2	2
CS19342.4	3	2	1	-	1	-	-	-	2	-	-	2	3	2	2
CS19342.5	3	2	2	2	1	-	-	-	3	1	3	2	3	2	3
Average	3.0	1.6	1.2	2.0	1.0	-	-	-	1.8	1.0	3.0	1.4	2.2	1.6	1.8

Correlation levels 1, 2 or 3 are as defined below:
1: Slight (Low)   2: Moderate (Medium) 3: Substantial (High)
No correlation: "-"

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
MC19301	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	MC	3	0	0	0

Objectives:
- To impart basic principles of thought process, reasoning and inference.
- To acquire knowledge in holistic life style of yoga science and wisdom in modern society with rapid technological advancements and societal disruptions.
- To gain knowledge in Indian perspective of modern science.
- Be familiarized with Indian philosophical, linguistic and artistic traditions.

UNIT-I	INTRODUCTION TO INDIAN KNOWLEDGE SYSTEM	9

Basic structure of the Indian Knowledge System –Veda – Upaveda - Ayurveda, Dhanurveda - Gandharvaveda, Sthapathyaveda and Arthasasthra. Vedanga (Six forms of Veda) – Shiksha, Kalpa, Nirukta, Vyakarana, Jyothisha and Chandas- Four Shasthras - Dharmashastra, Mimamsa, Purana and Tharkashastra.

UNIT-II	MODERN SCIENCE AND YOGA	9

Modern Science and the Indian Knowledge System – a comparison - Merits and demerits of Modern Science and the Indian Knowledge System - the science of Yoga-different styles of Yoga – types of Yogaasana, Pranayam, Mudras, Meditation techniques and their health benefits – Yoga and holistic healthcare – Case studies

UNIT-III	INDIAN PHILOSOPHICAL TRADITION	9

Sarvadharshan/Sadhdharshan – Six systems (dharshans) of Indian philosophy - Nyaya, Vaisheshika, Sankhya, Yoga, Vedanta-Other systems- Chavarka, Jain (Jainism), Boudh (Buddhism) – Case Studies.

UNIT-IV	. INDIAN LINGUISTIC TRADITION	9

Introduction to Linguistics in ancient India – history – Phonetics and Phonology – Morphology –Syntax and Semantics-Case Studies

UNIT-V	INDIAN ARTISTIC TRADITION	9

Introduction to traditional Indian art forms – Chitrakala (Painting), Murthikala / Shilpakala (Sculptures), Vaasthukala, Sthaapathya kala (Architecture), Sangeeth (Music), Nruthya (Dance) and Sahithya (Literature) – Case Studies.

	Total Contact Hours	:	45

Course Outcomes:
On completion of the course, the students will be able to
- Understand basic structure of the Indian Knowledge System.
- Apply the basic knowledge of modern science and Indian knowledge system in practice.
- Understand the importance Indian Philosophical tradition.
- Appreciate the Indian Linguistic Tradition.
- Understand the concepts of traditional Indian art forms.

Text Book (s):

1	V. Sivaramakrishnan (Ed.), "Cultural Heritage of India-course material", BharatiyaVidyaBhavan, Mumbai, 5th Edition, 2014.
2	Swami Jitatmanand, "Modern Physics and Vedant", BharatiyaVidyaBhavan.
3	Swami Jitatmanand, "Holistic Science and Vedant", BharatiyaVidyaBhavan.
4	Fritzof Capra, "Tao of Physics".
5	Fritzof Capra, "The Wave of life".

Reference Books(s) :

1	VN Jha (Eng. Trans.), "Tarkasangraha of Annam Bhatta", International ChinmayFoundation,Velliarnad, Arnakulam.
2	Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata.

| 3 | GN Jha (Eng. Trans.), Ed. RN Jha, Yoga-darshanam with Vyasa Bhashya,VidyanidhiPrakashan, Delhi 2016. |
| 4 | RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, VidyanidhiPrakashan, Delhi 2016. |

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
MC19301.1	-	-	-	-	-	1	1	3	2	-	-	1	-	-	-
MC19301.2	-	-	-	-	-	1	1	3	2	-	-	1	-	-	-
MC19301.3	-	-	-	-	-	1	1	3	2	-	-	1	-	-	-
MC19301.4	-	-	-	-	-	1	1	3	2	-	-	1	-	-	-
MC19301.5	-	-	-	-	-	1	1	3	2	-	-	1	-	-	-
Average	-	-	-	-	-	1	1	3	2	-	-	1	-	-	-

Correlation levels 1, 2 or 3 are as defined below:
1: Slight (Low)   2: Moderate (Medium) 3: Substantial (High)

No correlation: "-"

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
MA19453	**PROBABILITY AND STATISTICS**	**BS**	**3**	**1**	**0**	**4**

Objectives:	
●	To provide the required mathematical support in real life problems and develop probabilistic models which can be used in several areas of science and engineering.
●	To provide the required skill to apply the statistical tools in Engineering problems.

UNIT-I	ONE – DIMENSIONAL RANDOM VARIABLE	12
	Discrete and continuous random variables – Moments – Moment generating function –Binomial, Poisson, Geometric, Uniform, Exponential, and Normal distributions.	
UNIT 2	**TWO – DIMENSIONAL RANDOM VARIABLE**	12
	Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Applications of Central Limit Theorem	
UNIT-III	**TESTING OF HYPOTHESIS**	12
	Statistical hypothesis - Large sample test based on Normal distribution for single mean and difference of means - Tests based on t, F and Chi-square test for single sample standard deviation. Chi-square tests for independence of attributes and goodness of fit.	
UNIT-IV	**DESIGN EXPERIMENTS**	12
	One way and Two way classifications - Completely randomized design – Randomized block design – Latin square design - 2^2 factorial design	
UNIT-V	**STATISTICAL QUALITY CONTROL**	12
	Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits – Acceptance Sampling	
	Total Contact Hours	**: 60**

Course Outcomes:	
On completion of the course, the students will be able to	
●	characterize standard probability distribution by employing basic techniques and methods of probability mass function and probability density function for discrete and continuous random variables.
●	develop skills to solve problems on correlation and regression
●	obtain statistical data from experiments and able to analyze the same using statistical test
●	design experiments using suitable ANOVA techniques and draw conclusions.
●	use control charts to study, analyze and interpret problems in statistical quality control

Text Book (s):	
1	Veerarajan T, 'Probability, Statistics and Random Processes with Queueing Theory and Queueing Networks', Mc Graw Hill, 2016
2	Johnson R.A. and Gupta. C.B., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2017.

Reference Books(s) :	
1	Devore J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2012
2	Walpole R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia ,9th Edition, 2013.

3	Ross S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 4th Edition, Elsevier, 2009
4	Spiegel M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill, 4th Edition, 2013.

CO-PO-PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 1	PO1 2	PSO1	PSO2	PSO3
MA19453.1	3	3	3	2	2	-	-	-	-	-	1	2	1	1	2
MA19453.2	3	3	3	2	2	-	-	-	-	-	1	2	1	1	2
MA19453.3	3	3	3	3	3	-	-	-	-	-	2	3	2	2	3
MA19453.4	3	3	3	3	3	-	-	-	-	-	2	3	2	2	3
MA19453.5	3	3	3	3	3	-	-	-	-	-	2	3	2	2	3
Average	3	3	3	2.6	2.6	-	-	-	-	-	1.6	2.6	1.6	1.6	2.6

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

No correlation: ""*

Subject Code	Subject Name (Theory Course)	Category	L	T	P	C
CD19401	Strategic Design Management	HS	3	0	0	3

Objectives:
- Learn the overview of strategic management.
- Understand the functionality of external and internal assessment.
- Study about varies types of strategies and their analysis.
- Know implementation steps in strategy and its problems.
- Learn the steps in implementing strategy and its development issues.

UNIT – I	OVERVIEW OF STRATEGIC MANAGEMENT	9

The nature of strategic management: strategic management, key terms in strategic management, strategic management model, benefits of strategic management model, pitfalls in strategic management, guidelines for effective strategic management, comparing business and military strategy, Strategy Formation: Business vision and mission, importance of vision and mission statement, characteristics, writing and evaluating mission statements.

UNIT – II	EXTERNAL AND INTERNAL ASSESSMENT	9

The nature of external audit, Industrial organization view, Economic, social, cultural, demographic, natural environment, political, government, legal technological, and competitive forces, sources of external information, forecasting tools and techniques, competitive profile matrix (CPM) – assurance of learning exercises. Internal Assessment: nature of internal audit, resource-based view, integrated strategy and culture, management, marketing, finance, production, research and development, MIS, value chain analysis (VAC), Internal Factor Evaluation (IFE) matrix.

UNIT – III	SWOT Analysis	9

The critical theory – where to look for factors – how to create strategic responses to a plan – how to approach a swot assignment – avoiding. Usual mistakes – how to implement swot analysis in financial planning.

UNIT – IV	STRATEGY IMPLEMENTATION	9

Implementing strategies: nature of strategy implementation, annual objectives, policies, resource allocation, managing conflict, matching structure with strategy, restructuring, reengineering, E-engineering, human resource concerns when implementing strategies, nature of strategic implementation, current marketing and finance issues, research & development issues, MIS issues.

UNIT – V	STRATEGY EVALUATION AND CONTROL	9

Strategy Review, Evaluation and Control: Nature of strategy evaluation, strategy-evaluation framework, balanced scorecard, published sources of strategy-evaluation information, characteristics of an effective evaluation system, contingency planning, auditing, Global Issues: multinational organization, advantages and disadvantages of international operations, global challenge, worldwide tax rates, joint ventures in India.

	Contact Hours	:	45

Course Outcomes:
On completion of the course students will be able to:
- Understand the various functions of strategic management.
- Evaluate external and internal assessment and value chain analysis.
- Apply strategic action and its analysis in real world scenarios.
- Apply strategy implementation in real life systems.
- Learn and execute strategy evaluation and control in global scenarios.

Text Book(s):

1	Fred R. David, Strategic Management , Pearson Education, Limited, 15th Student Manual/Study Guide Edition 2015.
2	Thomas L Wheelen, J.David Hunger Strategic Management and Business Policy: Toward Global Sustainability, 13th Edition, Prentice Hall, 2011.
3	Hill W.L. Charles, Jones R. Gareth, Strategic Management: Theory: An Integrated Approach, Cengage Learning, 11th edition, 2014.

Reference Book(s):

1	Azhar Kazmi, Business Policy and Strategic Management, Tata McGraw Hill, 3rd Edition
2	R. Srinivasan, Strategic Management – The Indian context, Prentice Hall of India, 2012.
3	Wheelen, Hunger, Kansal, Strategic Management and Business Policy, Pearson Education, 15th Edition.

Web links for Theory:

1.	https://pracownik.kul.pl/files/12439/public/3_David.pdf
2.	https://books.google.co.in/books/about/SWOT_Analysis.html?id=Yrp3DQAAQBAJ&redir_esc=y
3.	https://www.flipkart.com/financial-management-f-swot-analysis-techniques/p/itmf3d43fe7bc75f?pid=9789391462376&lid=LSTBOK9789391462376RL28PD &marketplace=FLIPKART&cmpid=content_book_15083003945_u_8965229628_gmc_pla& tgi=sem,1,G,11214002,u,,,556262839325,,,,c,,,,,,,&gclid=CjwKCAjwzeqVBhAoEiwAOrEm zRnMxzq1P06DEFC2X1xlBwVNdhTcfIeHUfwSx1YgEzIvA4HckmbwrhoCxZUQAvD_Bw E

CO-PO-PSO matrices of course

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CD19341.1	2	1	2	2	2	2	1	2	2	1	2	2	1	2	2
CD19341.2	1	2	2	1	2	1	1	1	2	2	1	2	1	2	1
CD19341.3	2	2	2	1	2	1	1	2	2	2	1	2	2	2	2
CD19341.4	1	1	2	2	2	2	1	2	1	1	2	1	2	1	2
CD19341.5	2	2	1	2	1	2	1	2	2	2	2	1	1	1	1
Average	1.6	1.6	1.8	1.6	1.8	1.6	1	1.8	1.8	1.6	1.6	1.6	1.4	1.6	1.6

Correlation levels 1, 2 or 3 are as defined below:
1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)
No correlation: "*"

Subject Code	Subject Name (Lab Oriented Theory Course)	Category	L	T	P	C
CS19441	OPERATING SYSTEMS	PC	3	0	4	5

Objectives:
● To study the basic concepts and functions of operating systems.
● To learn about Processes, Threads, Scheduling algorithms and Deadlocks.
● To study various Memory Management schemes.
● To learn I/O Management and File Systems.
● To learn the basics on Linux, Windows and Android OS.

UNIT-I	INTRODUCTION	9
Operating Systems Overview — OS Structure and Operations –Virtualization - System Calls – Types of System Calls-System Programs-System Boot Process – BIOS – POST- Bootstrap Loader.		
UNIT-II	PROCESS MANAGEMENT	10
Process Concepts– Process Scheduling - Operations - Interprocess Communication- Threads Overview - CPU Scheduling – FCFS – SJF – Priority – RR – Multilevel Queue Scheduling - Multilevel Feedback Queue - Process Synchronization – Critical Section Problem – Peterson's Solution – Synchronization Hardware –Semaphores- Classic Problems of Synchronization – Monitors – Deadlocks –Characterization-Prevention – Avoidance – Detection – Recovery.		
UNIT-III	MEMORY MANAGEMENT	9
Main Memory - Swapping - Contiguous Memory Allocation – Paging - Structure of a page table – Segmentation - Virtual Memory – Demand Paging - Page Replacement-FIFO-LRU-Optimal - Allocation of Frames – Thrashing.		
UNIT-IV	I/O MANAGEMENT	9
File System -Concepts - Access Methods- Directory Structure - Mounting - Protection - File System Implementation – Directory Implementation – Allocation Methods – Free-Space Management - Mass Storage Structure - Disk Scheduling - Disk Management - Swap-Space Management.		
UNIT-V	LINUX, WINDOWS & ANDROID OS	8
The Linux System – Design Principles – Kernel Modules – Memory Management – Windows 10- Overview- Key Components- Android- Architecture - Security Model.		
	Contact Hours :	45

List of Experiments	
1	Installation and Configuration of Linux in a Virtual Machine
2	System monitoring using shell script
3	Text processing using Awk script
4	User-defined Signal Handler
5	Trace system calls with systrace tool

6	Inter-process Communication using Shared Memory		
7	Scheduling algorithms – FCFS, SJF, Priority and RR		
8	Producer Consumer Problem Solution using Semaphore		
9	Bankers Deadlock Avoidance algorithm		
10	Contiguous Memory Allocation - First Fit and Best Fit		
11	Page Replacement Algorithms - FIFO & LRU		
12	Customization of Linux Kernel		
13	Develop a Simple LKM		
		Contact Hours	**60**
		Total Contact Hours	**105**

LAB EQUIPMENT:	
1	**Hardware**: Standalone desktops with minimum desktop configuration.
2	**Software**: System loaded with Linux to run C and invoke System calls. Equivalent configuration can also be used.

Course Outcomes:
On completion of the course, the students will be able to
● Understand the concepts of Operating Systems and its structure.
● Analyze the various Scheduling algorithms and methods to avoid Deadlock.
● Compare and contrast various memory management schemes.
● Mount file systems and evaluate various disk scheduling techniques.
● Understand the basic principles of Linux, Windows and Android operating systems.

Text Books:	
1	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2012.
2	Nikolay Elenkov, "Android Security Internals: An In-Depth Guide to Android's Security Architecture",No Starch Press, 2015.

Reference Books:	
1	William Stallings, "Operating Systems – Internals and Design Principles", 9thEdition, Pearson, 2018.
2	Andrew S. Tanenbaum and Herbert Bos, "Modern Operating Systems", 4th Edition, Pearson, 2016.
3	AchyutGodbole and AtulKahate, "Operating System", 3rd Edition, Tata McGraw Hill, 2017.
4	Pavel Y., Alex I., Mark E., David A., "Windows Internal Part I - System Architecture, Processes, Memory Management and More", 7th Edition, Microsoft Press, 2017.

Web links:	
1	https://www.octawian.ro/fisiere/cursuri/asor/build/html/_downloads/Russinovich_M_WinInternals_part1_7th_ed.pdf
2	https://swayam.gov.in/
3	https://www.youtube.com/watch?time_continue=98&v=xwxgpCKo7c4
4	https://spoken-tutorial.org/tutorial-search/?search_foss=Linux&search_language=English

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS19441.1	2	-	-	-	3	-	1	-	1	2	2	2	3	-	1
CS19441.2	2	2	2	1	2	-	-	-	2	-	2	2	2	3	2
CS19441.3	2	2	2	1	2	-	-	-	1	-	2	2	2	3	2
CS19441.4	2	2	-	-	2	-	-	-	2	-	2	2	3	2	1
CS19441.5	2	-	1	-	2	-	-	1	1	-	2	2	3	-	2
Average	2.0	2.0	1.7	1.0	2.2	-	1.0	1.0	1.4	2.0	2.0	2.0	2.6	2.7	1.6

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low)   2: Moderate (Medium)   3: Substantial

(High) No correlation: "-"

Subject Code	Subject Name (Lab oriented Theory Course)	Category	L	T	P	C
CS19341	DESIGN AND ANALYSIS OF ALGORITHMS	PC	3	0	2	4

Objectives:
- Learn and understand the algorithm analysis techniques and complexity notations.
- Become familiar with the different algorithm design techniques for effective problem solving in computing.
- Learn to apply the design techniques in solving various kinds of problems in an efficient way.
- Understand the limitations of Algorithm power.
- Solve variety of problems using different design techniques.

UNIT-I	INTRODUCTION AND ANALYSIS OF ALGORITHMS	9

Introduction –Algorithm Specification –Important Problem types- Performance Analysis: Space Complexity - Time Complexity - Asymptotic Notations - Using Limits for Comparing Orders of Growth – Basic Efficiency Classes-Solving Recurrence Relations: Substitution methods and Master Theorem Method.

UNIT-II	BRUTE FORCE AND DIVIDE-AND-CONQUER	9

Brute Force: Exhaustive Search - Travelling Salesman Problem - Knapsack Problem - Assignment problem - Divide and Conquer Method: Analysis of Binary Search, Merge sort and Quick sort Algorithms, Integer Multiplication-Finding Minimum and Maximum.

UNIT-III	GREEDY TECHNIQUE AND DYNAMIC PROGRAMMING	9

Greedy Method – Minimum Spanning Trees: Kruskals Algorithm– Fractional Knapsack - Huffman Codes - Dynamic Programming: General Method - String Editing - 0/1 Knapsack - Travelling Salesman Problem.

UNIT-IV	BACKTRACKING AND BRANCH & BOUND	9

Backtracking: General Method - 8 Queen's Problem - Sum of Subsets Problem - Graph Colouring - Hamiltonian Circuit Problem - Branch and Bound: LC branch and bound - 0/1 Knapsack - Travelling Salesman Problem.

UNIT-V	STRING MATCHING AND NP COMPLETE & NP HARD	9

String Matching: Naive String Matching - Rabin Karp - Knuth Morris Pratt - NP Complete and NP Hard Problems: Basic Concepts - Non Deterministic Algorithms - Class of NP Complete and NP Hard – Approximation Algorithms :: Travelling Salesman problem.

	Contact Hours	:	45

	List of Experiments
1	Finding Time Complexity of algorithms.
2	Design and implement algorithms using Brute Force Technique.
3	Design and implement algorithms using Divide and Conquer Technique.
4	Design and implement algorithms using Greedy Technique.
5	Design and implement algorithms using Dynamic Programming.
6	Design and implement algorithms using Backtracking.
7	Design and implement algorithms using Branch and Bound.
8	Implement String Matching algorithms.

	Contact Hours	:	30
	Total Contact Hours	:	75

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

- Analyze the time and space complexity of various algorithms and compare algorithms with respect to complexities.
- Decide and apply Brute Force and Divide and Conquer design strategies to Synthesize algorithms for appropriate computing problems.
- Apply Greedy and Dynamic Programming techniques to Synthesize algorithms for appropriate computing problems.

●	Apply Backtracking and Branch and Bound techniques to Synthesize algorithms for appropriate computing problems.
●	Apply string matching algorithms in vital applications.

LAB EQUIPMENT:	
1	**Hardware**: Standalone desktops with minimum desktop configuration.
2	**Software**: System loaded with windows or Linux to run C.

Text Books:	
1	Anany Levitin, "Introduction to the Design and Analysis of Algorithms", 3rd Edition, Pearson Education, 2012.
2	Ellis Horowitz, Shani, Sang024hevarRajasekaran, "Computer Algorithms", 2nd Edition Universities Press, 2008.

Reference Books	
1	Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", 3rd Edition, PHI Learning Private Limited, 2012.
2	Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
3	Donald E. Knuth, "The Art of Computer Programming", Volumes 1& 3 Pearson Education, 2009.
4	Sara Baase Allen Van Gelder, "Computer Algorithms - Introduction to Analysis", Pearson Education Asia, 2010.
5	Droomey R. G, "How to solve it by Computer", Pearson Education, 2006.

Web links for Theory & Lab:	
1	https://www.geeksforgeeks.org/fundamentals-of-algorithms/
2	https://www.hackerrank.com/domains/algorithms

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS19341.1	3	-	-	-	-	-	-	-	-	-	-	1	3	2	2
CS19341.2	2	3	2	2	-	-	-	-	-	-	-	1	3	3	1
CS19341.3	2	3	2	2	-	-	-	-	-	-	-	1	3	3	1
CS19341.4	2	3	2	2	-	-	-	-	-	-	-	1	3	3	1
CS19341.5	1	2	2	2	-	-	-	-	-	-	-	1	3	3	1
Average	2.0	2.8	2.0	2.0	-	-	-	-	-	-	-	1.0	3.0	2.8	1.2

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low)   2: Moderate (Medium) 3: Substantial (High) No

correlation: "-"

Subject Code	Subject Name (Lab Oriented Theory Course)	Category	L	T	P	C
CS19P06	**HUMAN COMPUTER INTERACTION**	PE	2	0	2	3

Objectives:
• Learn the foundations of Human Computer Interaction.
• Be familiar with the design technologies and software process.
• Learn human interaction models and theories
• Be aware of Design thinking concepts.
• Learn the guidelines of design thinking and apply it.

UNIT-I	**FOUNDATIONS OF HCI**	6
The Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – Processing and networks; Interaction: Models – Frameworks – Ergonomics – Styles – Elements – Interactivity – Paradigms.		
UNIT-II	**DESIGN & SOFTWARE PROCESS**	6
Interactive Design basics – Process – Scenarios – Navigation – Screen design – Iteration and prototyping. HCI in software process – Software life cycle – Usability engineering – Prototyping in practice – Design rationale - Design rules – Principles, Standards, Guidelines, Rules – Universal Design.		
UNIT-III	**MODELS AND THEORIES**	6
Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models - Task Analysis.		
UNIT-IV	**MOBILE HCI**	6
Mobile Ecosystem: Platforms–Application frameworks– Types of Mobile Applications: Widgets– Applications– Games– Mobile Information Architecture–Mobile 2.0.		
UNIT-V	**WEB INTERFACE DESIGN**	6
Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages.		
	Contact Hours :	**30**

List of Experiments	
1	Design a user interface for Welcome screen.
2	Design a user interface by applying design rules for assigning a grade to students based on the subject marks.
3	Design a user interface with Layouts for printing the numbers in ascending order and descending order.
4	Design a user interface by using task analysis for calculator.
5	Design a user interface with direct selection for registration of a student for admissions.
6	Design a user interface by using colours for displaying and changing of picture on the form.
7	Design a user interface with widgets for end semester exam registrations.
8	Design a user interface by using drag and drop for creating forms.
9	Design a user interface with Overlays and Inlays for menu-based program.
10	Mini Project.

	Contact Hours	:	**30**
	Total Contact Hours	:	**60**

	Course Outcomes:
	On completion of the course, the students will be able to
•	Describe the foundations of Human Computer Interaction.
•	Demonstrate with the design technologies and software process.
•	Apply the concepts of human interaction models and theories .
•	Design effective HCI for individuals and persons with disabilities.
•	Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.

	Text Book(s):
1	Jeff Johnson, "Designing with the Mind in Mind. Simple Guide to Understanding User Interface Design Guidelines", Morgan Kaufmann, 2014.
2	Brian Fling, "Mobile Design and Development", First Edition, O'Reilly Media Inc., 2009.
3	Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O'Reilly, 2009.
4	Ben Shneiderman , Catherine Plaisant, Maxine Cohen, Steven Jacobs," Designing the User Interface: Strategies for Effective Human-Computer Interaction ", Pearson, Edition 5, 2010

	Reference Book(s)/Web link(s)
1	Jeff Johnson, "Designing with the Mind in Mind. Simple Guide to Understanding User Interface Design Guidelines", Morgan Kaufmann, 2014.

CO - PO – PSO matrices of course

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS19P06.01	2	3	-	-	2	2	3	-	-	3	-	-	-	3	-
CS19P06.02	3	3	3	3	2	-	3	2	3	3	2	3	-	3	3
CS19P06.03	2	3	3	2	3	1	2	3	3	3	-	3	2	3	3
CS19P06.04	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CS19P06.05	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Average	2.4	3.0	3.0	2.75	2.6	2.25	2.8	2.75	3.0	3.0	2.67	3.0	2.67	3.0	3.0

Note: Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low)   2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

Subject Code	Subject Name (Laboratory Course)	Category	L	T	P	C
CD19411	PYTHON PROGRAMMING FOR DESIGN	PC	0	0	4	2

Course Objectives:

- To understandcomputers, programming languages and their generations and essential skills for a logical thinking for problem solving.
- To write, test, and debug simple Python programs with conditionals, and loops and functions
- To develop Python programs with defining functions and calling them
- To understand and write python programs with compound data- lists, tuples, dictionaries
- To search, sort, read and write data from/to files in Python.

List of Experiments

1.	Introduction to Python : Variables, Operators and IO Operations.
2.	Selection control structures.
3.	Iteration control structures.
4.	Strings
5.	List and Tuples
6.	Sets and Dictionary
7.	Experiments on functions.
8.	Experiments based on Files.
9.	Experiments based on Packages: numpy, pandas, flask
10.	Design based experiments with PyTorch
11.	Design based experiments with tknitter

Contact Hours :		**60**

Course Outcomes:

On completion of the course, students will be able to:

- Understand the working principle of a computer and identify the purpose of a computer programming language and ability to identify an appropriate approach to solve the problem.
- Write, test, and debug simple Python programs with conditionals and loops.
- Develop Python programs step-wise by defining functions and calling them.
- Use Python lists, tuples, dictionaries for representing compound data.
- Apply searching, sorting on data and efficiently handle data using flat files.

LAB EQUIPMENT:	
1	**Hardware**: Standalone desktops with minimum desktop configuration.
2	**Software**: System loaded with windows or Linux to run Python, Pytorch and related packages.

CO - PO – PSO matrices of course

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CD19411.1	2	2	2	2	1	-	-	-	1	1	1	1	3	3	-
CD19411.2	2	1	1	1	1	-	-	-	-	-	1	1	3	2	-
CD19411.3	1	1	2	1	2	-	-	-	-	-	1	1	2	3	2
CD19411.4	2	2	3	2	2	-	-	-	-	-	2	1	2	2	2
CD19411.5	2	2	3	2	3	-	-	-	-	-	2	1	2	2	2
Average	**1.8**	**1.6**	**2.2**	**1.6**	**1.8**	**-**	**-**	**-**	**1**	**1**	**1.4**	**1**	**2.4**	**2.4**	**2**

Note: Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low)   2: Moderate (Medium) 3: Substantial (High)

Subject Code	Subject Name (Employability Enhancement Course)	Category	L	T	P	C
GE19421	SOFT SKILLS-I	EEC	0	0	2	1

Description
- The course, **"VAP"** intends to enhance the students' confidence to communicate in front of an audience effectively.
- The emphasis is on improving the spoken skills of the students so that they can communicate both, in the college and in the corporate setting to deliver their message successfully
- In today's technology driven world, communicating with confidence is imperative.
- Hence, this course aims at providing students with the necessary practice in the form of debates, discussions and role plays.

Program Learning Goals :
- This program will help our students to build confidence and improve their English communication in order to face the corporate world as well as providing them with opportunities to grow within an organization.

Objectives:
- To help students break out of shyness.
- To build confidence.
- To enhance English communication skills.
- To encourage students' creative thinking to help them frame their own opinions.

Week	Activity Name	Description	Objective
1	Introduction	The trainer and the college facilitator talk to the students about the course and in turn the students introduce themselves.	To set expectations about the course and the students are made aware of the rules and regulations involved in this program
2	If I ruled the world	This is a quick and useful game by getting students to form a circle and provide their point of view. Each student then repeats what the other has said and comes up with their own opinion.	The aim of this activity is to for students to get to know each other and also develop their listening skills as well as learning how to agree and disagree politely.
3	Picture Narrating	This activity is based on several sequential pictures. Students are asked to tell the story taking place in the sequential pictures by paying attention to the criteria provided by the teacher as a rubric. Rubrics can include the vocabulary or structures they need to use while narrating.	The aim of this activity is to make the students develop creative way of thinking.
4	Brainstorming	On a given topic, students can produce ideas in a limited time. Depending on the context, either individual or group brainstorming is effective and learners generate ideas quickly and freely. The good characteristics of brainstorming are that the students are not criticized for their ideas so students will be open to sharing new ideas.	The activity aims at making the students speak freely without the fear of being criticized. It also encourages students to come up with their own opinions.
5	Debate	Is competition necessary in regards to the learning process?	The aim of this activity is to develop the students ability to debate and think out of the box

6	Short Talks	Here the students are given topics for which they take one minute to prepare and two minutes to speak. They can write down points but can't read them out they can only use it as a reference.	The activity aims at breaking the students' shyness and encouraging them to standup in front of the class and speak. It also aims at creating awareness that they are restricted for time so they only speak points that are relevant and important.
7	Debate	Will posting students' grades on bulletin boards publicly motivate them to perform better or is it humiliating?	This activity aims at enhancing the students unbiased thought process when it comes to exams and grades as well as develop their skills to debate
8	The Art of diplomacy	The facilitator proceeds to share multiple concepts of conversation and helps the participants to identify the various methods of being diplomatic and how do deal with misinformation.	The aim of the lesson is to provide an opportunity for the participants to learn about body language and choosing the appropriate words for conversation.
9	Debate	Are humans too dependent on computers?	The aim of this activity is to test the students debating skills and thought process with a topic that affects everybody in daily life.
10	Story Completion	The teacher starts to tell a story but after 2 sentences he/she asks students to work in groups to create the rest of the story which includes the plot and the ending.	This activity aims at building their narrating skills as well as their creativity and ability to work in a team.
11	Role play debate	Students scrutinize different points of view or perspectives related to an issue. For example, a debate about the question "Should students be required to wear uniforms at school?" might yield a range of opinions. Those might include views expressed by a student (or perhaps two students – one representing each side of the issue), a parent, a school principal, a police officer, a teacher, the owner of a clothing store, and others.	The aim of this activity is to get students to speak based on other people's perspective instead of their own. The students take the role of various characters and debate accordingly.
12	I Couldn't Disagree More	This is a game where students practice rebuttal techniques where one student provides a thought or an idea and the other students starts with the phrase I couldn't disagree more and continues with his opinion	The aim of this activity is to improve general communication skills and confidence.
13	Feedback	At the end of the session in the final week (12) the trainer would provide feedback to the students on best practices for future benefits	The aim is to do both give feedback to students as well as obtain feedback on the course from them.
			Total Contact Hours : 30

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

- Be more confident.
- Speak in front of a large audience.
- Be better creative thinkers.
- Be spontaneous.
- Know the importance of communicating in English.

	Reference Books(s):
	Kings Learning work sheets.

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS19443.1	2	2	2	-	-	-	-	-	1	-	-	1	2	2	-
CS19443.2	2	2	3	3	3	-	-	-	2	1	2	1	2	1	-
CS19443.3	2	2	2	2	2	-	-	-	2	1	2	1	1	2	1
CS19443.4	2	2	2	2	2	-	-	-	1	1	-	-	1	2	1
CS19443.5	2	2	2	4	2	-	-	-	2	-	2	2	1	2	3
Average	2.0	2.0	2.2	2.8	2.3	-	-	-	1.6	1.0	2.0	1.3	1.4	1.8	1.7

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low)   2: Moderate (Medium) Substantial (High)

No correlation: "-"