Integral University, Lucknow
Department of Computer Science &Engineering
B.TECH. COMPUTER SCIENCE
Subject Name: Physics, Subject Code: PY-101
w.e.f Session 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	To analyze the connection between daily life observations and science. To realize that apparently different ideas of Optics such as Interference and Diffraction have interrelationship between them. To realize the simplicity of ideas involved in explaining complex phenomenon.
CO 2	To grow in ideas of different aspect of light and develop connection between daily life applications and science To analyze the process of development of a new theory while dealing with Polarization. To correlate that the conceptualization of an idea is far ahead than its practical realization while dealing with LASER. To grow in realization of totally different manifestation of light. To find the most recent applications of light in terms of communication and storage of data. To realize that how the design of complex systems is based on the simple ideas.
CO 3	To grow in developing connection between philosophy and science. To find that seemingly different ideas such as Optics and Mechanics have interrelationship between them. To understand the process of development of a new theory and its application in life. To realize the requirement of power of imagination.
CO 4	To grow in developing the connection between philosophy and science To find that seemingly different ideas such as Compton Effect and Quantum Theory have interrelationship between them. To understand and analyze the process of development of a new theory and how the development of one idea leads to the development of a apparently different idea.
CO 5	To grow in developing connection between daily life utility and material science. To realize that apparently different materials with respect to Electric and Magnetic properties have inter relationship between them. To evaluate that how totally different manifestation of Modern Science leads to new technology.

COURSE OBJECTIVES: The purpose of this undergraduate course is to impart basic knowledge of fundamental concept of physics which is necessary for a strong engineering knowledge base.

UNIT I	**Electrostatics-**	**8**
	Boundary conditions and Boundary value problems in electrostatics, The Uniqueness theorem, Laplace and Poisson'sequations in electrostatics and their applications, method of electrical images and their simple applications, energy stored in discrete and continuous system of charges.	
UNIT II	**Wave Optics-**	**8**

	Methods of formation of coherent sources, Theory of Interference, Fresnel's Biprism, Displacement of Fringes, thinfilm interference, Newton's ring. Fraunhoffer diffraction at single slit and grating, Rayleigh's criterion of resolution,resolving power of grating.	
UNIT III	**Optical activity and Modern Optics-**	**8**
	Production of plane polarized light by reflection and Double refraction, Nicol prism. Optical activity, Fresnel'stheory, polarimeter (Laurentz and Biquartz). Principle of fiber optics, numerical aperture, attenuation, dispersion in optical fibers, material dispersion, waveguidedispersion, intermodal and intramodal dispersion, Pulse dispersion in step index fiber, Main components of laser,Einstein's coefficients, He-Ne laser, Nd-YAG laser and their applications.	
UNIT IV	**Properties of Matter and Relativistic Mechanics-**	**8**
	Viscosity, Poiseuille's equation, Frame of reference, Michelson-Morley experiment and its implications, Galileantransformation equations, Einstein's postulates, Lorentz transformation equations and their consequences, energy mass relation, relativistic kinetic energy.	
UNIT V	**Quantum Physics-**	**8**
	Compton effect, Basic postulates of quantum mechanics, Wave function and its physical admissibility, orthogonalityand normalization of wave functions, Heisenberg's uncertainty principle (no derivation) and its applications to (non-existence of electron in nucleus, Bohr's radius), Schrodinger's equation and its application to particle in 1-D box andfinite well.	

References:

1. Fundamentals of Optics by Jenkins and White.
2. Optical Fiber Communication by Gerd Keiser.
3. Concepts of Modern Physics by Arthur Beiser.
4. Introduction to Special Theory of Relativity by Robert Resnick.
5. Quantum Physics by Eisberg.
6. Introduction to Nanotechnology by Poole Owens, Wiley India.
7. Solid State Physics by S.O. Pillai, New Age Publications.

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	3	1	3	3	3	2	1	3			
CO2	2	2	2	2	2	3	2	2	2	2	2	2	1		3
CO3	3	3	1	3	3	1	3	3	3	1	3	3		2	
CO4	2	2	2	3	1	2	2	2	2	2	3	1	3		
CO5	2	1	1	1	2	2	2	2	1	1	1	2			1
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science &Engineering
B.TECH. COMPUTER SCIENCE
Subject Name: Professional Communication-I, Subject Code: LN-101
w.e.f Session 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	2	1	0	3

CO 1	Basic Understanding of communication and Professional Communication
CO 2	Basic knowledge of structural and functional grammar. Learning Language through literature
CO 3	Basic tools of communication and improvement in communicative competence
CO 4	Understanding the basic grammar and basic structure of language
CO 5	Enhancement of writing skills in English i.e. writing application, report and various types of letters

COURSE OBJECTIVES:

- **Developing the art of communication and learning language though literature**
- **Knowledge of Professional, cultural and cross-cultural communication**
- **Basic concept of structural and functional grammar; meaning and process of communication, verbal and nonverbal communication**
- **Knowledge of reading and comprehension of general and technical articles, precise writing, summarizing, abstracting**
- **Basic concepts of group discussion, organizing seminars and conferences**
- **Development of Reading and Writing skills**

UNIT I	**Introduction to Communication**	**4**
	Definition, Types of Communication, Channels of Communication, Language.	
UNIT II	**Interpersonal Communication**	**6**
	Culture- Definition and Types, Communication and Culture including Cross Cultural Communication.	
UNIT III	**Written Communication**	**8**
	Letter Writing- Informal and Formal - Letters of Enquiry, Letters of complaint, Response to complaints and enquiries,Self Exploration through description.	
UNIT IV	**Grammar through Worksheets**	**12**
	Situational activities and modules- Parts of Speech, Tenses, Articles, Modals,Active and Passive, Subject-Verb Agreement, Direct and Indirect Speech, Degrees of comparison.	
UNIT V	**Grammar through Worksheets Continued**	**10**
	Sentences: Simple, Compound, Complex, Declarative, Assertive, Negative, Interrogative, Exclamatory, Imperative.	

References:

1. Wren PC and Martin H, “High School Grammar and Composition”, S. Chand and Co.
2. K. Floyd, “Interpersonal Communication: The Whole Story” (2009), McGraw Hill.
3. Greenbaum Sidney and Nelson Gerald, “An Introduction to English Grammar”, Pearson.
4. Swan Michael, “Practical English Usage” OUP, 2005.
5. Raymond Murphy, “Intermediate English Grammar”, (2007) Cambridge University Press.

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	3		1				3	3	2	2
CO2	3	2	3	2	1	1						2	1	2	1
CO3	3	2	1	1	1	2	3					2	1	3	2
CO4	3	2	3	2		3						1	2	2	2
CO5	3	2	2	1	1	2	1					2	3	3	2
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science &Engineering
B.TECH. COMPUTER SCIENCE
Subject Name: Engineering Mathematics-I, Subject Code: MT-101
w.e.f Session 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Able to calculate rank of matrix, characteristic equation & characteristic roots & use the applicability of Cay lay Hamilton Theorem to find inverse of matrix which is very important in many engineering application.
CO 2	To develop ability to solve higher derivative, expansion of functions in ascending power of variable & partial derivatives.
CO 3	Develops ability to solve Jacobian, error and approximation and Extrema of the function.
CO 4	Learn the evaluation policy of some special function like gamma & Beta function. & their relation which is helpful to evaluate some definite integral arising in various branch of Engineering.
CO 5	Able to determine vector differentiation and integration.

COURSE OBJECTIVES: The course is aimed to develop the skills in mathematics which is necessary for grooming them into successful engineering graduate. The topics introduced will serve as basic tools for specialized studies in science field.

UNIT I	**Differential Equations**	**8**
	Linear differential equations of first order, Linear differential equations of higher order with constant coefficients,Complementary functions and particular integrals, Simultaneous linear differential equations, Solution ofsecond order differential equations by changing dependent and independent variables, Method of variation ofparameters, Applications to engineering problems (without derivation).	
UNIT II	**Laplace Transform**	**8**
	Laplace transform, Existence theorem, Laplace transform of derivatives and integrals, Unit stepfunction, Dirac-delta function, Laplace transform of periodic functions, Inverse Laplace transform, Convolutiontheorem, Applications to solve simple linear and simultaneous differential equations.	
UNIT III	**Fourier Series and Partial Differential Equations**	**9**
	Periodic functions, trigonometric series, Fourier series of period 2 π, Euler's formulae, functions havingarbitrary period, change of interval, Even and odd functions, Half range sine and cosine series. Introduction of partial differential equations, linear partial differential equations with constant coefficients ofsecond order and their classifications to parabolic,	

	elliptic and hyperbolic forms with illustrative examples.	
UNIT IV	**Applications of Partial Differential Equations**	**8**
	Method of separation of variables for solving partial differential equations, Wave equation up to two-dimensions,Laplace equation in two-dimensions, Heat conduction equations up to two dimensions, Equations of transmissionLines.	
UNIT V	**Basic Statistics and curve fitting**	**7**
	Mean, Median, Mode, Standard deviation and Variance, Method of least squares, Curvefitting of straight line and parabola.	

References:

1. E. Kreyszig Advanced Engineering Mathematics, Wiley Eastern Ltd.
2. Jaggi and Mathur Advanced Engineering Mathematics, Khanna Publication.
3. B. S. Grewal Higher Engineering Mathematics, Khanna Publication.
4. Dennis G. Zill Advanced Engineering Mathematics, CBS Publication.

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	3	3					1			
CO2	3	2	2	1	2	2	2		1	3			1	2	
CO3	3	2	3	1	3	2	3				1				3
CO4	3	2	3	1	3	3	2	2		1			2		
CO5	3	2	1	1	3	2	1						3		
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science &Engineering
B.TECH. COMPUTER SCIENCE
Subject Name: Basic Electrical Engineering, Subject Code: EE103/EEE103
w.e.f Session 2017-18

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Know about the concept of D.C Circuit Analysis and Network Theorems Circuit.
CO 2	Steady State Analysis of Single Phase AC Circuits AC fundamentals.
CO 3	Know about concept of Three Phase AC Circuits Three phase system and measuring devices.
CO 4	Layout of Power System and transformer
CO 5	Know about Electromechanical energy conversion devices: AC/ DC Machines

COURSE OBJECTIVES:

- Knowledge and concept of D.C Circuit Analysis and Network Theorems Circuit.
- Use of Steady State Analysis of Single Phase AC Circuits AC fundamentals.
- Knowledge and concept of Three Phase AC Circuits Three phase system and measuring devices.
- Basic concepts of Power System and Transformer
- Study of Electromechanical energy conversion devices: AC/ DC Machines.

UNIT I	**D.C CIRCUIT ANALYSIS AND NETWORK THEOREMS**	**8**
	Circuit concepts: Concept of network, Active and passive elements, linear network, unilateral and bilateral elements, source transformation, Kirchhoff's Law: loop and nodal methods of analysis, star delta transformation. **Network theorems:** Superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem.	
UNIT II	**STEADY STATE ANALYSIS OF SINGLE-PHASE AC CIRCUITS**	**8**
	AC fundamentals: Average and effective value of Sinusoidal waveform , form factor and peak factor, concept of phasor, phasor representation of sinusoidally varying voltage and current, analysis of series RLC circuits. Apparent, active and reactive powers, power factor, causes and problems of low power factor, power factor improvement, resonance, bandwidth and quality factor in series circuit.	
UNIT III	**THREE PHASE AC CIRCUITS&MEASURING INSTRUMENTS**	

	Three phase system: Its necessity and advantages, meaning of phase sequence, star and delta connections, balanced supply, line and phase voltage/current relationship. **Measuring Instruments:** Types of instruments: construction and working principle of PMMC, MI type instruments, induction type energy meter.	**8**
UNIT IV	**INTRODUCTION OF POWER SYSTEM, MAGNETIC CIRCUIT AND SINGLE PHASE TRANSFORMER**	
	Introduction of Power System: General layout of electrical power system, standard generation, transmission and distribution voltage levels, concept of grid. **Magnetic circuit:** Concepts, analogy between electric and magnetic circuit. **Single Phase Transformer:** Principle of operation, construction, emf equation, equivalent circuit, losses, efficiency, Introduction to auto transformer.	**8**
UNIT V	**PRINCIPLE OF ELECTROMECHANICAL ENERGY CONVERSION**	
	DC Machines: Types, emf equation of generator and torque equation of motor, applications. **Three Phase Induction Motor:** Types, principle of operation, applications. **Single Phase Induction Motor:** Principle of operation and introduction to methods of starting, applications. **Three Phase Synchronous Machines:** Principle of operation of alternator, synchronous motor, applications.	**8**

References:

1. V.Deltoro, "Principle of Electrical Engg." PHI, 2009.
2. M.A Mallick, Dr. I. Ashraf, "Fundamental of Electrical Engg," CBS Publishers, 2010.
3. A. Hussain, "Basic Electrical Engg" Dhanpat Rai & sons, 2007.
4. I J Nagrath, "Basic Electrical Engg", TMH, 2010.

CO-PO MAPPING

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	3						3	3	3	2
CO2	3	3	3	2	1	1						2	3	2	1
CO3	3	2	1	1	2	2	3					3	3	3	2
CO4	3	2	2	2	3	3						2	3	2	2
CO5	3	1	1	1	1	2	1					2	3	3	2
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science &Engineering
B.TECH. COMPUTER SCIENCE
Subject Name: Basic Electronics, Subject Code: EC-101
w.e.f Session 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Understand the current voltage characteristics of semiconductor devices. Identify the unique vocabulary associated with electronics and explain the basic concepts of Semiconductor diodes such as pn junction diode, characteristics and ammeters, DC loadline, Zener diode. To apply the basics of diode to describe the working of rectifier circuits such as Full and half wave rectifiers.
CO 2	Analyze dc circuits and relate ac models of semiconductor devices with their physical Operation Draw and explain the structure of bipolar junction transistor. Explain the operation of each device in terms of junction bias voltage and charge carrier movement. Identify and explain the various current components in a transistor.
CO 3	Design and analyze of electronic circuits Describe the application of transistors for Current and voltage amplification. Also to describe the characteristics of different configurations of the transistor. Describe DC load line and bias point. List, explain, and design and analyze the different biasing circuits.
CO 4	Evaluate frequency response to understand behavior of Electronics circuits. Sketch, explain and design the amplifier circuit for given specification and analyze them discuss oscillator principles, oscillator types, and frequency stability as it relates to its operation. Analyze and Design the different types of Oscillators. Discuss ideal and practical operational amplifier (op amp) their electrical parameters, need for op amp. Explain and design different application circuits using op amp
CO 5	List and explain the different number system. Solve examples on converting one form of number system to another form. State Boolean laws and theorems. State and explain the different logic gates using truth table. Analyze and design different adder circuits.

COURSE OBJECTIVES:

UNIT I	**Semiconductor Diode**	**8**
	Mechanism of Conduction in Semiconductors: Mobility and Conductivity, Electrons and holes in anintrinsic semiconductors, Donor and acceptor impurities, Fermi level, Carrier densities insemiconductor, Hall effect, Diffusion, Recombination. Junction DiodePN junction characteristic and its equation, Effect of Temperature, Depletion Layer, Piecewise lineardiode model, Breakdown Mechanism, Zener and Avalanche Breakdown characteristics. Diode as circuit elementHalf wave and full wave rectifiers, capacitive filters, Zener diode as a regulator, clamper, clipper andvoltage double, special diode- LED, Schott key diodes.	
UNIT II	**BJT characteristics and circuits**	**8**
	Transistor Operation, CE, CB, CC configuration and their characteristics, transistor biasing circuits,stability factor, h- parameter model (low frequency), computation of Ai, Av, Ri, Ro of single transistorCE amplifier configuration.	
UNIT III	**Field Effect Transistors**	**8**
	JFET: Construction and principle of working,Drain / Transfer characteristics, basic amplifier circuits, Biasing of JFETMOSFET: Enhancement and depletion type N-channel, P-channel, Drain / TransferCharacteristics.	
UNIT IV	**Switching theory & Logic gates**	**8**
	Number system, Conversion, Compliments, Addition and Subtraction, BCD numbers,Boolean algebra, Canonical form, Logic gates, Minimization of logical function usingKarnaugh map.	
UNIT V	**Operational Amplifier**	**8**
	Concept of ideal operational amplifier (inverting and non-inverting) and its applications,Inverter, integrator, differentiator, voltage follower, summing and differential amplifierElectronic Instruments: Digital Multimeter (block diagram approach), CRO (block diagram and itsworking),Measurement of voltage, phase, frequency. Double beam CRO (block diagram & it'sworking).	

References:

1. Bolyested&Nashekey / Electronic Devices and Circuit Theory, PHI
2. Milliman &Halkias: Integrated Electronics, Mc Graw Hill
3. J. S. Katre: Electronics Engineering, Tech-Max Publication

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	3	3					1			
CO2	3	2	2	1	2	2	2		1	3			1	2	

CO3	**3**	**2**	**3**	**1**	**1**	**2**	**3**				**1**				**3**
CO4	**3**	**2**	**3**	**1**	**2**	**3**	**2**	**2**		**1**			**2**	**2**	**1**
CO5	**3**	**2**	**1**	**1**		**2**	**1**						**3**	**1**	
1. Low Association 2: Average Association 3: Strong Association															

PHYSICS LAB (PY104)

L T P
0 0 2

CO 1	To demonstrate how interference takes place by division of amplitude and by division

	of wavefront.
CO 2	To demonstrate the practical applications of polarization phenomenon in finding the specific rotation, refractive index and Brewster's angle.
CO 3	To demonstrate the practical application of Fraunhoffer diffraction in wavelength and focal length calculation.
CO 4	To demonstrate the magnetic and heating effect of current in finding the magnetic field and Stefan's constant.
CO 5	To demonstrate how to calculate the energy band gap of a semiconductor material and viscosity of a liquid

COURSE OBJECTIVES:
the purpose of this undergraduate course is to impart practical knowledge of the concepts through different experiments related to its theoretical course.

List of Experiments:

1. To determine the wave length of monochromatic light by Newton's ring.

2. To determine the wave length of monochromatic light with the help ofFresnel's Biprism.

3. To determine the focal length of two lenses by nodal slide and locate theposition of cardinal points.

4. To determine the specific rotation of cane sugar solution using Biquartzpolarimeter.

5. To determine the wavelength of spectral lines using plane transmissiongrating.

6. To determine the Brewster's angle and refractive index of material with thehelp of a laser source.

7. To determine the variation of magnetic field along the axis of a currentcarrying coil and then to estimate the radius of the coil.

8. To verify Stefan's law by electrical method.

9. To determine the energy band gap of a given semiconductor material.

10. To determine the viscosity of a liquid.

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	3		1				3	3	3	2
CO2	3	2	3	2	1	1						2	1	2	1
CO3	3	2	1	1	2	2	3		2			3	3	3	2
CO4	3	2	3	2		3						2	2	2	2

CO5	3	1	2	1	1	2	1					2	3	3	2
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Electrical Engineering
B.TECH. ELECTRICAL ENGINEERING
Subject Name: Electrical Engineering Lab, Subject Code: EE104/EEE104
w.e.f Session 2017-18

Pre-requisite	Co-requisite	L	T	P	C
None	None	0	0	2	1

CO 1	Know about the concept of D.C Circuit Analysis and Network Theorems Circuit.
CO 2	Steady State Analysis of Single Phase AC Circuits AC fundamentals.
CO 3	Know about concept of Three Phase AC Circuits Three phase system and measuring devices.
CO 4	Layout of Power System and transformer
CO 5	Know about Electromechanical energy conversion devices: AC/ DC Machines

COURSE OBJECTIVES:

- Knowledge and concept of D.C Circuit Analysis and Network Theorems Circuit.
- Use of Steady State Analysis of Single Phase AC Circuits AC fundamentals.
- Knowledge and concept of Three Phase AC Circuits Three phase system and measuring devices.
- Basic concepts of Power System and Transformer
- Study of Electromechanical energy conversion devices: AC/ DC Machines.

List of Experiments:

1. Verification of Thevenin's Theorem.
2. Verification of Superposition Theorem.
3. Verification of Maximum Power Transfer Theorem.
4. To study V-I characteristics of diode.
5. To study the input & output characteristics of BJT in CE configuration.
6. To study the full wave rectifier circuit with &without filter and determine the ripple factor.
7. To study the phenomenon of resonance in series RLC circuit.
8. Determination of losses in single phase transformer by OCT and SCT.
9. To calibrate a single-phase induction type energy meter.
10. To study the running and reversing of a three phase SCIM.
11. Study of OP Amp based inverting and non-inverting amplifier.

CO-PO MAPPING:

PO-	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

PSO / CO															
CO1	3	2	2	1	3	3		1				3	3	3	2
CO2	3	2	3	2	1	1						2	1	2	1
CO3	3	2	1	1	2	2	3		2			3	3	3	2
CO4	3	2	3	2		3						2	2	2	2
CO5	3	1	2	1	1	2	1					2	3	3	2
1. Low Association 2: Average Association 3: Strong Association															

ENGINEERING GRAPHICS (ME103)

L T P

0 0 2

1. Introduction

Engineering graphics as a tool to communicate ideas, Lettering and dimensioning.

Construction of geometrical figures like pentagon and hexagon.

2. Orthographic Projection

Principles of orthographic projections Principal and auxiliary planes, First and

Third angle projections.

Projection of points. Pictorial view.

Projection of lines parallel to both the planes. Parallel to one and inclined too other,Inclined to both the planes.Application to practical problems.

Projection of solid in simple position, Axis or slant edge inclined to one andparallel to other plane, solids lying on a face or generator on a plane.

Sectioning of solids lying in various positions, True shape of the section.

Development of lateral surfaces, sheet metal drawing.

3. Isometric Projection

Principles of isometric projection, Isometric projection using box and offset methods.

WORKSHOP PRACTICE (ME104)

L T P

0 1 2

1. Machine Shop

a. Study of tools and operations

b. Plane turning

c. Step turning

d. Taper turning

e. Threading

f. Single point cutting tool grinding.

2. Fitting Bench Working Shop

a. Study of tools and operations

b. Simple exercises involving filing work.

c. Making perfect male-female joint.

d. Simple exercises involving drilling/tapping/dieing.

3. Black Smithy Shop

a. Study of tools and operations

b. Simple exercises based on black smithy operations such asupsetting drawing down, punching, bending, fullering and swaging

4. Welding Shop

a. Study of tools and Operations

b. Simple butt joint

c. Lap Joint

d. Oxy acetylene welding

5. Sheet Metal Shop

a. Study of tools and Operations

b. Making funnel complete with soldering.

c. Fabrication of tool box, tray, electrical panel box etc.

6. Carpentry Shop

a. Study of tools and Operations and carpentry joints.
b. Simple exercise using jack plain.
c. To prepare half lap corner joint, mortise and tennon joints.
d. Simple exercise on woodworking lathe.

7. Foundry

a. Making a mould using single piece pattern.
b. Making a mould using two-piece pattern
c. Making a mould using a pattern with core print
d. Melting Pouring and Making an Aluminum Casting.

Integral University, Lucknow
Department of Computer Science & Engineering
B.TECH. COMPUTER SCIENCE
Subject Name: Chemistry, Subject Code: CH101
w.e.f Session 2019-20

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Analyze and compare magnetic behavior and stability of heteronuclear diatomic molecules, Significance of hydrogen bonding ,band theory, radius ratio, density of unit cell, fullerenes and graphite
CO 2	Comprehension of types of polymers to make an appropriate choice of use of polymers (Natural, synthetic and biodegradable).
CO 3	Compare reaction intermediates and mechanism of chemical reactions and isomerism.
CO 4	Interpret phase rule, phase diagram, corrosion and its prevention, calculation of activation energy, rate constant, half-life period, emf of electrochemical cells, construction and operation of galvanic cell and concentration cells,
CO 5	Determination of calorific value , analyzing water softening methods, principles, instrumentations of UV, IR and NMR spectroscopy and their applications.

COURSE OBJECTIVES: The course is aimed to develop the skills in Chemistry which is necessary for grooming them into successful engineering graduate. The topics introduced will serve as basic tools for specialized studies in science field.

UNIT I	**Chemical bonding and state of matter:** Molecular theory of hetero diatomic molecules, Band theory of bonding in metals, Hydrogen bonding. Solid state chemistry: Radius ratio rule, Space lattice (only cubes), Types of Unit cells, Bragg's law, calculation of density of unit cell. One and Two Dimensional solids, Graphite as two dimensional solid and its conducting and lubricating properties. Fullerene and its applications	**8**
UNIT II	**Polymers:** Polymerization and its classification, Thermoplastic and thermosetting resins. Elastomers (Buna-S, Buna-N, thiokols, polyurethanes, silicons), Polyamides (Nylon-6, Nylon-6,6, Nylon-6,10, Nylon-11, Kevlar), Polyesters (Terelene), Polyacrylates (PMMA, PAN, PVC). Organic conducting and biodegradable polymers.	**8**
UNIT III	**Structural and mechanistic concepts in organics**: Stability of reaction intermediates, e.g. Carbanions, Carbocations and free radicals. Types of organic reactions, mechanism of nucleophilic substitutionreactions. Mechanism of the following name reactions. i. Aldolcondensation ii. Cannizzaro reaction	**8**

	iii. Beckmannrearrangement iv. Hofmann rearrangement and v. Diels-Alderreaction E-Z Nomenclature. R.S configuration, Optical isomerism of organic compounds containing one chiral center. Examples of optically active compounds without chirality. Conformations of n-butane.	
UNIT IV	**Reaction kinetics, Phase rule, Electrochemistry and Corrosion:** Order and molecularity of reactions. First and second order reactions. Energy ofactivation. Phase Rule, its application to one component system(water). Equilibrium potential, electrochemical cells (galvanic and concentrationcells) Electrochemical theory of corrosion and protection ofcorrosion.	**8**
UNIT V	**Analytical methods, Fuel and Water treatment:** Basic principles of spectroscopic methods. The use of UV, Visible, IR, 1HNMR, for the determination of structure of simple organic compounds. Classification of fuels, determination of gross and net calorific values using Bomb Calorimeter. Hardness of water, softening of water by Lime-Soda process, Zeolites and ion exchange resins process and Reverse Osmosis. Treatment of boiler feed water by Calgon process	**8**

References:

- Jain P. C. and Jain M. 1994. Engineering Chemistry. Danpat Rai publishing company Pvt. Ltd., Delhi.
- Bahl B.S, Arun Bahl and Tuli B.D. 2007. Essentials of Physical Chemistry. S. Chand and Co. Ltd., Delhi.
- Industrial Chemistry B.K.Sharma, Goel publishing house.

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1						1		2	3	2	2
CO2	3		2	1		2	1	2		1		3	3		2
CO3	3	2	2	2		2				1		2	3	2	
CO4	3	3	2	2	1	2	2			1		3	3	3	2
CO5	3	3	2	2	2	2	2	2		1		2	3	3	2
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science &Engineering
B.TECH. COMPUTER SCIENCE
Subject Name: Engineering Mathematics-II, Subject Code: MT-112
w.e.f Session 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Solve first order linear equations and higher order differential equation of certain types and interpret the solutions.
CO 2	To use shift theorems to compute the Laplace transform, inverse Laplace transform and the solutions of second order, linear equations with constant coefficients.
CO 3	Able to determine given function in terms of sine and cosine terms in Fourier series.
CO 4	Apply problem-solving using concepts and techniques from PDE's and Fourier analysis applied to diverse situations in physics, engineering, financial mathematics and in other mathematical contexts.
CO 5	Apply method of least squares to find the curve of best fit for the given data

COURSE OBJECTIVES: The course is aimed to develop the skills in mathematics which is necessary for grooming them into successful engineering graduate. The topics introduced will serve as basic tools for specialized studies in science field

UNIT I	**Differential Equations**	**8**
	Linear differential equations of first order, Linear differential equations of higher order with constant coefficients,Complementary functions and particular integrals, Simultaneous linear differential equations, Solution ofsecond order differential equations by changing dependent and independent variables, Method of variation ofparameters, Applications to engineering problems (without derivation).	
UNIT II	**Laplace Transform**	**8**
	Laplace transform, Existence theorem, Laplace transform of derivatives and integrals, Unit stepfunction, Dirac-delta function, Laplace transform of periodic functions, Inverse Laplace transform, Convolutiontheorem, Applications to solve simple linear and simultaneous differential equations.	
UNIT III	**Fourier Series and Partial Differential Equations**	**9**
	Periodic functions, trigonometric series, Fourier series of period 2 π, Euler's formulae, functions havingarbitrary period, change of interval, Even and odd functions, Half range sine and cosine series. Introduction of partial differential equations, linear partial differential equations with constant coefficients ofsecond order and their classifications to parabolic, elliptic and hyperbolic forms with illustrative examples.	
UNIT IV	**Applications of Partial Differential Equations**	**8**

	Method of separation of variables for solving partial differential equations, Wave equation up to two-dimensions,Laplace equation in two-dimensions, Heat conduction equations up to two dimensions, Equations of transmissionLines.	
UNIT V	**Curve fitting and Solution of Equations**	**7**
	Method of least squares, curve fitting of straight line and parabola, Solution of cubic and biquadratic equations.	

References:

1. E. Kreyszig Advanced Engineering Mathematics,Wiley Eastern Ltd.
2. Jaggi and Mathur Advanced Engineering Mathematics, Khanna Pub.
3. B. S. Grewal Higher Engineering Mathematics, Khanna Pub.
4. Dennis G. Zill Advanced Engineering Mathematics, CBS Pub.

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	3	3					1			
CO2	3	2	2	1	2	2	2			3			1	2	
CO3	3	2	3	1	3	2	3								3
CO4	3	2	3	1	3	3	2			1			2		
CO5	3	2	1	1	3	2	1								
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science &Engineering
B.TECH. COMPUTER SCIENCE
Subject Name: Basic Mechanical Engineering, Subject Code: ME-101
w.e.f Session 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Explain basic concepts of thermal sciences and temperature measurement on the basis of zeroth law of thermodynamics.
CO 2	Understand and apply first and second law of thermodynamics to various processes and real systems.
CO 3	Model the problem using free-body diagrams and reach to solution by using equilibrium equations.
CO 4	Draw Shear Force Diagram (SFD) and Bending Moment Diagrams (BMD) for statistically determinate beams.
CO 5	Design simple components on the basis of knowledge of stress, strain and strength of material.

COURSE OBJECTIVES:

UNIT I	**FUNDAMENTALS OF THERMODYNAMICS**	**8**
	Fundamental Concepts and Definitions: Definition of Thermodynamics, System, surrounding and universe, Phase, Concept of continuum,Macroscopic & microscopic point of view. Density, Specific volume, Pressure, temperature.Thermodynamic equilibrium, Property, State, Path, process, Cyclic process, Energy and its form,Work and heat, Enthalpy. Laws of thermodynamics: Zeroth law: Concepts of Temperature, Zeroth law.	
UNIT II	**FIRST LAW &SECOND LAW**	**8**
	First law: First law of thermodynamics. Concept of processes, Flow processes and control volume,Flow work, Steady flow energy equation, Mechanical work in a steady flow of process. Second law: Essence of second law, Thermal reservoir, Heat engines, COP of heat pump and refrigerator.Statements of second law, Carnot cycle, Clausius inequality.	
UNIT III	**MECHANICS AND STRENGTH OFMATERIALS**	**8**
	Force system and Analysis: Basic Concept: Laws of motion. Transfer of force to parallel position, Resultant of planer force system.Free Body diagrams, equilibrium and its equation.	

	Friction: Introduction, Laws of Coulomb friction, Equilibrium of bodies involving dry friction, beltfriction.	
UNIT IV	**STRUCTURE ANALYSIS**	**8**
	Beams: Introduction, Shear force and bending moment, Shear and bending moment diagram for staticallydeterminate beams.	
UNIT V	**STRESS AND STRAIN ANALYSIS**	**8**
	Simple Stress and strain: Introduction, Normal, shear stresses, Stress-strain diagrams for ductile andbrittle materials. Pure Bending of Beams: Introduction, Simple bending theory.	

References:

1. Van Wylen G.J. &Sonnlog R.E. Fundamentals of Classical Thermodynamics, John Wiley &Sons, Inc. NY.
2. WarkWenneth: Thermodynamics (2nd edition) Mc Graw Hill Book Co. NY.
3. Holman, J.P.: Thermodynamics, Mc Graw Hill Book Co.NY.
4. Shames I.H., Engineering Mechanics, P.H.I.
5. D.S. Kumar, Mechanical Engineering, S.K. Katarial& Sons.
6. BhaviKatti S.S., Engineering Mechanics, New Age Pub.
7. P.K. Bharti: Engineering Mechanics, Kataria and Sons.
8. R.K. Rajput, Mechanical Engineering, Laxmi Pub.

PO-PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**	**2**	**2**	**1**		**2**						**3**	**3**	**2**	**2**
CO2	**3**	**3**	**3**	**2**		**3**						**3**	**3**	**3**	**2**
CO3	**3**	**3**	**3**	**2**		**3**						**3**	**3**	**2**	**1**
CO4	**3**	**2**	**2**	**2**		**3**						**3**	**3**	**2**	**1**
CO5	**3**	**3**	**2**	**1**		**3**						**3**	**3**	**2**	**2**
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
B.TECH. COMPUTER SCIENCE
Subject Name: Computer Programming, Subject Code: CS-101
w.e.f Session 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Understand basic concepts of computer, networks and formulation of algorithmic solutions to problems.
CO 2	Understanding of programming concepts of C language and their implementation.
CO 3	Analyze and develop programs on pointers and functions.
CO 4	Develop programs on different operations on arrays, matrices & strings.
CO 5	Implement programs on structure, union & Dynamic memory allocation.

Objective:

- To give knowledge of computers, networks, algorithms & flowcharts.
- To provide fundamental concepts of programming language 'C'.
- To show the use of functions and pointers to different problems.
- To study the implementation of arrays, matrices and strings.
- To give concepts of user defined data types structure & union.

UNIT I	**Introduction to Computers:**	**9**
	Generation of computers, Characteristic and classifications of computers. Components of Computer: CPU, Various I/O Devices, Memory & its types, (Memory Hierarchy, Storage Media), Computer Software and their types, Operating System. Computer Networks & Communication: LAN, MAN, WAN, Network Topologies, Modes of Data Communication. Introduction to Internet and its Safeguard: Internet Addresses, Domain Name System, URL, Web Browsers Search Engines, Firewalls, Anti-Virus, Translators. Algorithm and flowchart: Algorithm and flow chart characteristics, Sketching Flowcharts of various problems.	
UNIT II	**Starting C:**	**8**
	Standard I/O in 'C', 'C' Fundamental, C Character set, Constants, Variables, Keywords and Identifiers, Data types, Declaration. Operators and Expressions, Conditional statements (If, If-else), Nesting of if- else statement, switch statement, The? operator, goto statement. Decision making and Looping (While, Do-While, for), Break and Continue statements, Case Control Structures (Switch), C programs based on above concepts.	
UNIT III	**Introduction to pointers:**	**9**

	Declaration and initialization of pointers, accessing the address of the variable, accessing the variable through the pointer, chain of pointers, pointers operators, pointer arithmetic Introduction to Functions: Need of "C" function, User Defined and Library Functions, Prototype of Function, Call by Value; Call by Reference; Nesting of Functions, Recursion. Pointers with function, C program based on above concept.	
UNIT IV	**Array:**	**10**
	Concept of One Dimensional and Multi-Dimensional arrays, Declaration, Operations: insert, delete, search, traverse, and merge, matrix operations, Sorting: Bubble sort, merge sort, insertion sort. Character array and strings: declaring and initializing strings variable, reading and writing a character, reading and writing strings from terminal, Arithmetic operations on characters, string handling functions. Application of pointers, and function on array, C program based on above concept.	
UNIT V	**Structures:**	**8**
	Defining Structure, Declaration of Structure Variable, Accessing Structure members, copying and comparing structure variable, operation on individual member, nesting of structures, Array of structures. Application of pointers and function on Structures. Union Defining Union Declaration of Union, difference between structure and Union, Introduction of Static and Dynamic memory allocation- The process of Dynamic memory allocation, C program based on above concept.	

References:

1. Foundation of Information Technology by 'D.S. Yadav'- New age International
2. Programming in 'C' by 'E Balagurusamy'. -TMH Publication.
3. Let us 'C' by 'YashwantKanitkar'-BPB Publication.
4. The C Programming Essentials by Dey- Pearson Publication.

CO-PO/PSO MAPPING

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2				3		3	2			2	3	2	
CO2	3	3	1			1		2				2	1	3	
CO3	3	2				2	3	2				3			3
CO4	3	2		2		3	2	2				1			3
CO5			1			1							1		3
1. Low Association 2: Average Association 3: Strong Association															

CHEMISTRY LAB (CH-102)

Course objectives:

CO 1	Analyze the need, design and perform given set of experiments with precision and accuracy.
CO 2	Utilize the fundamental laboratory techniques for analyses such as titrations.
CO 3	Organize the records of all performed experiments in the manner which is required in laboratory.
CO 4	Comprehension of principle, instrumentation and use of UV-VIS spectrophotometer and pH meter.
CO 5	Able to analyze importance of personal safety, care of chemicals, equipments and gain experimental skill.

List of Experiments

1. To determine the Iron content in the given iron ore by using external indicator.

2. To determine the Alkalinity in the given water sample

3. To determine the Chloride content in the given water sample by Mohr's method. (Argentometric method)

4. To determine the Percentage of Available Chlorine in the given sample of Bleaching powder iodometrically.

5. To determine the temporary and permanent hardness in water sample by Complexometric titration using EDTA as standard solution.

6. To determine the Equivalent weight of Iron by Chemical Displacement method. (The Equivalent weight of copper is 63.5)

7. To determine the strength of given HCl solution by titrating it against NaOH solution using pH meter.

8. To determine the iron concentration in the given water sample by Spectrophotometer using potassium thiocyanate as color developing agent.

9. To detect the presence of functional groups in the given organic compound.

10.To detect the presence of Elements in the given organic compound.

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1					2			2			
CO2	3	3	3	3	1	2	1	2	2			2			
CO3	3	2	2	2		2			2	3		2			
CO4	3	1	2	2	1	2	2	1	2			2			
CO5	3	2	2	2	1	2	2	1	2			2			
1. Low Association 2: Average Association 3: Strong Association															

MECHANICAL ENGINEERING LAB (ME-102)

L T P

0 0 2

List of Experiments

1. To study and sketch the model of fire tube (Lancashire and Locomotive) boiler.

2. To study and sketch the model of water tube (Babcock & Wilcox) boiler.

3. To study and sketch the model of two stroke S.I. Engines.

4. To study and sketch the model of four stroke S.I. Engines.

5. To study and sketch the model of four stroke C.I. Engines.

6. To study and sketch the model of vapour compression refrigerator.

7. To study and sketch the model of simple steam engine.

8. To determine the Rockwell hardness no. of a given specimen using hardnesstester.

9. To perform the tensile test on specimen and determine the different mechanicalproperties with the help of UTM.

10. To determine the impact strength of mild steel by Izod method using impacttesting machine.

11. To perform the compression test on brick and determine the ultimate compressivestrength with the help of UTM.

COURSE: COMPUTER PROGRAMMING LAB

COURSE CODE: CS102

COURSE CREDIT: 1

COURSE OBJECTIVES:

- To learn the basic concepts and syntax of C programming.
- To be able to develop logics which help them to create programs and applications using C language.
- To learn the use of C libraries functions in C language.
- To learn the file handling and basic memory allocation concepts in C language.
- After learning the C programming they can easily switch over to any other language.

List of Experiments (s)

1	Write a Program to print any message
2	Write a Program to print sum and Multiply of two numbers.
3	Write a Program to enter the temperature in Celsius(c) then count it into Fahrenheit
4	Write a Program to swap the number taking the help of third variable.
5	Write a Program to calculate the volume of box.
6	Write a Program to swap the number without taking the help of third variable.
7	Write a Program to check a year is leap year not.
8	Write a Program to print number is even or odd.
9	Write a Program to Print month of name using switch case
10	Write a Program to print the no is positive or negative.
11	Write a Programto find the greater number enter by user.
12	Write a Program to find the greater number Input 3 No.
13	Write a Program to enter any no and check whether the given no is palindrome or not.
14	Write a Program to enter any no. and check whether the given no. is Armstrong or not.
15	Write a Program to Print Pattern * * * * * * * * * *
16	Write a Program to Print Pattern 1 2 3 4 1 2 3 1 2 1
17	Write a Program to Print Pattern 1 1 2 1 2 3

1 2 3 4

18 Write a program to find in C to design the report card of 5 subject
according to the following condition if the total percentage are.
>=35 and <45 IIIrdDiv
>=45 and <60 IIndDiv
>=60 IstDiv
If any students score <35 in any of the subject display fail

19 Write a Program to create 2-D array or order M*N and insert the element and display it.

20 Write a Program to find the addition of two matrix of order M*N.

21 Write a Program to find the Transpose of the matrix.

22 Write a Program to swap two numbers Call by Value.

23 Write a Program to swap two number using function pointers.

24 WAP for structure of player Name, batting average and then name.

COURSE OUTCOMES (CO):

After completion of the course, a student will be

CO 1	Able to understand the basic concepts of C programming language and their implementation.
CO 2	Able to design and develop various programming problems using C programming concepts.
CO 3	Able to analyze and develop programs on pointers and functions.
CO 4	Able to develop programs on different operations on arrays, matrices & strings.
CO 5	Able to implement programs on structure, union & Dynamic memory allocation.

CO-PO MAPPING:

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2		3		3						2	1	1
CO2	1	1	1	2	1		3						2	1	1
CO3	1	2	2	2			3						2	1	1
CO4	1	2	2	2			3						2	1	1
CO5	1	2	1				3						2	1	1
	1. Low Association **2: Average Association** **3: Strong Association**														

PROFESSIONAL COMMUNICATION LAB (LN-151)

Day 1. Introductions (Instructors, Students and Curriculum)

Day 2. Listening exercises

Day 3. Framing Questions

Day 4. Making Small talks

Day 5. Presentation Making- tips, do's and don'ts/ group presentations

Day 6. Group presentations

Day 7. Phonetic alphabet

Day 8. Phonetic transcription

Day 9. Intonation

Day 10. Stress

Day 11. . Working on Negotiations

Day 12- 14Situational conversational section- Social language, emergency situations/ seeking help, inquiries, communicating bad news

Day 15: Exercise on cross cultural communication

Sadaf Abid
13/2/14

Integral University, Lucknow
Department of Computer Science & Engineering
B.Tech (CSE), 2nd Year/3rd Semester
Subject Name: Data Structure Using C, Subject Code: CS-204
w.e.f Session 2016

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Describe the basics of Data structure operation and programming implementation skills
CO 2	Stack and Queue and various application based on these data structures
CO 3	Learning the different types of tree and learn its augmentation to control the operation complexity.
CO 4	Learn different sorting and searching algorithms and analyze their performances.
CO 5	Learning File and record management, implementing various searching and routing applications on graph.

Objective: Explain the basics of Data Structure, their Managements and Operations such as array, string manipulations and various operation over linked list. Programming implementation

- To learn stack, queue and various operations, different application based on given data structure such as, recursion, polish and reverse polish conversion parenthesis management, priority Queue. Programming implementations
- Understand the deep knowledge of tree data structure and its various applications to control the operation complexity management. Programming implementation
- To study the various sorting and searching strategy and different algorithms approach, know hashing and collision resolving techniques. Programming implementation
- Understand the new range of hierarchical data structure such as Graph and various routing and traversal algorithms over the graph. Introduction to file and record handling

UNIT I	**Introduction to Data Structures** Basic Terminology, Elementary Data Organization, Data Structure Operations. Algorithms, Analysis of Algorithms, Complexity of Algorithms, Time-Space Tradeoff. **Arrays:** Array Definition, Representation and Analysis, Single and Multi-Dimensional Arrays, Address Calculation, Application of Arrays, Character String Representation, Character String Operation, Sparse Matrices & Vectors. **Linked List:** Representation and Implementation of Singly Linked List, Traversing, Searching of Linked List, Insertion & Deletion to/from Linked List, Underflow & Overflow. Circular Linked List, Doubly Linked List, Two- way Header List, Polynomial Representation & Addition, Generalized Linked List, Garbage Collection and Compaction.	**9**
UNIT II	**Stacks** Array Representation and Implementation of Stack, Operations on Stacks: Push & Pop, Linked Representation of Stack, Application of Stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of Postfix Expression using Stack. **Recursion:** Recursive Definition and Processes, Recursion in C, Example of Recursion, Tower of Hanoi Problem.	**9**

	Queues: Array and Linked Representation and Implementation of Queues, Operations on Queue: Create, Add, Delete, Full and Empty; Circular Queues, D-queues and Priority Queues**.**	
UNIT III	**Trees**	**8**
	Basic Terminology, Binary Trees, Binary Tree Representation, Algebraic Expressions, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary Trees, Traversing Binary Trees, Threaded Binary Trees, Traversing Threaded Binary Trees, Huffman Algorithm, Binary Search Tree (BST), Insertion and Deletion in BST, Path Length, AVL Trees, B-trees.	
UNIT IV	**Searching and Hashing**	**7**
	Sequential Search, Binary Search, Comparison and Analysis, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation. **Sorting:** Insertion Sort, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort.	
UNIT V	**Graphs**	**7**
	Terminology & Representations, Graphs & Multi-Graphs, Directed Graphs, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees. **File Handling:**Physical Storage Media File Organization, Organization of Records into Blocks, Sequential Files, Indexing and Hashing, Primary Indices, Secondary Indices	

References:

1. A. M. Tannenbaum. "Data Structure Using C/C+"
2. Horowitz And Sahani "Fundamental of Data Structure", Galgotia Publication
3. Lipschutz "Data Structure", Schaum series.

CO-PO/PSO MAPPING

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	3	1	2	1	3	1	2	1	2	1	2	2
CO2	3	2	1	1	1	2	3	2	2	2	3	1	3	2	2
CO3	2	2	2	2	1	1	3	2	3	1	1	2	2	1	2
CO4	3	2	1	2	3	1	1	3	2	2	3	3	2	3	1
CO5	1	2	2	3	1	2	1	3	1	2	1	2	1	2	2
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
B.Tech (CSE), 2nd Year/3rd Semester
Subject Name: Object Oriented Concepts using Java, Subject Code: CS270
w.e.fSession 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Describe the basics of Data structure operation and programming implementation skills
CO 2	Stack and Queue and various application based on these data structures
CO 3	Learning the different types of tree and learn its augmentation to control the operation complexity.
CO 4	Learn different sorting and searching algorithms and analyze their performances.
CO 5	Learning File and record management, implementing various searching and routing applications on graph.

Objective: Explain the basics of Data Structure, their Managements and Operations such as array, string manipulations and various operation over linked list. Programming implementation

- To learn stack, queue and various operations, different application based on given data structure such as, recursion, polish and reverse polish conversion parenthesis management, priority Queue. Programming implementations
- Understand the deep knowledge of tree data structure and its various applications to control the operation complexity management. Programming implementation
- To study the various sorting and searching strategy and different algorithms approach, know hashing and collision resolving techniques. Programming implementation
- Understand the new range of hierarchical data structure such as Graph and various routing and traversal algorithms over the graph. Introduction to file and record handling.

UNIT I	**Introduction**	**9**
	Programming language Types and Paradigms, Computer Programming Hierarchy, Features of Java Language, JVM –The heart of Java, Java's Magic Bytecode. **The Java Environment:**Installing Java, Java Program Development, Java Source File , Structure, Compilation, Executions. **Basic Language Elements:**Lexical Tokens, Identifiers, Keywords, Literals, Comments, Primitive Data types, Operators Assignments.	
UNIT II	**Object Oriented Programming using Java**	**8**
	Class Fundamentals , Object & Object reference , Object Life time & Garbage Collection, Creating and Operating Objects , Constructor & initialization code block, Access Control, Modifiers, methods Nested , Inner Class &Anonymous Classes ,Abstract Class & Interfaces Defining Methods, Argument Passing Mechanism , Method Overloading, Recursion, Dealing with Static Members, Finalize() Method, Native Method. Use of "this"reference, Use of Modifiers with Classes &Methods.	
UNIT III	**Extending Classes and Inheritance**	**8**

	Use and Benefits of Inheritance in OOP, Types of Inheritance in Java, Inheriting Data members and Methods , Role of Constructors in inheritance , Overriding Super Class Methods ,Use of "super", Polymorphism in inheritance ,Type Compatibility and Conversion Implementing interfaces. **Package:** Organizing Classes and Interfaces in Packages , Package as Access Protection , Defining Package , Making JAR Files for Library Packages Import and Static Import Naming Convention For Packages.	
UNIT IV	**Exception Handling**	**8**
	Exceptions & Errors ,Types of Exception ,Control Flow In Exceptions, ,Use of try, catch, finally, throw, throws in Exception Handling ,In-built and User Defined Exceptions, Checked and Un-Checked Exceptions. **Array & String:**Defining an Array, Initializing & Accessing Array, Multi – Dimensional Array, Operation on String, Mutable & Immutable String, Creating Strings using StringBuffer.	
UNIT V	**Thread**	**9**
	Understanding Threads, Needs of Multi-Threaded Programming, Thread Life-Cycle, Thread Priorities, Synchronizing Threads, Inter Communication of Threads. **I/O Classes:**Input/output Operation in Java(java.io Package),Streams and the new I/O Capabilities ,Understanding Streams, The Classes for Input and Output, The Standard Streams, Working with File Object, File I/O Basics, Reading and Writing to Files, Buffer and Buffer Management, Read/Write Operations with File Channel.	

References:

4. T.Budd"An Introduction to OOP" Pearson Education
5. Naughton, Schildt, "The Complete Reference JAVA2", TMH
6. Balagurusamy E, "Programming in JAVA", TMH
7. "Head First Java" by Kathe Sierra.
8. "A Beginner's Guide (Sixth Edition)" by Herbert Schildt

CO-PO/PSO MAPPING

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	3	1	2	1	3	1	2	1	2	1	2	2
CO2	3	2	1	1	1	2	3	2	2	2	3	1	3	2	2
CO3	2	2	2	2	1	1	3	2	3	1	1	2	2	1	2
CO4	3	2	1	2	3	1	1	3	2	2	3	3	2	3	1
CO5	1	2	2	3	1	2	1	3	1	2	1	2	1	2	2
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
B.Tech (CSE), 2nd Year/3rd Semester
Subject Name: Principle Of Management And Engineering Economics, Subject Code: BM 225
w.e.fSession 2016

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Know about the concepts of database, their types, design concepts and ER-models
CO 2	Know about the concepts of relational databases, working with SQL for frontend development
CO 3	Know about the concepts of query optimization, transaction processing and concurrency control
CO 4	Know about the concepts of database technologies, distributed database environment
CO 5	Know about the concept of data warehouse, data cleaning and data integration

Objective: The course curriculum helps to understand the designing of the database models, understanding of the relationships between different records and databases. Its major objective is the storage, manipulation and working with the transactions. It helps in the connectivity of the large databases with the various webpages. It also introduces the concept of several technologies which helps in resolving the integrity, atomicity problems. It helps in the transformation of one type to different types. It removes multiple duplicacy, allows access to multiple users and helps in data protection.

UNIT I		**8**
	Nature and Significance of Economics. Meaning of Science. Engineering and Technology and their Relationship with Economic Development.	
UNIT II		**8**
	The Concept of Demand and Supply. Elasticity of Demand and Supply, Indifference Curve Analysis, Price Effect. Income Effect and Substitution Effect.	
UNIT III		**8**
	Functions of Money, Value of Money, Inflation and Measures to Control it, Brief Idea of Functions of Banking System viz Commercial and Central Banking, Business Fluctuations.	
UNIT IV		**8**
	Definition, Nature and Significance of Management, Evaluation of Management Thought, Contributions of Max Weber. Taylor and Fayol.	
UNIT V		**8**
	Factors of Individual Behavior, Perception. Learning and Personality Development Interpersonal Relationship and Group Behavior.	

References:

9. Dewett, K.K. / Modern Economic Theory / S. Chand
10. Luthers Fred / OrganizaionalBehaviour

11. Prasd 1. M. / Principles of Management
12. A. W. Stonier & D. C. Horgne / A textbook of Economics Theory / Oxford Publishing House Pvt. Ltd.

CO-PO/PSO MAPPING

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	3	1	2	1	3	1	2	1	2	1	2	2
CO2	3	2	1	1	1	2	3	2	2	2	3	1	3	2	2
CO3	2	2	2	2	1	1	3	2	3	1	1	2	2	1	2
CO4	3	2	1	2	3	1	1	3	2	2	3	3	2	3	1
CO5	1	2	2	3	1	2	1	3	1	2	1	2	1	2	2
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
B.Tech (CSE), 2nd Year/3rd Semester
Subject Name: Digital Electronics, Subject Code: EC-209
w.e.fSession 2016

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Know about the concepts of database, their types, design concepts and ER-models
CO 2	Know about the concepts of relational databases, working with SQL for frontend development
CO 3	Know about the concepts of query optimization, transaction processing and concurrency control
CO 4	Know about the concepts of database technologies, distributed database environment
CO 5	Know about the concept of data warehouse, data cleaning and data integration

Objective: The course curriculum helps to understand the designing of the database models, understanding of the relationships between different records and databases. Its major objective is the storage, manipulation and working with the transactions. It helps in the connectivity of the large databases with the various webpages. It also introduces the concept of several technologies which helps in resolving the integrity, atomicity problems. It helps in the transformation of one type to different types. It removes multiple duplicacy, allows access to multiple users and helps in data protection.

UNIT I	**Wave shaping** RC High Pass Circuit, Low Pass Circuit, Response to Sine, Step, Pulse and Square Wave Inputs. RC Circuit as a Differentiator, Integrator and Compensated Attenuator. Number Systems, Review of Boolean Algebra, Minimization of Boolean Functions, K-Map, Don't Care Input Combinations, Tabular Method.	**8**
UNIT II	**Logic families** Use of Diode, Transistor, and MOSFET as a Digital Circuit Element; Formation of Basic Logic Gates, and Study of their Input-Output Characteristics, Fan-in, Fan-out, Noise Margin, Circuit Concept and Comparison of Various Logic Families-TIL, IIL, ECL, NMOS and CMOS. Tristate Logic, Open Collector Output Circuits; Interfacing between Logic Families; Power Consumption, Gate Delay.	**8**
UNIT III	**Combinational Circuits** Decoders, Encoders, Three State Devices, Multiplexer Demultiplexer, Comparator, Adder, Sub Tractor, ALU, Hazards and its Avoidance.	**8**
UNIT IV	**Sequential Circuit** Latches, Flip Flops, Shift Registers, Counters; Synchronous and Asynchronous Sequential Circuits, Multi-vibrators.	**8**
UNIT V	**Memory**	**8**

	ROM, PROM, EPROM & EEPROM; RAM, SRAM and DRAM; PLA, PAL, PLD;FPGA, Bi CMOS circuits.	

References:

13. Mano, M. Morris / "Digital Design" / Prentice Hall /
14. Mano, M. Morris / "Digital Logic and computer Design" / PHI
15. Gopalan, k. "Go pal" / Introduction to Digital Microelectronic circuits" / TMH.
16. Jacob Mill man and Herbert Taub / Pulse, Digital and switching wave forms "TMH
17. Malvino, A.P. and Leach. Donald P. / "Digital Principles and applications"/ TMH.
18. R. P. Jain, Modem Digital Electronics, TMH.
19. J. M. Yarbrough, Digital Logic: Applications and Design' Vikas Publishing.

CO-PO/PSO MAPPING

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	3	1	2	1	3	1	2	1	2	1	2	2
CO2	3	2	1	1	1	2	3	2	2	2	3	1	3	2	2
CO3	2	2	2	2	1	1	3	2	3	1	1	2	2	1	2
CO4	3	2	1	2	3	1	1	3	2	2	3	3	2	3	1
CO5	1	2	2	3	1	2	1	3	1	2	1	2	1	2	2
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
B.Tech (CSE), 2nd Year/3rd Semester
Subject Name: Discrete Structure, Subject Code: CS 206
w.e.fSession 2016

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Describe the basic organization of computer and data representation techniques used in computer systems.
CO 2	Use the computer arithmetic in designing of CPU.
CO 3	Design the control unit using hardwired and micro programmed approach.
CO 4	Resolve the issues arising in the design of elements of memory hierarchy.
CO 5	Design the input output organization and resolve the issues arising in data transfer.

Objective: Explain the basic components of computer, their interconnection and data representation techniques in computer systems

- To assess the working of CPU and become familiar with computer arithmetic's.
- Understand the control unit design using hardwired and micro programmed approach.
- To study the memory organization and articulate design issues in each element of memory hierarchy.
- Understand the input output organization, data transfer, and modes of communication.

UNIT I	**Set Theory**	**9**
	Definition of Sets, Countable and Uncountable Sets, Venn Diagrams, Proofs of Some General Identities on Sets **Relation:** Definition, Types of Relation, Composition of Relations, Pictorial Representation of Relation, Equivalence Relation, Partial Ordering Relation. **Function:** Definition, Type of Functions, One to One, Into and Onto Function, Inverse Function, of Functions, Recursively Defined Functions. Theorem Proving Techniques: Mathematical Induction Simple and Strong), Pigeonhole Principle, Prove by Contradiction.	
UNIT II	**Algebraic Structures**	**8**
	Definition, Properties, Types: Semi Groups, Monoid, Groups, Abelian Group, Properties of Groups, Subgroup, Cyclic Groups, Cosets, Factor Group, Permutation Groups, Normal Subgroup, Homomorphism and Isomorphism of Groups, Example and Standard Results, Rings and Fields: Definition and Standard Results.	
UNIT III	**Posets, Hasse Diagram and Lattices**	**9**

	Introduction, Ordered Set, Hasse Diagram of Partially, Ordered Set, Isomorphic Ordered Set, Well Ordered Set, Properties of Lattices, Bounded I and Complemented Lattices. **Boolean Algebra:** Basic Definitions, Sum of Products and Product of Sums, Form in Boolean Algebra, Logic Gates and Karnaugh Maps. **Tree:** Definition, Rooted Tree, Properties of Trees, Binary Search Tree, Tree Traversal.	
UNIT IV	**Propositional Logic**	**7**
	Proposition, First Order Logic, Basic Logical Operation, Truth Tables, Tautologies, Contradictions, Algebra of Proposition, Logical Implications, Logical Equivalence, Predicates, Universal And Existential Quantifiers.	
UNIT V	**Combinatorics & Graphs**	**8**
	Recurrence Relation, Generating Function, Simple Graph, Multi Graph, Graph Terminology, Representation of Graphs, Bipartite, Regular, Planar and Connected Graphs, Connected Components in a Graph, Euler Graphs, Hamiltonian Path and Circuits, Graph Coloring, Chromatic Number, Isomorphism and Homomorphism of Graphs.	

References:

20. Liptschutz, Seymour, "Discrete Mathematics", McGraw Hill.
21. Trembley, J.P & R. Manohar, "Discrete Mathematical Structure with Application to Computer Science", McGraw Hill.
22. Kenneth H. Rosen, "Discrete Mathematics and its applications", McGraw Hill.
23. Deo, Narsingh, "Graph Theory With application to Engineering and Computer.Science.", PHI.
24. Krishnamurthy, V., "Combinatorics Theory & Application", East-West Press Pvt. Ltd., New Delhi.

CO-PO/PSO MAPPING

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	3	1	2	1	3	1	2	1	2	1	2	2
CO2	3	2	1	1	1	2	3	2	2	2	3	1	3	2	2
CO3	2	2	2	2	1	1	3	2	3	1	1	2	2	1	2
CO4	3	2	1	2	3	1	1	3	2	2	3	3	2	3	1
CO5	1	2	2	3	1	2	1	3	1	2	1	2	1	2	2
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
B.Tech (CSE), 2nd Year/3rd Semester
Subject Name: Cyber Law And Information Security, Subject Code: CS-203
w.e.fSession 2016

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Understand key terms and concepts in cyber law, intellectual property and cybercrimes(internet security threats), trademarks and domain theft.
CO 2	Keep an appropriate level of awareness, knowledge and skill on the disciplines of technology, E-business and law to allow them to minimize the occurrence and severity of information security incidents.
CO 3	Understand about Information System and principles of Information Security (as confidentiality, integrity, and availability)
CO 4	Understand about cryptography and techniques used to detect and prevent network intrusions.

Objective: Knowledge about cyber law, intellectual property and cyber crimes(internet security threats), trademarks and domain theft

- Knowledgeon the disciplines of technology, E-business and law to allow them to minimize the occurrence and severity of information security incidents.
- Knowledge about Information System and principles of Information Security (as confidentiality, integrity, and availability)
- Knowledge of cryptography and techniques used to detect and prevent network intrusions.

UNIT I	**Fundamentals of Cyber Law**	**7**
	Jurisprudence of Cyber Law, Object and Scope of the IT Act 2000, Introduction to Indian Cyber Law, Unicitral Model Law, ISP Guideline. Intellectual property issues and cyber space, Indian perspective, Overview of Intellectual property related legislation in India, Patent, Copy Right, Trademark law, Law related to semiconductor layout &design.	
UNIT II	**E - Commerce**	**8**

	Security Threats to E - Commerce, Virtual Organization, Business Transactions on Web, E-Governance and EDI, Concepts in Electronics payment systems, E-Cash, Credit/Debit Cards, E- Agreement, Legal recognition of electronic and digital records, E- Commerce Issues of privacy, Wireless Computing- Security challenges in Mobile devices. Digital Signatures - Technical issues, legal issues, Electronic Records, Digital Contracts, and Requirements of Digital Signature System.	
UNIT III	**Investigation and Ethics**	**9**
	Cyber Crime, Cyber jurisdiction, Cyber crime and evidence act, Treatment of different countries of cyber crime, Ethical issues in data and software privacy, Plagiarism, Pornography, Tampering computer documents, Data privacy and protection, Domain Name System, Software piracy, Issues in ethical hacking. Internet security threats: Hacking, Cracking, Sneaking, Viruses, Trojan horse, Malicious Code & logic bombs.Introduction to biometric security and its challenges, Finger prints.Cyber crime forensic: CASE STUDY in Cyber Crime.	
UNIT IV	**Information security**	**9**
	Information Systems and its Importance, Role of Security in Internet and Web Services, Principles of Information Security, Classification of Threats and attacks, Security Challenges, Security Implication for organizations, Security services - Authentication, Confidentiality, Integrity, Availability and other terms in Information Security, Information Classification and their Roles. Introduction to Cryptography, Issues in Documents Security, Keys: Public Key, Private Key, Firewalls, Basic Concepts of Network Security, Perimeters of Network protection & Network attack, Need of Intrusion Monitoring and Detection.	

References:

1. Harish Chander "Cyber Law and IT Protection" , PHI Publication, New Delhi
2. Merkov, Breithaupt," Information Security", Pearson Education
3. "Cyber Law in India" - Farooq Ahmad-Pioneer books.
4. K. K. Singh, Akansha Singh "Information Security and Cyber law", Umesh Publication, Delhi

CO-PO/PSO MAPPING

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	3	1	2	1	3	1	2	1	2	1	2	2
CO2	3	2	1	1	1	2	3	2	2	2	3	1	3	2	2
CO3	2	2	2	2	1	1	3	2	3	1	1	2	2	1	2
CO4	3	2	1	2	3	1	1	3	2	2	3	3	2	3	1
CO5	1	2	2	3	1	2	1	3	1	2	1	2	1	2	2
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
B.Tech (CSE), 2nd Year/3rd Semester
Subject Name: Human Values & Professional Ethics, Subject Code: BM-226
w.e.fSession 2016

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Know about the concepts of database, their types, design concepts and ER-models
CO 2	Know about the concepts of relational databases, working with SQL for frontend development
CO 3	Know about the concepts of query optimization, transaction processing and concurrency control
CO 4	Know about the concepts of database technologies, distributed database environment
CO 5	Know about the concept of data warehouse, data cleaning and data integration

Objective:

UNIT I	**Human Value Education**	**6**
	Understanding the need, basic guidelines, content and process for Value Education, Self Exploration - Its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly.	
UNIT II	**Introduction to Ethical Concept**	**6**
	Definition of industrial ethics and values, Ethical rules of industrial worker. Values and Value Judgments. Moral Rights and Moral rules, Moral character and responsibilities. Privacy, Confidentiality, Intellectual Property and the Law. Ethics as Law	
UNIT III	**Professional Responsibility**	**6**
	The basis and scope of Professional Responsibility, Professions and Norms of Professional Conduct, Ethical Standards versus Profession, Culpable mistakes, the Autonomy of professions and codes of ethics. Employee status and Professionalism. Central Professional Responsibilities of Engineers: The emerging consensus on the Responsibility for safety among engineers, hazards and risks.	
UNIT IV	**Engineers Ethics**	**6**

	Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles- theories about right action - Self-interest - customs and religion - uses of ethical theories. Valuing Time – Co- operation – Commitment	
	Global Issues	**6**
	A Glimpse of Life Stories: Life story of **Prophet Mohammad**,Mahatma Gandhi, Swami Vivekanand, Marie Curie and Steve Jobs. Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership	

References:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Value Education.
2. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 1996.
3. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

CO-PO/PSO MAPPING

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	3	1	2	1	3	1	2	1	2	1	2	2
CO2	3	2	1	1	1	2	3	2	2	2	3	1	3	2	2
CO3	2	2	2	2	1	1	3	2	3	1	1	2	2	1	2
CO4	3	2	1	2	3	1	1	3	2	2	3	3	2	3	1
1. Low Association 2: Average Association 3: Strong Association															

COURSE: DATA STRUCTURE USING C LAB

COURSE CODE: CS208

COURSE CREDIT: 1

COURSE OBJECTIVES:

1. To develop skills to design and analyze simple linear and non linear data structures.
2. To design and implement various data structure algorithms.
3. To introduce various techniques for representation of the data in the real world.
4. To identify and apply the suitable data structure for the given real world problem
5. To write algorithms for solving problems with the help of fundamental data structures

COURSE OUTCOMES (CO):
After completion of the course, a student will be

CO 1	Able to handle operations like insertion, deletion, traversingmechanism etc. on various data structures.
CO 2	Able toimplement the stack, Queue and their applications
CO 3	Able toimplement different types of trees and Binary Tree Traversal.
CO 4	Able to implement different Sorting and Search methods
CO 5	Able to perform basic operations (creation and traversal) on graphs and determine minimum spanning tree

List of Experiments:

1. To implement traversing, insertion and deletion in arrays.
2. To implement, addition, Multiplication of Two sparse Matrices.
3. To implement insertion, deletion and pattern matching of a substring in a given string using linked list.
4. To implement Insertion and deletion in Singly Linked List at Given Location as well as for a Given Item in sorted List.
5. To Implement Insertion and deletion in Circular Linked List.
6. To implement insertion and Deletion in Stack and Queue using arrays and pointer.
7. To implement Fibonacci Series and Tower of Hanoi Using Recursion.
8. Creation of Trees and Tree Traversal Algorithms: Recursive and Non-Recursive.
9. Creation of Graphs and Graph Traversal Algorithms.
10. Sorting:
    a) Insertion Sort
    b) Quick Sort
    c) Merge Sort
    d) Bubble Sort
    e) Heap Sort
11. Implementation of Sparse Matrix and Polynomial using Linklist.

CO-PO MAPPING:

PO-	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

PSO / CO															
CO1	3	3	3	2	2	1					2	1	1		
CO2	3	3	3	3	3	1					2	1	3		
CO3	3	3	3	3	3	1					2	1	3		
CO4	3	3	3	3	3	1					2	1	2		1
CO5	3	3	3	3	3	1					2	1	1		2
1. Low Association 2: Average Association 3: Strong Association															

COURSE: Python Programming LAB

COURSE CODE: CS272

COURSE CREDIT: 1

SYLLABUS:

1. Understanding Python installation and its Integrated Development Environments (IDEs).
2. Write a program to illustrate various data types & concepts of variables/Constant in Python.
3. Write a program to perform different Arithmetic Operations on numbers in Python (Addition, Subtraction, Multiplication, Division, etc.)
4. Write a program in python to demonstrate the concept of "Loop" and print the following pattern of prime numbers if input is number of lines. e.g.; if n=3, output should be:
5. Write a program to implement the concept of "List" (create, append, and remove lists in python).
6. Write a program to search an input number in a list of n numbers and print a "YES" along with its position (index) otherwise print a "No".
7. Write a program to create, concatenate and print a "String" and accessing sub-string from a given string.
8. Write a program to demonstrate working of "Tuples" in python.
9. Write a program to illustrate the working of "Dictionaries" in python.
10. Write a program to check whether input string is "Pangram" or not.
11. Write a program to find factorial of a number using "Recursion".
12. Write a program implement the concept of "Functions" in python and sort „n" numbers in ascending and descending order after taking input (Integer number) from user.

13. Write a program to define a "module" and import a specific function in that module to another program.
14. Write a program that reads an input text "File" and prints all of the unique words in the file in (alphabetical order).
15. Write a program that depicts the implementation of Python "Class" which reverse a string word by word.
16. Write a python script to print the current date in the following format "Sun May 29 02:26:23 IST 2017"
17. Write a Python class to implement pow(x, n)
18. Write a program to implement the working of "NumPy" in python.

Text Books:

1. Guido van Rossum and Fred L. Drake Jr., ―An Introduction to Python – Revised andupdated for Python 3.2, Network Theory Ltd., 2011
2. Kenneth A. Lambert, ―Fundamentals of Python: First Programs, CENGAGE Learning,2012.
3. Timothy A. Budd, ―Exploring Python, Mc-Graw Hill Education (India) Private Ltd., 2015.
4. Robert Sedgewick, Kevin Wayne, Robert Dondero, ―Introduction to Programming inPython: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.

COURSE OBJECTIVES:

1. To build a strong foundation of python and its IDEs.
2. Study of various object oriented programming constructs and data structures available inPython.
3. Writing and using functions and modules.
4. Developing file handling applications.
5. Exploring the use of libraries in developing real-world applications.

COURSE OUTCOMES (CO):

After completion of the course, a student will be

CO 1	Install and configure python and its IDEs.
CO 2	Write basic programs using the various data structures provided in python.
CO 3	Develop small modules and components using object-oriented methodology.
CO 4	Use the libraries and develop file handling applications.
CO 5	Develop some working applications using python.

CO-PO MAPPING:

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

CO1	3	2	2	3	3	1	1	1	1	1	2	1	**2**	**3**	**1**
CO2	3	2	1	1	2	1	1	1	1	1	1	2	**3**	**2**	**3**
CO3	2	3	2	2	3	1	1	2	1	2	1	2	**2**	**3**	**2**
CO4	3	1	2	1	2	1	1	2	2	1	1	1	**2**	**2**	**3**
CO5	2	3	3	3	3	2	1	2	2	1	2	2	**3**	**2**	**2**
1. Low Association 2: Average Association 3: Strong Association															

COURSE: OBJECT ORIENTED CONCEPT USING JAVA LAB

COURSE CODE: CS271

COURSE CREDIT: 1

COURSE OBJECTIVES:

- To learn the basic concepts and syntax of object oriented programming.
- To be able to develop logics which help them to create programs and applications using java language.
- To learn the use of exception handling .
- To learn the use of methods and threads.
- After learning the object oriented programming they can easily create desktop based projects.

COURSE OUTCOMES (CO):
After completion of the course, a student will be

CO 1	Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs.
CO 2	Read and make elementary modifications to Java programs that solve real-world problems.

CO 3	Validate input in a Java program.
CO 4	Identify and fix defects and common security issues in code.
CO 5	Document a Java program using Javadoc.

List of Experiments:

1.Create a class named 'Student' with String variable 'name' and integer variable 'roll_no'. Assign the value of roll_no as '2' and that of name as "John" by creating an object of the class Student.

2.Print the average of three numbers entered by user by creating a class named 'Average' having a method to calculate and print the average.

3.Write a program that would print the information (name, year of joining, salary, address) of three employees by creating a class named 'Employee'.

4.Write a program to print the area and perimeter of a triangle having sides of 3, 4 and 5 units by creating a class named 'Triangle' with constructor having the three sides as its parameters.

5.Create a class called 'Matrix' containing constructor that initializes the number of rows and number of columns of a new Matrix object. The Matrix class has the following information:

a. number of rows of matrix
b. number of columns of matrix
c. elements of matrix in the form of 2D array

6.Write a program to print the names of students by creating a Student class. If no name is passed while creating an object of Student class, then the name should be "Unknown", otherwise the name should be equal to the String value passed while creating object of Student class.

7.Create a class named 'Member' having the following members:

Data members

1. Name
2. Age
3. Phone number
4. Address
5. Salary

It also has a method named 'printSalary' which prints the salary of the members. Two classes 'Employee' and 'Manager' inherits the 'Member' class. The 'Employee' and 'Manager' classes have data members 'specialization' and 'department' respectively. Now, assign name, age, phone number, address and salary to an employee and a manager by making an object of both of these classes and print the same.

8.Create a class with a method that prints "This is parent class" and its subclass with another method that prints "This is child class". Now, create an object for each of the class and call

1. method of parent class by object of parent class
2. method of child class by object of child class
3. method of parent class by object of child class

9.Write a program to perform inheritance where animal is the superclass and cat is the subclass.
10.Write a java program to calculate the average value of array elements where array elements are {20,30,25,25,-16,60,-100}
10.Program to calculate any shape area while using Encapsulation
12.Program to perform Overloading by changing datatypes of parameters

CO-PO MAPPING:

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2		3		3						2		1
CO2	1	1	1	2	1		3						2	1	1
CO3	1	2	2	2			3							1	1
CO4	1		2	2			3						2	1	1
CO5	1	2	1				3						2	1	
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
B.Tech (CSE), 2nd Year/4th Semester
Subject Name: Computer Graphics, Subject Code: CS-207
w.e.f Session 2016

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Know about the concept of Computer Graphics components and their relevance to classical and modern problems.
CO 2	Know about the concept of writing algorithms for Line generation, Curve generation, Display File, Segments and Polygon filling.
CO 3	Know about the concept of mapping from a world coordinate system to device coordinates, clipping, and projections.
CO 4	Know about the concept and principles of Two Dimensional & Three Dimensional Computer Graphics primitive operations (Translation, Scaling, Rotation, Reflection, Shearing and problems based on these).
CO 5	Know about the concept of Curve generation, Hidden line surface removal techniques and concepts on Animation.

Objective: Basic concepts of Computer Graphics components and their relevance to classical and modern problems.

- Study of algorithms for Line generation, Curve generation, Display File, Segments and Polygon filling.
- Knowledge of mapping from a world coordinate system to device coordinates, clipping, and projections.
- Basic concepts and principles of Two Dimensional & Three Dimensional Computer Graphics primitive operations (Translation, Scaling, Rotation, Reflection, Shearing and problems based on these).
- Study of Curve generation, Hidden line surface removal techniques and concepts on Animation.

UNIT I	**Introduction**	**8**
	Representing Pictures, Pixels and Frame Buffers, Vector and Character Generation. Graphics Primitives: Display Devices, Primitive Devices, Display File Structure, Display Control Text. Line Drawing Algorithms: Digital Differential Analyzer, Bresenham's Algorithms. Circle Generation: Bresenham's, Mid Point Algorithm.	
UNIT II	**Polygon**	**8**
	Polygon Representation, Entering Polygons, Filling Polygons: Flood Fill Algorithm, Boundary-Fill Algorithm and Scan-line Polygon Filling Algorithm. Segments: Segments Table, Creating Deleting and Renaming Segments, Visibility, Image Transformations.	
UNIT III	**Two Dimensional Transformations**	**9**
	Representation of Points, Homogeneous Coordinates. Transformation: Translation, Rotation, Scaling, Reflection, Shearing. Windowing : Introduction, Viewing Transformation- Window to Viewport Coordinate Transformation Multiple Windowing. Clipping: Line Clipping- Cohen-Sutherland, Midpoint Subdivision, Cyrus-Beck Algorithm, Polygon Clipping-Sutherland-Hodgman.	

UNIT IV	**Three Dimensional Transformation**	**7**
	3-D Geometry Primitives, Transformations: Translation, Rotation, Scaling, Reflection, Shearing. Projection: Orthographic, Axonometric, Oblique, Perspective.	
UNIT V	**Hidden Line and Surface**	**9**
	Back Face Removal Algorithms, Hidden Line Methods: Floating Horizon, Z-Buffer, Painter's Algorithm, Warnock's Algorithm. Introduction to Curve Generation, Bezier, Hermite and B-spline Algorithms and their Comparisons. Surface Rendering: Simple Illumination Model, Phong&Gourad Shading. Animation: Introduction, Design of Animation Sequences, Keyframe System, Parameterized System, Morphing, Motion Specification.	

References:

1. Rogers, "Procedural Elements of Computer Graphics", McGraw Hill.
2. Rogar and Adams, "Mathematical Elements of Computer Graphics", McGraw Hill .
3. Newman and Sproul, "Principle of Interactive Computer Graphics", Mc G raw Hill.
4. Steven Harrington, "Computer Graphics", A programming Approach 2nd Edition.
5. Hearn & Baker, "Computer Graphics.

CO-PO/PSO MAPPING

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	3	1	2	1	3		2	1	2	1		2
CO2	3	2		1	1	2		2	2	2		1	3	2	
CO3			2	2	1		3		3		1	2			2
CO4	3	2		2	3	1	1	3	2	2		3	2	3	1
CO5		2	2	3	1	2	1	3		2	1	2		2	
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
DepartmentofMathematics
B.Tech:2nd year / 4th Semester
Subject Name: Mathematical Analysis (For CSE only) Subject Code: MT206
(Revisedw.e.f. session2017-18)

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

UNIT I	Bisection Method, Iteration Method, False Position Method, Newton-Raphson Method. Rate ofConvergenceofMethods.SolutionofsystemoflinearequationsbyLUdecompositionmethod.	**8**
UNIT II	Finite differences, Newton's forward & backward formula, Gauss forward and backward formula forequal intervals. Lagrange's and Newton's divided difference formula for unequal intervals,Numericaldifferentiation.	**8**
UNIT III	Numerical Integration by Trapezoidal Rule, Simpson's 1/3 Rule, Simpson's 3/8 Rule, Boole's & Weddle's Rule. Numerical solution of ordinary differential equations by Euler's Method, Modified Euler's Method and Runge-Kutta Method.	**8**
UNIT IV	Analytic functions, C-R equations, Cauchy's integral theorem, Cauchy's integral formula forderivativesofanalytic functions, Conformalmapping,Bilineartransformation.	**8**
UNIT V	Correlation and Regression Analysis, Definition of Probability: Classical and Axiomatic, Conditional Probability, Baye's theorem, Binomial Distribution, Poisson distribution and Normal Distribution.	**8**

References:

1. Sastry, Introductory method of Numerical Analysis, PHI, New Delhi.
2. Balaguruswamy, Numerical method, TMH, New Delhi.
3. Jain, Iyengar, Jain, Numerical Methods for Scientific & Engineering Computations, New Age International, New Delhi.

4. P. Kandasamy, Numerical Methods, S. Chand & Company, New Delhi.
5. H.K. Dass, Introduction to Engineering Mathematics, S. Chand & Company, New Delhi.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publication.
7. Q.S. Ahmad, Z.Khan&S.A.Khan, Numerical and Statistical Techniques, Ane Books Pvt.Ltd., New Delhi.

CO-PO/PSO MAPPING

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	3	1	2	1	3	1	2	1	2	1	2	2
CO2	3	2	1	1	1	2			2	2	3	1	3	2	2
CO3	2	2	2	2	1	1	3	2	3	1	1	2	2	1	2
CO4	3	2	1		3	1	1		2		3	3	2		1
CO5	1	2	2	3	1	2	1	3	1	2	1	2	1	2	2
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
B.Tech (CSE), 2nd Year/4th Semester
Subject Name: Database Management System, Subject Code: CS-212

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Explain the features of database management systems and relational database. Design conceptual models of a database using ER modeling for real life applications
CO 2	Create and populate a RDBMS for a real life application, with constraints and keys, using SQL. Retrieve any type of information from a database by formulating complex queries in SQL & Relational Algebra.
CO 3	Analyze the existing design of a database schema and apply concepts of normalization to design an optimal and efficient database.
CO 4	Analyze the concepts of indexing, hashing, database transactions, serializability, recoverability, deadlock, and ways to recover from deadlock.
CO 5	Explain database locks, timestamps and various concurrency control protocols to manage concurrent database access.

Objective:

- To describe a sound introduction to the discipline of database management systems and introduce concepts of the Entity-Relationship model.

- To build concepts of relational data model design by writing database queries using Relational Algebra and basic SQL as a universal database language
- To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization.
- To provide an overview of the concept of transactions, serializability, recoverability, deadlock, and how to recover from deadlock.
- To understand database locks, timestamps and various concurrency control protocols.

UNIT I		**9**
	Introduction: An Overview of Database Management System, Database System Vs File System, Database System Concepts and Architecture, Data Models Schema and Instances, Data Independence and Data Base Language and Interfaces, Data Definitions Language, DML, Overall Database Structure. **Data Modeling Using the Entity Relationship Model:** ER Model Concepts, Notation for ER Diagram, Examples based on E-R diagram, Mapping Constraints, Keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagrams to Tables, Extended ER Model, Relationships of Higher Degree.	
UNIT II		**8**
	Relational Data Model and Language: Relational Data Model Concepts, Integrity Constraints: Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. **Introduction to SQL:** Characteristics of SQL, Advantage of SQL. SQL Data Types and Literals. Types of SQL Commands. SQL Operators and Their Procedure. Tables, Views and Indexes. Queries and Sub Queries. Aggregate Functions. Insert, Update and Delete Operations. Joins, Unions, Intersection, Minus, Cursors in SQL.	
UNIT III		**8**
	Data Base Design & Normalization: Functional Dependencies, Normal Forms, First, Second, Third Normal Forms, BCNF, Inclusion Dependences, Loss Less Join Decompositions, Normalization using FD, MVD, and JDs, Alternative Approaches to Database Design. **Storage and File Structure:** Overview of Physical Storage Media, File Organization, Organization of Records in File, Data Dictionary Storage.	
UNIT IV		**8**
	Indexing & Hashing: Basic Concepts, B+ Tree Index Files, B- Tree Index Files, Static Hashing, Dynamic Hashing. **Transaction Processing Concepts:** Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Deadlock Handling.	
UNIT V		**8**
	Concurrency Control Techniques: Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols forConcurrency Control, Validation Based Protocol, Multiple Granularity, Multi Version Schemes, Recovery with Concurrent Transaction.	

References:

1. Korth, Silbertz, Sudarshan, "Data base concepts", McGraw-Hili
2. Elmasari, Navathe, "Fundamentals of Database Systems", Addison Wesley
3. Date C.J., "An Introduction to Database Systems", Addison Wesley

CO-PO/PSO MAPPING

CO	PO												PSO			
	PO I	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	1	1	1	2		2	2	1		3	1	1		2
CO2	2	2	3	3	2	1		1	2			2	1	2	1	3
CO3	3	2	1	1	2	2	3	1	2			3	1	2	1	
CO4	3	2	2	2	3	3				1		2		1	2	2
CO5	3	1	1	1	1	2	1					2	1	3	2	
1. Low Association 2: Average Association 3: Strong Association																

Integral University, Lucknow
Department of Computer Science & Engineering
B.Tech (CSE), 2nd Year/4th Semester
Subject Name: Computer Organization & Architecture, Subject Code: CS-284
w.e.fSession 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Describe the basic organization of computer and data representation techniques used in computer systems.
CO 2	Resolve the issues arising in the design of elements of memory hierarchy.
CO 3	Explain and design the control unit using hardwired and micro programmed approach.
CO 4	Acquire the knowledge of advanced concepts of performance measure and parallel processing.
CO 5	Explain and compare high performance processors.

Objective: Explain the basic components of computer, their interconnection and data representation techniques in computer systems. To assess the working of cpu and become familiar with computer arithmetic's. Understand the control unit design using hardwired and micro programmed approach. To study the memory organization and articulate design issues in each element of memory hierarchy

UNIT I	**Introduction to Computer Organization & Architecture** Elements of Digital Computer, Bus Architecture and Bus Arbitration, Micro-operation, Register Transfer, Bus and Memory Transfer, Data Representation, Addition and Subtraction of Signed Numbers, Booth Algorithm.	**8**
UNIT II	**Memory and Processor Organization** Memory: Main, Cache, Auxiliary and Virtual Memory, Concept of Address Mapping, Addressing Modes, Central Processing Unit (CPU): Single Accumulator, General Register, and Stack Organization. RISC and CISC Characteristics.	**8**
UNIT III	**Hardwired and Micro Programmed Control** Instruction Formats, Instruction and Interrupt Cycle, Timing and Control, Hardwired Control Design: Design of Computer Registers, Execution of a Computer Instruction, MicroProgrammed Control Design: Basic Concept of MicroProgrammed Control design, Microprogram Sequencer.	**8**
UNIT IV	**Parallel and Pipeline Processing** Introduction to Parallel Processing, Parallel Architecture Classification, Performance of Parallel Processors, Pipelining: Introduction, Arithmetic Pipeline, Instruction Pipeline, Introduction to different types of available computers.	**8**
UNIT V	**High Performance Processors** Superscalar, Vector, and VLIW Architecture, Cache Architecture: Cache Coherence and Synchronization Mechanism, Interconnection Network for Parallel Computers.	**8**

References:

6. "Computer System Arch." By- Morris Mano, Prentice Hall India, New Delhi.
7. "Computer Organization." By- Vranesic&Hamacher, Tata Mgraw Hill, New Delhi
8. "Kai Hwang", Advanced Computer Architecture, McGraw Hill International.
9. "Moreshwar R. Bhujade", Parallel Computing, New Age International.

CO-PO/PSO MAPPING

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2		1		2					1	2	2		3	
CO2	2		3	2	3			1			3	3				
CO3	3	3	3	2	2						1		2	1		2
CO4	3	3	2		3	3					3	3				1
CO5	3		3	3	2	2	1		1	2	1	2		2		
1. Low Association 2: Average Association 3: Strong Association																

Integral University, Lucknow
Department of Computer Science & Engineering
B.Tech (CSE), 2nd Year/4th Semester
Subject Name: Disaster Management, Subject Code: ES-202
w.e.f Session 2016

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Know about the concepts of database, their types, design concepts and ER-models
CO 2	Know about the concepts of relational databases, working with SQL for frontend development
CO 3	Know about the concepts of query optimization, transaction processing and concurrency control
CO 4	Know about the concepts of database technologies, distributed database environment
CO 5	Know about the concept of data warehouse, data cleaning and data integration

Objective: The objective of this course is to familiarize the students with basic management principles relating to disaster management and mitigation techniques.

UNIT I		**8**
	Concept of Disaster Management. Types of disaster and their impact:Natural and Man-made like- Earthquakes, Floods, Droughts, Cyclones,Avalanches,Forest Fires, Terrorism related disaster etc. Assessment of Human and Economic Losses.	
UNIT II		**8**
	Impact of Extensive Industrialization, Impact of Global Warming and Environmental degradation, National and Global Disaster.	
UNIT III		**8**
	National Policy for Disaster Management, Elementary knowledge of the disaster management Act 2005. Types of Responses: Central, State, District level, People's community participation in Disaster management. Post Disaster management and Rehabilitation measures.	
UNIT IV		**8**
	Capacity building for meeting disasters. Long- term measures for prevention of Disasters. Mitigation techniques/ Strategies: Early Warning Systems, Data sharing at National and International Levels.	

CO-PO/PSO MAPPING

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	3	1	2	1	3	1	2	1	2	1	2	2
CO2	3	2	1	1	1	2	3	2	2	2	3	1	3	2	2
CO3	2	2	2	2	1	1	3	2	3	1	1	2	2	1	2
CO4	3	2	1	2	3	1	1	3	2	2	3	3	2	3	1
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
B.Tech (CSE), 2nd Year/4th Semester
Subject Name: Graph Theory & Applications Subject Code: CS-281
w.e.fSession 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Demonstrate the knowledge of fundamental concepts in graph theory, including properties and characterization of graphs and trees.
CO 2	Apply models of Graph theory, Probability theory respectively to solve problems of connectivity anduncertainty.
CO 3	Analyzing graphs, trees and random phenomena occurring in real life situations using Graph theory.
CO 4	Interpret the models of Graph theory, Probability theory for real life and engineering problems.
CO 5	Develop efficient algorithms for graph related problems in different domains of engineering and science.

Objective: Learn the fundamental concepts in graph theory in view of its applications in modern science.Learn to understand and create mathematical proofs, including an appreciation of its significancein computer science. Use the concepts of Graph theory in subsequent courses in the design and analysis of algorithms,computability theory, software engineering and computer systems.Apply concepts of the theory of probability in study of random phenomena, analyzing andinterpreting data that involve uncertainties.

UNIT I	**Introduction to Computer Organization & Architecture**	**8**
	Graphs, Sub Graphs, Walks, Path & Circuits, Connected Graphs, Disconnected Graphs, Operations on Graphs, Euler Graphs, Hamiltonian Paths and Circuits, Trees, Pendant Vertices in Trees, Distance & Centers in Trees; Spanning Trees, Fundamental Circuits. Finding all Spanning Trees of a Weighted Graphs.	
UNIT II	**Memory and Processor Organization**	**8**
	Cut Sets and Cut Vertices, Properties of all Cut Sets in a Graph, Fundamental Circuit & Cut Set, Connectivity and Separability, Network Flows, Isomorphism. Planar Graphs, Combinatorial and Geometric Dual, Kuratowski's two Graph, Detection of Planarity	
UNIT III	**Hardwired and Micro Programmed Control**	**8**
	Introduction to Vector Space of a Graph and Vectors, Matrix Representation of Graph: Incidence Matrix and its Sub Matrices, Circuit Matrix and Cut Set Matrix, Path Matrix and Relationship Among Ar, Bf and Cf, Adjacency Matrices, Rank-Nullity Theorem.	

UNIT IV	**Parallel and Pipeline Processing**	**8**
	Colouring, Covering & Partitioning of a Graph: Chromatic Number, Chromatic Partitioning, Chromatic Polynomials, Matching, Covering, Four Colour Problem. Directed Graphs: Definitions, Types, Digraphs and Binary Relations	
UNIT V	**High Performance Processors**	**8**
	Applications of Graph Theory: Analysis and Synthesis of Contact Network, Activity Networks in Project Planning: Analysis of an Activity Network, Graphs in Game Theory, Graphs in Computer Programming.	

References:

10. DeoNarsingh, Graph Theory with Applications to Engineering and Computer Science, PrenticeHall, India, 1974.
11. Bondy J.A. and U.S. Murthy, Graph Theory with Applications, The Macmillan Press Ltd.,1976.
12. Harary F., Graph Theory, Addison-Wesley publishing Co., 1972.

CO-PO/PSO MAPPING

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	1	1	3			1	1	1	3	2		3	
CO2	3	3	3	2	3		3	1			3	3				
CO3	3	2	1	1	2				2		1			1		2
CO4	3	2	2		3	3					3	3				1
CO5	3	1	1	1	2	2	1		1	2	1	2		2		

1. Low Association 2: Average Association 3: Strong Association

COURSE: COMPUTER ORGANIZATION& ARCHITECTURE LAB

COURSE CODE: CS285

COURSE CREDIT: 1

COURSE OBJECTIVES:

- To learn the basic concepts of flip flops.
- To learn about adders and registers.
- To learn the working of counters and multipliers.
- To learn the working of associative memory cell.
- To learn the working of multiplexer and demultiplexer.

COURSE OUTCOMES (CO):
After completion of the course, a student will be able to

CO 1	Design & Implement various flip flop SR, JK, D and T
CO 2	Design & Implement half adder and full adder circuit.
CO 3	Design & Implementcounter and register.
CO 4	Design & Implement associative memory cell.
CO 5	Design & Implementmultiplexer and demultiplexer.

CO-PO MAPPING:

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2					2				2						2
CO2	3		3	3		1	2		2				3		4	
CO3	1	1								3				2		
CO4		2	2	3		1			1				1		3	1
CO5	1		1				3			1						
1. Low Association 2: Average Association 3: Strong Association																

COURSE: COMPUTER GRAPHICS LAB

COURSE CODE: CS283

COURSE CREDIT: 1

COURSE OBJECTIVES:

1. Understand the need of developing graphics application
2. Learn algorithmic development of graphics primitives like: line, circle, polygon etc.
3. Learn the representation and transformation of graphical images and pictures.

COURSE OUTCOMES (CO):

After completion of the course, a student will be

CO 1	Implement basic algorithms related to line & circle drawing.
CO 2	Implement various line & circle drawing algorithms.
CO 3	Hands on experiments on 2D transformations.
CO 4	Conceptual implementation of clipping and other drawing algorithms.
CO 5	Describe the importance of viewing and projections.

CO-PO MAPPING:

PO-PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	1	1	1	–	–	–	–	–	–	–	–	2	**1**
CO2	2	2	1	1	1	–	–	–	–	–	–	–	–	2	**1**
CO3	2	2	1	2	1	–	–	–	–	–	–	–	–	2	**1**
CO4	2	2	1	2	1	–	–	–	–	–	–	–	–	2	**1**
CO5	2	2	2	3	2	–	–	–	–	–	–	–	–	2	**1**
1. Low Association 2: Average Association 3: Strong Association															

COURSE: ADVANCE JAVA PROGRAMMING LAB

COURSE CODE: CS282

COURSE CREDIT: 1

COURSE OBJECTIVES:

- To learn the basic concepts and syntax of advance java programming.
- To be able to develop logics which help them to create programs and applications using java language.
- To learn the use of JDBC-ODBC.
- To learn the use of jsp and servlet .
- After learning the advance java programming they can easily create web projects.

COURSE OUTCOMES (CO):
After completion of the course, a student will be

CO 1	Able to understand the basic concepts of Advance java Programming..
CO 2	Able to design and develop various web pages using applet.
CO 3	Able to analyze and develop programs on Servlet and JSP.
CO 4	Able to develop programs on different project using Swing and Bean.
CO 5	Able to implement programs using JDBC-ODBC

List of Programs:

1. Create GUI application using AWT & Applet classes.
2. Design & develop the client-server application using NET package.
3. Implement database application using JDBC package.
4. Create client server Application using RMI.
5. Introduction to Java Beans and EJB program.
6. Describe & develop Java Servlet ,HTTP request and response program.
7. Create a Servlet program for cookies
8. Create application using Java Swing package.
9. Introduction to Java Server Pages and its sample programs.
10. Design program for JSP by using JSP Exception and JSP Action Elements.

CO-PO MAPPING:

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2		3		3						2		1
CO2	1	1	1	2	1		3						2	1	1
CO3	1	2	2	2			3							1	1
CO4	1		2	2			3						2	1	1
CO5	1	2	1				3						2	1	
1. Low Association 2: Average Association 3: Strong Association															

COURSE: DBMS LAB

COURSE CODE: CS220

COURSE CREDIT: 1

COURSE OBJECTIVES:

1. To explain basic database concepts, applications, data models, schemas and instances.
2. To demonstrate the use of constraints and relational algebra operations.
3. Develop solutions for database applications using procedures, cursors and triggers
4. Describe the basics of SQL and construct queries using SQL.
5. To familiarize issues of concurrency control and transaction management.

COURSE OUTCOMES (CO):
After completion of the course, a student will be

CO 1	Able to understand the basics of SQL and construct queries using SQL in database creation and interaction.
CO 2	Able to using COUNT, SUM, AVG, MAX, MIN, GROUP BY, HAVING, VIEWS Creation and Dropping.
CO 3	Ability to formulate queries using SQL DML/DDL/DCL commands.
CO 4	Understand various advanced queries execution such as relational constraints, joins, set operations, trigger.
CO 5	Able to design a commercial relational database system by writing SQL using the system.

List of Programs:
1. Database design using E-R Model and Normalization.
2. Write the queries for DDL, DML & DCL.
3. Write Queries using Logical Operators (=, <, > etc.)
4. Write queries using SQL operators (BETWEEN…AND, IN(list), LIKE, ISNULL and along with Negation expressions.)
5. Write SQL query using Character, Number, Date and Group Functions.
6. Write SQL Queries for Relational Algebra (UNION, INTERSECT and MINUS etc.)
7. Write queries for extracting data from more than one table (Equi-Join, Non-Equi Join, Outer Join)
8. Write SQL Queries for Sub queries, Nested queries.
9. Concept of COMMIT, ROLLBACK and CHECK POINTS.
10. Creation of Views.
11. Write programs by the use of PL/SQL (Procedures and Functions.)
12. High-level language extension with Cursor and with Triggers.
13. Creation of Forms & Reports.
14. Design and Implementation of the Mini Project.

CO-PO MAPPING:

PO-PSO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**

CO															
CO 1	3	2	3	2	2	1					2	3	1	2	
CO 2	2	3	3	2	3	1					2	1	3		
CO 3	3	3	2	3	3	3					1	2	1	1	
CO 4	3	3	3	2	3	1					3	1	2		2
CO 5	3	2	3	1	3	1					2	1	1		2
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
Subject Name: Design and Analysis of Algorithm, Subject Code: CS-301
w.e.f Session 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Would be able to analyze the problem and design an efficient algorithm to solve it by using & modifying classical design techniques or creating a new solution technique.
CO 2	For an algorithm given all the required parameters, would be able to analyze the algorithm and evaluate its utility in the given situation, able to apply the approach where problem can be solved by smaller input then apply for larger perspective
CO 3	Given more than one solutions for the problem, would be able to evaluate and compare those using standard mathematical techniques and select the best solution.
CO 4	For a design problem given, would be able to compare and evaluate different Data Structures available and modify or create new them for the same.
CO 5	For given different problems, would be able to categorize the different kind of complexities and develop non deterministic solution to problems having large complexities.

UNIT I	**Introduction:** Introduction: Algorithms, Analysis of Algorithms, Growth of Functions: Asymptotic Notations, Standard Notations and Common Functions; Recurrence Methods: Substitution Method, Iteration Method, Recursion Tree Method, Master's Method.	**8**
UNIT II	**Designing of Algorithms and Advanced Data Structure** Divide & Conquer: Heap Sort, Quick Sort, Sorting in Linear Time, Medians and Order Statistics.Red-Black Trees, Augmenting Data Structure, Binomial Heaps, Fibonacci Heaps.	**8**
UNIT III	**Advanced Design and Analysis Techniques** Greedy Algorithms: Knapsack Problem, Travelling Salesperson Problem, Minimum Cost Spanning Trees: Kruskal's Algorithm, Prim's Algorithm. Dynamic Programming: Longest Common Subsequence, Matrix Chain Multiplication, 0/1 Knapsack Problem, Single Source Shortest Path: Dijkstra's Algorithm, Bellman Ford Algorithm.	**8**
UNIT IV	**Amortized Analysis, Back Tracking: and Branch & Bound** Accounting Method, Aggregate Method, Potential Method, Introduction, Subset Sum Problem, n-Queens problem and Introduction, 0/1 Knapsack, 15 Puzzle problem.	**8**

UNIT V	**String Matching and Complexity Theory**	**8**
	Algorithm, The Rabin-Karp Algorithm, The Knuth-MorrisPratt Algorithm. Class P and NP, NP-hard Problems, NP-Complete Problems, Polynomial Reduction, Approximation Algorithm	

References:

1. Coremen, Rivest, Lisserson, "Algorithms", PHI.

2. Horwitz & Sahani, Fundamental of Computer Algorithm, Galgotia.

3. Michael T. Goodrich and Roberto Tamassia, Algorithm Design: Foundation, Analysis and Internet Examples, John Wiley Publications.

CO-PO/PSO MAPPING

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	3	1	3		3	1	1			1	1	3	
CO2	2	2	3	3	1	1	2	2	1			2	2	2	1
CO3	1	1	1	2	3	1		2	2			1		3	1
CO4	2	2	1	2	2	1	2	1	3		1		2	1	1
CO5	1	2	1	3	1		1		2	3	1	1	1	2	3
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
Subject Name: Principles of Operating System Subject Code: CS303
w.e.f Session 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	The basic concepts of Operating System, its functions and services.
CO 2	Design and effective memory management scheme for the operating system where there is less wastage and the response time is quick.
CO 3	The basic concepts of Processes in Operating System and the application of various CPU scheduling algorithms.
CO 4	Analyse the basic concepts of process synchronization, deadlock and related issues.
CO 5	The basic components of file management, disk management etc and will become familiar with the protection and security mechanisms taken by operating system.

Objective: To introduce students with basic concepts of Operating System, its functions and services.
To critique how memory management is implemented by the operating system, including concepts of paging, segmentation, paged segmentation etc. To introduce the concepts of Processes in Operating System and various algorithms to schedule these processes. To provide the knowledge of basic concepts towards process synchronization, deadlock and related issues.To gain insight on file management, disk management etc and to become familiar with the protection and security mechanisms taken by operating system.

UNIT I	**Desktop OS and Mobile OS**	**8**
	Importance of Operating Systems; Basic Concepts and Terminology; Evolution of Operating Systems: Batch, Interactive, Time Sharing & Real Time Systems. Operating System Structure: Simple Structure, Layered Approach; System Calls; Kernels: overview, objectives of kernel, types of kernels. Architecture, Android OS, iOS, Virtual OS, Cloud OS and their design.	
UNIT II	**Process,Threads, CPU Scheduling and Real Time Scheduling**	**8**
	Introduction, Process Model, Process State, Process Control Block. Overview, benefits of threads, types of threads. Basic Concepts, Scheduling Criteria, And Types of Scheduling, Scheduling Algorithms: FCFS, SJF, Round Robin, Priority Scheduling, Multilevel Queue Scheduling, Multilevel, Feedback Scheduling. Introduction, Uniprocessor scheduling, Multiprocessor Scheduling.	
UNIT III	**Process Synchronization and Deadlock**	**8**
	Principles of Concurrency, Race Condition, Critical Section, Critical Section Problem, Synchronization Mechanism, Semaphores and Classical Problems of Synchronization: Bounded Buffer Problem, Readers Writers Problem.Principles, System Model, Deadlock Characterization, Methods of Deadlock Handling: Prevention, Avoidance, Detection & Recovery from Deadlock	
UNIT IV	**Memory Management and Virtual Memory Management**	**8**

	Introduction, logical vs. physical address space, swapping, contiguous memoryallocation, paging, segmentation, segmentation with paging. Introduction, demand paging, performance, page replacement, page replacement algorithms (FCFS, LRU, Optimal), allocation of frames, thrashing.Other Memory Management Schemes: Swapping, Overlays.	
UNIT V	**Device Management, Disk Scheduling and Protection & Security**	**8**
	Introduction, types of devices, FCFS, SSTF, SCAN, CSCAN, LOOK, C-LOOK Scheduling File Systems: file concept, Access Mechanism, directory structure, file system structure, allocation methods (Contiguous, linked, indexed), free-space management (bit vector, linked list, grouping), Directory implementation (linear list, hash table), efficiency & performance.	

References:

1. Galvin, Silberchatz "Operating Systems Principles", Addision Wesley.
2. Milenekovie, "Operating System Concept", McGraw Hill.
3. Dietal, "An Introduction to Operating System", Addion Wesley.
4. Tannenbaum, "Operating System Design And Implementation", PHI.
5. Gary Nutt, "Operating System, A Modern Perspective", Addision Wesley

CO-PO/PSO MAPPING

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	3	2	3				1		3		**1**	
CO2	3	3	3	2	1	1		1				2			
CO3	3	2	1	1	2	2	3		2			3			**3**
CO4	3	2	2	2	3	3				1		2		**2**	
CO5	3	1	1	1	1	2	1					2			
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
Subject Name: Theory of Automata & Formal Languages Subject Code: CS304
w.e.f Session 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	To demonstrate computational mathematical models for problem solving and describe howthey relate to formal languages.
CO 2	To analyze the relationship among language classes and grammars with the help of Chomsky Hierarchy.
CO 3	To apply rigorous formal mathematical model for proving different properties of grammars, languages and automata.
CO 4	To apply mathematical foundations, algorithmic principles and computer science theory to the modeling and design of computer based systems in a way that demonstrates.
CO 5	Have an overview of how the theoretical study in this course is applicable to and engineering application like designing the compilers.

Objective: The primary objective of this course is to introduce students to the foundations of computability theory. Other objectives include the application of mathematical techniques and logical reasoning to important problems, and to develop a strong background in reasoning about finite state automata and formal languages.

UNIT I	**Machine**	**8**
	Finite state machine, definitions, Finite automaton model, acceptance of stringsandlanguagesDeterministic Finite Automata(DFA), Nondeterministic Finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, FA with output: Moore and Mealy machine, Equivalence of Moore and MealyMachine, Applications and Limitation of FA.	
UNIT II		**8**
	Chomsky Hierarchy, Regular Grammars, Unrestricted Grammars, Context Sensitive Language, Regular expression (RE); Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non-Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages	
UNIT III		**8**

	Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.	
UNIT IV		**8**
	Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stacks PDA, Non-Deterministic Push Down Automata.	
UNIT V		**8**
	Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory	

.

References:

1. HopcroftandUllman,"IntroductiontoAutomataTheoryLanguagesandComputation",AddisonWesley.
2. Mishra&Chandrasekhar,"TheoryofComputerSciences",PHI.
3. PeterLinz,"AnIntroductiontoFormalLanguagesandAutomata",Jones&Ba
rtlettLearning. Recommended Prerequisite – CS206Co-requisite - None

CO-PO/PSO MAPPING

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2		1		1		1		2	**1**		**3**
CO2	3	2	3	2	2	1						2		**3**	
CO3	3	3	3	2	1	2			2			2	**2**		**3**
CO4	3	2	2	2	3	3	1	2		1	1	2	**2**		
CO5	3	2	1	1		2				2		2		**1**	**2**

1. Low Association 2: Average Association 3: Strong Association

Integral University, Lucknow
Department of Computer Science & Engineering
Subject Name: Software Engineering, Subject Code: CS-340
w.e.f Session 2022-23

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Identify the best suitable SDLC model for a given set of user requirements.
CO 2	Estimate the total effort, to assess and manage the potential risks involved while developing the software.
CO 3	Create a good quality SRS and design a highly cohesive and low coupled software.
CO 4	Follow the standard coding guidelines and practices and prepare best possible test cases to uncover errors.
CO 5	Work on modern CASE tools and follow the international quality standards to produce good quality software.

Objective:

1. Explain the basic understanding of software, its characteristics, and importance of following engineering principles to develop software.
2. Assess the applicability, strengths, and weaknesses of the different development life cycle models to provide real world software solutions.
3. To understand various processes of each phase of SDLC and make the students capable to prepare quality documentation for software development.
4. To develop effort estimation and risk management skills for developing software.
5. Study of CASE tools, Quality Assurance activities etc. for focusing on quality issues of software.

UNIT I	**Introduction to Software Engineering**	**8**
	Types of Software, Software Characteristics, Quality of a Good Software, Software Myths, Software Components, Software Crisis, Software Engineering: Definition, Challenges, Software Engineering Processes, Similarity and Differences from Convential Engineering Processes. Software Development Life Cycle Models: Build and Fix Models, Waterfall Model, Prototyping Model, RAD Model Iterative Enhancement Model, Evolutionary Development Model and Spiral Model, WINWIN Spiral Model, Fourth Generation Techniques.	
UNIT II	**Planning a Software**	**8**
	Process Planning, Effort Estimation: Uncertainities in Effort Estimation, Building Effort Estimation Models, A Bottom-Up Estimation Approach, COCOMO Model, Project Scheduling & Staffing: Overall Scheduling, Detailed Scheduling, Team Structure, Software Configuration Management(SCM): - Baselines, Version Control, Change Control & Configuration Audit, Risk Management: Reactive and Proactive Risk Strategies, Software Risks, Risk Analysis, Identification, Projection, Assessment, Monitoring and Managing the Risk, RMMM Plan.	
UNIT III	**Software Requirements Analysis and Specification**	**8**

	Software Requirements: Need for SRS, Requirement Process, Problem Analysis: Informal & formal Approaches, Data Flow Modeling, Object Oriented Modeling, Prototyping, Requirements Specifications: Characteristics of an SRS, Components of SRS, Specification Language, Structure of Requirement Document: IEEE Standards for SRS, Validation, Metrics. **Designing and Coding:** Designing: Function Oriented Design: Design Principles: Problem Partitioning and Hierarchy, Abstraction, Modularity, Top Down and Bottom-Up Strategies, Module Level Concepts: Coupling, Cohesion; Structure Design Methodology, Verification, Introduction to Object Oriented Design & User Interface Design, Software Measurement Metrics: Various Size Oriented Measures- Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.	
UNIT IV	**Coding & Testing**	**8**
	Coding: Programming Principles and Guidelines: Common Coding Errors, Structured Programming, Information Hiding, Programming Practices, Coding Standards, Coding Process, Refactoring, Verification: Code Inspection, Static Analysis, Proving Correctness, Combining Different Techniques, Metrics. **Testing:** **Testing Fundamentals:** Error Fault and Failure, Test Oracles, Test Cases and Test Criteria, Test Case Execution and Analysis, Unit Testing, Integration Testing: : Top Down and Bottom up, Acceptance Testing: Alpha and Beta Testing., Regression Testing, functional and non-functional testing. Testing Techniques: White Box: Logic Coverage, Path Coverage, Loop Coverage, Data Flow Testing. Black Box Testing: Boundary Value Analysis, Equivalence Class Testing, state Table Based Testing, Decision Table Based Testing.	
UNIT V	**Computer Aided Software Engineering (CASE)**	**8**
	CASE Tools, Scope, Benefits of CASE Tool, support in Software Life Cycle, Architecture of CASE Environment, Types of CASE Tools, Software Reliability and Quality Management: -Software Quality Management: Quality Concepts, Software Quality Assurance, Software Reviews, Formal Technical Reviews, and Statistical Quality Assurance. Software Reliability, ISO 9000 Quality Standards, CMM Levels.	

References:

1. Software Engineering: A Practitioner's Approach by Roger S. Pressman, McGraw-Hill International edition.

2. An Integrated Approach to Software Engineering, by Pankaj Jalote, Narosa Publishing House.

3. Software Engineering by K.K. Agarwal.

4. Software Engineering by Ian Sommerville, Addison-Wesley.

5. Fundamentals of Software Engineering by Rajib Mall, PHI.

CO-PO/PSO MAPPING

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	2		1	1	2	2	3	2	1	3			
CO2	3	3	2	2	1		1		2	1	3	1		2	1	
CO3	3	3	3	2					3	3		2		3		
CO4	3	2	2	2	1	3		2	3	3		2	2	1		
CO5	3	1	3	2	3	2	1	2	2	2	2	2			1	1
1. Low Association 2: Average Association 3: Strong Association																

Integral University, Lucknow
Department of Computer Science & Engineering
B.TECH. CSE
Subject Name: Cloud Computing, Subject Code: CS-334
w.e.f Session 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO1	Explain the various paradigm of cloud computing and computing techniques.
CO2	Articulate the concepts ,key technologies, strength and limitation of cloud computing and possible application
CO3	Identify the architecture and infrastructure of cloud computing including SaaS, PaaS,Iaas, public cloud, private cloud and hybrid cloud.
CO4	Interpret various data, scalability and cloud services to acquire efficient database for cloud storage.
CO5	Describe the appropriate cloud computing solutions and recommendations according to application used.

Objective:

1.To study the the various paradigm of cloud computing and computing techniques.

2.To study the concepts ,key technologies, strength and limitation of cloud computing and possible application

3.To understand the architecture and infrastructure of cloud computing including SaaS, PaaS,Iaas, public cloud, private cloud and hybrid cloud.

4.To study Interpretation of various data, scalability and cloud services to acquire efficient database for cloud storage.

UNIT I		**8**
	Introduction: Historical development, Vision of Cloud Computing, Characteristics of cloud computing as per NIST, Cloud computing reference model, Cloud computing environments, Cloud services requirements, Cloud and dynamic infrastructure. Overview of cloud applications: ECG Analysis in the cloud, Protein structure prediction, Gene Expression Data Analysis ,Satellite Image Processing, CRM and ERP ,Social networking.	
UNIT II		**8**

	Cloud Computing Architecture: Cloud Reference Model, Types of Clouds, Cloud Interoperability & Standards, **Scalability and Fault Tolerance; Cloud Solutions: Cloud Ecosystem, Cloud Business Process Management, Cloud Service** **Management. Cloud Offerings: Cloud Analytics, Virtual Desktop Infrastructure.**	
UNIT III		**8**
	Cloud Management & Virtualization Technology: Resiliency, Provisioning, Asset management, Concepts of Map reduce, **Cloud Governance, High Availability and Disaster Recovery. Virtualization: Fundamental concepts of compute ,storage,** **networking, desktop and application virtualization .Virtualization benefits, server virtualization, Block and file level storage** **virtualization Hypervisor management software, Infrastructure Requirements , Virtual LAN(VLAN) and Virtual** **SAN(VSAN) and their benefits.**	
UNIT IV		**8**
	Cloud Security: Cloud Information security fundamentals, Cloud security services, Design principles, Secure Cloud **Software Requirements, Policy Implementation, Cloud Computing Security Challenges, Virtualization security** **Management, Cloud Computing Security Architecture.**	
UNIT V		**8**
	UNIT 5 **Market Based Management of Clouds, Federated Clouds/Inter Cloud: Characterization & Definition, Cloud Federation** **Stack, Third Party Cloud Services. Case study: Google App Engine, Microsoft Azure, Hadoop, Amazon.**	

References:

1. **Buyya, Selvi ," Mastering Cloud Computing ",TMH Pub.**
2. **Kumar Saurabh, "Cloud Computing" , Wiley Pub.**
3. **Krutz , Vines, "Cloud Security " , Wiley Pub.**
4. **Velte, "Cloud Computing- A Practical Approach" ,TMH Pub.**
5. **Sosinsky, "Cloud Computing" , Wiley Pub.**

CO-PO/PSO MAPPING

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	–	–	–	–	–	–	–	–	–	–	–	–	3
CO2	3	3	–	–	–	–	–	–	–	–	–	–	–	–	3
CO3	3	3	3	3	–	–	–	–	–	–	–	–	2	3	3
CO4	3	3	3	3	–	–	–	–	–	–	–	–	2	3	3
CO5	3	3	3	3	–	–	–	–	–	–	–	–	2	3	3

1. Low Association	2: Average Association	3: Strong Association

Integral University, Lucknow
Department of Bioengineering
B.TECH. COMPUTER SCIENCE & ENGG
Subject Name: Introduction to Internet of Things, Subject Code: CS341
w.e.fSession 2021-22

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Understand the concepts of Internet of Things and can able to build IoT applications.
CO2	Understand IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, and sensing modules
CO3	Student must be able to understand the specialized aspects of IoT Devices
CO4	Elaborate the need for Data Analytics and Security in IoT
CO5	Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi

OBJECTIVES:

1. To understand the concepts of Internet of Things.
2. To introduce the concept of M2M (machine to machine) with necessary protocols
3. To illustrate diverse methods of deploying smart objects and connect them to network.
4. To introduce the Raspberry PI platform, that is widely used in IoT applications
5. To Infer the role of Data Analytics and Security in IoT

UNIT I	**Introduction to IoT**	**7**
	Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT,Comparing IoT Architectures , Functional blocks of IoT, Communication models & APIs, IoT Challenges.	
UNIT II	**Communication Protocols**	**7**
	Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensors, Actuators and Smart Objects, Sensor Networks, Connecting Smart Objects, IoT AccessTechnologies.	
UNIT III	**IoT and M2M**	**8**

	Software defined networks, network function virtualization, difference between SDNand NFV for IoT, Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMPNETOPEER	
UNIT IV	**IoT Physical Devices and Endpoints**	**10**
	Introduction to Arduino and Raspberry Pi- Installation,Interfaces (serial, SPI, I2C), Programming – Python program with Raspberry PI focusing on interfacing externalgadgets, controlling output, reading input from pins.	
UNIT V	**IoT Physical Servers and Advanced Topics**	**8**
	Introduction to Cloud Storage models andcommunication APIs, Web server – Web server for IoT, Cloud for IoT, An Introduction to Data Analytics for IoT,Big Data Analytics Tools and Technology, Securing IoT, Common Challenges in OT Security,	

References:

1. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition,McGraw Hill Education, 2017. (ISBN: 978-9352605224)
2. Internet of Things - A Hands-on Approach, ArshdeepBahga and Vijay Madisetti, Universities Press, 2015, ISBN: 978817371954
3. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,"IoT

CO-PO/PSO MAPPING:

↓CO\PO\PSO →	PO1: Ability to apply knowledge of science, computing and	PO2: Ability to analyze the computer engineering problems.	PO3: Ability to develop and design solutions based on	PO4: Ability to handle complex and interdisciplinary	PO5: Ability to apply state of the art tools and techniques in	PO6: Ability of being aware about the existing social	PO7: Ability to provide environment friendly and	PO8: Ability to understand their professional and ethical	PO9: Ability to work as an individual as well as in teams.	PO10: Ability to communicate with the stake holders by	PO11: Ability to manage the day to day challenges by optimizing	PO12: Ability to engage and encourage themselves in	PSO1	PSO2	PSO3	PSO4
CO1	1	2		3	1		3	2				1	2	1	2	2
CO2			2	3	3				2	3	1	1	1	1	3	2
CO3	1	3			2	1		2	3				1	2	1	2
CO4			1	2			3			3	2	1	2	3	2	1
CO5:	1	2	3		1	2		3					2	1	1	3
3: Strong Association, 2: Average Association, 1: Low Association																

Title of the Course: Digital Image Processing Course Code: CS312	L	T	P
	3	1	0

CO	After the completing the course the student should be able to	level
CO1	Explain basic image processing techniques for solving real problems	2
CO2	Applying processing techniques for solving problems in Computer Science	3
CO3	Evaluate algorithms for higher level image processing.	4
CO4	Develop understanding for object registration and recognition	4
CO5	Develop an application using existing image processing algorithms	6

PO	**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**	**PS O1**	**PS O2**	**PS O3**	**PS O4**
CO 1	2	1	3	1	1	3	1	2	1	1	2	**3**	**2**		
CO 2	3	2	3	2	1	1			2		2	**1**	**3**		
CO 3	2	2	1	1	2	2	3		1		3			**3**	
CO 4	3	2	2	2	3	3					2			**3**	
CO 5	3	1	1	1	1	2	1				2				**3**

1. Low Association 2: Average Association 3: Strong Association

COURSE: Visual Programming Lab

COURSE CODE: CS343

COURSE CREDIT: 1

COURSE OBJECTIVES:

This course introduces computer programming using the Visual BASIC programming language with object-oriented programming principles. Emphasis is on event-driven programming methods, including creating and manipulating objects, classes, and using object-oriented tools.

COURSE OUTCOMES (CO):
After completion of the course, a student will be

CO 1	Design, create, build, and debug Visual Basicapplications.
CO 2	Explore Visual Basic's Integrated Development Environment (IDE).
CO 3	Write and apply decision structures for determining different operations
CO 4	Write and apply procedures, sub-procedures, and functions to create manageable code.
CO 5	Write Visual Basic programs using object-oriented programming techniques including classes, objects, methods, instance variables, composition, and inheritance, and polymorphism.

CO-PO MAPPING:

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2		3		3						2	1	3
CO2	1	2	2	1	3		1						1	3	1
CO3	3	2	2	2			2						3	1	2
CO4	2	1	3	1			2						1	2	1
CO5	1	2	1				3						2	1	2
1. Low Association 2: Average Association 3: Strong Association															

COURSE: OPEN SOURCE SOFTWARE TECHNOLOGIES LAB

COURSE CODE CS310

COURSE CREDIT: 1

re-requisite	Co-requisite	L	T	P	C
None	None	0	0	2	1

CO 1	Explain common open source licenses and the impact of choosing a license to explain open- source project structure and how to successfully set up a project
CO 2	Competent with Linux in their systems Install different useful packages in Linux using RPM can Schedule task automatically and run administrative commands.
CO 3	Able to understand web server easily how to store, process and deliver web pages to the users. How intercommunication is done using by variety of available Protocols.
CO 4	Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database by formulating complex queries in MySQL.
CO 5	Design and develop Client Server applications using open source scripting language. Able how to design GUI Applications in open source scripting language to evaluate different processes.

COURSE OBJECTIVES:

- To motivate students to use open source operating systems.
- To teach students to setup their own Linux server .
- To teach students to setup their own web server and commands
- To learn using MySql as an open source database system.
- To learn PHP as open source development programming language.

List of Experiments:

Overview of FOSS & Basic Command interface on Linux
Usage of Basic Linux Commands, File and Folder Management Commands
Learning Network related Command and Administrative Commands
Learning Vi Editor & its Modes And GUI Tools
Learning Shell Script, A Shell Script to demonstrate various control Constructs
A Script to check for a file and directory existence in the file system
A Script to execute different command to demonstrate Switch

A Script to handle command line argument and other Special symbols
Learn how to Compile, Debug & Execute C, C++ & Java Programming Codes without IDEs.
Learning about LAMP STACK its Installation And Configuration on Linux (Ubuntu) and Perform Post
Creating simple Database in MySql Server performing queries
Learning A Deep Dive in MySql Server Using PhpMyAdmin Tool for Administering and Monitoring the
Basics of PHP Web Programming, PHP code to demonstrate the usage of Variable, String, Array and
Some Deep Dive in PHP Programming:- A PHP Program to implement customized functions and other
A PHP Program to demonstrate the use of PHP mail ()
Learning Database Connectivity between PHP and MySql, Create a login Control for a web page to
A Mini Project to create a website for University Utilities

CO-PO MAPPING:

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	1					2			3	3	2	
CO2	2	3	3	2					2			1	2	2	
CO3	3	3	2	2		2	3		2			1	1	2	
CO4	2	2	3	2	1	2			2			1	2	1	
CO5	2	2	2	2					2			1			3
1. Low Association 2: Average Association 3: Strong Association															

COURSE: Designing and Analysis of Algorithm Lab

COURSE CODE: CS 302

COURSE CREDIT: 1

COURSE OBJECTIVES:

- To learn the basic concepts of divide and conquers with help of various examples.
- To be able to develop logics which help to find the optimal solution.
- To learn the Dynamic approach to through various problems.
- To learn the uses of augmented data structure and their implementation.
- Learning Backtracking and its implementation.

COURSE OUTCOMES (CO): After completion of the course, a student will be

CO 1	Able to understand the basic concepts of Divide and conquer their implementation.
CO 2	Able to understand and develop solution to optimization problem(Greedy algorithm)
CO 3	Able to analyze and develop dynamic solution and implementation
CO 4	Develop understanding of Backtracking problems and their implementation
CO 5	Understanding and develop the logic to implementation of different augmenting data structures (RB Tree)

List of Experiments:

Experiment No.	**Program**
	Introduction
1	Implement Merge Sort
2	Implement Quick Sort(Divide & Conquer)
3	Implement Heap Sort
4	Implement Knapsack problem (Greedy ALGO.)
5	Implement of directed and undirected graph
6	Implement Shortest path by Dijkstra Algorithm
7	Implement 8- Queen problem(Back Tracking)
8	Implement Minimal spanning tree by
8.1	Kruskal's Algorithm
8.2	Prim's Algorithm
9	Implement Pattern Matching

10	Implement Binary Search Tree
11	Insert a element in Red Black Tree

CO-PO MAPPING:

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2		3	1	3	1					2	1	1
CO2	2	1	3	2	1	2	3					1	2	1	1
CO3	1	2	2	2			3	2				2	2	1	1
CO4		2	2	2	1	2	3	2					2	1	1
CO5	1	2	1		1		3					1	2	1	1
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
Subject Name: DATA COMPRESSION Subject Code: CS342
w.e.f Session 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Understand the importance of compressions, and different compression models
CO 2	Solve the various problems based on lossless compression approach such as Huffman, adaptive Huffman models
CO 3	Solve problems using arithmetic and dictionary based compression techniques.
CO 4	Apply partial prediction matching, and learn to transformation of source basedon Transform algorithms
CO 5	Represent the various dynamic model in the form of structured vector representation

Objective:

- Basic knowledge of Data compression
- Types of data compression
- Various techniques o f Data compression
- Application of data compression

UNIT I	**Introduction** Compression Techniques: Loss Less Compression, Lossy Compression, Measures of Performance, Modeling and Coding. Mathematical Preliminaries for Lossless Compression: A Brief Introduction to Information Theory: - Models: Physical Models, Probability Models, Markov Models, Composite Source Model, Coding:-Uniquely Decodable Codes, Prefix Codes	**8**
UNIT II	**Huffman Coding** The Huffman Coding Algorithm: Minimum Variance Huffman Codes, Adaptive Huffman Coding: Update procedure, Encoding procedure, decoding procedure. Golomb Codes, Rice Codes, Tunstall codes. Application of Huffman Coding. Text compression, Audio Compression.	**8**
UNIT III	**Arithmetic Coding** Coding a Sequence, Generating a Binary Code, Comparison of Binary and Huffman Coding, Applications: Bi-Level Image Compression-JBIG and JBIG2 Standards. Dictionary Techniques: Introduction, Static Dictionary: - Diagram Coding, Adaptive Dictionary: The LZ77 Approach, The LZ78 Approach Applications. Image Compression: The Graphics Interchange Format (GIF), Compression over Modem.	**8**
UNIT IV	**Prediction with Partial Match**	**8**

	The Basic Algorithm, The ESCAPE SYMBOL, Length of Context, The Exclusion Principle, The Burrows-Wheeler Transform, Move-to- Front Coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markov Compression.	
UNIT V	**Quantization**	**8**
	Introduction of Scalar and Vector Quantization, Advantages of Vector Quantization Over Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree Structured Vector Quantizes, Structured Vector Quantizes.	

References:

1. Introduction to Data Compression, Second Edition, Khalid Sayood, The Morgan Kaufmann Series
2. Data Compression: The Complete Reference 4th Edition by David Salomon, Springer
3. Text Compression1st Edition by Timothy C. Bell Prentice Hall
4. Elements of Data Compression, Drozdek, Cengage Learning

CO-PO/PSO MAPPING

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2								3	2	2
CO2	2	2	2	2	2								2	2	1
CO3	2	2	1	1	2								3	2	1
CO4	3	2	1	2	1	2	1						3	2	1
CO5	2	2	3	2	2	1	1	1					3	2	2
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
Subject Name: Microprocessor and its Applications, Subject CodeCS-313
w.e.fSession 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	**Understand the basic architecture of 8085 and 8086.**
CO 2	**Impart the knowledge about the instruction set.**
CO 3	**Understand the basic idea about the data transfer schemes and its applications**
CO 4	**Develop skill in simple program writing for INTEL 8085 and INTEL 8086.**
CO 5	**Understand advance microprocessor, microcontroller and Embedded System.**

Objective: This course deals with the systematic study of the Architecture and programming issues of 8 bit 8085-microprocessor and interfacing with other peripheral ICs and co-processor. In addition, a 16-bit microprocessors and other chips (8255, 8251, 8253 and 8257) are introduced. The aim of this course is to give the students basic knowledge of the microprocessors (8085 and 8086) needed to develop the systems using it.

UNIT I	Category of Memory, Microprocessor, Microcontroller, Buses, machine Language, Assembly Language, High Level Language, Assembly Language Program Development Tool. 8085 Microprocessor: Architecture, Pin diagram, Instruction Type, Instruction Cycle, Timing Diagram, Addressing Modes, Instruction Set. Assembly Programming based on 8085, Interrupt and Interrupt Service Routine.	**8**
UNIT II	8086 Microprocessor: Architecture, Pin Diagram, Timing Diagram, Addressing Modes, Instruction Set, Instruction Templates, Assembly Language Programming: Based on Procedure, Macros, Number conversion, String operation.	**8**
UNIT III	Interfacing with Peripheral Devices and Memory: Types of Transmission, 8257(DMA), 8255(PPI), Serial Data Transfer (USART 8251), Keyboard- Display Controller (8279), Priority Interrupt Controller(8259)	**8**
UNIT IV	Interfacing with Timers and its Applications: Programmable Interval Timer/Counter (8253/8254): Introduction, Modes, Interfacing of 8253, Applications, ADC: Introduction, ADC Converters, ADC IC (0808/0809), Interfacing and Application of ADC.	**8**
UNIT V	Advanced Microprocessors and Micro-Controller: Introduction to Intel 80186, 80286, 80386 and 80486 Microprocessor. Introduction to Embedded System and Microcontrollers, 8051 Micro-controller: Introduction, Architecture.	**8**

References:

1. R.S. Gaonkar: “Microprocessor architecture, Programming and Applications with 8085/8080”, Penram Publication.
2. B.Ram : “ Fundamental of Microprocessor and Microcomputer”, DhanpatRai Publication, 4th edition.
3. R. Singh and B.P. Singh: “ Microprocessor Interfacing and its application”, New Age International Publishers, 2nd Edition.
4. D.V. Hall: “ Microprocessor Interfacing”, TMH (Revised 2nd Edition).
5. R. Singh and B.P. Singh: “Advanced Microprocessor and Micro-controllers”, New Age International Publishers, 2nd Edition

CO-PO/PSO MAPPING

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	2	1	1			1	1	1	2	1	2	2
CO2	2	3	1	1	1	2	3	2		2			3	2	
CO3	1	2	2	2					1	1	1	2	2	1	2
CO4	1	2	2	3	4	1				2		3	2		
CO5	1	1	2	3	5			3	1	2	1	2	1	2	2
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
Subject Name: COMPILER DESIGN, Subject Code: CS 315
w.e.fSession 2020-21

Pre-requisite	Co-requisite	L	T	P	C
Theory of Automata and formal Languages (CS 304	**None**	**3**	**1**	**0**	**4**

CO 1	**Know about the concepts of a preprocessor, translation rule ,cross compiler, assembler loader and linker.**
CO 2	**To know about the basic principles of the compiler, and its constituent parts, algorithms, and data structures required to be used in the compiler.**
CO 3	**Know about the conceptsof the function and complexity of modern compilers.**
CO 4	**Know about the concepts of code generation algorithms to get the machine code for the optimized code**
CO 5	**Know about the concept flow graph, machine-dependent, and machine-independent optimization, intermediate code ,.**

Objective: The course curriculum helps to understand the concepts of compiler and phases, various translation schemes, the complexity of the input program, machine dependent code and machine independent code, optimization theory, syntax directed translation scheme of the input jobs, role and responsibility of pre-processor in compiler designing and compiling of the input jobs.

UNIT I	Introduction to Compiler, Phases and Passes, Bootstrapping, Finite State Machines and Regular Expressions and their Applications to Lexical Analysis, Implementation of Lexical Analyzers, Lexicalanalyzer Generator, LEX-compiler, Formal Grammars and their Application to Syntax Analysis, BNF Notation, Ambiguity, YACC.	8
UNIT II	The Syntactic Specification of Programming Languages: Context Free Grammars, Derivation and Parse Trees, Capabilities of CFG. Basic Parsing Techniques: Parsers, Top Down Parsing, Predictive Parsers, LL(1), Shift Reduce Parsing, Operator Precedence Parsing, Elimination of left recursion	8
UNIT III	Automatic Construction of Efficient Parsers: LR Parsers, the Canonical Collection of LR(O) Items, Constructing SLR Parsing Tables, Constructing Canonical LR Parsing Tables, Constructing LALR Parsing Tables, using Ambiguous Grammars, an Automatic Parser Generator, Implementation of LR Parsing Tables, Constructing LALR Sets of Items.	8

UNIT IV	Syntax-Directed Translation: Syntax-Directed Translation Schemes, Implementation of Syntax-Directed Translators, Intermediate Code, Postfix Notation, Parse Trees & Syntax Trees, Three Address Code, Quadruple & Triples, Translation of Assignment Statements, Boolean Expressions, Statements that Alter the Flow of Control, Postfix Translation, Translation with a Top Down Parser. More About Translation: Array References in Arithmetic Expressions, Procedures Call, Declarations, Case Statements.	8
UNIT V	Symbol Tables: Data Structure for Symbols Tables, Representing Scope Information. Run-Time Administration: Implementation of Simple Stack Allocation Scheme, Storage Allocation in Block Structured Language. Introduction to Code Optimization: Loop Optimization, the DAG Representation of Basic Blocks, Value Numbers and Algebraic Laws, Global Data-Flow Analysis. Introduction to Code Generation.	8

References:

1. Aho, Sethi & Ullman, "Compiler Design", Addision Wesley.

CO-PO/PSO MAPPING

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	2	1	1			1	1	1	2	1	2	2
CO2	2	3	1	1	1	2	3	2		2			3	2	
CO3	1	2	2	2					1	1	1	2	2	1	2
CO4	1	2	2	3	4	1				2		3	2		
CO5	1	1	2	3	5			3	1	2	1	2	1	2	2
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
Subject Name: Computer Networks, Subject Code: CS-305
w.e.f Session 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	**A.** Students shall be able to understand the basic concepts of communication process including the key aspects of networking such as hardware components, communication principles, and performance criteria of a Network. **B.** Demonstrate the ability to recognize and differentiate various transmission media, switching techniques and to identify limitations of typical communication systems, physical structures, network models, and internetworking. **C.** Students shall be able to compare and contrast Open System Interconnect (OSI) and the TCP/IP Model for its worth, need and operability.
CO 2	**A.** Demonstrate clear understanding & Ability to utilize the knowledge of error handling techniques to detect and remove errors from data packets. **B.** Analyze and distinguish various flow control techniques at Data Link layer and formulate concrete logic to resolve flow control issues in network. **C.** Comprehend and apply the knowledge of access control mechanism for secure and smooth functioning of network.
CO 3	**A.** Able to demonstrate clear understanding of Routing mechanism and IP addressing schemes. **B.** Able to understand and apply the knowledge IP addressing schemes to identify, deduce and design network structure based on the concept of sub-netting/super-netting using modern simulation tools in lab such as **Packet-Tracer.** **C.** Identify and Apply knowledge of routing approaches and schemes to identify and develop appropriate routing algorithms as solution by analyzing to problem statement in the purview of inter-networking using modern tools in lab such as **Net-Sim.**
CO 4	**A.** Demonstrate the clear understanding of Transmission Control Protocol and Congestion control techniques. **B.** Illustratively explain the concept of Connectionless and Connection oriented services and unambiguously differentiate and identify the best preferred service for a given problem statement. **C.** Able to apply the knowledge of flow control and congestion control techniques to evaluate the performance of network using modern tools in Lab such as Network Simulator
CO 5	**A.** Students shall be able to recognize, evaluate and explain various reasons and causes affecting Network performance. **B.** Students shall be able to analyze and evaluate to Quality of Service in networking and apply knowledge to improve the same. **C.** Demonstrate the ability to identify various protocols and its internal functioning which are used at Application layer. Students will have in depth knowledge of networking-process, issues, challenges and various approaches to resolve them thru classical networking techniques and modern tools like NS2.

Objective: The objective of this curriculum is to inculcate the conceptual & practical knowledge of computer networking right from "Basic" to a "Higher-Level" understanding of the subject. It helps to acquire the know-how of designing & organization computer network, understanding the communication process and use of networking devices. The course objectives include learning Network Models, its working principles and network protocols

involved therein. It also helps students to gain the practical knowledge of designing efficient networks, its implementation, monitoring and troubleshooting of computer network.

UNIT I	**Basics of Network & Physical Layer** Data communication, Components, Data representation, Data flow. Performance criteria, topologies, category: LAN. MAN & WAN. OSI layered architecture, TCP/IP protocol suite. Physical Layer: Transmission Media Guided media, Twisted pair, coaxial cable, fiber optics. Unguided media: radio waves, microwaves & infrared waves. Circuit switching network, Packet Network & Virtual Circuit. Connecting Devices: Repeater, Hub, Switch, Bridge, Router and Gateway.	**8**
UNIT II	**Data Link Layer** Error Handling: types of error, Block Coding, Hamming distance, Linear Block Codes, Cyclic Codes. Flow control: Stop & wait, Sliding Window Protocols: Designing and functioning of Go-Back-N, Selective Repeat method. Random Access protocol ALOHA, CSMA, CSMA/CD. Channelization: Frequency Division Multiple Access, Time Division Multiple Access, Code Division Multiple Access. Overview of Fast Ethernet: FDDI.	**7**
UNIT III	**Network Layer** IPv4 Addressing, Classfull addressing, net-id, hosted, mask, subnet. Classless addressing, subnetting using classless addressing. Datagram formats for IPv4 and IPv6 addresses. Address mapping protocols: ARP and RARP. Packet delivery and packet forwarding. Unicast routing: Distance vector routing-RIP and Link state routing-OSPF. Path vector routing-BGP	**10**
UNIT IV	**Transport Layer** Process to process delivery, Connectionless versus connection oriented services. User data gram protocol, frame format of datagram. Transmission control protocol: TCP services, TCP features, Segment format. Congestion Control: Open loop techniques (Retransmission, window and acknowledgement policies.), Closed loop techniques (Back pressure and choke packet).	**8**
UNIT V	**Quality of Service** Flow characteristics: Reliability, Delay, Jitter and bandwidth. Traffic Scheduling: FIFO technique, Weighted fair queuing. Traffic shaping: Leaky bucket and token bucket. Application Layer: Domain name System: Name space, Domain Name space, Distribution of domain name space. DNS in internet, Resolution. Electronic Mail: SMTP, IMAP, POP3. File Transfer: FTP. Telnet, WWW: architecture, Client, URL, Cookies.	**8**

References:

1. Forouzen, **"Data Communication and Networking",** TMH
2. A.S.Tanenbaum**, "Computer Networks",** 3rd Edition,Prentice Hall India,1997
3. W. Stallings, **"Data and Computer Communication",** Macmillan Press,1989.

CO-PO/PSO MAPPING

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	1	1	1	2	1	1	1	1	2	**3**	**1**	**3**
CO2	3	3	3	3	3	1			1	1	1	2	**3**	**2**	**3**
CO3	3	3			3	1	1	2	1	1	2	2	**1**	**3**	**2**
CO4	3	2	2	2	2	1	1		2	1	1				**1**
CO5	2	3	2	2	2	2	2	2	2	1	2	2	**3**	**2**	**2**
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
Subject Name: Real Time System, Subject Code: CS-320
w.e.f Session 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	**Apply the knowledge of operating system concepts to understand real time system concepts like tasks and scheduling.**
CO 2	**Analyze the various parameters related to the different types of scheduling in single processor and multiprocessor environments.**
CO 3	**The basic concepts of real time databases and their applications.**
CO 4	**Apply the basic concepts of fault tolerance and clocks to design an effective real time system.**
CO 5	**Identify the various protocols for effective resource sharing.**

UNIT I	**Introduction**	**6**
	Introduction to Real Time Systems, Structure of Real Time System, Various Classification of Real Time Systems, Embedded System, Characterizing Real Time System & Task, Various Issues in Real Time System	
UNIT II	**Task Assignment & Scheduling**	**10**
	Classical Uniprocessor Scheduling Algo- Rate Monotonic, EDF. Uniprocessor Scheduling of IRIS Tasks, Identical and Nononidentical Linear & Concave Reward Function, 0/1 Reward Function. Task Assignment Algorithms- Utilization Balancing, A Next-Fit Algorithm for RM Scheduling, A Myopic Offline Scheduling FAB Algorithm & Buddy Strategy	
UNIT III	**Real Time Database**	**8**
	Real Time vs. General purpose Database, Main Memory database, Concurrency Control Issues, Real Time OS- Threads and Tasks, Kernel, Case Study of QNX, VRTX, Vx Works.	
UNIT IV	**Fault Tolerance Techniques**	**8**
	Introduction Fault, Fault Detection and Error Containment, Redundancy Data Diversity, Reversal Checks, Malicious & Integrated Failure Handling. Clock Synchronization: Introduction Clocks, A Nonfault Tolerant Synchronization Algorithms, Impact of Fault, Fault Tolerant Synchronization in H/Wand S/W	

UNIT V	**Real Time Communication**	8
	Introduction, N/W Topologies, Protocols: Internet & Resource Reservation Protocols, Real Time Protocol, Contention-Based Protocol	

References:

1. C.M. Krishna & Shin, "Real Time Systems", Mc Graw Hill 1985.
2. Jane W.S. LIU, "Real Time Systems", Pearson Education".
3. Levi & Agarwal, "Real Time System", McGraw Hill.

CO-PO/PSO MAPPING

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	1	2	1	1	1	1	2	**3**	**1**	**3**
CO2	3	2	3	3	3	1			1	1	1	2	**3**	**2**	**3**
CO3	3	3			3	1	1	2	1	1	2	2	**1**	**3**	**2**
CO4	3	2	2		2	1	1		2	1	1				**1**
CO5	2	3	2	2	2	2	3		2	1	2	2	**3**	**2**	**2**

Integral University,
B.TECH. COMPUTER SCIENCE & ENGG
Subject Name: Concepts inAdvanced Database System, Subject Code: CS346
w.e.f Session 2018-19

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Have knowledge about advance SQL queries and its applications.
CO2	Have knowledge and understanding of distributed database.
CO3	Have knowledge about database tuning and Explain basic issues related to Database security.
CO4	HaveknowledgeaboutPL/SQLanditsimplementationinvariousqueryprocess.
CO5	Have knowledge and understanding of Advanced data bases and data warehouse.

OBJECTIVES:

- To give the knowledge of Advance SQL Queries , which help the student to learn the working of Internal processing of DBMS, when the query imputed.
- To give knowledge and understandings of Distributed database .
- To give the knowledge about database tuning and Explain basic issues of Database security.
- To give the knowledge of database tuning and database security.
- To give the knowledge about data warehouse , connectivity and different types of emerging databases.

UNIT I	**Query Processing and Optimization**	**8**
	Clustering & Indexing, Query Processing, Estimations for Query Processing Cost Algorithms for executing selection Operations, Algorithms for executing Join Operations, Algorithm for executing Project Operations. Query Optimization: Heuristics for Query Optimizations, Query Evaluation Plans, Pipelined Evaluations, System Catalogue in RDBMS	
UNIT II	**Object Oriented databases**	**8**
	Database Tuning: Database Workloads, Tuning Decisions, DBMS Benchmarks, Multiple Attribute Search Keys, Extended Relational Model & Object Oriented Database System: Requirement, Properties, Structured Types, Object Identity, Containment, and Class Hierarchy, Logic Based Data Model, and Nested Relational model.	
UNIT III	**Distributed databases**	**8**
	Distributed Database System: Structure of Distributed Database, Data Fragmentation, Data Model, Query Processing, Semi Join, Parallel & Pipeline Join, Concurrency Control in Distributed Database System,	

	Recovery in Distributed Database System, Distributed Deadlock Detection and Resolution, Commit Protocols	
UNIT IV	**Database Security**	**8**
	Database Securities: Database Security, Access Control and Grant & Revoke on Views and Integrity Constraints, Mandatory & Discretionary Access Control, Role of DBA, Security in Statistical Databases	
UNIT V	**Enhanced databases**	**8**
	Enhanced Data Model for Advanced Applications: Database Operating System, Introduction to Temporal Database Concepts, Introduction to Spatial and Multimedia Databases, Introduction to Data Mining, Introduction to Active Database System & Deductive Databases, Database Machines, Web Databases.	

References:

6. Majumdar & Bhattacharya, "Database Management System", TMH.
7. Korth, Silberchatz, Sudarshan, "Database Concepts", Addison Wesley
8. Elmastri, Navathe, "Fundamentals of Database Systems", Addison Wesley
9. Date C.J., "An Introduction to Database System", Addison Wesley.
10. Ramakrishnan, Hadzilacous, Goodman, "Concurrency Control & Recovery", Addiosn Wesley.
11. Ceri & Palgatti, "Distributed Databases", McGraw Hill.

CO-PO/PSO MAPPING:

↓CO\PO\PSO →	PO1: Ability to apply knowledge of science, computing and	PO2: Ability to analyze the computer engineering problems,	PO3: Ability to develop and design solutions based on	PO4: Ability to handle complex and interdisciplinary	PO5: Ability to apply state of the art tools and techniques in	PO6: Ability of being aware about the existing social	PO7: Ability to provide environment friendly and	PO8: Ability to understand their professional and ethical	PO9: Ability to work as an individual as well as in teams.	PO10: Ability to communicate with the stake holders by	PO11: Ability to manage the day to day challenges by optimizing	PO12: Ability to engage and encourage themselves in	PSO1	PSO2	PSO3	PSO4
CO1	1	2		1	1		3	2				1	2	1	2	2
CO2			3	1	3				2	3	3	1	1	2	3	2
CO3	1	1			2	1		3	3				1	1	1	2
CO4			1	2			1			3	2	1	2	1	2	1
CO5:	1	2	3		1	2		3					2	2	1	3
3: Strong Association, 2: Average Association, 1: Low Association																

Integral University, Lucknow
B.TECH. COMPUTER SCIENCE & ENGG
Subject Name: Software Project & Quality Management, Subject Code: CS-311

w.e.f Session 2020-21

Pre-requisite	Co-requisite	L	T	P	C
Software Engineering	None	3	1	0	4

CO 1	**Analyze the systematically stepwise project planning.**
CO 2	**Have knowledge of strategic program management, analysis of technical assessment of projects and study and analysis of different Cost-Benefit Evaluation Techniques.**
CO 3	**Apply, analyze and compare effort estimation and different network planning models.**
CO 4	**Evaluation and analysis of different resources and Critical Path, monitoring and control, Prioritizing monitoring and change control.**
CO 5	**Compare and analyze modern project management, contract management, ISO Standards, CMM, Six Sigma Approach.**

Objective

----------.

UNIT I	**Introduction**	**8**
	Overview of Software Project Planning Software Project, Categorization of Software Project, Introduction to Stepwise Project Planning: Identify Project Scope and objectives, Identify Project Infrastructure, Project Products and Activities, Activity risks, Resource Allocation, Project Plan Execution	
UNIT II		**8**
	Project Evaluation: Strategic Program Management, Technical Assessment, Cost Benefit Analysis, Cash Flow Forecasting, Cost-Benefit Evaluation Techniques: Net profit, Payback Period, Return on Investment, Net Present Value, Internal Rate of Return, Risk Evaluation, Selection of Technologies, overview of software development models	
UNIT III		**8**
	Software Effort Estimation an Overview, Project Schedules, Network Planning Models, Activity Duration Estimation, and Risk Management: Identification,	

	Analysis and Abatement of Risk	
UNIT IV		**8**
	Resource Allocation: Nature of resources, Identifying Resource Requirements, Scheduling Resources, Creating Critical Path, Counting the Cost, Cost Schedules. Monitoring and Control: Visualizing progress, Cost Monitoring, Prioritizing Monitoring, Getting Project Back to Target, Change Control	
UNIT V		**8**
	Contract Management, Human Resource Management, Software Quality Definition, Software Quality Assurance, Quality Assurance Plan, Quality Matrices, ISO Standards, CMM, Six Sigma Approach	

References:

1. Software Project Management by Bob Hughes and Mike Cotterell, Third Edition, TMH.
2. Information Technology Project Management by Kathy Schwalbe, International Student Edition, THOMSON Course Technology, 2003.
3. Software Quality by Mordechai Ben-Menachem/Garry S Marliss. Thomson Learning Publication
4. Software Project Management A Unified Framework by Walker Royce. Pearson Education.

CO-PO/PSO MAPPING

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	3	1	1	1	1	1	3	1	2	2
CO2	3	3	3	2	1		1	1	1	1	1			2	1
CO3	3	2	1	1	2	3	1	1	1	1	1	3	2	1	2
CO4	3	2	2	2		1		1			1	2	3		3
CO5	3	1	1	1	1	2	3	1	1	1	1	2	1	2	2

1. Low Association 2: Average Association 3: Strong Association

Integral University, Lucknow
Department of Computer Science & Engineering
B.Tech. Computer Sc. & Engineering
Subject Name: Advance Computer Architecture, Subject Code: CS-345
w.e.f Session- 2021-22

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Registers, bus as well as memory and its hierarchy and input/output devices.
CO 2	Division based algorithms for different representation of data and discuss I/O interfaces, ports and Data Transfer modes
CO 3	Register and stack organization and construct different control units.
CO 4	Types of memory and memory mapping of one type with other
CO 5	Knowledge about Interconnection Network, non-blocking network, cross bar network, and shuffle exchange network.

UNIT I		**8**
	Introduction to Computer Architecture, Evolution of Computer Architecture, Parallel Computing, Parallel Architectural Classification Schemes: Flynn's, Shores, Feng's Classification; Performance of Parallel Processors: Speedup Performance Laws, Amdahl Law, and Gustafson Law, Performance Metrics and Measures	
UNIT II		**8**
	Pipeline Processing: Introduction to Pipeline Processing, Arithmetic Pipelines, Pipelined Instruction Processing, Instruction Level Parallelism. Interlocks, Hazards, and Hazards Detentions & Resolution, Scheduling of Pipelines	
UNIT III		**10**
	Processor Architectures: Superscalar Architecture, Vector Architecture and VLIW Architecture, Super pipeline design, Memory Technology: Cache Architecture; Cache Coherence and Synchronization Mechanisms, Shared-Memory Organizations	
UNIT IV		**10**

	Synchronous parallel processing, SIMD Architecture and programming principals, SIMD parallel algorithm, Data mapping and memory in Array Processor	
UNIT V		**8**
	Interconnection Network, introduction to permutations, group of mapping, decomposition of a permutation into cycles, elementary permutation used in interconnection network, complete non-blocking network, cross bar network, clos network, Benes's network, shuffle exchange network	

References:

1. Peterson & Heresy, "Quantitative approach to computer Architecture",
2. Kai Hwang, "Advanced Computer Architecture", McGraw Hill International.
3. "Morgan Kaufman". Quin, "Parallel computing, Theory & Practices", McGraw Hill
4. Bhujde, "Parallel Computing", New Age International Hwang, "Advance ComputerArchitecture

CO-PO/PSO MAPPING

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	3	1	1	1		1	3	1	2	2
CO2	3	3	3	2	1	1	1	1	1		1	2		2	1
CO3	3	2	1	1			1	1	1		1	3		1	2
CO4	3	2	2		3	2	1	1	1		1	2	3	2	3
CO5	3	1	1	1	1	2	3	1	1	1	1	2	1	2	2
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
B.Tech. Computer Sc. & Engineering
Subject Name: Green Computing, Subject Code: CS-347
w.e.f Session- 2021-22

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Obtain the fundamentals of green computing and its IT strategies
CO 2	Learn about green assets, modeling and information systems
CO 3	Acquire knowledge on grid framework
CO 4	Understand the concept of green compliance
CO 5	Work with case studies

UNIT I	**Introduction**	**8**
	Green IT Fundamentals: Business, IT, and the Environment –Environmental Impacts of IT, Green IT, Holistic Approach to Greening IT, Greening IT, Applying IT for enhancing. Environmental sustainability, Green IT Standards and Eco-Labelling of IT, Enterprise Green, IT strategy, Green IT: Burden or Opportunity?	
UNIT II	**Green Devices and Hardware with Green Software**	**9**
	Green Devices Hardware/Software: Introduction, Life Cycle of a device or hardware, Reuse, Recycle and Dispose, Energy-saving software techniques, Evaluating and measuring software Impact to platform power	
UNIT III	**Green Assets and Modeling and Grid Framework**	**9**

	Green Assets: Buildings, Data Centers, Networks, and Devices – Green Business Process Management: Modeling, Optimization, and Collaboration –Green Information Systems: Design and Development Models. Virtualization of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data center – Green Grid framework	
UNIT IV	**Green Compliance and Social Aspects**	**9**
	Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future. Introduction, Strategizing Green Initiatives, Implementation of Green IT, Information Assurance, Communication and Social media	
UNIT V	**Regulating the Green IT and CASE STUDIES**	**9**
	Introduction, The regulatory environment and IT manufacturers, Non regulatory government initiatives, Industry associations and standards bodies, Green building standards, Green data centers, Social movements and Greenpeace. Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.	

References:

1. BhuvanUnhelkar, ―Green IT Strategies and Applications-Using Environmental Intelligence‖, CRC Press, June 2014.
2. Woody Leonhard, Katherine Murray, ―Green Home computing for dummies‖, August 2012.
3. Harnessing Green IT Principles and Practices , San Murugesan, G.R. Gangadharan, Wiley Publication, ISBN:9788126539680

CO-PO/PSO MAPPING

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	3					2	1	2	2	3	1
CO2	3	3	1	2	1			1	1	2	2	1			3
CO3	3	3	3	1	1	1				2	2	2	2	2	3
CO4	2	2	1	2	1	2	2	3	2	2			1	2	1
CO5	3	1	1	2	1	2	1	3	1	2	1	2	1	2	2
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
B.Tech. Computer Sc. & Engineering
Subject Name: Human Computer Interaction, Subject Code: CS-348
w.e.f Session- 2021-22

Course Outcome (CO)	Description
CO1	Acquire fundamental concepts of computer components functions regarding interaction with human and vice versa
CO2	Analyze interface problems to recognize what design approach and interaction styles are required in the light of usability standards and guidelines.
CO3	Utilize basic concepts to construct a user-interaction strategy for a given problem its usability evaluation and to meet desired needs within realistic constraints such as social, political and ethical norms.
CO4	Ability to design and develop an interface by using appropriate HCI techniques that are preferred by the user.
CO5	Ability to apply different evaluation technique with case studies.

Unit 1: Introduction to user-centric design – case studies, historical evolution, issues and challenges and current trend, Engineering user-centric systems – relation with software engineering, iterative life-cycle, prototyping, guidelines, case studies.

Unit 2: User-centric computing – framework, introduction to models, model taxonomy, Computational user models (classical) – GOMS, KLM, Fitts' law, Hick-Hymans law.

Unit 3: Computational user models (contemporary) 2D and 3D pointing, constrained navigation, mobile typing, touch interaction, Formal models – case study with matrix algebra, specification and verification of properties, formal dialog modeling.

Unit 4: Empirical research – research question formulation, experiment design, data analysis, statistical significance test. Case Study 1- Multi-Key press Hindi Text Input Method on a Mobile Phone.

Unit 5: User-centric design evaluation – overview of evaluation techniques, expert evaluation, user evaluation, model-based evaluation with case studies. Case Study 2 – GUI design for a mobile phone based Matrimonial application.

References:

1. Samit Bhattacharya (July, 2019). Human-Computer Interaction: User-Centric Computing for Design, McGraw-Hill India, Print Edition: ISBN-13: 978-93-5316-804-9; ISBN-10: 93-5316-804-X, E-book Edition: ISBN-13: 978-93-5316-805-6; ISBN-10: 93-5316-805-8.
2. Dix A., Finlay J.,Abowd G. D. and Beale R. Human Computer Interaction, 3rd edition, Pearson Education, 2005.
3. Preece J., Rogers Y., Sharp H., Baniyon D., Holland S. and Carey T. Human Computer Interaction,Addison-Wesley, 1994.
4. B. Shneiderman; Designing the User Interface,Addison Wesley 2000 (Indian Reprint).

CO-PO/PSO MAPPING

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	3	1	1	1	1	1	3	1	2	2
CO2	3	3	3	2	1	1	1	1	1	1	1	2	3	2	1
CO3	3	2	1	1			1			1	1	3		1	2
CO4	3	2	2		1	2	1	1	1					2	3
CO5	3	1	1	1	1	2	3	1	1	1	1	2	1	2	2
1. Low Association 2: Average Association 3: Strong Association															

COURSE: COMPILER DESIGN LAB

COURSE CODE: CS316

COURSE CREDIT: 1

COURSE OBJECTIVES:

1. Write a program to implement TOKENIZER.
2. Write a program using call statement and CASE statement.
3. Write a program to find out FIRST / FOLLOW of grammar.
4. Evaluate POSTFIX and PREFIX expression with the help of stack.
5. Write a program to implement OPERATOR PRECEDENCE PARSER.
6. Design a parser like RECURSIVE DESCENT PARSER.
7. Design PREDICTIVE PARSER.
8. Design I.R(0) PARSER..

COURSE OUTCOMES (CO):

After completion of the course, a student will be

CO 1	**Able to understand the basic concepts TOKEN and lexeme, the flow of control**
CO 2	**Able to design and develop various programming concepts, like case statements, and procedure calls.**
CO 3	**Able to analyze and compute first and follow, and used the concept first and follow, to implement various parsing algorithms.**
CO 4	**Able to develop programs on the different parser.**
CO 5	**Able to implement programs on various SDT.**

CO-PO MAPPING:

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1		2		2						2	2	1
CO2	3	1	2	2	2		3						1	2	1
CO3	4	2	2	2			2						3	2	2
CO4	3	2	3	3			3						3	1	1
CO5	1	2	1				3						2	1	1
1. Low Association 2: Average Association 3: Strong Association															

\

COURSE: Microprocessor Lab

COURSE CODE: CS314

COURSE CREDIT: 1

COURSE OBJECTIVES:

- To expose students to the operation of typical microprocessor (8086) trainer kit.
- To prepare the students to be able to solve different problems by developing differentprograms.
- To develop the quality of assessing and analysing the obtained data.

COURSE OUTCOMES (CO):

After completion of the course, a student will be

CO 1	Identify relevant information to supplement to the Microprocessor and Microcontroller course6.
CO 2	Set up programming strategies and select proper mnemonics and run their program on the training boards.
CO 3	Practice different types of programming keeping in mind technical issues and evaluate possible causes of discrepancy in practical experimental observations in comparison
CO 4	Develop testing and experimental procedures on Microprocessor and Microcontroller analyse their operation under different cases.
CO 5	**Prepare professional quality textual and computational results, incorporating accepted data analysis and synthesis methods, simulation software, and word-processing tools.**

Programs
Write a program to two add 16 bit Hexadecimal numberswithout carry.
Write a program to two add 16 bit Hexadecimal numbers withcarry.
Write a program to find the greatest number from an arrayof 10 numbers.
Write a program to calculatethe factorial of a number.
Write a program to multiply two 16-bit numbers resultshould be greater than 16 bit.
Write a program to input 5 numbers and arrange them indescending order.
Write a program to convert the string data it's Two'scomplement form.
Write a program to multiplytwo 8-bit signed - numbers.
Write a program to read 8 bit data from Port B. Complement this data & send it back to Port A.
Write a program to move ablock of data from one memory location to another.

CO-PO MAPPING:

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	2	-	1	-	-	2	2	2	2	2	1	1
CO2	3	3	1	2	2	1	1	1	2	2	2	2	2	1	1
CO3	1	2	3	2	-	3	-	2	2	3	1	-	2	1	1
CO4	2	3	-	2	2	1	-	1	2	2	-	2	2	1	1
CO5	1	2	1	2	3	-	2	-	2	2	1	2	2	1	1
1. Low Association 2: Average Association 3: Strong Association															

COURSE: COMPUTER NETWORKS LAB

COURSE CODE: CS306

COURSE CREDIT: 1

COURSE OBJECTIVES:

Resource sharing is the main objective of the computer network Lab. The objective of this lab course is to get practical knowledge of working principles of various communication protocols. Analyse structure and formats of TCP/IP layer protocols using network tools such as and network simulators (NS2). This lab provides a practical approach to Ethernet/Internet networking.

COURSE OUTCOMES (CO):
After completion of the course, a student will be

CO 1	Understand the practical approach to network communication protocols.
CO 2	Understand network layers, structure/format and role of each network layer.
CO 3	Able to design and implement various network application such as data transmission between client and server, file transfer, real-time multimedia transmission.
CO 4	Understand the various Routing Protocols/Algorithms and Internetworking.
CO 5	Understand the structure and organization of computer networks; including the division into network layers, role of each layer, and relationships between the layers.

CO-PO MAPPING:

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**2**	**1**	**2**		**3**		**3**						**2**	**1**	**3**
CO2	**1**	**1**	**1**	**2**	**1**		**1**						**1**	**3**	**1**
CO3	**3**	**2**	**2**	**2**			**3**						**3**	**1**	**2**
CO4	**2**	**1**	**3**	**1**			**2**						**1**	**2**	**1**
CO5	**1**	**2**	**1**				**3**						**2**	**1**	**2**
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
B.TECH.
Subject Name: Artificial Intelligence, Subject Code: CS-422
w.e.f Session 2022-23

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Design an intelligent agent to solve real world problems.
CO 2	Identify the best heuristic for problem solving that will lead to find the optimal solution within constraints and adverse conditions.
CO 3	Represent knowledge using logic programming, create knowledge base and apply inference mechanisms.
CO 4	Apply statistical and probabilistic machine learning techniques for a real world problem in order to solve it.
CO 5	Design and develop an expert system, solve problems using evolutionary programming, using swarm intelligence and develop programs using PROLOG

Objective:

1. Explain the basic problem solving techniques, knowledge representation methods and learning methods of Artificial Intelligence.
2. Assess the applicability, strengths, and weaknesses of the basic knowledge representation, problem solving, and learning methods in solving particular engineering problems.
3. Understand the role of knowledge representation, problem solving, and learning in intelligent system engineering.
4. Develop intelligent systems by assembling solutions to concrete computational problems.
5. Develop an interest in the field sufficient to take more advanced subjects.

UNIT I	**INTRODUCTION**	**8**
	Introduction to AI, Current Trends in AI, Intelligent Agents:- Agents and Environments, Nature of Environments, Structure of Agents, Problem Solving, Problem Solving Agents, Example Problems, Searching for Solutions, Uniformed Search Strategies (BFS, DFS, DLS, IDS)	
UNIT II	**SEARCHING TECHNIQUES**	**8**
	Informed (Heuristic) Search Strategies: - Heuristic Function, Greedy best first search, A* search, Local Search Algorithms and Optimization Problems (Hill Climbing & Genetic Algorithm), Introduction to Constraint Satisfaction Problems (CSP), Adversarial Search:- Optimal Decisions in Games (MiniMax algorithm), Alpha – Beta Pruning.	
UNIT III	**KNOWLEDGE AND REASONING**	**8**
	Introduction to logical Agents, Propositional Logic:- Representation, Syntax and Semantics, Forward Chaining, Backward Chaining, CNF, Resolution, First Order Logic:– Representation, Syntax and Semantics, Inference in First Order Logic:– Unification, Forward Chaining, Backward Chaining, Resolution.	
UNIT IV	**LEARNING**	**8**

	Forms of Learning, Inductive Learning:- Learning Decision Trees, Statistical learning methods:- Naïve bayes models, Bayesian network, EM algorithm, HMM, Instance based learning:-nearest neighbor models	
UNIT V	**INTELLIGENT SYSTEMS**	**8**
	Expert System- Stages in the Development of an Expert System, Difficulties in Developing Expert System, Application of Expert System, Introduction to Evolutionary Programming, Swarm Intelligent Systems, Introduction to PROLOG.	

References:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", 2nd Edition, PearsonEducation / Prentice Hall of India, 2004.\

2. George F. Luger, "Artificial Intelligence-Structures and Strategies for Complex Problem Solving",Pearson Education / PHI, 2002.

3. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd., 2000.

4. N.P. Padhy, "Artificial Intelligence and Intelligence systems", Oxford Press.

CO-PO/PSO MAPPING

PO - PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	3	3	1		2						1	2	3		
CO 2	3	3	3	2		2						3			2	1
CO 3	3	2	3	2	3							3	1	2		
CO 4	3	2	2	2	3	3						2		2	2	2
CO 5	3	3	3	3	3	2	1	1	1			2		3		1

1. Low Association 2: Average Association 3: Strong Association

Integral University, Lucknow
Department of Computer Science &Engineering
B.TECH. COMPUTER SCIENCE
Subject Name: Distributed Systems, Subject Code: CS-410
w.e.f Session 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Understand the software and hardware concepts of distributed systems
CO 2	Evaluate and analyze the issues and implementations of deadlock detection and the agreement problems.
CO 3	Analyze the RMI, RPC and security issues, replication and fault tolerance in the distributed systems.
CO 4	Compare and analyze the flat and nested transactions, applications and analysis of locks in view of distributed systems, File systems and recent advances.
CO 5	Implement and analyze distributed multimedia, CORBA RMI, Java RMI, CORBA services.

COURSE OBJECTIVES:

- The aim of this course is to introduce the student to the areas of cryptography and cryptanalysis.
- This course develops a basic understanding of the algorithms used to protect users online and to understand some of the design choices behind these algorithms.
- Aim is to develop a workable knowledge of the mathematics used in cryptology in this course.
- Reveal different types of cipher generation method to solve engineering and other problems.
- Understand the theory and applications of cryptography and network security.

UNIT I	**CHARACTERIZATION OF DISTRIBUTED SYSTEMS:** Introduction: Examples of Distributed Systems, Resource Sharing and the Web Challenges. System Models Architectural Models, Fundamental Models, Theoretical Foundation for Distributed System: Limitation of Distributed System, Absence of Global Clock, Shared Memory, Logical Clocks, Lamports& Vectors Logical Clocks, Causal Ordering of Messages, Global State, Termination Detection. Distributed Mutual Exclusion: Classification of Distributed Mutual Exclusion, Requirement of Mutual Exclusion Theorem, Token Based and Non-Token Based Algorithms, Performance Metric for Distributed Mutual Exclusion Algorithms.	**8**
UNIT II	**DISTRIBUTED DEADLOCK DETECTION:** System Model, Resource vs Communication Deadlocks, Deadlock Prevention, Avoidance, Detection & Resolution, Centralized Dead Lock Detection, Distributed Dead Lock Detection, Path Pushing Algorithms, Edge Chasing Algorithms. Agreement Protocols: Introduction, System Models, Classification of Agreement Problem, Byzantine Agreement Problem, Consensus Problem, Interactive	**8**

	Consistency Problem, Solution to Byzantine Agreement Problem, Application of Agreement Problem, Atomic Commit in Distributed Database System.	
UNIT III	**DISTRIBUTED OBJECTS AND REMOTE INVOCATION:**	**8**
	Communication Between Distributed Objects, Remote Procedure Call, Events and Notifications, Security: - Overview of Security Techniques, Cryptographic Algorithms, Cryptography Pragmatics, Needham Schroeder, Kerberos, SSL & Millicent, Replication: System Model and Group Communication, Fault – Tolerant Services, Highly Available Services, Transactions with Replicated Data.	
UNIT IV	**TRANSACTIONS AND CONCURRENCY CONTROL:**	**8**
	Transactions, Nested Transactions, Locks, Optimistic Concurrency Control, Timestamp Ordering, Comparison of Methods for Concurrency Control. Distributed Transactions: Flat and Nested Distributed Transactions, Atomic Commit Protocols, Concurrency Control in Distributed Transactions, Distributed Deadlocks, Transaction Recovery, Distributed File Systems: File Service Architecture, Sun Network File System, The Andrew File System, Recent Advances.	
UNIT V	**DISTRIBUTED SHARED MEMORY(DSM):**	**8**
	Architecture, Algorithms for implementing DSM, Client- Server Algorithm, Migration Algorithm, Read Replication Algorithm, Full Replication Algorithm. Distributed Multimedia Systems: Introduction, Characteristics of Multimedia data, Quality of service management, Resource management, Stream Adaption. Case Study: CORBA RMI, CORBA Services, Java RMI.	

References:

1. Couloris, Dollimore, Kindberg," Distributed systems: Concepts and Design". PearsonEducation Asia, 3ed.
2. Singhal and Shivratri," Advanced Concepts in Operating Systems", Mc Graw Hill.

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	3	1	1	1	1	1	3	2	1	1
CO2	3	3	3	2	1	1	1	1	1	1	1	2	3	2	1
CO3	3	2	1	1	2	3	2	2	3	1	1	3	1	2	2
CO4	3	2	2	2	3	3	1	1	1	1	1	2	2	3	2
CO5	3	1	1	1	1	2	1	1	1	1	1	2	2	2	1
1. Low Association 2: Average Association 3: Strong Association															

w.e.f Session 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Compare and analyze various Cryptographic Techniques
CO 2	Understanding various Symmetric Key Distribution techniques
CO 3	Apply, analyze and compare various public key cryptography techniques
CO 4	Implement Digital Signature techniques
CO 5	Understand the various Security Applications

COURSE OBJECTIVES:

UNIT I	**Introduction to OSI Security Architecture:** Security Attacks, Services and Mechanisms, Introduction to Cryptology. Conventional Encryption: Conventional Encryption Model, Classical Encryption Techniques – Substitution Ciphers: Caesar Cipher, Monoalphabetic Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Cipher, One-Time Pad; Transpositions Ciphers: Rail Fence Technique; Rotor Machines, Cryptanalysis, Steganography. Modern Block Ciphers- Block Ciphers Principles: Stream & Block Ciphers, Fiestal Cipher, Shannon's Theory of Confusion and Diffusion, S-DES, Data Encryption Standards (DES): DES Encryption and Decryption, Strength of DES.	**8**
UNIT II	**Block Cipher Modes of Operation:** ECB, CBC, CFB, OFB, CTR, Triple DES: Double DES, TDES with Two Keys, TDES with Three Keys. Symmetric Key Distribution using KDC, Random Number Generation: Use of Random Numbers, Pseudo Random Number Generators, Cryptographically Generated Random Numbers, Blum BlumShub Generator. Introduction to Graph, Ring and Field, Prime and Relative Prime Numbers, Modular Arithmetic, Fermat's & Euler's Theorem, Primality Testing, Euclid's Algorithm.	**8**
UNIT III	**Principles of Public Key Cryptosystems:** Introduction, Application & Requirement; RSA Algorithm: Computational Aspects, Security of RSA; Diffie-Heilman Key Exchange Algorithm, Introductory Idea of Elliptic Curve Cryptography. Message Authentication & Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes (MAC), Hash Functions: Requirement for a Hash Function, Simple Hash Functions, Security of Hash Function & MAC, MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA-1).	**8**
UNIT IV	**Digital Signatures:**	**8**

	Requirements, Direct & Arbitrated Digital Signature, Protocols: Mutual & One way Authentication; Digital Signature Standard (DSS): DSS Approach, Digital Signature Algorithm. Authentication Applications: Kerberos Version 4 & Difference between Kerberos v4 & v5, Kerberos Realms; X.509 Authentication Service: Authentication Procedures, Directory Authentication Service; Electronic Mail Security – Pretty Good Privacy (PGP): Operational Description, Cryptographic Keys, Key Rings, Public Key Management.	
UNIT V	**IP Security:**	**8**
	Architecture, Authentication Header, Encapsulating Security Payloads, Combining Security Associations, Key Management; Web Security: Secure Socket Layer & Transport Layer Security, Secure Electronic Transaction (SET). System Security: Intruders, Viruses and Related Threats: Malicious Programs, The Nature of Viruses, Types of Viruses, Macro Viruses, Email Viruses; Firewall: Firewall Design Principles, Trusted Systems.	

References:

1. William Stallings, "Cryptography and Network Security: Principles and Practice" Prentice Hall, New Jersey.
2. Johannes. A. Buchmann, "Introduction to cryptography", Springer Verlag. Bruce Schiener, "Applied Cryptography".

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2								3	2	2
CO2	2	2	2	2	2								2	2	1
CO3	3	2	2	1	2								3	2	1
CO4	3	2	2	2	1	2	1						3	2	1
CO5	3	2	3	2	2	1	1	1					3	2	2
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science &Engineering
B.TECH. COMPUTER SCIENCE
Subject Name: Mobile Computing, Subject Code: CS-417
w.e.f Session 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

COURSE OUTCOME (CO)	DESCRIPTION	Bloom's Taxonomy Level
CO 1	To understand and compare the various wireless communication technologies.	Knowledge (level1)
CO 2	To visualize the various important steps in GSM communication.	Understand (level2)
CO 3	To specify and identify the requirement the mobile IP and Transport Protocol.	Understand (level2)
CO 4	To examine and simulate the important aspects of Mobile Adhoc Networks.	Analyze(level4) Evaluate (level5)
CO 5	To apply the knowledge gained to design and develop a mobile application.	Apply(level3) Evaluate (level5)

COURSE OBJECTIVES:

- to give the knowledge of TCP/IP protocol.
- to give the knowledge of packet switching and message switching.
- to give the knowledge of sliding window protocol.
- to give the knowledge of the CDMA.
- to give the knowledge of network layer protocols viz. IPv4, ARP, RARP.
- to give the knowledge of routing.
- to give the knowledge of TCP & UDP.
- to give the knowledge of congestion control.
- to give the knowledge of quality of service.
- to give the knowledge of DNS, FTP, TELNET and remote logging.

UNIT I	**Introduction to Wireless Communication:**	8
	Application, Frequencies for radio transmission, Signals, Antennas, Signal propagation, Multiplexing: Space division multiplexing, Frequency division multiplexing, Time division multiplexing, Code division multiplexing, Modulation: Amplitude shift keying, Frequency shift keying, Phase shift keying, Advanced frequency shift keying, Advanced phase shift keying, spread spectrum: Direct sequence spread spectrum, Frequency hopping spread spectrum, Cellular	

	systems.	
UNIT II	**Channel Allocation:**	**8**
	Motivation for a specialized MAC, Hidden and exposed terminals, Near and far terminals, SDMA, FDMA, TDMA, Fixed TDM, Classical Aloha, Slotted Aloha, Carrier sense multiple access, Carrier sense multiple access with collision detection, Multiple access with collision avoidance.	
UNIT III	**Telecommunications Systems:**	**8**
	GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security; Satellite systems: History, Applications, Basics of GEO, LEO and MEO, Routing, Localization, Handover, Examples; GPRS.	
UNIT IV	**Wireless LAN:**	**8**
	Infra-red vs radio transmission, Infrastructure and ad-hoc network, IEEE 802.11: System architecture, Protocol architecture, Physical layer, medium access control layer, MAC management, 802.11b, 802.11a, Bluetooth: User scenarios, Architecture, Radio layer, Baseband layer. Introduction to WAP architecture and Protocol stack.	
UNIT V	**Mobile network layer:**	**8**
	Mobile IP: Goals, assumptions and requirements, Entities and terminology, IP packet delivery, Agent discovery, Registration, Tunneling and encapsulation, Optimizations, Reverse tunneling, IPv6, Dynamic host configuration protocol.	

References:

1. Jochen Schiller, "Mobile Communications, Pearson Education, 2nd Edition, 2003.
2. Dharma Prakash Agrawal & Qing-An Zeng "Introduction to Wireless & Mobile Systems", Thomson Brooks/Cole, 2nd Edition 2003.
3. Krzysztof Wesolowski, "Mobile Communication Systems ", John Wiley & Sons, Ltd.
4. Ron Olexa, "Implementing 802.11, 802.16 and 802.20 Wireless Networks, Elsevier

CO-PO MAPPING:

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	3						3	1	1	
CO2	3	3	3	2	1	1						2			3
CO3	3	2	1	1	2	2	3					3	2		3
CO4	3	2	2	2	3	3						2		4	
CO5	3	1	1	1	1	2	1					2	1		4
1. Low Association 2: Average Association 3: Strong Association															

Integral University, Lucknow
Department of Computer Science &Engineering
B.TECH. COMPUTER SCIENCE
Subject Name: Fuzzy Logic & Neural Networks, Subject Code: CS-415
w.e.f Session 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Learn about soft computing techniques and their applications.
CO 2	Analyze various neural network architectures.
CO 3	Enable students to understand different Clustering Algorithms.
CO 4	Define the fuzzy systems.
CO 5	Identify and select a suitable Soft Computing technology to solve the problem; construct a solution and implement a Soft Computing solution.

COURSE OBJECTIVES:

The objectives of this course are:

1. To introduce the concepts in Soft Computing such as Artificial Neural Networks, Fuzzy logic-based systems, genetic algorithm-based systems and their hybrids.
2. Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
3. Reveal different applications of these models to solve engineering and other problems.
4. Understand the theory and applications of artificial neural network and fuzzy systems to engineering applications with emphasis on image processing and control.
5. Discuss neural networks and fuzzy systems, architectures, algorithms and applications, including Back-propagation, Competitive Learning, Fuzzy inference methods and expert systems etc.

UNIT I	**Introduction:**	**8**
	History of Neural Networks, Structure and Function of a Single Neuron, Architectures and Their Applications, Supervised Learning: Single Layer Networks: Perceptron's, Linear Separability, Perceptron Training Algorithms and Their Modifications: Pocket Algorithm and Adaline. Supervised Learning: Multiplayer Networks: Multilevel Discrimination, Preliminaries, and	

	Backpropagation Algorithm, Setting the Parameters Values, Accelerating the Learning Process.	
UNIT II	**Adaptive Multilayers Networks:**	**8**
	Network Pruning Algorithms, Marchand Algorithm, Upstart Algorithm, Cascade Correlation. Prediction Networks: Feed Forward Networks for Forecasting, Recurrent Networks (Partially, Fully), Radial Basis Functions and Probabilistic Neural Networks.	
UNIT III	**Unsupervised Learning:**	**8**
	Winner-Take-All Networks: Hamming Networks, Maxnet. Learning Vector Quantization, Counter Propagation Networks (Forward Only Counter Propagation networks), Adaptive Resonance Theory (ART1), K-Means Clustering Algorithms, Kohonens Self Organization Maps, Principal Component Analysis.	
UNIT IV	**Fuzzy Logic:**	**8**
	Fuzzy Sets, Properties, Operation on Fuzzy Sets, Fuzzy Relations, Operation on Fuzzy Relations, Fuzzy IF-THEN Rules, Variable Inference Techniques, Fuzzification and Defuzzification Methods, Fuzzy System Design.	
UNIT V	**Associative Models:**	**8**
	Auto-Association, Hetro-Association, Hopefield Networks, Brain State-In-ABox Networks, and Boltzman Machines. Optimization Methods: Optimization Using Hopefield Networks, Introduction to Simulated Annealing and Ant Colony Optimization and Evolutionary Computation, Introduction to Hybrid Systems, Introduction to Deep Learning.	

References:

1. Kishan Mehrotra, Chilukuri K. Mohan, Sanjay Ranka, Elements of Artificial Neural Networks, MIT Press/Penram International.
2. Simon Haykin, Neural Network a comprehensive Foundation, Macmillan College, proc, Con, Inc.
3. Ross T.J., Fuzzy Logic with Engineering Applications, McGraw-Hill.
4. Zurada J.M., Introduction to Artificial Neural Systems, Jaico Publishers.
5. Riza C. Berkiu and Trubatch, Fuzzy system Design Principles, Building Fuzzy IF-THEN Rule Bases, IEEE Press.
6. Goldberg D.E., Genetic Algorithms in Search Optimization and Machine Learning, Addison Wesley. 7. Dorigo and Thomas Stützle, Ant Colony Optimization, MIT Press.
8. Intelligent Hybrid Systems, SuranGoonatilake and Sukhdev Khebbal (Eds.), Intelligent Hybrid Systems, John Wiley.

CO-PO MAPPING:

PO-PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	1	1	3						2	1	1	
CO 2	3	2	3	2	1	1						1			3
CO 3	3	2	1	2		2	3					3	2		2
CO 4	3	2	2	2	3	3						2		3	
CO 5	3	1	1	1	1	2	1					2	1		3

1. Low Association 2: Average Association 3: Strong Association

Integral University, Lucknow
Department of Computer Science & Engineering
B.TECH.
Subject Name: Data Warehouse and Data Mining, Subject Code: CS-418
w.e.f Session 2018-19

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Develop a strong foundation of knowledge about data warehouse and related techniques.
CO 2	Design and build a data warehouse from the available historical data and perform OLAP operations to discover knowledge.
CO 3	Preprocess the data using cleaning, integration, transformation and reduction and find associations and correlations among that data.
CO 4	Classify the given dataset by using statistical and probabilistic models to predict the class labels of new data.
CO 5	Perform cluster analysis by using some major clustering methods and work on the recent advancements on text and web mining.

Objective:

1. Understand the concepts of Data Warehouse and its building blocks.
2. Study the architecture of Data Warehouse and the essential processes in building a data warehouse.
3. Study of data mining functionalities, related technologies and its techniques.
4. Study of various classification and prediction algorithms.
5. Study of major clustering techniques and current trends in data mining.

UNIT I	**Overview & Concepts**	**8**
	The Compelling Need for Data Warehousing: Introduction to Data Warehousing,Failures of Past Decision Support System, Data Warehouse Building Blocks: -Nature of data in datawarehouse, OLAP in the Data Warehouse: Major Features and Functions, OLAP Models, Comparisonbetween operational Data Base Systems & Data warehouse.	
UNIT II	**Data Warehouses and Data Marts**	**8**
	Overview of Components, Meta data & its types, MultidimensionalData Model: - Data cubes, Schemas for multidimensional databases, concept hierarchies, OLAPoperations in multidimensional data models, Data Warehouse Architecture: - 3-tier architecture, DataExtraction, Transformation, and Loading, Data Quality: Why is data Quality Critical? Data QualityChallenges.	
UNIT III	**Data Mining**	**8**

	Introduction, Data Mining Functionalities, Classification of Data Mining System; MajorIssues in Data Mining, Data Preprocessing: Preprocess, Descriptive Data Summarization, Data Cleaning,Data Integration & Transformation, Data Reduction, Mining Frequent Patterns, Association, andCorrelations, Basic Concept, Efficient & Scalable Frequent Item set Mining Methods, Mining VariousKinds of Association Rules.	
UNIT IV	**Classification & Prediction**	**8**
	Issues, Classification by Decision Tree Induction, Bayesian Classification,Classification by Back Propagation, Associative Classification, nearest neighbor classification, Prediction.	
UNIT V	**Cluster Analysis**	**8**
	What is Cluster Analysis, Types, Categorization of Major Clustering Methods,Partitioning Methods, Hierarchical Methods- cure and chameleon, Density-Based Methods: DBSCAN &OPTICS, Wave Cluster, CLIQUE. Current trends: Text mining, web mining.	

References:

1. "Data Warehousing Fundamental" by PaulrajPonniah,John Wiley & Sons INC.

2. Data Mining Concepts & Techniques by Jiawei Han &MichlineKamber.

3. Mallach,"Data Warehousing System",McGraw Hill

4. M.H.Dunham, "Data Mining:Introductory and Advanced Topics" Pearson Education

CO-PO/PSO MAPPING

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2			2	1					2		2			
CO2		2		1			2							1		
CO3	2		1			1		1				1	1			3
CO4	2			2												
CO5	3		2			1				1				2		
1. Low Association 2: Average Association 3: Strong Association																

Integral University, Lucknow
Department of Computer Science & Engineering
B.TECH.
Subject Name: Pattern Recognition
, Subject Code: CS-419
w.e.f Session 2022-23

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	The students learn the basic concepts and methods for the recognition of patterns in data
CO 2	The student achieve working knowledge of pattern recognition application development process
CO 3	Understanding and application of both supervised and unsupervised classification methods to detect and characterize patterns in real-world data
CO 4	Application of different algorithmic approaches for the detection and characterization of patterns in multi-dimensional data
CO 5	Introducing the curse of dimensionality and various methods of dimensions reduction

Objective:

1. To introduce the students to the basic concepts and methods for the recognition of patterns in data
2. To provide the student with a working knowledge of pattern recognition application development process
3. Understand and apply both supervised and unsupervised classification methods to detect and characterize patterns in real-world data
4. Apply different algorithmic approaches for the detection and characterization of patterns in multi-dimensional data
5. To introduce the curse of dimensionality and various methods of dimensions reduction

UNIT I	**INTRODUCTION**	**8**
	Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.	
UNIT II	**Statistical Patten Recognition**	**8**
	Statistical Patten Recognition: Bayesian Decision Theory, Classifiers, Normal density and discriminant functions.	
UNIT III	**Parameter estimation methods**	**8**
	Parameter estimation methods: Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.	

UNIT IV	**Nonparametric Techniques**	**8**
	Nonparametric Techniques: Density Estimation, Parzen Windows, K-Nearest Neighbour Estimation, Nearest Neighbour Rule, Fuzzy classification.	
UNIT V	**Unsupervised Learning & Clustering**	**8**
	Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques: Iterative square - error partition clustering – K-means, agglomerative hierarchical clustering, Cluster validation	

References:

1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", 2nd Edition, John Wiley, 2006.
2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, "Pattern Recognition", 4th Edition, Academic Press, 2009.

Integral University, Lucknow
Department of Computer Science & Engineering
Subject Name: SciLab
Subject Code: CS-424
w.e.f Session 2020-21
Credit:1

Syllabus

1. **Installing**, Expressions: Show mathematical expressions with numbers
   Variables, Diary command,Define symbolic constants.
   Basic functions, suppressing output(;),help,clc
2. **Vector Operations**, Define vector, Calculate length of a vector.
   Perform mathematical operations on Vectors such as addition,subtraction and multiplication.
   Define a matrix, Calculate size of a matrix,Perform mathematical operations on Matrices such as addition, subtraction and multiplication.
3. **Matrix Operations,** Access the elements of Matrix, Determine the determinant, inverse and eigen values of a matrix, Define special matrices, Perform elementary row operations, Solve the system of linear equations.
4. **Conditional Branching,** 'if' and 'then' with the example,use of the 'else' keyword use of the 'elseif' keyword,example for select
5. **Iteration,** Explain syntax of 'for' statement- tell that the variable iterates over a list/vector/matrix.
6. **Scripts and Functions,** Introduction to the file formats in Scilab.

7. **Plotting 2D graphs,** Aboutlinspace: linspace is a linearly spaced vector.
   Plot a simple graph: x=linspace(12,34,10), y=linspace(-.1,2,10), plot(x,y)
   plot2d
   Use of "clf()".
   Configure the title for the plot
   Configure a legend
   Divide a graphic window into a matrix of sub-windows using subplot(mnp)
8. **Xcos introduction**
   What is XCOS.
   What is palette.
   To collect the blocks from the palette and connect them to construct the block diagram.
   Set the parameters of different blocks.
   To setup the simulation parameters.
   Simulate the constructed block diagram.

Integral University, Lucknow
Department of Computer Science & Engineering
Subject Name: AI Lab Subject Code: CS-423
w.e.f Session 2020-21
Credit:1

List of Experiments

1	To understand & solve Tower of Hanoi problem
2	To understand Uninformed search techniques (BFS)
3	To understand Uninformed search techniques (DFS)
4	To understand Uninformed search techniques (IDS)
5	To understand Uninformed search techniques (DLS)

6	To understand Informed search techniques (A*)
7	To understand artificial neural networks & their basic working principle Learning Through perception
8	To understand Optimizing Informed search techniques
9	To understand the Machine learning concept & implementation of Example based learning