Academic Regulations, Curriculum and Syllabi
2019

B. Tech.
Computer Science and Engineering
(Duration of Study : 4 years)

GMRIT
Training Tomorrow's Engineers Today

Department of Computer Science and Engineering
GMR Institute of Technology
Rajam, Andhra Pradesh
(An Autonomous Institute Affiliated to JNTU Kakinada, AP)
NBA Accredited and NAAC Accredited

Academic Rules and Regulations

2019

Undergraduate Programs

GMR Institute of Technology
Rajam 532 127, Andhra Pradesh
(An Autonomous Institute, Affiliated to JNTUK, Kakinada, AP)
Accredited by NAAC & NBA

The Vision of GMRIT

- To be among the most preferred institutions for engineering and technological education in the country
- An institution that will bring out the best from its students, faculty and staff – to learn, to achieve, to compete and to grow – among the very best
- An institution where ethics, excellence and excitement will be the work religion, while research, innovation and impact, the work culture

The Mission of GMRIT

- To turnout disciplined and competent engineers with sound work and life ethics
- To implement outcome based education in an IT-enabled environment
- To encourage all-round rigor and instill a spirit of enquiry and critical thinking among students, faculty and staff
- To develop teaching, research and consulting environment in collaboration with industry and other institutions

Department Vision

To be a nationally most preferred department of learning for students and teachers alike, with dual commitment to research and serving students in an atmosphere of innovation and critical thinking.

Department Mission

1. To provide high-quality education in Computer Science Engineering to prepare the graduates for a rewarding career in Computer Science Engineering and related industries, in tune with evolving needs of the industry.
2. To prepare the students to become thinking professionals and good citizens who would apply their knowledge critically and innovatively to solve professional and social problems.

Program Educational Objectives

PEO 1: To produce the competent software engineers as team players in industry and allied fields providing viable solutions.

PEO 2: Adopt contemporary technologies for dynamic industry requirements with self-paced learning providing scope for advanced research.

PEO 3: Nurture professionalism with soft skills, managerial & leadership skills and Ethical values

Program Outcomes

Engineering graduate will be able to

PO 1: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. (Engineering knowledge)

PO 2: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. (Problem analysis)

PO 3: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. (Design/development of solutions)

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

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

PO 6: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the

professional engineering practice. (The engineer and society)

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

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

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

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

PO 11: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. (Project management and finance)

PO 12: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. (Life-long learning)

PSO1: Ability to apply the software engineering principles to meet automation of the process and service industries apart from the community utilities. (Program Specific)

PSO2: Ability to design, develop and implement management systems, E-Commerce tools and Web Apps for product development. (Program Specific)

1st Semester and 2nd Semester

19HSX01 Communicative English

(Common to all B Tech Programmes)

3 0 0 3

Course Outcomes

1. Develop effective listening skills for better comprehension of English spoken in different social and workplace contexts.
2. Compose speech clearly on a specific topic using appropriate language in informal discussions
3. Explain the implicit and explicit meanings of a text while reading
4. Summarize the texts of reading and listening based on comprehension
5. Construct sentences using proper grammatical sentence structures
6. Choose and use the appropriate vocabulary, phrases in different contexts

COs – POs Mapping

Cos	PO10	PO12
1	3	1
2	3	1
3	3	1
4	3	1
5	3	1
6	3	1

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions about main idea and supporting ideas.
Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.
Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.
Writing: Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph.
Grammar and Vocabulary: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural; basic sentence structures; simple question - wh-questions; word order in sentences.
Poem: Once upon a time by Gabriel Okara

15 Hours

Unit II

Listening: Listening for global comprehension and summarizing what is listened to.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed
Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together
Writing: Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters.
Grammar and Vocabulary: Cohesive devices - linkers, sign posts and transition signals; use of articles and zero article; prepositions.
Short-story: Next Sunday by R.K. Narayan

15 Hours

Unit III

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.
Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.
Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for reading comprehension
Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions; introducing the structure of essay writing.
Grammar and Vocabulary: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes
Speech: The fringe benefits of failure (Harvard inaugural address) by J. K. Rowlings

15 Hours

Unit IV

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.

Speaking: Formal oral presentations on topics from academic contexts -without the use of PPT slides.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.

Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables.

Grammar and Vocabulary: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms; Editing short texts identifying and correcting common errors in grammar and usage.

Essay: How to read a book? by Virginia Woolf

15 Hours
Total:60 Hours

Textbook (s)

1. English All Round: Communication Skills for Undergraduate learners, Vol.1,Published by Orient Black Swan, 2019

Reference (s)

1. Chase, Becky Tarver. Pathways:Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
2. Skillful Level 2 Reading & Writing Student's Book Pack (B1) MacmillanEducational.
3. Hewings, Martin.Cambridge Academic English (B2). CUP, 2012. (Student Book, Teacher Resource Book, CD & DVD)
4. Bailey, Stephen. Academicwriting: A handbook for international students.Routledge, 2014
5. Dhanavel. S.P. English and Communication Skills for Students of Science and Engineering. Orient Blackswan, 2009.

Web resource(s)

Grammar/Listening/Writing

1. 1-language.com
2. www.5minuteenglish.com
3. www.englishpractice.com

Grammar/Vocabulary

4. English Language Learning online
5. www.bbc.co.uk/learningenglish
6. www.better-english.com
7. www.nonstopenglish.com
8. www.vocabulary.com

Reading

9. www.usingenglish.com
10. www.englishclub.com
11. www.english-online.at

Listening

12. learningenglish.voanews.com
13. www.englishmedialab.com

Speaking

14. www.talkenglish.com
15. BBC Learning English – Pronunciation tips
16. Merriam-Webster – Perfect pronunciation Exercises

All Skills

17. www.englishclub.com
18. www.world-english.org
19. learnenglish.britishcouncil.org

Online Dictionaries

20. Cambridge dictionary online
21. MacMillan dictionary
22. Oxford learner's dictionaries

19MAX01 Engineering Mathematics I
(Common to all B. Tech. Programmes)

3 1 0 3

Course Outcomes

1. Find the solution of system of linear equations, eigenvalues and eigen vectors
2. Identify the nature of the quadratic form using matrix theory
3. Classify and solve first and higher order ordinary differential equations with constant coefficients
4. Apply the knowledge of Mean value theorems, Maxima and Minima of functions of several variables
5. Analyze the characteristics to trace the curve
6. Adapt methods for measuring lengths, volumes, surface area of an object and also the procedure to transform change of variables and order of integration

COs – POs Mappings

COs	PO1	PO12
1	3	1
2	3	1
3	3	1
4	3	1
5	3	1
6	3	1

3- Strongly linked | 2-Moderately linked | 1-Weakly linked

Unit I
Matrices
Rank-Echelon form, Normal form, Solution of Linear System of equations –Gauss Elimination Method and Gauss Jordan Method
Eigen values and Eigen vectors – Properties (without proofs), Cayley-Hamilton Theorem (without proof) - Inverse and powers of a matrix
Quadratic forms- Reduction of quad ratic form to canonical form using orthogonal transformation – Rank, index and signature, Nature of Quadratic form
LU-Decomposition Method

11+4 Hours

Unit II
Differential Equations
Differential equations of first order and first degree–exact and reducible to exact, Newton's Law of cooling, Law of natural growth and decay, orthogonal trajectories
Linear differential equations of higher order with constant coefficients with RHS term of the type
□□□, sin □□, cos □□ polynomials in □, □(□), □□(□)
Problems related to LCR circuits

11+4 Hours

Unit III
Curve tracing and Functions of Several Variables
Curve tracing-Cartesian, Polar and Parametric curves
Functions of several variables-Partial differentiation, Taylor's theorem (generalized Mean Value theorem-without proof), Jacobian, Functional dependence, Maxima and Minima of functions of two variables with and without constraints
Applications of Mean value theorems

11+4 Hours

Unit IV
Applications of Integration
Lengths, Volumes and Surface areas of revolution in Cartesian and Polar Coordinates
Multiple integrals-Double integrals, Change of order of Integration, change of variables (Cartesian and Polar coordinates) and evaluation of triple integrals
Problems related to Centroid and Mass

12+3 Hours
Total:45+15 Hours

Textbook (s)

1. B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publishers, New Delhi, 2012
2. E. Kreyszig, Advanced Engineering Mathematics, 9th Ed., Wiley, 2012

3. R. K. Jain, S. R. K. Iyengar, Advanced Engineering Mathematics, 4th Ed., Narosa Publishing House, New Delhi, 2014

Reference (s)

1. B. V. Ramana, Engineering Mathematics, 4th Ed., Tata McGraw Hill, New Delhi, 2009
2. D. S. Chandrashekharaiah, Engineering Mathematics, Volume 1, Prism Publishers, 2010
3. T. K. V. Iyengar, B. Krishna Ghandhi, S. Ranganathan and M.V. S.S.N. Prasad, Engineering Mathematics, Volume-I, 12th Ed., S. Chand Publishers, 2014
4. U. M. Swamy, P. VijayaLaxmi, K. L. Sai Prasad and M. Phani Krishna Kishore, A Text Book of Engineering Mathematics–I, Excel Books, New Delhi, 2010

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2(%)	Open Book Examinations (%)
Remember	20	20	-
Understand	50	50	-
Apply	30	30	60
Analyze	-	-	30
Evaluate	-	-	10
Create	-	-	-
Total (%)	100	100	100

SAMPLE QUESTION (s)

Remember

1. State Cayley-Hamilton theorem.
2. What is Bernoulli's equation?

Understand

1. Represent $x^2 + 3x - 1$ in powers of $(x - 1)$ using Taylor's theorem.
2. Show that $3x^4y^2\hat{i} + 4x^3y^2\hat{j} + 3x^2y^2z\hat{k}$ is solenoidal.

Apply

1. Make use of the properties, to compute the sum and the product of the Eigen values of $A = \begin{pmatrix} 1 & 2 & 3 \\ 0 & 5 & 1 \\ 0 & 0 & 2 \end{pmatrix}$.
2. Solve $(x^3 - 3x^2 + 4) = x^{2x} + 6 + 80\cos 2x$

Evaluate

1. Determine the Eigen values and corresponding Eigen vectors of $\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$
2. Evaluate $\iiint_v \nabla . \vec{F}\, dv$, where $\vec{F} = 4x\hat{i} - 2y^2\hat{j} + z^2\hat{k}$ and v is bounded by $x^2 + y^2 = 4$, $z = 0$ and $z = 3$.

Analyze

1. Examine the given differential equation for a circuit in which self-inductance and capacitance neutralize each other is $L\frac{d^2q}{dt^2} + \frac{1}{C}q = 0$ and find the current i as a function of t of given that i is the maximum current, and $q = 0$ when $t = 0$. **(For Open Book Examination and not for semester end examination)**
2. Analyze the graph of $y^2(a - x) = x^2(a + x)$ by using the properties of curve tracing **(For Open Book Examination and not for semester end examination)**

19PYX01 Engineering Physics

(Common to all B. Tech. Programmes)

3 1 0 3

Course Outcomes

1. Interpret the concepts of mechanics to understand the conservative principles
2. Outline the principles of electrostatics, magnetostatics and able to explain electromagnetism
3. Illustrate the concepts of Interference, Diffraction, Polarization and their applications
4. Summarize the fundamental concepts of quantum theory and identify the applications of quantum theory in various contexts
5. Classify solids into conductors, insulators and semiconductors and understand conductivity in intrinsic and extrinsic semiconductors
6. Demonstrate the emission of laser light and their applications in various engineering fields. Interpret and classify optical fibers and their applications in modern communication systems.

COs – POs Mapping

COs	PO1	PO12
1	3	1
2	3	1
3	3	1
4	3	1
5	3	1
6	3	1

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I

Mechanics, Electrostatics and Magnetostatics

Scalar and Vector fields, – Gradient, divergence and curl – Gravitational potential energy – Work Energy theorem – Central forces – Conservative forces– Angular momentum - Kepler's laws of planetary motion (qualitative)
Electric flux - Gauss's law (electrostatics) – Applications of Gauss law: Coulomb's law from Gauss law, Spherically distributed charge (Non conducting sphere) - Ampere's law, application of Ampere's law - Biot- Savart's law, Applications of Biot-Savart's law: B due to current carrying straight conductor and a circular loop
– Faraday's law – Lenz's law - Maxwell's equations.
Electric field due to infinite sheet of charge and infinite line of charge

13+4 Hours

Unit II

Wave Optics

Principle of Superposition-Interference of light - Conditions for sustained Interference –Young's double slit interference-Interference in thin films (reflected light) - Newton's Rings, Determination of Wavelength, applications of Interference
Diffraction - Fraunhofer Diffraction at Single slit - Diffraction Grating – Grating Spectrum - Determination of Wavelength - applications of Diffraction.
Polarization - Types of polarization - Polarization by double refraction - Nicol's Prism - Half wave and Quarter wave plates - applications of Polarization.
Wedge shaped film - Polariods - Rayleigh criterion in resolution

10+4 Hours

Unit III

Quantum theory and semiconductors

Dual nature of matter - de-Broglie Hypothesis - Properties of matter waves – Uncertainty Principle - Physical significance of wave function - Schrödinger's wave equation – Particle in infinite potential well (one dimensional box) - Free electron theory of metals, electrical conductivity - Fermi Dirac Distribution function (qualitative) - Kronig - Penney model (qualitative) - Classification of materials into conductors, semiconductors and insulators.
Intrinsic semiconductors - Density of charge carriers (qualitative) - Fermi energy level – Electrical conductivity - Extrinsic semiconductors (P-type & N-type) - Density of charge carriers (qualitative) - Dependence of Fermi energy on carrier concentration and temperature - Hall effect - Applications of Hall effect - Drift and Diffusion currents
Tunneling effect

13+4 Hours

Unit IV

Lasers and Optical Fiber

Characteristics of laser – Stimulated absorption – Spontaneous emission - Stimulated emission – Population inversion – Pumping mechanism – Active medium –Laser systems: Ruby laser, He-Ne laser, Semiconductor laser – Applications of Lasers

Introduction to Optical Fibers-Total Internal Reflection and Critical angle of propagation-Acceptance angle-Numerical Aperture-Classification of fibers based on Refractive index profile and modes – Applications of optical fibers - Block Diagram of Fiber optic Communication system

Fiber optic sensors - Holography.

9+3 Hours

Total:45+15 Hours

Textbook (s)

1. Halliday, Resnick and Krane, Physics Part-II, Wiley India Pvt. Ltd, 2014
2. D Kleppner and Robert Kolenkow, An Introduction to Mechanics –II, Cambridge University Press, 2015.
3. David J Griffiths, Introduction to Electrodynamics, Printice Hall of India, 2012.
4. R.K. Gour and S.L. Gupta, Engineering Physics, Dhanpathrai Publications, New Delhi, 2014
5. S. O. Pillai, Solid State Physics, 6th Ed., Newage International Publishers, 2015
6. A. S. Vasudeva, Modern Engineering Physics, S. Chand and Company, New Delhi, 2006

Reference (s)

1. V. Rajendran, Engineering Physics, McGraw Hill Education (India) Private LTD, 2010
2. M. Armugam, Engineering Physics, Anuradha Agencies, 2007
3. P.K. Palanisamy, Engineering Physics – I, II, Scitech Publications (India) Pvt. Ltd, 2011.
4. M.R. Srinivasan, Engineering Physics, New age International Publishers, 2nd Edition, 2014.

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Examinations (%)
Remember	40	40	-
Understand	40	40	-
Apply	20	20	80
Analyze	-	-	20
Evaluate	-	-	-
Create	-	-	-
Total (%)	100	100	100

SAMPLE QUESTION (s)

Remember

1. Define Principle of Superposition.
2. State Faraday's law of electromagnetic induction and Lenz's law.
3. Recall vector and scalar fields.

Understand

1. Explain the construction and working principle of Nicole's prism.
2. Illustrate Ruby laser and explain its working principle with energy level diagram.
3. Outline fermidirac distribution function.

Apply

1. Demonstrate any four applications of lasers with reference to their characteristics. **(For Open Book Examination and not for semester end examination)**
2. Apply Biot-Savart's law, and calculate the Magnetic field induction along the infinite length of a straight conductor at points close to the conductor. **(For Open Book Examination and not for semester end examination)**
3. Calculate electric field intensity due to infinite line of charge by applying Gauss law. **(For Open Book Examination and not for semester end examination)**

Analyze

1. Compare insulator, semiconductor and conductors based on energy bands **(For Open Book Examination and not for semester end examination)**
2. Differentiate the types of optical fiber based on refractive index profiles. **(For Open Book Examination and not for semester end examination)**
3. Justify the formation of newton rings based on interference of light. **(For Open Book Examination and not for semester end examination)**

19CYX01 Engineering Chemistry

(Common to all B.Tech. Programmes)

3 1 0 3

Course Outcomes

1. Illustrate the different types of polymers and their applications
2. Interpret the Nernst equation for electrode potential and construct various types of energy storage devices
3. Describe corrosion factors and implement prevention measures
4. Estimate the calorific value of a fuel and select a suitable fuel as an energy resource
5. Describe the important renewable energy sources and their usage
6. Explain bonding, colour and magnetic properties of molecules

COs – POs Mapping

COs	PO1	PO12
1	3	1
2	3	1
3	3	1
4	3	1
5	3	1
6	3	1

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I

Polymer Chemistry

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, copolymerization (stereospecific polymerization) with specific examples of polymer formation.

Plastics - Thermoplastics and Thermosettings; Compounding of plastics; Preparation, properties and engineering applications of – Teflon, Bakelite, polycarbonate; Fibre reinforced plastics (FRP), Elastomers: Processing of natural rubber, Vulcanization of rubber–Engineering applications of rubber

Conducting polymers: mechanism of conduction in polyacetylene and applications of conducting polymers, Bio-degradable polymers: Poly hydrohyalkanoates (PHA), Poly caprolactum (PCL)

Molecular imprinting polymers (MIP)

12+3 Hours

Unit II

Electrochemistry and Corrosion

Concept of Electrode potential, electrochemical cell, Nernst equation, cell potential calculations

Primary cells – Fuel cells, hydrogen-oxygen fuel cells, working of the cells

Secondary cells – lead acid and lithium ion batteries- working of the batteries including cell reactions

Corrosion: Introduction to corrosion, electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, metal oxide formation by dry electrochemical corrosion, Pilling Bedworth ratios and uses, environmental factors (pH, temperature, DO) affecting corrosion rate, protection methods – corrosion inhibitors with specific examples, cathodic and anodic protection.

Organic coatings

11+4 Hours

Unit III

Fuel Chemistry

Fuels **–** Types of fuels, calorific value - HCV, LCV, numerical problems based on calorific value; Working and calorific value determination using Bomb calorimeter & Junkers Calorimeter, Characteristics of a good fuel, Analysis of coal - Proximate analysis & Ultimate analysis, refining of petroleum, liquid fuels, knocking and anti-knock agents, Octane and Cetane values, cracking of oils-Catalytic cracking, Synthetic petrol-polymerization, Fischer Tropsch & Bergius Process

Renewable Energy Resources: Energy scenario in India, Solar energy- Harnessing of solar energy in the form of Photo-voltaic cells, Bio-energy: Biodiesel

Rocket Fuels

11+4 Hours

Unit IV

Structure and Bonding Models

Molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O2, N2, NO and CO, etc. π-molecular orbitals of butadiene and benzene, calculation of bond order

Crystal field theory – salient features – energy level diagrams for transition metal ions – splitting in octahedral and tetrahedral environments, Magnetic properties and colour of complexes
Band theory of solids – band diagrams for conductors, semiconductors and insulators, role of doping on band structures.
Planck's quantum theory, Schrodinger equation (qualitative treatment only)

11+4 Hours
Total: 45+15 Hours

Textbook (s)

1. P. C. Jain and Monica Jain, Engineering Chemistry, 16th Ed., DhanpatRai Publishing Company, New Delhi, 2015
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference (s)

1. S. Chawla, A Textbook of Engineering Chemistry, 3rd Ed., Dhanpat Rai & Co (Pvt) Ltd, New Delhi,2012
2. P. Murthy, C. V. Agarwal, A. Naidu, Textbook of Engineering Chemistry, B. S. Publications, Hyderabad,2006
3. S. S. Dara, A Textbook of Engineering Chemistry, S. Chand and Company Limited, New Delhi,1994

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Examinations (%)
Remember	20	20	-
Understand	60	60	-
Apply	20	20	60
Analyze	-	-	40
Evaluate	--	-	-
Create	--	-	-
Total (%)	100	100	100

SAMPLE QUESTION (s)

Remember

1. Define polymer. Which are the different types of polymerization?
2. Differentiate between polymer and plastic? List out the differences between thermoplastics and thermosettingplastics?
3. Define calorific value, HCV andLCV

Understand

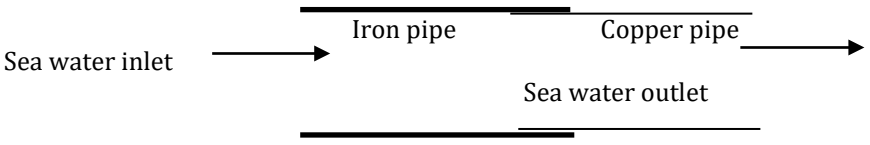
1. What is meant by vulcanization of rubber? Explain the advantages of vulcanization.
2. What is compounding of plastics? Explain the role of Fillers and Stabilizers with examples in compounding of plastics.
3. How a photo-voltaic cell is constructed and what is the working mechanism ofit?

Apply

1. By which methods, the underground pipelines are protected from corrosion? Explain the involved mechanisms.
2. Illustrate the Molecular orbital diagram of NO molecule by applying the MOT.

Analyze

1. When a metal X (of reduction potential = 0.337V at 25^0C) is connected to another metal Y (of reduction potential = -0.140V at 25^0C) and this structure is exposed continuously to sea water, which type of corrosion would take place? Explain with suitable mechanism. **(For Open Book Examination and not for semester end examination)**
2. Which type of corrosion is involved in the following jointed pipeline and why? Explain the involved mechanism indetail **(For Open Book Examination and not for semester end examination)**



19BEX01 Basics of Engineering

(Common to all B. Tech. Programmes)

3 1 0 3

Course Outcomes

1. Understand the principles of surveying and building materials and components
2. Understand the working principle of steam, Gas, Diesel, Hydro-electric, Nuclear Power plants and IC Engines
3. Understand the working principle of vapour compression & vapour absorption refrigeration systems, Window and Split type AC systems
4. Illustrate the behavior of basic electric circuit elements for both DC and AC excitation
5. Outline the construction and working principle of DC machines with appropriate safety measures
6. Understand the operation of sensors for engineering applications.

COs – POs Mapping

COs	PO1	PO12
1	3	1
2	3	1
3	3	1
4	3	1
5	3	1
6	3	1

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I

Surveying, building materials and components

Surveying principles, measurements of distances and areas. Building Materials: Bricks, stones, sand, cement, steel and concrete. Substructure: safe bearing capacity, foundations and types. Superstructure: stone and brick masonry, beams, columns, lintels, roofs, floors, plastering.

Layout of building (Plan and Elevation)

12+3 Hours

Unit II

Power Plant, IC Engines, Refrigeration and Air Conditioning System

Power plant – Classification, Working principle - steam, Gas, Diesel, Hydro-electric and Nuclear Power plants. IC Engines - Working principle of Petrol and Diesel Engines, Four stroke and two stroke cycles, Comparison. Refrigeration and Air Conditioning System – Simple and practical vapour absorption system, Window and Split type room Air conditioner.

Layout of typical domestic refrigerator

11+4 Hours

Unit III

Fundamentals of Electrical Engineering

Voltage, Current, Ohm's law, Kirchhoff's laws, Faraday's Laws, Basic circuit elements–R, L and C-series and parallel circuits, mesh and nodal analysis, Generation of alternating current, basic definitions, RMS and average values of periodic waveforms-form factor and peak factor, Principle of operation and construction-DC machines, Electric shock and its prevention, Methods of earthing.

Indian electricity safety rules.

11+4 Hours

Unit IV

Sensors & Consumer Electronics

Sensors and Applications: Resistive Sensors, Inductive Sensors, Capacitive Sensors, Optical Sensors, Electro Magnetic Sensors, Thermal Sensors. Electronic Appliances: Photo Copier, Digital Camera, Mobile Phone, Television, Washing Machine.

Ultrasonic sensors and applications

11+4 Hours

Total: 45+15Hours

Textbook(s):

1. G. Shanmugam and M.S. Palanichamy, Basic Civil and Mechanical Engineering, 3rdEd., Tata. McGraw. Hill Publishing Co., New Delhi, 2000.
2. Ramamrutham S., Basic Civil Engineering, 3rd Ed., DhanpatRai Publishing Co. (P) Ltd. 2013.
3. Ganeshan.V, IC Engines, Tata McGraw-Hill Education Pvt. Ltd, 3rd Ed., 2013.

4. C.P.Arora, Refrigeration and Air Conditioning, Tata McGraw-Hill Publishing Company Limited, 3rd Ed., 2009.
5. P.K.Nag, Power Plant Engineering,Tata McGraw Hill Publishing Company, India, 4th Ed.,2014.
6. R.K.Rajput, Power Plant Engineering, 5th Ed., Lakshmi Publications, 2016.
7. D. P. Kothari and I. J. Nagrath, Theory and Problems of Basic Electrical Engineering, 4th Ed., PHI Learning Private limited, 2013.
8. Ramana Pilla, M. Surya Kalavathi and G.T.Chandra Sekhar, Basics of Electrical Engineering, 1st Ed., S. Chand & Company Ltd., 2018
9. D. Patranabhis, Sensors and transducers, 2nd Ed., PHI publication, 2013.

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Examinations (%)
Remember	20	40	-
Understand	55	60	25
Apply	25	-	75
Analyze	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total (%)	100	100	100

SAMPLE QUESTION (s)

Remember

1. Define Surveying.
2. Define Plane surveying.
3. Define Geodetic Surveying.
4. Define Bearing capacity, Ultimate bearing capacity, Gross safe bearing capacity and Net bearing capacity?
5. What are the different types of foundations and explain with neat sketches.
6. What is the standard Size of brick?
7. Why is gypsum needed in cement?
8. Define a cantilever beam.
9. What is D.P.C?
10. What is plastering?
11. Classify the power plant
12. Label the components of IC engine
13. State Faradays laws of Electro-magnetic Induction.
14. Define Kirchhoff's laws
15. List out five Indian electricity safety rules
16. Define RMS and average values, form factor and peak factor, of a periodic waveform
17. Define resolution of a sensor.
18. List any two applications of a electro magnetic sensor.
19. State the purpose of a sensor?
20. List any two applications of a capacitive sensor.
21. Define Slew rate of sensor.

Understand

(For Open Book Examination and not for semester end examination)

1. Explain Chain surveying with its accessories.
2. Explain different types of ranging methods.
3. Explain in detail about principle of Surveying
4. What are the factors effecting safe bearing capacity
5. What are the qualities of a good brick?
6. How are rocks classified? Briefly discuss the different classification of rocks.
7. What are the general principles of brick masonry?
8. Distinguish between short column and long column.
9. Differentiate between truss and a roof.
10. Compare the two stroke and four stroke engines.
11. Explan the working of split type air conditioner
12. Outline the expression for RMS and Average values of a sinusoidal voltage wave form

13. Outline the construction and working of DC generator.
14. Explain various methods of earthing.
15. Explain the preventive method of avo9iding electric shock
16. Explain the principle behind the operation of thermal sensors.
17. Explain sensitivity and repeatability with reference to a sensor.
18. Explain the working principle of photo copier.
19. Explain the operating principle of a washing machine.
20. Discuss the evolution of mobile phone technology.

Apply

(For Open Book Examination and not for semester end examination)

1. The following perpendicular offsets were taken at 10 meters intervals from a survey line to an irregular boundary line:3.25, 5.60, 4.20, 6.65, 8.75, 6.20, 3.25, 4.20, 5.65
2. Calculate the area enclosed between the survey line, the irregular boundary line, and first and last offsets, by the application of a) average ordinate rule b) trapezoidal rule and C) Simpson's rule.
3. Demonstrate the working of engine adopted by APSRTC bus.
4. Power can be produced from the steam. Justify the statement.

19BEX02 Problem Solving and Programming Skills

(Common to all B. Tech. Programmes)

3 1 0 3

Course Outcomes

1. Explain and illustrate aspects of the problem-solving using algorithm, flowchart
2. Demonstrate conditional and iterative statements to write programs
3. Understand and apply the concepts of arrays and user defined functions
4. Describe and apply the concepts of pointers and structures
5. Understand and apply the file manipulation functions to handle data files
6. Solve problems of varying complexity by developing programs in C

COs – POs Mapping

COs	PO1	PO12
1	3	1
2	3	1
3	3	1
4	3	1
5	2	1
6	2	1

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I

Introduction to Problem Solving and Fundamentals of C

Problem solving basics: Introduction to computers, the problem-solving Aspect, Top-down Design, Algorithms, Flowcharts/Pseudo codes, Implementation of algorithms, Types of Programming Languages, Program development steps, The compilation process, Syntax and Semantic errors.

Fundamentals of C: C Fundamentals: C Character set, Token, Data types, variables, Declarations, Operators and Expressions: Different types of operators, expressions, Type Conversions, Precedence and Order of Evaluation, Data input and output statements.

Control Flow Statements: Branching: if, if-else, nested if, else-if ladder, Looping: while, do-while, for, Break, Continue, goto, Switch statement

Comma and size of operators, bitwise operators, escape sequences

15+4 Hours

Unit II

Arrays and Functions

Arrays: definition, declaration, accessing elements, storing elements, 2-D arrays, Multidimensional arrays Strings and string manipulations

Functions: Built-in functions, User-defined Functions: Function prototyping, Function Definition, Passing arguments to function, call by value, Recursion, Passing arrays to function, Storage classes, Scope and life time of variables.

Preprocessor commands, *enumerations*

11+4 Hours

Unit III

Pointers and Structures

Pointers: Fundamentals, declarations, passing pointers as argument to function (Call by reference), arrays and pointers, Operations on pointers, dynamic memory management functions

Structures: Definition, declaration, Structures and Functions, Arrays of Structures, Pointers to Structures, Self-referential Structures, typedef, Unions

Dangling pointers, variable length arguments

10+4 Hours

Unit IV

Data Files and Introduction to Data Structures

File manipulation: Creation of Files, Opening and Closing a File, Processing a File, Unformatted Files

Introduction to Data Structures: Definitions, Classification of data structures: Linear, Non-Linear, Operations on Linked lists, Stack, Queue.

Command line arguments, Macros, error handling functions.

9+3 Hours

Total:45+15 Hours

Textbook (s)

1. Byron Gottfried, Programming with C, 3rd Ed., Tata McGraw Hill, 2017.
2. R. G. Dromey, How to solve it by Computer, Pearson Education India, 2008

Reference (s)

1. Y. Kanetkar, Let us C, 8th Ed., BPB Publication, 2004
2. ISRD Group, "Programming and Problem Solving Using C", Tata McGraw Hill, 2008.
3. F. E. V. Prasad, C Programming: A Problem-Solving Approach, Giliberg, Cengage, 2010
4. A. S. Tenenbaum, Y. Langsam and M. J. Augenstein,Data Structures using C, Pearson Education, 2009
5. Ellis Horowitz, Anderson-Freed, S Sahni, Fundamentals of Data Structures in C, 2nd Ed., Universities Press, 2008

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Examinations (%)
Remember	25	20	-
Understand	35	40	30
Apply	40	40	40
Analyze	-	-	30
Evaluate	-	-	-
Create	-	-	-
Total (%)	100	100	100

SAMPLE QUESTION (s)

Remember

1. Define Algorithm
2. List any four types of operators of C – Language
3.What is dangling pointer?

Understand

1. What is Structured programming?
2. Differentiate linear and nonlinear data structures
3. List any four string handling functions

Apply

1. Write a program for matrix multiplication using arrays
2. Solve Towers of Hanoi problem using recursion
3. Identify the suitable file mode for adding new data in to the existing file

Analyze

1. Compare structure and union
2. Differentiate logical and relational operators
3. Distinguish between Recursive and non-recursive functions

19BEX03 Problem Solving and Programming Skills Laboratory

(Common to all B. Tech. Programmes)

0 0 3 1.5

Course Outcomes

1. Implement, execute the programs in C language for solving a problem
2. Exercise conditional and iterative statements to Write C programs
3. Implement programs to develop applications using functions
4. Apply Arrays and structures to solve real world problems
5. Make use of pointers to design applications with efficient use of memory
6. Solve problems using files concept

COs – POs Mapping

COs	PO4
1	3
2	3
3	3
4	3
5	3
6	3

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

List of Experiments

1. Draw the Flow charts using Raptor tool (Minimum 2)
2. Mr. John takes a loan to buy a truck at the rate of some interest. Help John to calculate the simple interest to be paid for the loan amount for a time.

   For example:

   Given P=15000 amount at the rate of 5% interest annually (T=12 months).find SI?

   Functional Description:

   Complete the task using C editor and the output of the program is to display a float value.

   Constraints:

   - P>10,000
   - T>0
   - 2<=R<=5

   Sample Test case:

   15000
   11
   3
   4950.00
   The first integer indicates Principal amount
   Second integer indicates Time
   Third integer indicates Rate of interest
   Forth value indicates the interest to be paid by John.
3. A person brought a new house and want to paint his house. He is having following details: Length, Height, Breadth and cost for square feet to paint a single wall. Help him out to calculate the cost for painting work.

   For example:

   Given L=5, B=3, H=10, C=1000 and find total cost of house for painting

   Functional Description:

   Complete the task using C editor and the output of the program is to display a value.

   Constraints:

   - 0<L<100
   - 0<B<100
   - 1<=H<=10
   - C>100

   Sample Test case:

5
3
10
1000
150000
The first integer indicates Length
Second integer indicates Breadth
Third integer indicates Height
Fourth integer indicates Cost
Fifth value indicates total cost.

4. Government wants implement new pension scheme to people of the country based on the following criteria

Age	Amount to be paid monthly	Pension after 60 Years
Below 18	---	Not Eligible
18-22	210	5000
23-27	310	5000
28-35	410	5000
35-45	510	5000

Help the citizens to know how much amountneed to be paid based on age criteria

Functional Description:
Complete the task using C editor and the output of the program is to display a value.
Sample Test case:
20
210
5000
The first integer indicates Age
Second integer indicates amount to be paid
Third integer indicates pension amount

5. There are n students attempted a competitive exam. The college wants to allocate the section to a student based on their rank. Use an appropriate logic to order the students according to their rank.

Functional Description:
Complete the task using C editor by reading set of integer values into 1-D array and display them in sorted order.
Constraints:

- n>4
- All values should be in integer

Sample Test case:
5
3
2
1
4
10
1 2 3 4 10

6. Consider a country with n states. Read capital income from n states and find the highest , lowest capital income

Functional Description:
Complete the task using C editor by reading set of integer values into 1-D array and display highest and lowest values.
Constraints:

- n>=2
- All values should be in integer

Sample Test case:
5
3
2
1
4

10
1 10

7. 2 colleges with 3 teams each participating in a technical quiz. Each team should consists of students from IT, ECE, CSE. Find the total number of students participated from each branch in both colleges.

Functional Description:

Complete the task using C editor by reading set of integer values into 2-D array and display the output.

Constraints:

- All values should be in integer

Sample Test case:

College1			College2		
2	3	4	1	2	5
3	4	5	5	6	3
4	2	1	6	2	4

21 19 22

8. Divya is teaching her student Amit about palindromes. A palindrome is a word, phrase, number, or other sequence of characters which reads the same backward or forward.

For example

The string "MALAYALAM" is a palindrome. Help Divya to check whether Amit identified palindromes correctly or not.

Functional Description:

Complete the task using C editor and the output of the program is to display a value.

9. A box contains 'n' distinct color balls. A person has to take 'r' balls at a time. Find the arrangements and selections of balls.

Functional Description:

Complete the task using C editor and the output of the program is to display the output.

Constraints:

- n>0
- r>=0

Sample Test case:

5
3
10
60

The first integer indicates n
Second integer indicates r
Third integer indicates number of arrangements
Forth value indicates number of arrangements

10. a. Bob wants to store some information regarding his research work later he wants to see whenever necessary. Suggest him how efficiently he can do this work.
b. An Organization has several branches, which maintain information regarding company one Of Sub branches wants some information from main branch. Help them in effective way

Functional Description:

Complete the task using C editor and the output of the program is to display its content.

11. Determine all positive integer values that evenly divide into a number, its factors. Return the pth element of your list, sorted ascending. If there is no pth element, return 0.

For example, given the number n = 20, its factors are {1,2,4,5,10,20}. Using 1-based indexing if p = 3, return 4. If p > 6, return 0.

Function Description

Complete the function pth Factor in the editor below. The function should return a long integer value of the pth integer factor of n.

pth Factor has the following parameter(s):
n: an integer
p: an integer
Constraints

- $1 \leq n \leq 1015$

- $1 \le p \le 109$

Input Format for Custom Testing
Input from stdin will be processed as follows and passed to the function.
The first line contains an integer n, the number to factor.
The second line contains an integer p, the 1-based index of the factor to return.
Sample Case 0
Sample Input 0
10
3
Sample Output 0
5
Explanation 0
Factoring n = 10 we get {1, 2, 5, 10}. We then return the p = 3rd factor as our answer.
Sample Case 1
Sample Input 1
10
5
Sample Output 1
0
Explanation 1
Factoring n = 10 we get {1, 2, 5, 10}. There are only 4 factors and p = 5.
We return 0 as our answer.
Sample Case 2
Sample Input 2
1
1
Sample Output 2
1
Explanation 2
Factoring n = 1 we get {1}. We then return the p = 1st factor as our answer.

12. Alex wants to paint a picture. In one stroke, Alex can only paint the same colored cells, which are joined via some edge. Given the painting, determine the minimum number of strokes to completely paint the picture. Take for example, the canvas with height given by h = 3 and width given by w = 5 is to be painted with picture picture = ["aabba", "aabba", "aaaca"], the diagram below shows the 4 strokes needed to paint the canvas.

Strokes
Canvas 1 2 3 4
aabbaaa bb a
aabbaaa bb a
aaacaaaa c a

Function Description

Complete the function strokesRequired in the editor below. The function must return an integer, the minimum number of strokes required to paint the canvas.
StrokesRequired has the following parameter(s):
picture[picture[0],...picture[h-1]]: an array of strings where each string represents one row of the picture to be painted

Constraints

- $1 \le h \le 105$
- $1 \le w \le 105$
- $1 \le h*w \le 105$
- len(picture[i]) = w (where $0 \le i < h$)
- picture[i][j] ∈ {'a', 'b', 'c'} (where $0 \le i < h$ and $0 \le j < w$)

Input Format For Custom Testing
The first line contains an integer, h, that denotes the height of the picture and the number of elements in picture.
Each line i of the h subsequent lines (where $0 \le i < h$) contains a string that describes picture[i].
Sample Case 0

Sample Input For Custom Testing
3
aaaba
ababa
aaaca
Sample Output
5
Explanation
The 'a's can be painted in 2 strokes, 'b's in 2 strokes and 'c' in 1 stroke, for a total of 5.
Strokes
Canvas 1 2 3 4 5
aaaba aaa b a
ababa a a b b a
aaaca aaa c a
Sample Case 1
Sample Input For Custom Testing
4
bbba
abba
acaa
aaac
Sample Output
4
Explanation
The 'a's can be painted in 1 stroke, the 'b's in 1 stroke and each 'c' requires 1 stroke.
Strokes
Canvas 1 2 3 4
bbbabbb a
abba bb a a
acaa a aa c
aaacaaa c

13. We define the following:
A binary string is a string consisting only of 0's and/or 1's. For example, 01011, 1111, and 00 are all binary strings.
The prefix of a string is any substring of the string that includes the beginning of the string. For example, the prefixes of 11010 are 1, 11, 110, 1101, and 11010.
We consider a non-empty binary string to be magical if the following two conditions are true:
The number of 0's is equal to the number of 1's.
For every prefix of the binary string, the number of 1's should not be less than the number of 0's.
For example, 11010 is not magical because it doesn't have an equal number of 0's and 1's, but 110100 is magical because it satisfies both of the above conditions.
A magical string can contain multiple magical substrings. If two consecutive substrings are magical, then we can swap the substrings as long as the resulting string is still a magical string. Given a magical binary string, binString, perform zero or more swap operations on its consecutive magical substrings such that the resulting string is as lexicographically large as possible. Two substrings are considered to be consecutive if the last character of the first substring occurs exactly one index before the first character of the second substring.
For example, if we look at the magical binary string binString = 1010111000, we see two magical binary substrings, 1010 and 111000 among others. If we swap these two substrings we get a larger value: 1110001010. This is the largest possible magical substring that can be formed.
Function Description
Complete the function largest Magical in the editor below. The function must return a string denoting the lexicographically largest possible magical string that can be formed by performing zero or more swap operations on consecutive magical substrings of binString.
largestMagical has the following parameter(s):
binString: a string
Constraints
Each character of binString∈ {01}.
1 ≤ |binString| ≤ 50

binString is a magical string.
Input Format For Custom Testing
The only line of input contains the string binString.
Sample Case 0
Sample Input 0
11011000
Sample Output 0
11100100
Explanation 0
Given the magical string binString = 11011000, we can choose two consecutive magical substrings, 10 and 1100, to swap such that the resultant string, str = 11100100, is the lexicographically largest magical string possible.
Sample Case 1
Sample Input 1
1100
Sample Output 1
1100
Explanation 1
The only magical substring of binString is 1100. So none of the operations can be applied on the string.
Sample Case 2
Sample Input For Custom Testing
1101001100
Sample Output
1101001100
Explanation
The only consecutive magical substrings of binString are 110100 and 1100. Note that 100 is not a magical substring because it contains more zeroes than ones. If we were to swap them, it would result in a lexicographically smaller string. Thus, binString is already the lexicographically largest magical string that can be formed.

14. Write recursive functions for the following
    i) To find the factorial of the given positive integer
    ii) To generate first n terms of Fibonacci series
    iii) To compute the sum of first n integers
    iv) To find the GCD of given 2 numbers

List of Augmented Experiments[1]

1. Employee's Management System
2. Library management system
3. Automation of department store
4. Personal Dairy Management
5. Telecom Billing Management
6. Bank Management System
7. Contacts Management

Reading Material (s)

1. C Programming Lab manual–Department of CSE-GMRIT Rajam,2019

[1]Students shall opt any one of the Augmented Experiments in addition to the regular experiments

19HSX02 Communicative English laboratory

(Common to all B Tech Programmes)

0 0 3 1.5

Course Outcomes

1. Make use of the acquired knowledge of English sound system
2. Improve articulation of sounds using the patterns of accent, rhythm and intonation
3. Develop the skills of communication in formal and informal situations
4. Choose and play different roles and practice interpersonal communication
5. Organize ideas in a structured manner in public speaking activities
6. Demonstrate the necessary verbal and non-verbal communication in technical presentations

COs – POs Mapping

Cos	PO10	PO12
1	3	1
2	3	1
3	3	1
4	3	1
5	3	1
6	3	1

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

List of Experiments

Module-1: Letters and Sounds of English **(2) sessions**
Letters and sounds, Speech Organs

Module -2: Interaction-1: **(1) session**
Greeting and taking leave, introducing oneself to others.

Module -3: The Sounds of English: **(1) session**
Consonants, consonant clusters and Vowels

Module -4: Pronouncing Words:
Silent letters, Plural markers and past tense markers **(1 session**

Module -5: Interaction-2: **(1) session**
Making request and response to them ask for and give/refuse permission,
Ask for and give directions, thank and respond

Module -6: Stress and Intonation **(1) session**

Module -7: Interaction-3: **(1) session**
Invite, accept, and declining invitations, Make complaints and respond to them, Express sympathy

Module -8: Presentation Skills: **(2) sessions**
Oral and PPT Presentations

Module -9: Interaction-4: **(1) session**
Apologize and respond, advice and suggest, Telephone Skills

Module -10: Group Discussions **(1) session**

List of Augmented Experiments[1]

1. Common Errors in English
2. Listening Skills
3. Writing Skills
4. Reading Skills
5. Public Speaking
6. Interview Skills
7. Business Communication
8. Functional English
9. Preparation for GRE/TOEFL
10. Preparation for IELTS/CAT/GMAT

Reading Material (s)

1. K. Nirupa Rani, Jayashree Mohanraj and B. Indira, Strengthen Your Steps, Maruthi publications, 2012

2. K. Nirupa Rani, Jayashree Mohan Raj, B. Indira, (Ed) Speak Well (C.D) Orient Black Swan Pvt Ltd, Hyderabad, 2012
3. D. Jones, English Pronouncing Dictionary (Software)*CUP, Ver.1.0, 2003*
4. *J. Sethi, S. Kamlesh, D. V. Jindal. A Practical Course in English Pronunciation, Prentice-Hall of India, New Delhi, 2007*
5. T. Balasubramanian, A Textbook of English Phonetics for Indian students, McMillan, 1981
6. K. Mohan and M. Raman, Effective English Communication, 1st Ed., Tata McGraw Hills, 2000
7. R. K. Bansal and J. B. Harrison, Spoken English, 3rd Ed., Orient Black Swan, Hyderabad, 1983

[1]Students shall opt any one of the Augmented Experiments in addition to the regular experiments

19BEX04 Engineering Drawing

(Common to all B. Tech. Programmes)

0 0 3 1.5

Course Outcomes

1. Understand Principles of engineering drawing
2. Construct Conic sections using general methods and other methods
3. Construct Orthographic projections of Points, Lines and Planes
4. Construct Orthographic projections of Solids using basic drafting software
5. Construct Isometric projections using basic drafting software
6. Construct Orthographic projections from given isometric projections of an object and vice versa

COs – POs Mapping

COs	PO1	PO5	PO10
1	3	-	2
2	3	-	2
3	3	-	2
4	3	3	2
5	3	3	2
6	3	3	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

List of Experiments

Unit I

Conic Sections-Introduction to Orthographic Projections

Construction of conics using general method and other special methods

Orthographic Projections of Points, Straight Lines parallel to both planes, parallel to one plane and inclined to other plane

9 Hours

Unit II

Orthographic Projections of Straight Lines and Planes

Projections of Straight Lines inclined to both planes; Projections of Planes; Regular Planes Perpendicular Parallel to one Reference Plane and inclined to other Reference Plane; inclined to both the Reference Planes

Practice the following topics by using any one 2D drafting software

9 Hours

Unit III

Projections of Solids &Isometric Projections

Projections of Prisms, Cylinders, Pyramids and Cones with the axis inclined to one Principal Plane and Parallel to the other, Projections of Prisms, Cylinders, Pyramids and Cones inclined to both the Principal Planes Introduction to Isometric Projections, Isometric axes, angles, Isometric views, Construction of Isometric views of Simple planes and Solids in various positions

15 Hours

Unit IV

Conversion of Engineering Views

Conversion of Orthographic Views of Simple Solid objects into Isometric View, Conversion of Isometric View of Simple Solid objects into Orthographic Views

9 Hours

Total: 42 Hours

List of Drawing Sheets

1. Conics by General Method
2. Conics by using Special Methods
3. Projections of Points and Straight lines in Simple Positions
4. Projections of Lines inclined to both planes
5. Projections of Planes in Simple positions
6. Projections of Planes inclined to both planes
7. Projections of Solids
8. Projections of Solids inclined to both planes
9. Isometric Projections
10. Conversion of Orthographic views into Isometric views
11. Conversion of Isometric views into Orthographic views

List of Augmented Experiments[3]

1. Draw the Knuckle Pin and fork end of the knuckle joint
2. Draw the Socket and spigot cotter joint
3. Draw the Tommy bar and body of the Screw jack
4. Draw the Cup and Big and Small screws of screw jack
5. Draw the Connecting rod of IC Engine using CAD
6. Draw the Pipe spool with flanges and a valve
7. Draw a sample pipe line construction design in oil and gas industries using CAD
8. Draw the Pipe truss design using AutoCAD
9. Draw a 3-D bolt and nut with Threads using CAD
10. Draw a 3-D Cross head pattern using CAD
11. Draw the sample Bridge using CAD
12. Draw the pipe vice using CAD
13. Draw the Ni-Cd Battery zapper circuit diagram using CAD
14. Draw the circuit diagram of battery charger with automatic cutoff using CAD
15. Draw the satellite dish and Antenna using CAD

Reading Material (s)
Textbook (s)

1. N.D. Bhatt, V. M. Panchal, Pramod R. Ingle, Engineering drawing, Charotar Publications, 54th Edition, 2014
2. D. M. Kulkarni, A.P. Rastogi, Ashoke K. Sarkar, Engineering Graphics with Auto CAD, Prentice Hall of India, 2nd Edition, 2010

Reference (s)

1. K. C. John, Engineering Graphics for Degree, PHI Publications, 2nd Edition, 2009
2. M. B. Shah and B. C. Rana, Engineering Drawing, Pearson Publishers, 2nd Edition, 2009
3. D. A. Jolhe, Engineering Drawing, Tata McGraw-Hill Education, 1st Edition, 2008

[3]Students shall opt any one of the Augmented Experiments in addition to the regular experiments

19BEX05 Engineering Workshop

(Common to all B. Tech. Programmes)

0 0 3 1.5

Course Outcomes

1. Make use of basic hand tools of carpentry, fitting, tin smithy and house wiring
2. Develop simple wooden components cross lap, T-Lap, Dovetail and Mortise and Tennon joints
3. Develop simple house hold items Square Box without lid ,Taper Tray, Open Scoop and Funnel
4. Develop Square, V, Half Round and Dovetail Fits using mild steel
5. Understand simple house wiring circuits
6. Create a model using the basic principles of all workshop trades

COs - POs Mapping

COs	PO1	PO9	PO10
1	3	2	2
2	3	3	2
3	3	3	2
4	3	3	2
5	3	3	2
6	3	3	2

3–strongly linked | 2–moderately linked | 1–weakly linked

List of experiments
Trades

Carpentry :
1. Cross Lap joint
2. T-Lap joint
3. Dovetail Joint
4. Mortise and Tennon Joint

Fitting :
1. Square Fit
2. V- Fit
3. Half Round Fit
4. Dovetail Fit

Tin Smithy :
1. Square Box without lid
2. Taper Tray
3. Open Scoop
4. Funnel

House wiring :
1. Parallel/Series connection of three bulbs
2. Florescent Lamp Wiring
3. Stair Case Wiring
4. Godown Wiring

Total: 45 Hours

List of Augmented Experiments[1]

1. Prepare Tee–bridle joint
2. Prepare Corner dovetail joint
3. Make Corner bridge joint
4. Make Dovetail lap joint
5. Prepare 90^0 round elbow pipe
6. Prepare Ellipse using GI sheet
7. Make cylindrical pipe
8. Make Round T-pipe
9. Prepare hexagonal fitting
10. Prepare diagonal dovetail fitting
11. Prepare universal fitting
12. Make square fitting
13. Set the general house wring
14. Set the dim & bright lighting

15. Set the test lamping

Reading Material (s)

1. Engineering workshop Lab manual, Department of Mechanical Engineering, GMRIT Rajam.

[4]Students shall opt any one of the Augmented Experiments in addition to the regular experiments

19PYX02 Engineering Physics Lab

(Common to all B.Tech. Programmes)

0 0 3 1.5

Course Outcomes

1. Infer the knowledge from the scientific methods and learn the process of measuring different physical parameters
2. Develop the laboratory skills in handling of electrical and Optical instruments
3. Demonstrate the interference and diffraction phenomena of light
4. Inspect and experience physical principles of Magnetic fields and optical fiber communications
5. Apply the principles of physics and measure the solid state properties of materials
6. Design and analyze experiment based on physics concepts

COs – POs Mapping

COs	PO4
1	3
2	3
3	3
4	3
5	3
6	3

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

List of Experiments

1. Variation of magnetic field along the axis of current-carrying circular coil-Stewart and Gee's Method
2. Determination of wavelengths of spectral line of mercury spectrum using diffraction grating
3. Determination of radius of curvature of convex lens by forming Newton's rings
4. LCR circuit- Study of parallel and series Resonance
5. Measurement of thickness of a thin paper using wedge method
6. Fiber optics-Numerical aperture of a given fiber and study of bendig losses
7. Meldie's Experiment–Transverse and longitudinal modes
8. Determination of wave length of Laser by diffraction grating
9. Determination of Hall Coefficient and charge carrier density of semi-conductor
10. Determination of Band gap of a semiconductor

List of Augmented Experiments[5]

1. To study the magnetization (M) of a ferromagnetic material in the presence of a magnetic field B and to plot the hysteresis curve (M vs. B)
2. Study the Thermoemf of the thermo couple
3. LCR Series and Parallel–Design of circuit for various resonance frequencies
4. Determination of characteristics of Laser beam
5. Determination of Horizontal component of earth's magnetic field
6. Study of double refraction in calcite crystals
7. Dispersive power of various liquids using spectrometer
8. Photo cell–Characteristics and determination of Planks constant
9. Michelson's interferometer.

Reading Material (s)

1. Physics Lab manual–Department of Physics, BS & H, GMRIT, Rajam, 2019
2. S. Balasubramanian , M.N. Srinivasan " A Text book of Practical Physics"- S Chand Publishers, 2017
3. Y. Aparna and K. Venkateswararao, Engineering Physics–I and II, VGS Techno series, 2010
4. S. Panigrahi and B. Mallick, Engineering Practical Physics, Cengage leaning, Delhi, 2015
5. http://www.amrita.vlab.co.in Virtual Labs, Amrita University.
6. http:/www./iitk.vlab.co.in

[5]Students shall opt any one of the Augmented Experiments in addition to the regular experiments

19CYX02 Engineering Chemistry Lab
(Common to all B. Tech. Programmes)

0 0 3 1.5

Course Outcomes

1. Utilize different Analytical tools and execute experiments involving estimation of raw materials, finished products and environmental samples etc.
2. Utilize modern instruments like ion analyzer, UV Vis spectrophotometer for characterization of materials used in industry & environment
3. Determine the amount of fluoride present in water for its quality in drinking purpose
4. Estimate the acid number of oil and assess its suitability as a lubricant.
5. Prepare a cross-linked & thermosetting polymer - Bakelite
6. Identify the adulteration of food items such as milk, honey, tea, coffee

COs – POs Mapping

COs	PO4
1	3
2	3
3	3
4	3
5	3
6	3

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

List of Experiments

1. Introduction to Quantitative Analysis - Demonstration
2. Determination of Acid number of a lubricating oil [titration of weak acid vs. strong base]
3. Estimation of Strength of an acid in Pb-Acid battery by pH metry
4. Conductometry - Determination of cell constant and conductance of solutions
5. Potentiometry - Determination of redox potentials and emfs using Weston cell
6. Preparation of a polymer - Bakelite
7. Determination of molecular weight of a polymer using viscometer
8. Verify Lambert-Beer's law - □ calculation or conc. estimation
9. Assessment of quality of water – Fluoride content
10. Detection of adulteration of food in Honey/Milk/Tea
11. Making and using a blue printing paper
12. Measurement of 10Dq by spectrophotometric method
13. Determination of corrosion of metal in the presence/absence of inhibitor

List of Augmented Experiments[6]

1. Assessment of ground water quality of your village/Mandal (by taking min. 6 locations and determining min. 4 parameters – Fluoride, Chloride, Hardness, TDS etc.
2. Preparation of desired quality of Viscosity Index lubricating oil
3. Studies on the effect of various factors on corrosion
4. Making a battery of required potential
5. Energy scenario in India- Various sources, % consumption, solutions to meet future demand etc.

Reading Material (s)

1. K. Gouru Naidu, Engineering Chemistry Lab Manual, 1st Ed.,2014
2. G. Svehla, Vogel's Qualitative Inorganic Analysis, 7th Ed., Pearson Education, New Delhi,2003

[6]Students shall opt any one of the Augmented Experiments in addition to the regular experiments

19HSX03 Advanced Communicative English
(Language Elective for all B Tech Programmes)

3 0 0 3

Course Outcomes

1. Summarize the information while listening to English spoken in different social and workplace contexts
2. Play different roles in Group Discussions and make formal structured presentations on academic topics using PPT slides
3. Organize information from reading texts after selecting relevant and useful points
4. Paraphrase academic texts, prepare CV and make presentations and project reports
5. Apply the knowledge of grammar in both spoken and written communication with accuracy
6. Develop vocabulary to enhance communicative ability

COs – POs Mapping

Cos	PO10	PO12
1	3	1
2	3	1
3	3	1
4	3	1
5	3	1
6	3	1

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I

Listening:Listening for presentation strategies and answering questions on the speaker, audience, and key points.
Speaking: Formal presentations using PPT slides without graphic elements and with graphic elements.
Reading: Reading for presenting – strategies to select, compile and synthesize information for presentation; reading to recognize academic style.
Writing: Paraphrasing; using quotations in writing; using academic style - avoiding colloquial words and phrases. Writing structured persuasive/argumentative essays on topics of general interest using suitable claims, examples and evidences for presenting views, opinions and position.
Grammarand Vocabulary: Formal/academic words and phrases; Phrasalprepositions; phrasal verbs
Novel: *Time Machine* by H G wells

15 Hours

Unit II

Listening: Following an argument/ logical flow of thought; answering questions on key concepts after listening to extended passages of spoken academic discourse.
Speaking: Group discussion on general topics; agreeing and disagreeing, using claims
Reading: Understand formal and informal styles; recognize the difference between facts and opinions.
Writing: Formal letter writing and e-mail writing (enquiry, complaints, seeking permission, seeking internship); structure, conventions and etiquette.
Grammar and Vocabulary: Language for different functions such as stating a point, expressing opinion, agreeing/disagreeing, adding information to what someone has stated, and asking for clarification.
*Drama: Hayavadana*by Girlish karnad

15 Hours

Unit III

Listening: Identifying views and opinions expressed by different speakers while listening to discussions.
Speaking: Group discussion; reaching consensus in group work (academic context).
Reading: Identifying claims, evidences, views, opinions and stance/ position.
Writing: Applying for internship/ job **-** Writing one's CV/Resumeand cover letter.
Grammarand **Vocabulary:** Active and passive voice – use of passive verbs in academic writing.
Autobiography: Wings of Fire by Abdul Kalam

15 Hours

Unit IV

Listening: Understanding inferences; processing of information using specific context clues and processing of explicit and implicit information inferable from the text or from previous /back ground knowledge.
Speaking: Formal team presentations on academic/ general topics using PPT slides.

Reading: Reading for inferential comprehension.
Writing: Structure and contents of a Project Report; identifying sections in project reports; understanding the purpose of each section; significance of references.
Grammarand Vocabulary: Reinforcing learning; editing short texts; correcting common errors in grammar and usage.
Travelogue: Butter Chicken in Ludhiyana by Pankaj Mishra

15 Hours
Total: 60 Hours

Textbook (s)

1. English All Round: Communication Skills for Undergraduate Learners, vol.2, Published by Orient Black Swan, 2019.

Reference (s)

1. Chase, Becky Tarver. *Pathways:Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.
2. Skillful Level 2 Reading & Writing Student's Book Pack (B1) MacmillanEducational.
3. Hewings, Martin.*Cambridge Academic English (B2)*. CUP, 2012. (Student Book, Teacher Resource Book, CD & DVD)
4. Bailey, Stephen. *Academicwriting: A handbook for international students*. Routledge, 2014
5. Dhanavel,S.P.*English And Communication Skills For Students Of Science And Engineering.* Orient Blackswan, 2009.

Web resource(s)

Grammar/Listening/Writing

1. 1-language.com
2. www.5minuteenglish.com
3. www.englishpractice.com

Grammar/Vocabulary

4. English Language Learning online
5. www.bbc.co.uk/learningenglish
6. www.better-english.com
7. www.nonstopenglish.com
8. www.vocabulary.com

Reading

9. www.usingenglish.com
10. www.englishclub.com
11. www.english-online.at

Listening

12. learningenglish.voanews.com
13. www.englishmedialab.com

Speaking

14. www.talkenglish.com
15. BBC Learning English – Pronunciation tips
16. Merriam-Webster – Perfect pronunciation Exercises

All Skills

17. www.englishclub.com
18. www.world-english.org
19. learnenglish.britishcouncil.org

Online Dictionaries

20. Cambridge dictionary online
21. MacMillan dictionary
22. Oxford learner's dictionaries

19MAX02 Engineering Mathematics II

(Common to all B. Tech. Programmes)

3 1 0 3

Course Outcomes

1. Solve problems related to engineering applications using integral transform techniques
2. Make use of Laplace transforms in solving the differential equations with the initial and boundary conditions
3. Utilize basic knowledge of conservative field, potential function and work done and also identify the relationships between line, surface and volume integrals in engineering problems
4. Find the Fourier series of periodic functions and expand a function in sine and cosine series
5. Solve problems related to basic linear and non-linear partial differential equations
6. Formulate and solve some of the physical problems of engineering using partial differential equations

COs – POs Mappings

COs	PO1	PO12
1	3	1
2	3	1
3	3	1
4	3	1
5	3	1
6	3	1

3-Strongly linked | 2-Moderately linked | 1-Weakly linked

Unit I

Laplace Transforms

Laplace transforms of standard functions, Shifting Theorems, Transforms of derivatives and integrals (Properties-without proofs), Unit step function, Dirac delta function, evaluation of definite integrals Inverse Laplace transforms, Convolution theorem (without proof), Application of Laplace transforms to ordinary differential equations with constant coefficients

Laplace transforms of Periodic functions

11+4 Hours

Unit II

Vector Calculus

Vector Differentiation-Gradient, Divergence, Curl and Vector Identities (without proofs)

Vector Integration - Line integral, work done, Scalar Potential function, surface and volume integrals, Vector integral theorems- Green's, Stokes and Gauss Divergence Theorems (Theorems without proof) and related problems

Proofs of Vector Identities

11+4 Hours

Unit III

Fourier Series and Transformations

Fourier series– even and odd functions, Half-range sine and cosine series, Fourier integral theorem (without proof)

Fourier transforms – sine and cosine transforms, properties (without proofs), inverse Fourier transforms.

Fourier Transformofconvolutionproducts

11+4 Hours

UnitIV

Partial Differential Equations and Applications

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange) equations and non-linear equations (four standard types)

Method of Separation of Variables, Applications to wave equation, one dimensional heat conduction equation and two-dimensional Laplace equation (Cartesian form)

Charpit's method

12+3 Hours

Total:45+15 Hours

Textbook (s)

1. Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42nd Edition, New Delhi,2012
2. S. R. K. Iyengar, R. K. Jain, Advanced Engineering Mathematics, Narosa Publishing House, 4th Edition, New Delhi, 2014

3. B. V. Ramana , Engineering Mathematics, Tata McGraw Hill, New Delhi, 4th Edition,2009

Reference book (s)

1. T. K. V. Iyengar*et.al,* Engineering Mathematics, 12th Edition, Volume -II, S. Chand Publishers, 2014
2. U. M. Swamy *et .al,* A Text Book of Engineering Mathematics – I, Excel Books, New Delhi, 2010
3. D.S. Chandrashekharaiah, Engineering Mathematics, Vol- 1, Prism Publishers, 2010
4. Erwin Kreyszig Advanced Engineering Mathematics, Wiley Student Edition,9th Edition, 2012

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Examinations (%)
Remember	20	20	-
Understand	50	50	-
Apply	30	30	60
Analyze	-	-	30
Evaluate	-	-	10
Create	-	-	-
Total (%)	100	100	100

Sample question (s)

Remember

1. Define unit step function.
2. Solve the PDE. $\sqrt{p} + \sqrt{q} = 2$.

Understand

1. Interpret Laplace transform technique $y_{11} - 3y_1 + 2y = e^{3t}$ given $(0) = 1$ and $y_1(0) = 0$. 2. Show that the vector $(y^2 - yz) - (x^2 - zx)\,j - (x^2 - xy)\,k$ is Irrotational.

Apply

1. Verify Gauss divergence theorem $A = (y^3 - yz) - 2x^2y\,i - z\,k$ taken over the surface of the cube formed by the planes $x = y = z = a$ and coordinate planes.
2. A tightly stretched string with fixed end points $x = 0$ and $x = l$ is initially in a position given by $y = y_0 \sin^3\frac{\pi x}{l}$. If it is released from rest from this position, find the displacement $y(x, t)$.

Evaluate

1. Using Laplace transform to evaluate $\int_0^\infty \frac{\cos at - \cos bt}{t}\,dt$
2. Evaluate $f(x) = x^2$ as a fourier series in $-\pi < x < \pi$.

Analyze

1. Examine whether $F = (2xy + z^3) + (2x - 4) + (3xz^2 + 2)$ is a conservative vector field ? If so find the scalar potential?
2. Distinguish Gradient, Divergence and Curl by using their physical interpretation.

19HSX04 Communicative German

(Language Elective for all B Tech Programmes)

3 0 0 3

Course Outcomes

1. Demonstrate an awareness of the relevance of foreign languages and understanding of the foreign culture
2. Show a basic level of proficiency necessary in an environment where German is used professions and careers exclusively
3. Make use of German language in description, narration, asking/answering questions and short statements for the variety of topics and situations
4. Build familiar vocabulary, everyday expressions and very simple sentences, which relate to the satisfying of concrete needs
5. Comprehend the foreign language with sufficient ability to grasp the main idea and some supporting details in short conversations
6. Write sentences and short paragraphs in German language

COs – POs Mapping

Cos	PO10	PO12
1	3	1
2	3	1
3	3	1
4	3	1
5	3	1
6	3	1

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit-1

Grammar:

1) Nouns 2) Indefinite articles3) Definite articles4) Prepositions5) Negation6) Interrogatives7) Conjugation of verbs in present perfect 8) Conjugation of verbs in present tense

15 Hours

Unit-2

Vocabulary:

1) Alphabet2) Transport3) Hobby4) Birthday5) Colors6) Numbers 0 to 100 (Ordinal, cardinal) 7) Parts of the face and body 8) Clothes 9) Fruits and vegetables 10) Time, Days, Months, Seasons

15 Hours

Unit-3

Communicative skills:

1) How to greet 2) Locating objects and places3) How to ask and answer questions1) How to introduce oneself4) How to talk about the weather5) How to talk over the telephone

Grammar:

1) Personal Pronoun 2) Imperative mood 3) Nominative and Accusative cases 4) Dative case 5) Adjectives 6) Separable and Inseparable verbs 7) Modal verbs 8) Conjunctions 9) Plurals

15 hours

Unit-4

Civilization:

1)Greetings2) Etiquettes3) Facts about Germany4) German customs and traditions5) Food culture in Germany

Vocabulary:

1) Food and Drinking 2) Family and Friends 3) Names of Country, its Citizens & Language 4) Vacation 5) Home 6) Furniture 7) Office 8) Directions 9) Shopping 10) Contacts 11) Daily routine 12) Games/Sports 13) Medical Equipment

15 hours

Total: 60 hours

Recommended study material:

1. Netzwerk A1 Kursbuchby Stefanie Dengler, Paul Rusch, Helen Schmitz, TanjaSieber
2. Netzwerk A1 Arbeitsbuchby Stefanie Dengler , T Mayr-Sieber, Paul Rusch

19HSX05 Communicative French

(Language Elective for all B Tech Programmes)

3 0 0 3

Course Outcomes

1. Demonstrate an awareness of the relevance of foreign languages and understanding of the foreign culture
2. Show a basic level of proficiency necessary in an environment where French is used professions and careers exclusively
3. Make use of French language in description, narration, asking/answering questions and short statements for the variety of topics and situations
4. Build familiar, everyday expressions and very simple sentences, which relate to the satisfying of concrete needs
5. Comprehend the foreign language with sufficient ability to grasp the main idea and some supporting details in short conversations
6. Write sentences and short paragraphs in French language

COs – POs Mapping

Cos	PO10	PO12
1	3	1
2	3	1
3	3	1
4	3	1
5	3	1
6	3	1

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit-1

Grammar: 1) Nouns 2) Indefinite articles3) Definite articles4) Prepositions5) Negation6) Interrogatives7) Irregular verbs (Present tense): être8) Regular verbs (Present tense): -er 9) Expressions: c'est, cesont, il y a. 10) Imperative mood

15 Hours

Unit-2

Vocabulary: 1) Alphabet 2) Geography of France 3) Days4) Months5) Colours 6) Numbers 0 to 100 (Ordinal, cardinal) 7) Parts of the face and body

15 Hours

Unit-3

Communicative skills: 1) How to greet2) Locating objects and places3) How to ask and answer questions4) How to introduce oneself 5) How to talk about the weather6) How to talk over the telephone
Grammar: 1) Contracted Articles 2) Irregular verbs (present tense): avoir, aller, faire, venir, écrire, lire, recevoir.3) Adjectives 4) Verbs: -ir (present tense) 5) Tense: futurproche 6) Impersonal verbs: pleuvoir ;neiger. 7) Possessive adjectives

15 hours

Unit-4

Civilization: 1) Greetings 2) Etiquettes3) Facts about France4) French customs and traditions5) Food culture
Vocabulary: 1) Clothes 2) Fruits and vegetables 3) Festivals

15 hours
Total: 60 hours

Recommended study material

1. **Sans frontieres 1**by MichèleVerdelhan-Bourgad

19HSX09 Communicative Hindi

(Language Elective for all B Tech Programmes)

3 0 0 3

Course Outcomes

1. Build confidence to speak Hindi language and demonstrate an awareness and relevance of Hindi language
2. Show a basic level of proficiency in speaking in meaningful conversations in careers
3. Make use of good vocabulary in description, narration, asking/answering questions and short statements for the variety of topics and situations
4. Practice familiar, everyday expressions and sentence structures, which relate to the satisfying of concrete needs
5. Comprehend the language and grasp the main idea and some supporting details in short conversations.
6. Write simple sentences and short paragraphs in Hindi language

COs – POs Mapping

Cos	PO10	PO12
1	3	1
2	3	1
3	3	1
4	3	1
5	3	1
6	3	1

3–strongly linked | 2–moderately linked | 1–weakly linked

Unit I

Writing: Introduction to Alphabet (phonology) –classification; Mathra
Vocabulary: Useful words- home, animals, birds, vegetables, flowers, fruits, relationships, days, months
Grammar Noun, Pronoun, verb, adjective, adverb, post position, conjunction, interjection.

15hours

Unit II

Vocabulary: Antonyms, synonyms, gender, vachan, suffix, prefix
Speaking: Simple sentences, comparative sentences, Sentence structures, use of want, not, don't, must, so-that, aa-ee-ye
Grammar: Tense, Usage of lag-sak-chuck-Degrees of comparison

15hours

Unit III

Writing: Official, Formal and informal letters
Speaking: Self- introduction, Conversations (at bank, post office, etc.)
Grammar and Vocabulary: Translations - words; sentences, paragraphs.

15hours

Unit IV

Writing: Short notes/stories, Essay writing
Speaking: Short talk and Conversations in travel, market etc
Vocabulary: Names of numerals, business vocabulary, time and scales of measurement etc.

15hours

Total: 60hours

Recommended Study material:

1. Meenu Katuria. Saral Hindi Vyakarantatha Rachana. Kumar publications Delhi.
2. N. Rajesh Rakhade & G. Kanaka Durga. Hindi Speaking course, Mudra Books. 2014

3rd Semester

19MA304 - Probability and Statistics using Python **3 0 2 4**

Course Outcomes:

1. Understand the basic data structures of Python and visualize data using various libraries of Python
2. Understand basic probability axioms and apply Bayes' theorem related to engineering problems.
3. Understand various distributions of random variables and apply on given data.
4. Understand stochastic process and queuing systems with respect to computer science
5. Analyze given dataset based on descriptive statistics
6. Decide the null or alternative hypotheses using the suitable test statistic.

CO-PO Mapping

CO	PO1	PO4	PO12
1	3	1	2
2	3	2	2
3	1	3	1
4	3	2	1
5	3	2	1
6	2	3	1

3-Strongly linked | 2-Moderately linked | 1-Weakly linked

Unit I **12+8 Hours**

Fundamental of Python Programming

Variables, expressions, and statements, Conditional execution, Functions, Iteration; Python Data Structures: Strings, Files, Lists, Dictionaries, Tuples.
Data Interpretation and Visualization using Python packages: Pandas, Numpy, SciPy, Sklearn and Matplotlib.

Objects & Classes

Practical Components

1. Lab Activity: Python Installation and Lab Setup
2. Lab Activity: Basic Experiments on Fundamentals of Python
3. Lab Activity: Experiments on Exploratory Data Analysis using Numpy, Pandas and Matplotlib packages

Unit II **11+7 Hours**

Introduction to Probability and Random Variables

Definition, Events and their probabilities, Rules of Probability; Conditional Probability, Bayes Theorem, Random Variables**:** Discrete and Continuous; Expectation and Variance, Probability Density, Distribution of a Random Variables: Discrete and Continuous Distributions- Bernoulli distribution, Binomial Distribution, Poison Distribution and Normal Distribution; Central Limit Theorem.

Gaussian and chaotic random distributions

Practical Components

1. Lab Activity: Simulation of random experiment (e.g. Rolling an n-face dice) and plot the empirical probability of each event, alongside the theoretical probability.
2. Lab Activity: Python script to find conditional probability of a given event.
   There are two urns A and B. Urn contains R_A red balls and W_A white balls whereas urn B contains R_B red balls and W_B white balls. One of the urns is picked at random and then one ball is picked at random from this urn. Write a function **conditional probability** that calculates the conditional probability that the randomly chosen ball belonged to urn *A* given that it is white. Assume that $(R_A/W_A) \neq (R_B/W_B)$.
3. Lab Activity:
   A continuous random variable is a random variable that represents an infinite number of outcomes. If we sample a continuous random variable *X*, the obtained samples may not cover the whole sample space. Since the sample space of a continuous distribution has infinite number of observations, to estimate the exact distribution of the random variable we need infinite number of samples. Since this is not practically possible, we can use parameterized continuous distributions to approximate the observed distribution.

In this activity, the hourly weather dataset will be used, and the dataset contains temperature recording for the city of Detroit. Various continuous distributions studied in this Unit will be implemented.

Unit III **11+7 Hours**

Stochastic Process

Definition of Stochastic Process, Markov processes and Markov chains, Counting Processes: Binomial and Poison Processes

Queueing Systems: Definition, Components of a Queueing System, The Little's Law of Queueing System, Bernoulli single-server queuing process, Multi-server queuing systems

Introduction Statistics: Introduction to Statistics, Population and sample, parameters and statistics, Simple Descriptive Statistics and Graphical Statistics.

Buffer management and process management using queueing systems

Practical Components

1. Lab Activity: Simulation of Markov Process and Markov Chains using Python
2. Lab Activity:
   Imagine, you are the Operations officer of a Bank branch. Your branch can accommodate a maximum of 50 customers. How many tellers do you need if the number of customers coming in with a rate of 100 customers/hour and a teller resolves a query in 3 minutes?
3. Lab Activity: Python Modules for Descriptive Statistics

Unit IV **11+8 Hours**

Statistical Inference and Hypothesis Testing

Statistical Inference**:** Parameter Estimation, Confidence Intervals, Unknown Standard Deviation.

Hypothesis Testing**:** Hypothesis and alternative, Type I and Type II errors: level of significance, Chi- Square Test, Inference about variances, one tail and two-tail tests –tests of Hypothesis concerning one and two means & Proportions-Z test, Maximum error and interval estimation of means and proportions. Tests of significance – Student's t-test, F-test, Chi-square test for independence of attributes.

Regression & PCA

Practical Components

1. Lab Activity: Experiments on Error calculation
2. Lab Activity:
   Given a coin we can toss it *n*-times and count the number of heads we get. The null hypothesis is that the coins are unbiased, which means, P(□□□□□□)= □(□□□□□□) =0.5. Write Python code that takes critical values for different alternate hypothesis. (Vary *n* and significance level and observe the change in the critical values)
3. Lab Activity: Experiments on Regression and PCA

Total: 45+30 Hours

Textbook(s):

1. Wes McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython, 2nd Edition, O'Reilly Media, Inc
2. Michael Baron, Probability and Statistics For Computer Scientists, 2nd Edition, CRC Press

Reference (s):

1. José Unpingco, Python for Probability, Statistics, and Machine Learning, 2nd Edition, Springer Nature Switzerland

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Assignment Test[1] (%)
Remember	40	30	--
Understand	50	40	--
Apply	10	30	--
Analyze	--	--	--
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	--

[1]Assignment test should contain only questions related to Higher Order Thinking (HOT) Skills

SAMPLE QUESTION (S)
Remember

1. Define variable in python.
2. List any two differences between built-in and user defined functions.
3. List any two python packages used mathematics.

Understand

1. Explain use of probability and statistics in real world.
2. Illustrate about random variables in python.

Apply

1. Find different real time applications which use Markov process
2. Implement a queueing theory to handle multiple processes.

19HSX10 Engineering Economics and Project Management

3 1 0 3

Course Outcomes

At the end of the course, students will be able to

1. Illustrate the basic principles of engineering economics.
2. Demonstrate Cost-Volume-Profit (CVP) analysis in business decision making.
3. Implement the simple financial statements for measuring financial performance of a firm.
4. Evaluate investment proposals through various capital budgeting methods.
5. State key issues of organization, management and administration.
6. Determine the accurate project cost estimates and plan future activities.

CO-PO Mapping

CO	PO11	PO12
1	1	2
2	2	1
3	3	2
4	2	1
5	3	2
6	3	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I **10+3 Hours**

Introduction to Engineering Economics - Demand Forecasting & Cost Analysis

Concept of Engineering Economics – Types of efficiency – Managerial Economics Nature and Scope – Law of Demand – Types of Elasticity of demand.

Demand Forecasting & Cost Analysis: Demand Forecasting: Meaning, Factors Governing Demand Forecasting, Methods of Demand Forecasting (Survey and Statistical Methods) – Cost Analysis: Basic Cost Concepts, Break Even Analysis.

Factors affecting the elasticity of demand – Supply and law of Supply

Unit II **13 + 4 Hours**

Market Structures - Financial Statements & Ratio Analysis

Different type of Markets Structures – Features – Price Out-put determination under Perfect Competition and Monopoly

Financial Statements & Ratio Analysis: Introduction to Financial Accounting – Double entry system – Journal – Ledger – Trail Balance – Final Accounts (with simple adjustments) – Financial Analysis through Ratios: Interpretation of Liquidity Ratios (Current Ratio and quick ratio), Activity Ratios (Inventory turnover ratio and Debtor Turnover ratio, Creditors Turnover Ratio, Capital Turnover Ratio), Solvency Ratios (Debt- Equity ratio, Interest Coverage ratio), and Profitability ratios (Gross Profit Ratio, Net Profit ratio, Operating Ratio, P/E Ratio and EPS).

Price output determination under Monopolistic markets, Accounting concepts and conventions

Unit III **10 + 4 Hours**

Investment Decisions and Fundamentals ofManagement

Time Value of Money – Capital Budgeting: Meaning, Need and Techniques of Capital Budgeting

Introduction to Management: Nature – Importance – Classical Theories of Management: F.W.Taylor's and Henri Fayol's Theory – Functions and Levels of Management – Decision Making Process – Inventory Control, Objectives, Functions – Analysis of Inventory – EOQ.

Maslow & Douglas McGregor theories of Management, ABC Analysis

Unit IV **12 + 4 Hours**

Project Management

Introduction – Project Life Cycle and its Phases – Project Selection Methods and Criteria – Technical Feasibility – Project Control and Scheduling through Networks – Probabilistic Models of Networks – Time-Cost Relationship (Crashing) – Human Aspects in Project Management: Form of Project Organization – Role & Traits of Project Manager.

Sources of Long-term and Short-term Project Finance

Total: 45+15 Hours

Textbook (s)

1. Pravin Kumar, Fundamentals of Engineering Economics, Wiley India Pvt. Ltd. New Delhi, 2015
2. Rajeev M Gupta, Project Management, 2nd Ed., PHI Learning Pvt. Ltd. New Delhi, 2014

Reference (s)

1. Panneer Selvam. R, Engineering economics, 2nd Ed.,, Prentice Hall of India, New Delhi, 2013
2. R.B.Khanna, Project Management, PHI Learning Pvt. Ltd. New Delhi, 2011
3. R. Panneer Selvam & P.Senthil Kumar, Project Management, PHI Learning Pvt. Ltd. New Delhi, 2010
4. A. Aryasri, Management Science, 4th Ed., Tata McGraw Hill, 2014
5. A. Aryasri, Managerial Economics and Financial Analysis, 4th Ed., Tata McGraw Hill, 2014
6. Koontz & Weihrich, Essentials of Management, 6th Ed., TMH, 2010
7. Chuck Williams and Mukherjee, Principle of Management 7th Ed., Cengage Learning, 2013

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Examination[2] (%)
Remember	30	30	--
Understand	30	30	--
Apply	40	40	50
Analyze	--	--	30
Evaluate	--	--	20
Create	--	--	--
Total (%)	100	100	100

SAMPLE QUESTIONS

Remember

1. Define Managerial Economics. Explain its nature and scope.
2. Define Production Function? List the various types of production functions
3. Define the meaning of productivity? Explain how productivity can be enhanced in the Indian industries.
4. Define management and its functions
5. List out short-term source of finance and explain briefly

Understand

1. Summarize engineering economics with suitable examples.
2. Explain different elements of costs used in cost analysis
3. Illustrate the effect of price on demand and supply with the help of a diagram.
4. Explain the features of Perfect Competition
5. Explain Price-Output determination under Perfect Competition under Market period

Apply

1. Consider the following data of company for the year 2015
   Sales = Rs.2,40.000/-
   Fixed cost = Rs.50,000/-
   Variable cost = Rs.75,000/-
   Find out the followings
   a) Profit b) BEP c) Margin of safety
2. The following trial balance of Mr. Ramesh, prepare trading, profit & loss A/c for the year ended 31.12.2018 and balance sheet as on that date.

[2]Open Book Examination should contain only questions related to Higher Order Thinking (HOT) Skills

Particulars	Debit (Rs.)	Credit (Rs.)
Capital		1,00,000
Drawing	18,000	
Furniture	32,500	
Machinery	15,000	
Bills payable		15,000
Interest paid	900	
Sales		1,00,000
Purchases	75,000	
Opening stock	25,000	
Advertisement	15,000	
Wages	2,000	
Insurance	1,000	
Commission received		4,500
Sundry debtors	28,100	
Cash in hand	20,000	
Sundry creditors		10,000
Interest received		3,000
Total	**2,32,500**	**2,32,500**

Adjustments:

a) Closing Stock Rs.60,000 b) Outstanding wages Rs.500

3. From the following balances as on the date March 31st, 2014.

Particulars	**Amount (Rs.)**	**Particulars**	**Amount (Rs.)**
10% Debentures	3,00,000	Cash in hand	30,000
6% Long term Loans	50,000	Debtors	15,000
Share capital	2,50,000	Opening stock	50,000
Creditors	1,00,000	Closing stock	40,000
Bill payable	45,000	Gross Profit	20,000
Sales	100000	Building	700000

Calculate: Current Ratio, Debt-equity ratio, Quick ratio, Inventory turnover ratio, Debtors turnover ratio

4. A company requires 40,000 kg of raw materials. The company incurs a handing cost of Rs.360/- plus freight of Rs.390 per order. The incremental carrying cost of inventory of raw material is Rs. 15 per kg. Calculate:
   a) EOQ b) Number of orders per annum c) How frequently should orders be placed
5. The following table gives the activities in a construction project and other related information:

Activity	Immediate Predecessors	t0	t m	tp
A	-	1	9	11
B	-	5	6	7
C	A	5	7	9
D	A,B	4	7	10
E	C,D	1	4	7
F	C,D	7	9	11

a) Draw PERT diagram

b) Calculate total project duration

c) Mark the critical path

d) Find out the S.D and Variance of each activity

Open book question:

1. ABC Ltd., a US based organization, is engaged in manufacturing television screens. It is planning to establish a subsidiary organization in India to manufacture picture tubes. Cost studies produced the following estimates for the Indian subsidiary based on the estimated annual sales of picture tube (Rs.400000/-):

Particulars	Total Annual Cost (Rs.)	Percent of total annual cost that is variable
Materials	1936000	100%
Labour	900000	70%
Overhead	800000	64%
Administration	300000	30%

The Indian production would be sold by manufacturer's representatives who would receive a commission of 8% of the sales. No portion of the parent organizations' expenses is to be allocated to the Indian subsidiary.

a) Compute the sale price per picture tube to enable management to realize an estimated 10% profit on sale proceeds in India.
b) Is it feasible for ABC Ltd., to invest in the Indian market by studying the preceding calculation?

Analyze

1. A private school is considering the purchase a school bus to transport students to school. The initial cost of the bus is Rs.600,000. The life of bus is estimated to be five years, after the life time the vehicles would have to be scrapped with no salvage value. The school's management team has derived the following estimates for annual revenues and cost for the next five years.

year	Annual Revenue	Diver Cost	Repairs & maintenance	Other costs	Annual depreciation
1	330000	33,000	8,000	130000	120000
2	330000	35,000	13,000	135000	120000
3	350000	36,000	15,000	140000	120000
4	380000	38,000	16,000	136000	120000
5	400000	40,000	18,000	142000	120000

The buses would be purchased at the beginning of the project (i.e., in Year 0) and all revenues and expenditures shown in the table above would be incurred at the end of each relevant year. A business consultant has advised management that they should use a cost of capital of 10% to evaluate this project.

a) Attributes to be involved to estimate the net cash flow for each year in this project.
b) Justify the steps involved in the calculation process of net present cash flows above the project investment.

19CS303 Data Structures

3 1 0 3

Course Outcomes

At the end of the course, students will be able to

1. Describe the operations and implementation of List ADT (Understand)
2. Comprehend the operations and implementation of Stack and Queue (Understand)
3. Illustrate the applications of linear data structures (Apply)
4. Describe the operations and implementation of hash table (Understand)
5. Comprehend the operations and implementation of tree data structure (Understand)
6. Illustrate the variations of tree data structure (Understand)

CO-PO Mapping

CO	PO1	PO2	PO12
1	3	2	1
2	3	2	1
3	2	3	1
4	2	3	1
5	3	2	1
6	2	3	1

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I

Linear Data Structures – List **10 + 3 Hours**

Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list implementation –Singly linked lists- Circularly linked lists- Doubly-linked lists – Applications of lists –Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal) - Searching - Linear Search – Binary Search

Doubly linked Circular list

Unit II

Linear Data Structures – Stack and Queue **12 + 4 Hours**

Stack ADT – Array implementation – Linked list implementation – Applications of Stack – infix to postfix conversion, evaluation of postfix expression – Queue ADT – Array implementation – Linked list implementation – Application of Queue – Ticket counter

Circular Queue

Unit III

Sorting, Hashing Techniques and Trees **11 + 4 Hours**

Sorting – Bubble Sort – Selection Sort – Insertion Sort – Shell Sort – Radix Sort – Quick Sort – Merge Sort - Hashing - Hash Functions – Separate Chaining – Open Addressing – Rehashing
Trees: Introduction, Terminology, Binary Trees, Representation of Binary Trees using arrays and linked lists, Binary tree traversals

Extendible Hashing

Unit IV

Variations on Trees and Graphs **12 + 4 Hours**

Binary Search Trees: definition, basic operations of BST (Searching, Insertion and deletion) - Introduction to AVL trees: Balancing AVL tree by rotations after insertions and deletions of a data node Multi-way search trees: Introduction to m-way search trees, B-trees, B+ Trees;
Heaps: Binary heaps, definition of a Max-heap, Min-heap, Creating Max-Heap, Applications: Heap sort
Graphs: Terminology, Representation, Traversals: Depth First Search and Breadth First Search

Priority queue operations: insertions and extract-max

Total: 45+15 Hours

Textbook (s)

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, Pearson Education, 2002
2. Michael Main, Walter Savitch, Data Structures and other objects using C++, 4th Edition, Addison Wesley, 2018

Reference (s)

1. S. Tanenbaum, Y. Langsam and M.J. Augenstein,, Data Structures using C and C++, 2nd Edition, Pearson Education, 2015
2. R. F. Gilberg, B. A. Forouzan, Data Structures A Pseudocode Approach with C, 2nd Edition, CENGAGE Learning, 2005

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Examination[3] (%)
Remember	20	20	--
Understand	60	60	--
Apply	20	20	80
Analyze	--	--	20
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

1. What are abstract data types?
2. List any 2 disadvantages of array
3. Define linked list
4. Define data structure
5. List any 2 applications of queue

Understand

1. Compare linked list with array
2. Explain Bubble Sort Process with an example
3. Demonstrate with neat diagram and algorithm to insert a node before the given key
4. Explain Deletion process using an example binary search tree
5. Explain why the selection sort is more efficient than the bubble sort
6. Explain with suitable example of LL rotation after inserting a new node into an AVL tree
7. Demonstrate the application of singly linked lists for the addition of the polynomials P1 and P2

Apply

1. Develop an algorithm to concatenate two single linked lists
2. Construct a priority queue and implement all basic operations to demonstrate priority queue
3. Build a recursive procedure to count the number of nodes in a binary tree

Sample Questions for Open Book Examination

Apply

1. Select appropriate data structure to simulate the operations of a Music Player – Songs in music player are linked to previous and next song. you can play songs either from starting or ending of the list.

[3]Open book Examination should contain only questions related to Higher Order Thinking (HOT) Skills

2. A bracket is considered to be any one of the following characters: (,), {, }, [, or]. Two brackets are considered to be a matched pair if the an opening bracket (i.e., (, [, or {) occurs to the left of a closing bracket (i.e.,),], or }) of the exact same type. There are three types of matched pairs of brackets: [], {},and (). A matching pair of brackets is not balanced if the set of brackets it encloses are not matched. For example, {[(])} is not balanced because the contents in between { and } are not balanced. The pair of square brackets encloses a single, unbalanced opening bracket, (, and the pair of parentheses encloses a single, unbalanced closing square bracket,]. By this logic, we say a sequence of brackets is balanced if the following conditions are met: It contains no unmatched brackets. The subset of brackets enclosed within the confines of a matched pair of brackets is also a matched pair of brackets. Given n strings of brackets, determine whether each sequence of brackets is balanced. If a string is balanced, return YES. Otherwise, return NO.
3. You are given a stack of **N** integers such that the first element represents the top of the stack and the last element represents the bottom of the stack. You need to pop at least one element from the stack. At any one moment, you can convert stack into a queue. The bottom of the stack represents the front of the queue. You cannot convert the queue back into a stack. Your task is to remove exactly **K** elements such that the sum of the **K** removed elements is maximized.
4. Vikas is given a bag which consists of numbers (integers) blocks, Vikas has to organize the numbers again in the same order as he has inserted it into the bag**,** i.e. the first number inserted into the bag by Vikas should be picked up first followed by other numbers in series. Help Vikas to complete this work in O(n) time complexity with the condition to use one extra bag to complete the work (assume that the bags are compact and is in the form of a stack structure and has the same width as that of the number blocks and is large enough to fill the bag to the top and the number taken from bag is in reverse order).

19CS304 Digital Logic Design

3 0 2 4

Course Outcomes

At the end of the course, students will be able to

1. Understand different number systems, its conversions and binary arithmetic. (Understand)
2. Classify logic circuits using basic Logic gates and simplify logic expressions using theorems, K-map. (Understand)
3. Design and implement logical devices using combinational circuits. (Apply)
4. Demonstrate and compare the construction of programmable logic devices and different types of ROM(Understand)
5. Understand and Analyze Sequential circuits like latches and flip-flops. (Understand)
6. Analyze and Design sequential circuits like Registers and Counters. (Analyze)

CO-PO Mapping

CO	PO1	PO4
1	3	2
2	3	2
3	3	3
4	3	2
5	3	3
6	2	3

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I **10+6 Hours**

Number systems and Boolean algebra

Review of Number Systems, Conversion of Numbers from One Radix to Another Radix, Complements, Representation of Negative Numbers, Binary Arithmetic, Binary Codes, Error detecting & correcting codes, Basic Theorems and Properties of Boolean Algebra, Digital Logic Gates, Universal Gates.

IC specifications and pin diagram of gates

Practical Components

1. Realization of Logic gates and verification of Truth tables
2. Realization of basic gates using Universal gates

Unit II **12+8 Hours**

Boolean Function Minimization

Minimization of Switching Functions using K-Map up to 4-variables, Prime implicants, don't care combinations, Minimal SOP and POS forms

Combinational Arithmetic Logic Circuits-1

Adders, Subtractors, Binary Multiplier-*parity bit Generator,* Ripple carry adder, Multiplexer, De-Multiplexer, Encoder, Priority encoder, Decoder, MUX Realization of switching functions.

Code Converters, Magnitude Comparator

Practical Components

1. Implementation of Half Adder and Full Adder
2. Implementation and verification of Decoder and Encoder
3. Implementation and verification of MUX and DE-MUX

Unit III **12+6 Hours**

Programmable Logic Devices and Sequential Logic Circuits-1

Basic PLD's-ROM-PROM-PLA-PAL - Realization of Switching functions using PLD's Classification of Sequential Circuits (Synchronous and Asynchronous): Latches and Basic Flip-Flops-Truth Tables and Excitation Tables

Conversion of flip-flops

Practical Components

1. Realization of Flip-Flops using ICs

Unit IV **11+10 Hours**

Sequential Logic Circuits - II

Design of Registers - Buffer Register - Control Buffer Registers - Bidirectional Shift Registers - Universal Shift Register - Design of Synchronous Counters – Ripple counter, Up-down Counters, Design of Asynchronous Counters-Variable Modulus Counters (Mod-2,4,6,10 & 16), Ring Counter, Johnson Counter, Sequence generator.

Sequence detector

Practical Components

1.Verification of functioning of Basic Shift Register
2.Implementation of Synchronous Counter
3.Implementation of Asynchronous Counter

Total: 45+30 Hours

Textbook (s)

1. Digital Design 6th Edition by M Morris Mano, PEARSON INDIA,2018.
2. Charles H. Roth, Fundamentals of Logic Design,3rd Edition, Thomson Publications,2014
3. John F. Wakerly, Digital Design Principles & Practices, 4th Edition, PHI/ Pearson Education Asia,2008

Reference (s)

1. ZviKohavi, Switching & Finite Automata theory, 2nd Edition, TMH,2008
2. R P Jain,Modern Digital Electronics, 3rd Edition, TMH,2003
3. A. Anand Kumar, Switching Theory and Logic Design, 3rd Edition, PHP,2016.

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Assignment Test[4] (%)
Remember	20	10	--
Understand	50	40	--
Apply	30	30	--
Analyze	--	20	--
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	--

SAMPLE QUESTION (S)

Remember

1. Retrive the decimal value of the fractional binary number 0.1011
2. List any two postulates of Boolean algebra
3. List the four uses of Multiplexer.
4. Define Flip flop and Latch
5. Define Synchronous sequential circuit

Understand

1. Explain working functionality of Programable Logic Devices (PLD).
2. Represent the following Boolean expression to SOP and POS form: A+BC'+ABD'+ABCD
3. Represent the Boolean function T=F (w, x, y, z) = $\sum$ m (0,1,2,4,5,7,8,9,12,13) by using 8 to 1mux.
4. Illustrate a half adder using NAND – NAND
5. Represent a T flip flop using JK flip flop.
6. Differentiate between Bi-directional and Universal Shft Registers.

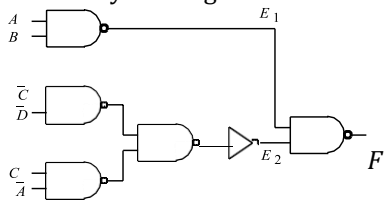
[4]Assignment test should contain only questions related to Higher Order Thinking (HOT) Skills

Apply

1. Find a circuit that has no static hazards and implements the Boolean function F(A,B,C,D) = Σ (0,2,6,7,8,,10,12) ..
2. Construct a four input NAND gate using gates with 2 inputs. Write down the truth table.Do the same for a 4 input NOR gate.
3. Implement MOD-6 and Johnson Counter.
4. Construct a combinational circuit to convert BCD to EX-3 code.
5. Implement a combinational logic circuit, which can compare two bits binary numbers.

Analyse

1. Analyze the following in two ways to get sums of product and product of sums equations. Then show how you can get one from the other using DeMorgan's Theorem



2. Why the input variables to a PAL are buffered
3. Why the fixed format in not used and floating format is used
4. What happens when an electric signal is grounded?
5. Design a Sequence detector to detect 10111001

19CS305 Discrete Mathematical Structures

3 1 0 3

Course Outcomes

At the end of the course, students will be able to

1. Construct and Verify the Correctness of Statements using Propositional and Predicate Logic. (Apply)
2. Illustrate the Operations on Discrete Structures such as Relations and Functions (Understand)
3. Demonstrate the Lattices and Algebraic Structures for the Modeling of Objects (Understand)
4. Utilize the Counting Techniques to Solve Combinatorics Problems (Apply)
5. Make use of the Binomial and multinomial Theorems to Solve Problems involving Recurrence Relations and Generating Functions (Apply)
6. Demonstrate Graphs and Trees as Tools to Visualize and Simplify Situations (Understand)

CO-PO Mapping

CO	PO1	PO12
1	3	1
2	3	1
3	3	1
4	3	1
5	3	1
6	3	1

3- Strongly linked | 2-Moderately linked | 1-Weakly linked

Unit I

Statement Logic and Predicate Logic **11+3 Hours**

Statements and Notations - Connectives - Well-formed Formulas - Truth Tables - Tautology – Equivalence Implication - Normal Forms - Rules of Inference for Statement Logic - Proof Techniques - Proof by Contradiction - Method of Induction.

Predicative Logic - Quantifiers - Universal Quantifiers - Free & Bound Variables - Rules of Inference for Predicate Logic

Program Correctness - Design of Logic Circuits

Unit II

Binary Relations, Functions and Algebraic Structures **11+4 Hours**

Binary Relations - Properties and Operations - Relational Graphs - Relation Matrices - Equivalence Relations -Compatibility Relations - Partial Ordering Relations - Hasse Diagram

Lattices - Properties and Types

Functions – Types of functions - Inverse Function - Composition of Functions

Algebraic Structures – Properties - Semi Groups – Monoids – Groups - Abelian Groups – Subgroups

Relations in Databases – Rings - Fields

Unit III

Combinatorics, Generating Functions and Recurrence Relations **12+4 Hours**

Basics of Counting – Cardinality - Sum and Product Rules - Permutations and Combinations with Repetitions

Binomial Coefficients - Binomial and Multinomial Theorems - The Principle of Inclusion and Exclusion - Pigeonhole Principle.

Generating Functions - Function of Sequences - Calculating Coefficient of Generating Functions - Recurrence Relations - Solving Recurrence Relation by Substitution.

Algorithm Analysis - Time and Space Complexity - Combinatorics for Bioinformatics

Unit IV

Basics of Graph Theory **11+4 Hours**

Representation of Graphs - Degree of a Graph - Handshaking Property - Complete Graphs - Regular Graphs -Bipartite Graphs -Walk – Path – Circuit – Cycle - Planar Graphs - Euler's Formula – Isomorphism - Euler Circuit and Hamilton Cycle - Chromatic Number - Trees and its Properties - Binary Trees and its Types.

Operations on Graphs, Four Color Problem, Applications of Graphs and Trees, Ternary Tree

Total: 45 + 15 Hours

Textbook (s)

1. Kenneth H. Rosen, Discrete Mathematics and Applications, 7th Edition, Tata McGraw Hill, 2015.
2. J. L. Mott, A. Kandel & T. P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians, Prentice Hall India, 2nd Edition, 2010.

Reference (s)

1. Tremblay J.P. and P. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 1997.
2. C. L. Liu and D. P. Mohapatra, Elements of Discrete Mathematics, A Computer Oriented Approach, 3rd Edition, Tata McGraw Hill, 2008.
3. D. S. Chandrasekharaiah, Mathematical Foundation to Computer Science, Prism Books Pvt. Ltd, Hyderabad, 4th Edition, 2012.
4. Ralph P. Grimaldi, B. V. Ramana, —Discrete and Combinatorial Mathematics - An Applied Introduction||, Pearson Education, India, 5th Edition, 2011.
5. Seymour Lipschutz and Marc Lipson, Discrete Mathematics, Revised 3rd Edition, Schaum's Outline Series, Tata McGrawHill, New Delhi, 2009.

Web References:

1. http://www.web.stanford.edu/class/cs103x
2. http://www.cs.odu.edu/~cs381/cs381content/web_course.html
3. http://www.cse.iitd.ernet.in/~bagchi/courses/discrete-book
4. http://www.saylor.org/course/cs202/
5. http://www.nptel.ac.in/courses/106106094/

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Examination[5] (%)
Remember	30	30	--
Understand	40	40	--
Apply	30	30	60
Analyze	--	--	30
Evaluate	--	--	10
Create	--	--	--
Total (%)	100	100	100

Remember

1. Define converse, contra positive and inverse of an implication
2. List out the different Principal normal forms with example
3. State the property of first theory of digraph theory by taking a suitable example
4. Define monoid and Abelian group with a suitable example
5. Define Pigeonhole Principle and the generalization of the Pigeonhole Principle

Understand

1. Explain the Planarity of the Kuratowski‟s two planar graphs
2. Explain the General Principle of Inclusion-Exclusion for n-sets
3. Draw the Hasse diagram of the following relation R is a relation defined as the divisors of 60 and denoted by D60.
4. Compare between Eulerian graph and Hamiltonian graph

[5]Open Book Examination should contain only questions related to Higher Order Thinking (HOT) Skills

Apply

1. Show that the identity. C(n, r -1) + C(n, r) = C(n +1, r)
2. Show that the complete graphs K2, K3, K4 are planar
3. Let G be the set of all non-zero real numbers with a binary operation *, defined as a*b = a^2b^2. Show that <G,*> is an abelian group.
4. Find the coefficient of x^9y^3 in the expansion of $(2x^{-3}y)^{12}$

Analyze

1. Differentiate between Permutation and Combination and find the relation between them.
2. Compare the Equivalence Relation, Compatible relation and Partial Order Relation.
3. Justify, whether the following argument is valid or not.

p → q
r → s p
V r
---
q V s

4. Identify the combinations in set of electives of 7 subjects that has no repetitions for a group of 10 members having 5 students in each group.

19CS306 Object Oriented Programming with C++

3 0 0 3

Course Outcomes

At the end of the course, students will be able to

1. Describe the basics of Object-Oriented concept (Understand)
2. Comprehend the basics of overloading, type conversion and its implementation (Understand)
3. Illustrate the importance and applications of inheritance (Apply).
4. Describe Virtual Function, runtime Polymorphism and Templates (Understand).
5. Illustrate exception handling (Understand).
6. Describe Standard Template Library (Understand).

CO-PO Mapping

CO	PO1	PO2	PO12
1	3	2	1
2	3	2	1
3	1	1	2
4	3	1	2
5	3	1	2
6	2	1	1

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I

Introduction to OOPs **11 + 3 Hours**

The Object-Oriented Technology Disadvantage of Conventional Programming- Key Concepts of Object-Oriented Programming Advantage of OOP- Object Oriented Language. **Classes and Objects:** Classes in C++- Declaring Objects- Access Specifiers and their Scope- Defining Member Function- Nested class, **Constructors and Destructor:** Introduction- Constructors and Destructor- Characteristics of Constructor and Destructor. Constructor with arguments & constructor overloading.

Copy constructor, inline functions, friend function and friend class.

Unit II

Compile time polymorphism and Type Conversion & Inheritance **13 + 4 Hours**

Overloading-Operator Overloading**: Overloading** Unary Operator- Operator Return Type- Overloading Assignment Operator (=)- Rules for Overloading Operators, Overloading Member Function, Inheritance, Reusability- Types of Inheritance- Virtual Base Classes- Object as a Class Member- Abstract Classes- Advantages of Inheritance-Disadvantages of Inheritance. **Pointers:** Pointer, Features of Pointers- Pointer Declaration- Pointer to Class- Pointer Object- The this Pointer- Pointer to Derived Classes and Base Class.

I*nterfaces, pure virtual function and Aggregation in C++.*

Unit III

Virtual Functions and runtime polymorphism **11 + 4 Hours**

Binding runtime Polymorphisms and Virtual Functions, Introduction- Binding in C++- Virtual Functions- Rules for Virtual Function- Virtual Destructor. **Generic Programming with Templates:** Generic Programming with Templates, Need for Templates- Definition of class Templates Normal Function Templates- Bubble Sort Using Function Templates- Difference Between Templates and Macros

Over Loading of Template Function.

Unit IV

Exception Handling **10 + 4 Hours**

Exception Handling- Principles of Exception Handling- The Keywords try throw and catch- Multiple Catch Statements –Specifying Exceptions. **Overview of Standard Template Library:** Overview of Standard Template Library- STL Programming Model- Containers- Sequence Containers- Associative Containers- Algorithms- Iterators- Vectors- Lists- Maps

User-defined exceptions and Namespaces.

Total: 45+15 Hours

Textbook (s)

1. Ashok N. Kamthane Object-Oriented Programming with ANSI and Turbo C++, 2nd Edition, Pearson, 2006.
2. Herbet Schildt, The Complete Reference C++, 5th Edition, TMH, 2012
3. Gary Bronson, A First Look of C++, 4th Edition CENAGE Learning, 2012
4. E Balaguruswamy Object-Oriented Programming with C++, Mc Graw Hill, 6th Edition 2013.

Reference (s)

1. Joyce Farrell, Object Oriented Programming using C++, 3rd Edition Cengage Publications, 2006
2. DS Malik, C++ Programming: from problem analysis to program design, 7th Edition, Cengage, 2009

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Examination[6] (%)
Remember	40	30	--
Understand	50	40	--
Apply	10	30	80
Analyze	--	--	20
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

SAMPLE QUESTIONS

Remember

1. Define class
2. Define inline function

Understand

1. Illustrate use of virtual functions
2. Explain operator overloading

Apply

1. Make use of STL to implement 1X20 vector.
2. Make use of exception handling concept to define a user defined exception.

[6]Open book Examination should contain only questions related to Higher Order Thinking (HOT) Skills

19CS307 Data Structures Lab

0 0 3 1.5

Course Outcomes

At the end of the course, students will be able to

1. Implement stack and queue data structures using array and linked list
2. Demonstrate the applications of stack and queue data structures
3. Implement sorting and searching algorithms and to compare their efficiency
4. Implement binary tree, binary search tree and tree traversals
5. Solve graph problems using appropriate data structure
6. Implement hashing techniques for real world applications (telephone directory, dictionary)

CO-PO Mapping

CO	PO4
1	3
2	3
3	2
4	2
5	3
6	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

List of Experiments

1. Implementation of list using array
2. Implementation of singly linked list
3. Implementation of doubly linked list
4. Implementation of Stack using array and linked list
5. Stack applications: Infix to postfix conversion
6. Implementation of sorting and searching algorithms: Bubble sort, Insertion sort, Selection sort, Merge sort, Quick sort, linear and binary search
7. Implementation of BST
8. Implementation of tree traversal algorithms
9. Implementation of Shortest path algorithms
10. Implementation of Graph Traversals using stack and queue
11. Implement open hashing
12. Implementation of closed hashing

Indicative list of applications-based experiments

1. Given an expression **exp** of length **n** consisting of some brackets. The task is to print the bracket numbers when the expression is being parsed.
   Input:
   The first line contains an integer **T,** the number of test cases. For each test case, there is a string exp containing the expression.
   Output:
   For each test case, the output is the bracket numbers of the expression.
2. Given an unsorted array **arr[]** of size **N**, rotate it by **D** elements (clockwise).
   Input:
   The first line of the input contains **T** denoting the number of test cases. First line of each test case contains two space separated elements, **N** denoting the size of the array and an integer **D** denoting the number size of the rotation. Subsequent line will be the N space separated array elements.
   Output:
   For each test case, in a new line, output the rotated array.
   Example:
   Input:
   2
   5 2
   1 2 3 4 5

10 3
2 4 6 8 10 12 14 16 18 20
Output:
3 4 5 1 2
8 10 12 14 16 18 20 2 4 6

3. Given a singly linked list. The task is to find the length of linked list, where length is defined as number of nodes in the linked list.
   Input:
   First line of input contains number of test cases T. For each test case, first line of input contains number of nodes N, to be inserted into the linked list and next line contains data of N nodes.
   Output:
   There will be a single line of output for each test case, which contains length of the linked list.
4. Given a doubly linked list, rotate the linked list counter-clockwise by P nodes. Here P is a given positive integer and is smaller than the count of nodes (N) in a linked list.
   Input:
   The first line of input contains an integer **T** denoting the no of test cases. For each test case, the first line of input contains two integers **N and P** denoting the number of nodes in Linked List and the number of nodes to be rotated respectively.
   Output:
   For each test case, output the final linked list after the P rotations in it**.**
5. Given a stack with **push(), pop(), empty()** operations, delete **middle** of it without using any additional data structure.
   Middle: ceil(size_of_stack/2.0)
   Input Format:
   The first line contains an integer **T**, the number of test cases. For each test case, the first line contains an integer **sizeOfStack** denoting the stack size. Next line contains space separated integers that will be pushed into the stack.
   Output Format:
   For each test case, in a new line, print the stack elements. **If stack size if 1 then just print**
6. Given a Queue **Q** containing **N** elements. The task is to reverse the Queue. Your task is to complete the function **rev(),** that reverses the **N** elements of the queue.
   Input Format:
   The first line of input contains an integer **T** denoting the Test cases. Then **T** test cases follow. The first line contains N which is the number of elements which will be reversed. Second line contains N space separated elements.
   Output Format:
   For each test case, in a new line, print the reversed queue.
7. Given a Binary Search Tree, find the sum of all leaf nodes. BST has the following property (duplicate nodes are possible): The **left subtree** of a node contains only nodes with **keys less** than the node's key; The **right subtree** of a node contains only nodes with **keys greater than** or **equal** to the node's key.
   Input:
   The first line of input contains a single integer **T** denoting the number of test cases. Then T test cases follow. Each test case consists of two lines. The first line of each test case consists of integer **N**, denoting the number of elements in the BST. The second line of each test case consists of N space-separated integers denoting the elements in the BST.
   Output:
   For each test case, in a new line, print the sum of leaf nodes.

Indicative list of Augmented Experiments

1. Implementation of symbol table
2. Evaluation of expression by constructing expression tree
3. Implementation of hash table with double hashing
4. Implementation of dictionary using hashing technique
5. Implementation of graph algorithms

Reading Material (s)

1. Data Structures Lab manual, Department of CSE, GMRIT, Rajam

19CS308 Object Oriented Programming Lab

0 0 3 1.5

Course Outcomes

At the end of the course, students will be able to.

1. Demonstrate basic building blocks of C++.
2. Demonstrate class and object concepts to represent real time entity as object.
3. Apply Inheritance concept to reuse existing code.
4. Make use of polymorphism to design operators and functions to exhibit different behavior.
5. Utilize Template concept to crate common objects and functions which suits to any data type.
6. Implementation of exception handling mechanism to control runtime errors and STL.

CO-PO Mapping

CO	PO4
1	3
2	3
3	3
4	3
5	3
6	3

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

List of Experiments

1. **Exercise – 1**
   Write a Simple Program on printing "Hello World" and "Hello Name" where name is the input from the user
   a) Convert any two programs that are written in C into C++
   b) Write a description of using g++ (150 Words)
2. **Exercise – 2**
   a) Write a Program that computes the simple interest and compound interest payable on principal amount (in Rs.) of loan borrowed by the customer from a bank for a given period of time (in years) at specific rate of interest. Further determine whether the bank will benefit by charging simple interest or compound interest.
   b) Write a Program to calculate the fare for the passengers traveling in a bus. When a Passenger enters the bus, the conductor asks "What distance will you travel?" On knowing distance from passenger (as an approximate integer), the conductor mentions the fare to the passenger according to following criteria.
3. **Exercise – 3**
   a) Write a program to implement call by value and call by reference using reference variable.
   b) Write a program to illustrate scope resolution, new and delete Operators. (Dynamic Memory Allocation)
   c) Write a program to illustrate Storage classes
   d) Write a program to illustrate Enumerations
4. **Exercises –4**
   Write a program illustrating Inline Functions
   a) Write a program illustrate function overloading. Write 2 overloading functions for power.
   b) Write a program illustrate the use of default arguments for simple interest function.
5. **Exercise -5**
   a) Write a program to illustrate function overloading. Write 2 overloading functions for adding two numbers
   b) Write a program illustrate function template for power of a number.
   c) Write a program to illustrate function template for swapping of two numbers.
6. **Exercise -6**
   Create a Distance class with: feet and inches as data members, member function to input distance, member function to output distance, and member function to add two distance objects.
   a). Write a main function to create objects of DISTANCE class. Input two distances and output the sum.
   b). Write a C++ Program to illustrate the use of Constructors and Destructors (use the above

program.)
c) Write a program for illustrating function overloading in adding the distance between objects (use the above problem)
d). Write a C++ program demonstrating a Bank Account with necessary methods and variables

7. **Exercise – 7**
   Write a program for illustrating Access Specifiers public, private, protected
   a) Write a program implementing Friend Function
   b) Write a program to illustrate this pointer
   c) Write a Program to illustrate pointer to a class
8. **Exercise -8**
   a). Write a program to Overload Unary, and Binary Operators as Member Function, and Non-Member Function.
   i. Unary operator as member function
   ii. Binary operator as nonmember function
   b). Write a c ++ program to implement the overloading assignment = operator
   c).Write a case study on Overloading Operators and Overloading Functions (150 Words)
9. **Exercise -9**
   a) Write C++ Programs and incorporating various forms of Inheritance
   i) Single Inheritance
   ii) Hierarchical Inheritance
   iii) Multiple Inheritances
   iv) Multi-level inheritance
   v) Hybrid inheritance
   b) Write a program to show Virtual Base Class
   c) Write a case study on using virtual classes (150 Words)
10. **Exercise-10**
    a) Write a Program in C++ to illustrate the order of execution of constructors and destructors in inheritance
    b) Write a Program to *show* how *constructors* are invoked in *derived class*
11. **Exercise -11**
    a) Write a program to illustrate runtime polymorphism
    b) Write a program to illustrate this pointer
    c) Write a program illustrates pure virtual function and calculate the area of different shapes by using abstract class.
    d) Write a case study on virtual functions (150 Words)
12. **Exercise -12**
    a) Write a C++ Program to illustrate template class
    b) Write a Program to illustrate class templates with multiple parameters
    c) Write a Program to illustrate member function templates
13. **Exercise -13**
    a).Write a Program for Exception Handling Divide by zero
    b). Write a Program to rethrow an Exception
14. **Exercise -14**
    a) Write a Program to implement List and List Operations
    b) Write a Program to implement Vector and Vector Operations
    c) Write a Program to implement Deque and Deque Operations
    d) Write a Program to implement Map and Map Operations

List of Augmented Experiments

1. Implement Tic tac toe game
2. Implement banking system
3. Implement Library Management System
4. Implement student report card
5. Implement supermarket billing system
6. Casino number guessing system
7. Snake and ladder game
8. Cricket score sheet
9. Hospital management system
10. Bookshop management system

11. Telephone directory management system
12. Student database management system
13. Hotel management system
14. Bus reservation system
15. GMRIT Payroll management system

Reading Material (s)

1. C++ Lab Manual, Department of CSE, GMRIT, Rajam

19BEA01 Environmental Studies

0 0 0 0

Course Outcomes:

1. Translate the learner's attitude to think globally and act locally
2. Motivate environmental organizations to create a concern about our present state of Environment.
3. Find solutions for conservation of natural resources
4. Identify the benefits of ecosystem conservation, biodiversity protection, implement pollution prevention and control measures
5. Illustrate social issues of environmental protection and adopt sustainable developmental practices
6. Perceives the basic structure of environmental policy and law pertaining to specific environmental issues (water quality, air quality, biodiversity protection, Forest, etc.)

COs – POs Mapping

CO	PO1	PO6	PO7	PO12
1	1	2	3	1
2	2	-	3	2
3	3	3	-	2
4	-	2	3	2
5	-	-	3	1
6	-	3	2	1

3–Strongly linked | 2–Moderately linked| 1–Weakly linked

Unit I

Multidisciplinary nature of Environmental Studies & Natural Resources

Definition, Scope and Importance, Multidisciplinary nature of Environmental Studies, Value of Nature - Productive, Aesthetic/Recreation, Option, Need for Public Awareness, Institutions (BNHS, BVIEER, ZSI, BSI) and People in Environment (Medha Patkar, Sundarlal Bahuguna, Indira Gandhi, Rachael Carson).

Natural Resources: Renewable and Non-renewable resources – Importance, uses, overexploitation/threats, and conservation of (i) forest (ii) water (iii) mineral (iv)food and (v) energy resources. (The topics include benefits and problems associated with dams, mining and case studies), role of an individual in conservation of natural resources.

Unit II

Ecosystem & Biodiversity

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Bio geological cycles (Energy flow, Carbon and Nitrogen Cycles), Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structures and functions of the following ecosystems:

a. Forest Ecosystem b. Aquatic Ecosystem

Biodiversity and its Conservation: Definition and levels of biodiversity, Bio-geographical classification of India, hot spots of biodiversity - India as a mega diversity nation, Threats to biodiversity, Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation.

Unit III

Environmental Pollution & Social Issues

Environmental Pollution: Definition, Cause, effects, control measures and case studies of: Air pollution b. Water pollution c. Soil pollution

Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Food and Household waste management, Disaster management (floods and cyclones)

Social Issues and the Environment: Sustainability, Urban problems related to energy, Water conservation and watershed management, Resettlement and rehabilitation of people; Environmental ethics: Issues and possible solutions, global warming, ozone layer depletion, Consumerism and waste products

Unit IV

Human Population and the Environmental Acts

Human Population and the Environment: Population growth, Affluence, Technology and Environmental Impact (Master Equation), Population explosion and Family Welfare Programme, Value Education, HIV/AIDS, Women and Child Welfare, Role of information Technology in Environment and human health.

Environment Protection Acts: Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act and Forest Conservation Act. Issues involved in enforcement of environmental legislation.

Text Book(s) and Reading Material (s)

1. E. Bharucha, Textbook of Environmental Studies, 1st Ed., University Press (India) Pvt. Ltd., 2005.
2. W. P. Cunningham, M.A. Cunningham, Principles of Environmental Science, 6th Ed., Tata McGraw Hill, 2008.
3. A. Kaushik, C. P. Kaushik, Perspectives in Environmental Studies, 4th Ed., New Age International Publishers, 2008.
4. H. S. Peavy, D. R. Rowe, G. Tchobanoglous, Environmental Engineering, 1st Ed., McGraw Hill Int. ed., 1984.
5. T. E. Graedel, B. R. Allenby, Industrial Ecology and Sustainable Engineering, 1st Ed., Pearson Publications, 2009.
6. http://172.30.1.222/wbc/it/schedule.aspx.
7. http://172.30.1.8/wbc/it/coursepage.aspx.
8. https://www.edx.org/course/environmental-protection-and-sustainability.

19CS409 Employability Skills I

1 1 1 0

Course Outcomes

1. Demonstrate oral communication and writing skills as an individual to present ideas coherently
2. Introspect & develop life skills with constructive approach
3. Assess and improve analytical skills
4. Demonstrate behavioral etiquettes and personal grooming
5. Choose career path balancing passion and opportunities
6. Exhibit adaptive skills under agile environment

COs –POs Mapping

COs	PO_1	PO_6	PO_8	PO_{10}	PO_{12}
1				3	
2				2	2
3	2				
4			2		
5					2
6		3			

3–Strongly linked | 2–Moderately linked| 1–Weakly linked

Unit-I

Communication Skills **7 hours**

Communication Skills & Confidence: How Communication Skills affect Confidence? How to communicate effectively.(with Examples)

Listening: Listening? , Listening Vs Hearing, Possible reasons for why people do not Listen at times, Active Listening Vs Passive Listening, How Listening can affect our relationships? How Listening helps in Campus Placements also? (with Examples)

Goal Setting: SMART Technique to Goal Setting, Putting First things First, SWOT Analysis and Time Management

Attitude & Gratitude: Attitude Vs Skills Vs Knowledge, Attitude Vs Behaviour, How to develop Positive Attitude? Developing the attitude of Gratitude.

Public Speaking: JAM, J2M, Presentations by Students on General Topics.

Quantitative Aptitude **8 hours**

Number system, L.C.M and H.C.F, Problems on Ages, Averages, Time and work, Pipes and cisterns

Unit-II

Python Programming **15 hours**

1. **Introduction**: Language Fundamentals, Flow Control, Modules, Data Structures (List, Tuples, Dictionaries) Packages (Numpy, Pandas, Matplotlib, Sklearn, Scipy)

   Practical Components:

   Lab Activity 1: Simulate different python programs for Flow control statements Lab
   Activity 2: Simulate different python data structures
   Lab Activity 3: Simulate the basic operations that performed in different packages

2. **Object Oriented Programming:** Defining Classes, The init () Method, Instantiating Classes, OOP features: Abstraction. Encapsulation, Single Inheritance, Polymorphism.

   Lab Activity 4: Simulate different python programs for Object Oriented Paradigm

3. **Exception Handling**: Default Exception and Errors, Catching Exceptions, Raise an exception, try. except statement, Raise, Assert, Finally blocks, User defined exception

   Practical Components:

   Lab Activity 5: Simulate different python programs for Exception Handling

4. **Python database Programming**: Introduction to MySQL, PYMYSQLConnections, Executing queries, Transactions, Handling error.

   Practical Components:

   Lab Activity 6: Database Connection Lab
   Activity 7: CRUD operations
   Lab Activity 8: Performing Transactions

Textbooks:-

1. Kenneth A. Lambert. “Fundamentals of Python: First Programs”, 2nd Edition, Cengage Learning, 2013
2. R. Nageswara Rao, “Core Python Programming”, Dreamtech, 2018

19HSX11 CC & EC Activities I

0 0 1 0

Course Outcomes

1. Interpret and present the abstractive technical information through an activity
2. Think critically in providing solutions to the generic and common problems
3. Demonstrate the creative thinking in dealing with liberal arts
4. Instill team sprit through active engagement with the peer
5. Develop programs of common interest having social impact
6. Empower the under privileged through motivational activities

COs –POs Mapping

COs	PO_6	PO_7	PO_9	PO_{10}
1				3
2	3	2		
3	3			
4			3	
5	3			
6	3			

3–Strongly linked | 2–Moderately linked| 1–Weakly linked

Co-Curricular and Extra Curricular (CCEC) Activities:

Students shall acquire 1 credit each in 2nd and 3rd years with the following scheme:
Scheme of evaluation for the CCEC activities:
• No. of slots in each Semester @ 1 slots every week : 12
• No. of Streams (1 CC + 1 EC + 1 Community Enagement) : 3
• No. of slots allotted for each stream : 4
Requirement for the award of 1-Credit
• Students shall choose at least two streams of events in each semester and among which Community engagement through NSS is mandatory
• Students shall secure an overall attendance of 75% in all events put together

The credits earned through these courses will be indicated in the grade memo and will be taken into account for CGPA calculation.

4th Semester

19IT304 Database Management Systems

3 1 0 3

Course Outcomes

1. Understand the fundamental concepts of data base and data models
2. Explain the use of Relational Algebra and integrity constraints in databases
3. Use SQL's Commands to handle the Database
4. Apply Normalization for schema refinement
5. Make use of the concept of transaction management and recovery system in databases
6. Outline Indexing concepts, different types of data

CO–PO Mapping

CO	PO1	PO2	PO3	PO12	PSO2
1	3	3	2	1	1
2	3	3	3	2	2
3	3	3	2	2	2
4	2	3	3	1	1
5	3	3	3	2	2
6	3	3	2	2	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I

Introduction to DBMS and ER Model **11+4 Hours**

DBMS Vs. File System, instance and schema, Data abstraction, Data independence, database users and database administrator, Database system structure, Introduction to Data Models (E-R Model, Relational Model, Hierarchical Model, Network Model, Object Oriented Data Model), Database Design Process, Entities, Attributes, Entity Sets, Relationships, Relationship Sets, Additional features of ER Model.

Applications of DBMS, Object Relational Data Model

Unit II

Introduction to Relational Model and Basic SQL Queries **11+4 Hours**

Relational Algebra Operations: Selection, Projection, Rename, Set Operators, Joins, Division, Examples of Relational Algebra Queries, Relational Calculus: Tuple Relational Calculus.
Integrity Constraints over Relations, Introduction to Views.
SQL Queries: Basic Structure, Set Operations, Aggregate Functions, Null values, Sub Queries, Group By And Having Clauses, Outer Joins.

Domain Relational Calculus, Query Optimization

Unit III

Normalization and Transaction Management **11+4 Hours**

Introduction To Schema Refinement - Problems Caused By Redundancy - Decomposition - Problems Related To Decomposition - Functional Dependency - Closure of a Set of Fds - Attribute Closure - First - Second - Third Normal Forms – BCNF - Multi Valued Dependencies – Fourth Normal Form, Join Dependency, Fifth Normal Form
Transactions: Acid Properties of Transaction - Transaction States - Schedule: Serial Schedule - Concurrent Schedules - Anomalies Associated with Concurrent Schedules (RW - WR - and WW Conflicts) - Serializability - Conflict Serializability - and View Serializability.

EF Codd Rules, Domain Dependency

Unit IV

Locking, Recovery Systems, Indexing, Different Types of Data **12 + 3 Hours**

Introduction to Lock Management-Lock Based Concurrency Control: 2pl-Strict 2pl-Concurrency without Locking: Timestamp–Based Concurrency Control, Optimistic Concurrency Control. Introduction to Aries - the Log - the Write-Ahead Log Protocol-Check Pointing Indexing: Types of Single-Level Ordered Indexes, Multilevel Indexes Different Types of Data: Structured, Semi-Structured and Unstructured Data

Heap File, Hash File Organizations

Total: 45+15 Hours

Textbook (s)

1. Elmasri & Navatha, Fundamentals of Database Systems, Pearson Education, 7th Edition, 2016
2. Silberschatz Korth, Database System Concepts, McGraw hill, 7th Edition, 2019

Reference (s)

1. Soraya Sedkaoui, Data Analytics and Big Data, Wiley, 1st Edition, 2018.
2. Peter Rob & Carlos Coronel, Database Systems design, Implementation and Management, 9th Edition, 2010.
3. Raghurama Krishnan & Johannes Gehrke, Database Management Systems, TATA McGraw-Hill, 3rd Edition, 2003
4. C.J.Date, An Introduction to Database Systems, Pearson Education, 8th Edition, 2006

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam (%)
Remember	40	40	--
Understand	30	40	--
Apply	30	20	50
Analyze	--	--	50
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

1. List any four application of DBMS
2. Define data model
3. List any four applications for triggers
4. Define functional dependency
5. List the 4 properties of Transaction

Understand

1. Explain E-R Model with suitable example
2. Explain the role of integrity constraints in database design
3. Illustrate the working principle of 'write a head log' protocol
4. Differentiate 3NF and 4NF
5. Explain Two Phase Locking Protocol

Apply

1. When multiple transactions are being executed by the operating system in a multiprogramming environment, there are possibilities that instructions of one transaction are interleaved with some other transaction. Apply the suitable concept to overcome the problem
2. Classify various normal forms according to their applicability
3. Give some real-world applications of Normalization
4. Illustrate the Commit and Rollback operations of Transaction Control
5. Give some real-world applications for Database indexing techniques

Analyze

1. Compare File processing system with DBMS
2. Analyze different locking protocol for concurrency control and serializability
3. Normalization will increase the complexity of the database design. Justify
4. Compare DDL and DML of SQL
5. Compare and Contrast Serializability and Recoverability

Evaluate

1. Is database redesign is necessary? explain
2. How can you evaluate the performance of two data models?
3. Evaluate the performance of query processor and list the corresponding metrics
4. How can you assess the throughput and delay for any DBMS?
5. How can you evaluate the impact of data models on the query processing?

Open Book Exam Questions

Question 1:

Anitha has a large CD collection. Her friends like to borrow her CD's, and she has to keep track of who has what. She maintains a list of friends, identified by unique FID's and a list of CD's, identified by CID's. With each friend are the name and telephone numbers which she can call to get the CD back. With each CD is actor name and title. Whenever a friend borrows a CD, She will enter that fact into her database along with the date borrowed. Whenever the CD gets returned, that fact, too, gets noted along with the date returned. Anitha wants to keep a complete history of her friends' borrowing habits so that she can ask favors of the heavy borrowers.

Draw an ER diagram to figure out the above situation and identify types of attributes and cardinality. Represent this database as a collection of 3NF relational tables.

Question 2:

The relational scheme R(A,B,C,D,E,F) and set of functional dependencies AB -> D, E -> C, AF -> B. From this, find out all super keys for this relation, and which of these super keys form a key.

19IT502 Operating Systems

3 1 0 3

Course Outcomes

1. Understand computer resources and operating system management.
2. Analyze various CPU Scheduling Algorithms for Process Management.
3. Examine process synchronization and coordination of operating system.
4. Analyze the Main Memory Management and allocation strategies.
5. Identify the use of Virtual Memory management policies with respect to storage management.
6. Identify the need of File-System Interface and I/O Systems.

CO–PO Mapping

CO	PO1	PO12
1	3	2
2	3	2
3	3	2
4	3	2
5	3	2
6	3	1

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I

Operating-Systems Overview and Process Management **12+4 Hours**

Operating-System Overview: Computer-System Organization and Architecture, Operating-System Structure, Operating-System Operations & Services, System Calls & its types.

Threads: Multi Core Programming, Multithreading Models, Thread Scheduling algorithms.

Process Management: Process Concepts, Process Scheduling Criteria, Scheduling Algorithms and evaluation.

Thread issues, Multilevel Queue, Multilevel feedback Queue Scheduling.

Unit II

Inter Process Communication Mechanism **11+4 Hours**

Process Synchronization: Cooperative process, the Critical Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classical Synchronization problems.

Deadlocks: Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance & Detection, Recovery from Deadlock.

Monitors, Synchronization Examples.

Unit III

Memory Management **11+4 Hours**

Main Memory: Contiguous Memory allocation, Swapping, Segmentation, Paging, Segmented paging, Multilevel paging.

Virtual Memory Management: Demand Paging, Page Replacement algorithms, Allocation of Frames.

Structure of page table, Thrashing, Memory-Mapped Files.

Unit IV

File System Interface & I/O Systems **11+3 Hours**

Mass-Storage Structure: Disk structure, Disk Scheduling, Disk management, Raid Structure.

File System: Access Methods, Directory Structures, Allocation Methods, Free-Space Management.

I/O Systems: I/O hardware Application of I/O Interface, Kernel I/O Sub-System.

File Sharing, File System Recovery, Transforming I/O Requests to Hardware Operation.

Total: 45+15 Hours

Textbook (s)

1. Operating System Concepts, Abraham Silberschatz, Greg Gagne, Peter B. Galvin, 9th Edition, Wiley, 2016.
2. Operating Systems, Harvey M. Deitel, Paul J. Deitel, David R. Choffnes, 3rd Edition, Pearson Prentice Hall, 2004.

Reference (s)

1. Operating Systems: Internals and Design Principles, William Stallings, 7th Edition, Pearson Prentice Hall, 2013.
2. Operating systems: A Concept based Approach, D. M. Dhamdhere, 2nd Edition, TMH, 2006.
3. Operating System: A Design Approach, Crowley, 1st Edition, TMH, 2001.
4. Modern Operating Systems, Andrew S Tanenbaum, 3rd Edition, PHI, 2009.

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam (%)
Remember	20	20	--
Understand	30	10	--
Apply	30	30	40
Analyze	10	20	30
Evaluate	10	20	30
Create	--	--	--
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

1. List any four operating systems
2. Define operating system
3. List any four operating system services

Understand

1. Explain System calls
2. Explain the role memory management in operating system
3. Illustrate the working principle critical section problem

Apply

1. When multiple transactions are being executed by the operating system in a multiprogramming environment, there are possibilities that instructions of one transaction are interleaved with some other transaction. Apply the suitable concept to overcome the problem
2. Give an example of a scenario that might benefit from a file system supporting an append-only access write.

Analyze

1. Context switching between two threads of execution within the operating system is usually performed by a small assembly language function. In general terms, what does this small function do internally?
2. Compare CPU scheduling algorithms
3. Analyze the general strategy behind deadlock prevention, and give an example of a practical deadlock prevention method.

Evaluate

1. Assuming the operating system detects the system is deadlocked, what can the operating system do to recover from deadlock?
2. Describe how to implement a lock using semaphores

Open Book Exam Questions

1. A file to be shared among different processes, each of which has a unique number. The file can be accessed simultaneously by several processes, subject to the following constraint: the sum of all unique numbers associated with all processes currently accessing the file must be less than n. Write a monitor to co-ordinate the access to the file. Ou may want to write start_access and end_access monitor procedures.

2. Consider a paging system with the page table stored in memory:
   a. If a memory reference takes 200 nanoseconds, how long does a paged memory reference take?
   b. If we add associative registers, and 75% of all page-table references are found in the associative registers, what is the effective memory reference time?

19CS403 Computer Organization and Architecture **3 1 0 3**

Course Outcomes

At the end of the course, students will be able to

1. Interpret the functional architecture of computing systems. (Understand).
2. Summarize the types of instruction and its micro operation with addressing modes (Understand)
3. Identify various arithmetic operations on fixed, floating point numbers and its representation (Apply)
4. Illustrate the concepts of control unit design and I/O processor(Understand)
5. Understand the memory hierarchy concepts (Understand)
6. Describe concept of parallelism and types of hazard(Understand)

CO-PO Mapping

CO	PO1	PO12
1	3	2
2	2	2
3	3	1
4	3	2
5	3	2
6	2	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I

Overview & Micro operation **12+4 Hours**

Components of a computer system – Performance measures - Classifying Instruction Set Architecture-Representing instructions -Micro operation – Logical operations – Shift operations - instruction codes - Computer Registers instruction –memory Reference instruction –Input-Output Reference instruction - Instruction cycle -Addressing and addressing modes.

Trends in Technology-Arithmetic micro-operations

Unit II

Arithmetic Operations **10+4 Hours**

ALU - Addition and subtraction with Signed Magnitude Data - Hardware Implementation – Multiplication – Hardware Implementation for Signed Magnitude Data – Division - Hardware Implementation for Signed Magnitude Data – Divide Overflow - Floating Point operations – Parallelism and Computer Arithmetic: Sub word Parallelism.

BCD Adder-BCD Subtraction

UNIT III

Control Unit and Memory Systems **11+3 Hours**

Basic MIPS implementation – Building data path – Control Implementation scheme – Memory hierarchy – Cache basics – Measuring and improving cache performance - Virtual memory- Input/output system-programmed I/O-DMA and Interrupts-I/O processors

Stack organization-RISC Vs CISC Architecture

Unit IV

Parallelism **12+4 Hours**

Instruction-level-parallelism – Parallel processing challenges – Flynn's classification – Multicore processors- Pipelining – Arithmetic pipeline –Instruction pipeline -Pipelined data path and control – Handling Data hazards & Control hazards – Exceptions.

Vector processing –single processor Vs parallel processor

Total: 45+15 Hours

Text Book(s):

1. David A. Patterson and John L. Hennessey, "Computer organization and design: The hardware /software interface", Morgan Kauffman / Elsevier, Fifth edition, 2014.
2. M.Morris Mano," Computer System Architecture", 3rd edition, Pearson /PHI,1992.

Reference(s):

1. V.Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, "Computer Organization ", 6th edition, Mc Graw-Hill Inc, 2012.
2. William Stallings "Computer Organization and Architecture, Seventh Edition, Pearson Education, 2007.
3. Andrew S Tanenbaum "Structured Computer Organization ", 5th edition, Pearson/PHI,2007

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open book Test[1] (%)
Remember	40	--	--
Understand	40	50	--
Apply	20	50	80
Analyze	--	--	20
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

1. What is micro operation?
2. Show the Register Reference Instruction format.
3. Define PC and MAR.
4. What are the two types of data representation?
5. Define Associative Memory

Understand

1. Identify the basic functional units of the system
2. Explain about logic micro operations and its applications with examples
3. Differentiate RISC and CISC architecture in terms of their instruction set and addressing modes.
4. Compare hardwired control unit is differing from micro programmed control unit designs
5. Demonstrate control memory

Apply

1. Starting from an initial value of R=11011101, determine the sequence of binary values in R after a logical shift-left, followed by a logical shift-right and a circular shift-right.
2. Analyze the contents of Register A that holds 8 bit binary 11011001 and Determine the B- operand and the logic micro operation to be performed in order to change the value in A to: (i) 01101101 (ii) 11111101State the differences between register stack and memory stack.
3. Perform the arithmetic operations (+70) + (+80) and (-70) + (-80) with binary numbers in signed-2's complement representation. Use eight bits to accommodate each number together with its sign. Show that overflow occurs in both cases, that the last two carries are unequal, and that there is a sign reversal.
4. Show the hardware to be used for the addition and subtraction of two decimal numbers with negative numbers in signed- 10's complement representation. Indicate how an overflow is detected. Derive the flowchart algorithm and try a few numbers to convince yourself that the algorithm produces correct results.
5. The procedure for aligning mantissas during addition or subtraction of floating-point numbers can be stated as follows: Subtract the smaller exponent from the larger and shift right the mantissa having the smaller exponent a number of places equal to the difference between the exponents. The exponent of the sum (or difference) is equal to the larger exponents. Without using a magnitude comparator, assuming biased exponents, and taking into account that only the AC can be shifted, derive an algorithm in flowchart form for aligning the mantissas and placing the larger exponent in the AC

[1]Assignment test should contain only questions related to Higher Order Thinking (HOT) Skills

Open book questions

Apply

1. Smith and Goodman found that for a given small size, a direct –mapped instruction cache consistently outperformed a fully associative instruction cache using LRU replacement.

a. Explain how this would be possible (*Hint:* You can't explain this with the three C's model because it "ignores" replacement policy)
b. Explain where replacement policy fits into the three C's model, and explain why this means that misses caused by a replacement policy are "ignored"- or, more precisely, cannot in general be definitively classified by the three C's model.
c. Are there any replacement polices for the fully associative cache that would outperform the direct-mapped cache? Ignore the policy of "do what a direct- mapped cache would do".
d. Use a cache simulator to see if Smith and Goodman's results hold for memory reference traces that you have access to. If they do not hold, why not?

2. John takes two numbers in sign magnitude representation (the two numbers are same with different signs), The 1's complement of one number is 6. The difference between 1's complement of these two numbers is 32. Find the numbers. And also find the product of these two numbers using the result of 2's complement value of these two numbers.

Analyze

1.A two-word instruction is stored in memory at an address designated by the symbol W. The address field of the instruction (stored at W + 1) is designated by the symbol Y. The operand used during the execution of the instruction is stored at an address symbolized by Z. An index register contains the value X. State how Z is calculated from the other addresses if the addressing mode of the instruction is a. direct b. indirect c. relative d. indexed.

2. An 8-bit computer has a 16-bit address bus. The first 15 lines of the address are used to select a bank of 32K bytes of memory. The high-order bit of the address is used to select a register which receives the contents of the data bus. Explain how this configuration can be used to extend the memory capacity of the system to eight banks of 32K bytes each, for a total of 256K bytes of memory.

19CS404 Design and Analysis of Algorithms

3 0 2 4

Course Outcomes

1. Understand the fundamentals for analyzing time and space complexity of algorithms
2. Describe the basic principles of various algorithm design techniques
3. Choose and apply appropriate algorithm design technique to solve real time application
4. Analyze the performance of algorithm designed for real time application
5. Understand P and NP problems
6. Analyze the performance of algorithm designed for real time application

COs–POs Mapping

CO	PO2	PO3
1	3	2
2	2	2
3	3	3
4	3	3
5	2	2
6	3	3

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I **10 + 6 hours**

Introduction to Algorithms

Fundamentals of algorithmic problem solving – Analysis framework - Performance Analysis: - Space complexity, Time complexity - Growth of Functions: Asymptotic Notation- Big oh notation, Omega notation, Theta notation, little oh, little omega. Mathematical Analysis of Non-recursive algorithms – Mathematical Analysis of Recursive algorithms - Brute Force: Bubble sort – Sequential search - String matching

Time complexities of basic operations on array, stack, queue

Practical Components

1. Problems on string matching using Brute Force approach
2. Analysis of recursive algorithms

Unit II **12 + 8 hours**

Algorithm Design Techniques - I

Decrease and Conquer: General method, Insertion sort, Topological sorting – Divide and Conquer: General method, Merge sort, Quick sort, Fibonacci search – Transform and conquer: General method, Heapsort – Disjoint sets: Operations, Simple Union and simple find, Weighted Union, Collapse Find.

Graph representation, graph applications

Practical Components

1. Problems on divide and conquer – median of 2 sorted arrays, inversion count
2. Problems on decrease and conquer

Unit III **14 + 10 hours**

Algorithm Design Techniques - II

Greedy method: General method, applications:-Job sequencing with deadlines, Minimum cost spanning trees (Prim's and Kruskal's Algorithms), Single source shortest path problem (Dijkstra's Algorithm), Optimal Merge Patterns (two way merge pattern) - Dynamic Programming: General method, applications:- Matrix chain multiplication, 0/1 knapsack problem, all pairs shortest path problem.

Optimal BST, Huffman trees and codes

Practical Components

1. Problems on Greedy technique
2. Problems on Dynamic Programming

Unit IV **9 + 6 hours**

Limitations of algorithm power methods to cope up

P, NP and NP-Complete Problems: - P and NP problems, NP-Complete problems. Backtracking: General method, applications:-n-queen problem, sum of subsets problem, Hamiltonian Circuit problem. Branch and Bound: General method, Applications: - Traveling sales person problem, Assignment Problem

Total: 45+30 hours

0/1 knapsack problem, graph coloring problem

Practical Components

1. Problems on backtracking technique
2. Problems on branch and bound technique

Textbook (s)

1. Introduction to The Design and Analysis of Algorithms, 3rd Edition, Anany Levitin, Pearson Education, 2017.
2. Introduction to Algorithms, second edition, T.H.Cormen, C.E.Leiserson, R.L. Rivest, and C.Stein, PHI Pvt. Ltd./ Pearson Education
3. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekaran, University press.

Reference (s)

1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft,Pearson education.
2. Algorithms – Richard Johnson Baugh and Marcus Schaefer, Pearson Education.
3. www.geeksforgeeks.org
4. www.hackerearth.com
5. www.tutorialspoint.com

SAMPLE QUESTION (S)

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	OBE (%)
Remember	15	10	-
Understand	35	20	10
Apply	30	40	60
Analyze	20	30	30
Evaluate	--	-	-
Create	--	-	-
Total (%)	100	100	100

Remember

1. Define performance analysis of an algorithm.
2. Define recurrence relation
3. Define disjoint sets.
4. Define optimality principle

Understand

1. Explain back tracking algorithm
2. Explain Asymptotic notations
3. Explain the LC search algorithm
4. Explain the divide and conquer strategy. Write the applications of divide and conquer strategy and write the control abstraction for divide and conquer strategy
5. Explain the 4 cases of master theorem
6. What are implicit and explicit constraints in back tracking ?

Apply

1. Solve the fractional knapsack problem with capacity m=20,W=(18,15,10),P=(25,24,15) for the optimum solution.
2. Create two arrays that store all even no's in one array and all odd no's in another array for a given set of elements
3. Find the space and time complexity of an algorithm to find the maximum element from an array.
4. Solve the recurrence relation T(n)=2T(n/2)+nlogn) using master theorem.

[2] Assignment Test should contain only questions related to Higher Order Thinking (HOT) Skills

5. Demonstrate the process of Fibonacci search with an example

6. Find the shortest tour for the TSP for the given graph using FIFOBB.

$$\begin{bmatrix} \infty & 20 & 30 & 10 & 11 \\ 15 & \infty & 16 & 4 & 2 \\ 3 & 5 & \infty & 2 & 4 \\ 19 & 6 & 18 & \infty & 3 \\ 16 & 4 & 7 & 16 & \infty \end{bmatrix}$$

Analyze

1. Analyze the time complexity of quicksort .
2. Differentiate greedy method with dynamic approach
3. Discuss the worst case time complexity of travelling sales person problem
4. How polynomial multiplication is best with FFT
5. Compute the time complexity of

```
fun()? int fun(int n)
{ int count = 0;
for (int i = n; i > 0; i /=
  2) for (int j = 0; j < i;
  j++)
     count +=
 1; return
 count;
}
```

19CS405 JAVA in Web Technologies

3 1 0 3

Course Outcomes

1. Understand HTML tags and CSS to design static web pages
2. Describe the basic concepts of Java Scripts to design dynamic web pages
3. Summarize object oriented programming concepts and develop applications using object oriented Principles
4. Develop interactive applications using AJAX, Servlets and JSP
5. Demonstrate database connectivity
6. Select appropriate tools for designing dynamic and interactive web applications

COs–POs Mapping

CO	PO1	PO2	PO3	PO5	PO6
1	3	2	1	2	1
2	3	1	3	2	1
3	2	1	3	2	1
4	2	1	3	2	1
5	2	1	3	3	2
6	2	2	3	2	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I **11+4 hours**

HTML Common tags- List, Tables, images, forms, Frames, Links and Navigation
CSS: Introduction, CSS Properties, Controlling Fonts, Text Formatting, Pseudo classes, Selectors
JavaScript: Learning Java script, Variables, operators, Functions, Control structures, Events, Validations, Objects, Document Object Model (DOM), Division Replacement, Browser Object Model (BOM).
Introduction to HTML5, introduction to CSS3

Unit II **13+4 hours**

Introduction to Java
Features of object-oriented programming, Overview of Object-Oriented Programming principles (Class, Object, Abstraction, Encapsulation, Polymorphism and Inheritance), Importance of Java to the Internet, Byte code, Java Virtual Machine, Data types, simple java programs, constructors, this keyword, methods, overloading methods and constructors

Inheritance: Basics, super keyword, Multilevel Hierarchy, Method overriding, Dynamic Method Dispatch, Abstract classes, final keyword, introduction to interface, differences between classes and interfaces, implementing interface, variables in interface and extending interfaces

Introduction to packages in JAVA, Java Built-in packages

Unit III **11+4 hours**

AJAX: Introduction, AJAX with XML
Servlets: introduction to servlets, Life cycle of servlets, JSDK, The servlet API, the javax.servlet package, Reading servlet parameters and initialization parameters, The javax.servlet HTTP package, Handling Http request and responses, Using cookie, session tracking.
Introduction to JSP: The problem with servlet, the anatomy of JSP page, JSP processing, JSP application design with MVC, Tomcat server and testing tomcats, using scripting elements implicit JSP objects.

Servlets in Net Beans-Servlets in Eclipse-Servlet filter: Authentication filter-Filter Config

Unit IV **10+3 hours**

JSP application development: Conditional processing display values using an expression to set an attribute, Declaring variables and methods, sharing data between JSP pages, Requests and users passing control and data between pages, Sharing sessions and application data, memory usage considerations
Database Access: Database Programming using JDBC, javax.sql. package; Accessing MySQL database-Accessing MS Access database- Accessing a Database from a Html Page
JSP Custom tags-Custom tag API-Custom URI

TEXT BOOKS

1. Internet and World wide web- How to program, Dietel and Nieto, Pearson.
2. Java: The Complete Reference, 11th Edition by Herbert Schildt, McGraw-Hill, 2018
3. Jon Duckett, Web programming with HTML, XHTML and CSS, 2nd Edition, Wiley India, 2010
4. Uttam Roy, Web Technologies, OXFORD University Press, 2010.

Sample Question(s)

Internal assessment pattern:

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Assignment Test2 (%)
Remember	25	15	--
Understand	30	15	20
Apply	25	25	40
Analyze	20	25	20
Evaluate	--	--	--
Create	--	20	20
Total (%)	100	100	100

Remember

1. List all OOPs principles
2. Define class and object
3. State various access controls available in JAVA
4. Define inheritance
5. List out different form elements in HTML
6. List out different types of JDBC drivers
7. Write about XML DTD
8. Write MVC architecture

Understand

1. Explain byte code
2. Explain the use of super, static and final keywords
3. Explain types of polymorphism with Example
4. Explain AJAX technologies

Apply

1. Write a java program to implements final variable, Method and classes
2. Explain the reason for the following code giving compiling errors.

```
abstract class AbstractClass
{
   abstract void abstractMethod()
   {
      System.out.println("First Method");
   }
}
```

3. Demonstrate how to develop a servlet
4. Design an application using JSP
5. Use JSP MVC architecture in application development

Analyze

1. Compare and Contrast an abstract class and an interface
2. Differentiate method overloading and overriding

3. Differentiate abstraction and encapsulation
4. Identify the uses of calling a synchronize method inside a synchronize method
5. Identify memory leak problems in Java objects
6. Analyze the processing time of servlets with JSP
7. Analyze the process of web application deployment
8. Compare Servlets with JSP
9. Analyze the difference between XML and AJAX

Create

1. Generate cookies for three user authentication process
2. Produce a JSP code for user tasks in e-commerce
3. Construct an enterprise application for a real problem

19IT308 Database Management Systems Lab

0 0 3 1.5

Course Outcomes

At the end of the course, students will be able to

1. Demonstrate ER Modeling concepts to design the Database
2. Apply integrity constraints on a database
3. Make use of DDL, DML, DCL, TCL commands in creation and manipulation of Database
4. Utilize sub queries to make the complex queries more readable
5. Implementation of database queries using PL/SQL
6. Experiment with triggers to maintain the referential integrity of data

CO-PO Mapping

CO	PO1	PO2	PO3	PO4	PO5
1	3	3	2	1	1
2	3	3	3	2	2
3	3	3	2	2	2
4	3	3	3	1	1
5	3	3	3	2	2
6	3	3	2	2	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

List of Experiments

1. Design ER Model for a given application & Convert ER model to Relational Model.
2. Creating users - roles and Granting privileges.
3. Creating and altering tables for various relations in SQL using Integrity Constraints.
4. Implementing queries in SQL using
   4.1 Insertion
   4.2 Retrieval (operations like union - intersect - minus - in - exists - group by and having etc.)
   4.3 Updation
   4.4 Deletion
5. Implementing the concepts of Rollback – commit, checkpoints and Views
6. Implementing joins - sub queries - nested and co related nested queries.
7. Experiment with built in functions in oracle (Numeric, String, Date, Aggregate functions etc.)
8. Implementing operations on relations using PL/SQL.
9. Implementing functions, stored procedures using PL/SQL
10. Implementing cursors using PL/SQL
11. Implement Exception Handling using PL/SQL
12. Creating triggers using PL/SQL

List of Augmented Experiments

1. Inventory control management System
2. College Management System
3. Hospital management System
4. Library management System
5. Payroll management System
6. Health care organization Management System
7. Restaurant Management System
8. Blood Donation Management System
9. Art Gallery Management System
10. Hotel Management System
11. School Management System
12. Salary Management System
13. Wholesale Management System
14. Time Table Management System
15. Website Management

Reading Material (s)

1. Database Management Systems Lab Manual, Department of CSE, GMRIT, Rajam

19CS407 JAVA in Web Technologies Lab

0 0 3 1.5

Course Outcomes

At the end of the course, students will be able to

1. Create a static web pages using HTML and CSS
2. Develop JavaScript code for form validation
3. Integrate frontend and backend technologies in client-server systems
4. Demonstrate Servlet life cycle methods
5. Design dynamic web applications using JSP
6. Demonstrate database connectivity using JDBC for developing web applications

CO–PO Mapping

CO	PO2	PO3	PO4	PO5	PO8
1	3	3	1	2	1
2	3	3	3	2	3
3	2	2	3	2	1
4	2	3	3	2	3
5	2	3	3	3	2
6	2	2	3	2	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

The students have to choose one of the following project and do the all 12 experiments related to that project.

1. Hospital Management System
2. Training and placement cell
3. School Education System
4. University Management System

The following are the experiments related to Training and Placement cell project. For the remaining projects, the concern lab instructor has to decide the experiments according to the websites given as examples.

Experiment 1: Design the following static web pages required for a Training and placement cell web site.

1) Home Page
2) Login Page
3) Registration page
4) Alumni Details Page

Experiment 2:

5) Placement Staff Details Page
6) Student personal Info Page
7) Student Academic Info page

Experiment 3: Apply different font styles, font families, font colors and other formatting Styles to the above static web pages.

Experiment 4: Validate the above designed Login and Registration pages using JavaScript.

Experiment 5: Demonstrate the basics of Java using classes, methods and objects.

Experiment 6: Demonstrate the different types of inheritance concept.

Experiment 7: Demonstrate Inheritance concept using method overriding, super & final keywords and runtime polymorphism.

Experiment 8: Install **Eclipse IDE and tomcat server**, access above developed static web pages using these servers.

Experiment 9: Write a servlet to connect to the database, Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration.

Experiment 10: Write a JSP to connect to the database, Insert the details of the student academic information with student academic info page.

Experiment 11: User Authentication:

Assume four users **user1user2, user3 and user4** having the passwords **pwd1, pwd2, pwd3 and pwd4** respectively. Write a servlet for doing the following.

1. Create a Cookie and add these four user id's and passwords to this Cookie.

2. Read the user id and passwords entered in the Login form (week1) and authenticate with the values (user id and passwords) available in the cookies.
   If he is a valid user (i.e., user-name and password match) you should welcome him by name (user-name) else you should display "**You are not an authenticated user** ".Use init-parameters to do this. Store the user-names and passwords in the webinf.xml and access them in the servlet by using the getInitParameters () method.

Experiment 12: Write a JSP which does the following job:

Authenticate the user when he submits the login form using the user name and password from the database.

List of Augmented Projects[10]

1. Web Crawlers
2. Online Hospital Management
3. Online Shopping Project
4. Web based Appointment Systems
5. Scrapbook
6. Online Job Recruitment System
7. Attendance management system
8. Online Banking system
9. Online Exam
10. Railway Reservation system
11. Leave Application Management System
12. Address Book
13. Movie Rental Systems
14. Online Auction System
15. Student Information system

Reading Material (s)

1. Web Technologies Lab manual–Department of CSE & IT-GMRIT Rajam

19CS409 Employability Skills II

1 1 1 3

Course Outcomes

1. Demonstrate oral communication and writing skills as an individual to present ideas coherently
2. Introspect & develop life skills with constructive approach
3. Assess and improve analytical skills
4. Demonstrate behavioral etiquettes and personal grooming
5. Choose career path balancing passion and opportunities
6. Exhibit adaptive skills under agile environment

COs – POs Mapping

COs	PO1	PO6	PO8	PO10	PO12
1	-	-	-	3	-
2	-	-	-	2	2
3	2	-	-	-	-
4	-	-	2	-	-
5	-		-	-	2
6	-	3	-	-	-

3–Strongly linked | 2–Moderately linked| 1–Weakly linked

Unit-I

Communication Skills **8 hours**

Building Confidence: Fear? Steps to Overcoming the Fear of Public Speaking? Self Esteem: Definition? Types of Self Esteem, Causes of Low Self Esteem, Merits of Positive Self Esteem and Steps to build a positive Self Esteem.

Group Discussions (Practice): GD? GD Vs Debate, Overview of a GD , Skills assessed in a GD, Dos & Don'ts, & Conducting practice sessions (Simple Topics).

Motivational Talk: Team Work: Team Vs Group? Stages in Team Building, Mistakes to avoid and Lessons to Learn (Through Stories or Can be a Case Specific)

Quantitative Aptitude **7 hours**

Percentages, Profit and loss, Mixtures and Allegations, Simple Interest, Compound Interest

Unit-II

Linux Programming **15 hours**

1. A brief history of LINUX, Difference Between Linux and Windows, Career Options, Interesting Facts about Linux, Why Linux is Virus proof?, Architecture of LINUX, Features of LINUX, Introduction to vi editor.

2. Basic Linux commands: mkdir, ls, touch, pwd, cd, chmod, cp, df, du, dd, adduser, passwd, mv, rm/rmdir, date, tar, gzip, sort, top, uname, who, man, echo, cat, more, wc, ftp, telnet, rlogin.

3. Introduction to Shells: Linux Session, Standard Streams, Redirection, Pipes, Tee Command, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Options, Shell/Environment Customization.

4. Files and Directories in Linux: File Structure and hierarchy, File Permissions.

5. User Administration in Linux.

6. TCP/IP Network Management: route, ifconfig, ping, netstat.

19HSX11 CC & EC Activities I

0 0 1 1

Course Outcomes

1. Interpret and present the abstractive technical information through an activity
2. Think critically in providing solutions to the generic and common problems
3. Demonstrate the creative thinking in dealing with liberal arts
4. Instill team sprit through active engagement with the peer
5. Develop programs of common interest having social impact
6. Empower the under privileged through motivational activities

COs –POs Mapping

COs	PO_6	PO_7	PO_9	PO_{10}
1				3
2	3	2		
3	3			
4			3	
5	3			
6	3			

3–Strongly linked | 2–Moderately linked| 1–Weakly linked

Co-Curricular and Extra Curricular (CCEC) Activities:

Students shall acquire 1 credit each in 2nd and 3rd years with the following scheme:
Scheme of evaluation for the CCEC activities:
• No. of slots in each Semester @ 1 slots every week : 12
• No. of Streams (1 CC + 1 EC + 1 Community Enagement) : 3
• No. of slots allotted for each stream : 4
Requirement for the award of 1-Credit
• Students shall choose at least two streams of events in each semester and among which Community engagement through NSS is mandatory
• Students shall secure an overall attendance of 75% in all events put together

The credits earned through these courses will be indicated in the grade memo and will be taken into account for CGPA calculation.

5th Semester

19CSC11 Exploratory Data Analytics

3 1 0 3

Course Outcomes

1. Explain the Data Analysis Fundamentals
2. Illustrate various data Visual aids
3. Categorize different data transformation and descriptive statistics
4. Identify different Correlation and Inferences from statistical tests
5. Make use of the concept Hypothesis Testing
6. Classify different Multivariate Analysis techniques

CO–PO Mapping

CO	PO1	PO4	PO12
1	3	2	1
2	3	3	2
3	3	2	2
4	2	3	1
5	3	3	2
6	3	2	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I

Exploratory Data Analysis Fundamentals **11+4 Hours**

Understanding data science, significance of EDA, steps in EDA. types of analysis (univariate, bivariate, multivariate). Making sense of data: Numerical data-Discrete&continuous data,categorical data, Measurment scales-Nominal, Ordinal,Interval, Ratio. Comparing EDA with classical and Bayesian analysis, getting started with EDA: Numpy, Pandas,Scipy, and Matplotlib.

Grouping data: groupby mechanics, rearranging, reshaping data structures, data aggregation methods, and cross-tabulation methods.

Objectives of Exploratory data Analysis, The applications of EDA.

Unit II

Visual aids for EDA **11+4 Hours**

Line chart, Bar charts,Box plot,residual plot, Scatter plot-bubble chart, scatterplot using seaborn, Area plot, stacked plot, and stem-and-leaf plot, pie chart, table chart, polar chart, histogram, lollipop chart, choosing the best chart.

Data transformation and descriptive statistics

Transformation techniques- performing data deduplication,replacing values, handling missing data, renaming axis indexes, outlier detection and filtering. Permutation and random sampling, computing indicators/dummy variables, string manipulations.

Descriptive statistics: Understanding statistics, distribution function (uniform, normal, exponential, binomial), cumulative distribution function, measure of central tendenacy, measure of dispersion (standard deviation, variance, skewness, kurtosis, percentiles, quartiles)

Violin Plots, Inter Quartile Range, Discretizaion & binning, heatmaps

Unit III

Correlation and Inferences from statistical tests : **11+4 Hours**

Introducing correlation, covariance, Pearson's Correlation, Spearman's Rank Correlation.

Hypothesis Testing: Testing a difference in mean, testing a correlation, chi-squared tests, errors, power. Model development and evaluation with regression techniques.

Correlation vs causation, ANOVA,

Unit IV

12 + 3 Hours

Multivariate Analysis: overview, Factor Analysis, Cluster Analysis, Discriminant analysis, EDA Case Study

Multidimensional Scaling, MANOVA vs ANOVA

Total: 45+15 Hours

Textbook (s)

1. Daniel J. Denis: Univariate, Bivariate, and Multivariate Statistics Using R: Quantitative Tools for Data Analysis and Data Science, Wiley,2020
2. Mukhiya Suresh Kumar Mukhiya, Ahmed Usman Ahmed: Hands-On Exploratory Data Analysis with Python: Perform EDA techniques to understand, summarize, and investigate your data, Packt, 2020
3. Downey, Allen. Think stats: exploratory data analysis. " O'Reilly Media, Inc.", 2014.
4. Neil H. Spencer: Essentials of Multivariate Data Analysis, CRC Press,2014

Reference (s)

1. Wes McKinney : Python for Data Analysis 2nd Edition,Wiley,2013
2. Glenn J. Myatt, Wayne P. Johnson: Making Sense of Data I: A Practical Guide to Exploratory Data Analysis and Data Mining, 2nd Edition,Wiley,2014
3. Wendy L. MartinezAngel R. MartinezJeffrey L. Solka: Exploratory Data Analysis with MATLAB, 2nd Edition,CRC Press,2011
4. Radhika Datar, Harish Garg : Hands-On Exploratory Data Analysis with R , Packt,2019
5. Joseph F Hair, Barry J. Babin, Rolph E. Anderson, William C. Black: Multivariate Data Analysis Cengage, 2018

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam (%)
Remember	50	40	--
Understand	30	40	--
Apply	20	20	50
Analyze	--	--	50
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

1. What is data science.
2. Define purpose of different data visualtion aids
3. List any two steps involved in EDA.

Understand

1. Explain different data represenation
2. Explain the role of various data grouping methods
3. Explain purpose of hypothesis testing in detail

Apply

1. Apply various visual aids to identify behavior of data
2. Make use of Multivariate Analysis methods for data nanlysis
3. Examine data with various distribution function

Analyze

1. Comapre and contrast varius data grouping methods.
2. Distinguish various methods to address problems with dummy variables
3. Examine various string handling methods

Evaluate

1. Evaluate the statistics of a given dataset
2. Justify the importance of data skewness
3. Measure data dispersion methods on a dataset

Open Book Exam Questions

Question 1:

Perform below analysis on a house price prediction dataset.

a) Univariate Analysis
    i. Analysis of a numerical feature
    ii. Analysis of a categorical feature
b) Bivariate Analysis
    i. Relationship of a numerical feature with another numerical feature
    ii. Relationship of a numerical feature with a categorical feature

Question 2:

Perform below analysis on weather prediction dataset.

a. Correlation Analysis
    a. Correlation Heat Map
    b. Zoomed Heat Map
b. Investgation of missing values
    a. What's missing? to what extent?
    b. Visualizing missing values in a dataframe

19CSC21 Web Programming Languages

3 1 0 3

Course Outcomes

At the end of the course, students will be able to

1. Understand what web applications are.
2. Analyze the templates and common scenarios of web development.
3. Examine various web programming languages and their usages.
4. Analyze the flow of data through various layers of web.
5. Identify the use of data management and compatibility of web browsers.
6. Identify the need of security and performance for a web application.

CO – PO Mapping

COs	PO_1	PO_2	PO_7	PO_{12}
1	3	3	2	2
2	3	3	2	2
3	3	3	2	2
4	3	3	2	2
5	3	3	1	2
6	3	1	1	1

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Syllabus

Unit I **12+4 Hours**

Overview of the web

Web application Overview: Basic concepts of web, The importance of web technology, Web programming languages

Web server: Introduction, Anatomy of HTTP transaction, Request and response structures, REST APIs.

Data management: Browser storage - Local storage & Session storage, Database storage.

HTML, CSS, HTTP, Status codes

Unit II **11+4 Hours**

Web programming in JavaScript

Introduction: Overview of fundamentals of JavaScript, ES6 JavaScript standard.

Node JS: Introduction, Node packages, HTTP web server – Creating a HTTP server that supports Create, Read, Update and Delete operations via various HTTP methods, Adding common request parser

Express: Creating a web server with express and body parser packages

NodeJS, ES6, Node packages.

Unit III **11+4 Hours**

Restful Programming

Introduction: Evolution of RESTful services, REST API Architectural Constraints, Designing REST API, REST API Error Handling Patterns, REST API Handling Change- Versioning Patterns, REST API Cache Control Patterns, REST API Response Data Handling Patterns, REST API Security.

Spring Boot

Introduction, Framework Theory, Beans Implementation, Dao Implementation, Running Project, Creating Model Class,

REST API Security, Creating XML Files

Unit IV **11+3 Hours**

Web programming in Python

Introduction: Basic concepts –, classes and interfaces, Python's HTTP package

HTTP server: Introduction, creating a server that supports Create, Read, Update and Delete operations

HTTP server, Python packages

Total: 45+15 Hours

Textbook (s)

1. Learn Web Development with Python, Fabrizio Romano, Gaston C. Hillar, Arun Ravindran, 1st Edition, 2018 Packt Publishing Pvt Ltd.
2. Learn Java for Web Development, Vishal Layka, 1st Edition, 2014. Apress Media LLC.
3. Node.js, John Bach, Alexander Aronowitz, 3rd Edition, 2021. mEm Inc.

Reference (s)

1. HTML 5 in simple steps, Kogent Learning Solutions Inc, Dreamtech Press.
2. Beginning HTML, XHTML, CSS, and JavaScript, John Duckett, Wiley India.
3. Beginning CSS: Cascading Style Sheets for Web Design, Ian Pouncey, Richard York, Wiley India.
4. Web Designing & Architecture-Educational Technology Centre, University of Buffalo.

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam (%)
Remember	20	20	--
Understand	30	10	--
Apply	30	30	40
Analyze	10	20	30
Evaluate	10	20	30
Create	--	--	--
Total (%)	100	100	100

Sample Question(s)

Remember

1. List any four HTML tags and CSS properties
2. Define web server
3. List four browser storage methods

Understand

1. What HTTP method should be used for updating data in a server?
2. Explain the of CSS in web development
3. Illustrate the working of a HTTP server

Apply

1. When user opens a website, the underlying web application wants to store browser specific data. What is a good approach for saving the data?
2. Give an example of a scenario that might benefit from browser storage instead of backend storage.

Analyze

1. There is a common body parsing workflow that every request to a server must obey. What is a good way to implement it?
2. Compare Servlet and Java Server Page
3. Analyze the general strategy behind cookies and session management.

Evaluate

1. Assuming the server received a permission error from the database, what is the best way to propagate it to the user?
2. Describe how to implement user authentication in a web server.

Open Book Exam Questions

1. A file is to be stored in the web server. However, the access to this file is to be limited to specific set of users. How can once achieve this using a web server?

2. Consider a request that yields data of high cardinality. How can one send the data without affecting the performance of the website?

19ITC31 Fundamentals of Security

3 1 0 3

Course Outcomes

7. Explain the fundamental concepts of information security
8. Illustrtae the use of cryptography and its functions
9. Identify different types of Cryptography methods
10. List out different types of Security Threats and Vulnerability
11. Make use of the concept of network security
12. Outline transport and network layer security

CO–PO Mapping

CO	PO1	PO2	PO5
1	3	1	1
2	3	3	2
3	1	2	3
4	2	3	1
5	3	2	3
6	3	2	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I

Security concepts **11+4 Hours**

What is security, Data vs Information vs Cyber security, Goals of Information Security, Computer Security Concepts, threats,attacks,and assets, security functional requirements, fundamental security design principles , computer security strategy, networking, benefits of networking.

protocols suite,hacking, network sniffing, social engineering

Unit II

Cryptography **11+4 Hours**

Introduction to cryptography, Cryptographic functions(Authentication, Nonrepudiation, confidentiality, integrity), Cryptanalysis. Types of Cryptography: Symmetric key and Asymmetric Key Cryptography, Message Integrity, Encryption and Decryption Techniques, Digital Signatures, Email Standards: MIME and PGP

Applications of Cryptography, cipher types, steganography

Unit III

Security Threats and Vulnerabilities **11+4 Hours**

Overview of Security Threats and Vulnerability: Types of attacks on Confidentiality, Integrity and Availability, Types of malware, Buffer Overflow

Security Counter-Measures: Passwords, Access Control (Authenticating users, Handling User Access), Antivirus Software, Firewalls, Intrusion Detection Systems and IPS.

Types of firewalls, advanced persistant threat

Unit IV

Network Security **12 + 3 Hours**

TCP/IP Suite, DNS, MITM, Attacks on TCP and DNS, VPN, Application layer security (PGP, S/MIME), Transport layer security (TLS), Network layer security (IPSec) Anonymous networks: Tor,I2P.

TCP Vulnerabilities, SSH vs SSL,

Total: 45+15 Hours

Textbook (s)

1. William Stallings, Lawrie Brown, Computer Security Principle sand Practice Third Edition,2015
2. Nihad A. Hassan, Rami Hijazi, Digital Privacy and Security Using Windows: A Practical Guide, Apress, 2017

Reference (s)

5. Michael T. Goodrich and Roberto Tamassia, Introduction to Computer Security, Addison Wesley, 2011.
6. Ross Anderson, Security Engineering: A Guide to Building Dependable Distributed, 3rd Edition, John Wiley & Sons Inc, 2021.
7. Kozierok, Charles M. The TCP/IP guide: a comprehensive, illustrated Internet protocols reference, 2005
8. Harris, Shon, "CISSP all-in-one exam guide." Sixth edition (2013).

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam (%)
Remember	50	40	--
Understand	30	40	--
Apply	20	20	50
Analyze	--	--	50
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

4. What is security.
5. Define cyber security
6. List any four computer security concepts
7. Define threat
8. Define intrusion

Understand

4. Explain Cryptographic functions
5. Explain the role of Symmetric key cryptography
6. Illustrate hashing techniques
7. Outline the purpose of digital signatures

Apply

4. RSA algorithm with example
5. Digital signature
6. Buila a firewall mechanism to protect laptop

Analyze

1. Compare and contrast RSA and ECC.
2. Distinguish differences between Symmetric and Asymetric key cryptography.
3. Examine the key sharing techniques in both Symmetric and Asymetric key cryptography techniques

Evaluate

1. Justify the ECC is best public key cryptosystem than other public key approaches.
2. Explain the importance of IPSec protocol.
3. Explain the importance of I2P protocol

Open Book Exam Questions

Question 1:

In a public-key system using RSA, you intercept the ciphertext C=10 sent to a user whose public key is e=5, and n=35. What is the plaintext M? and Perform encryption and decryption using the RSA algorithm for the following: 1. P=3; q=11, e=7; M=5. 2. P=17; q=31, e=7; M=2.

Question 2:
Suppose we have a set of blocks encoded with the RSA algorithm and we don't have the private key. Assume n=pq, e is the public key. Suppose also someone tells us they know one of the plaintext blocks has a common factor with n. Does this help us in any way?

19ECE02 Microprocessors and Microcontroller Programming

3 0 2 4

Course Outcomes

1. Summarize the architecture of 8086 microprocessor
2. Execute assembly language programs of 8086 microprocessor
3. Demonstrate the memory interfacing with 8086 microprocessor
4. Explain the architecture of 8051 microcontroller
5. Implement assembly language programs of 8051 microcontroller
6. Demonstrate the interfacing of peripherals with 8051 microcontroller

COs – POs Mapping

COs	PO1	PO2	PO3	PO4	PO5
1	2	1	1	-	-
2	2	2	2	2	3
3	2	2	2	2	2
4	2	1	1	-	-
5	2	2	2	2	3
6	3	3	3	3	3

3–Strongly linked | 2–Moderately linked| 1–Weakly linked

Unit I

8086 Microprocessors and Assembly Language Programming

Introduction and evolution of processors, Architecture of 8086 microprocessor, Register organization of 8086, Memory segmentation, Addressing Modes. Instruction set of 8086 microprocessor: Data transfer instructions, Arithmetic instructions, Logical Instructions, String instructions, Stack related instructions, Branching instructions, Assembler directives.

Data transfer instructions of 8085 microprocessor, Architecture of 8085 microprocessor

Practical Components

1. Data transfer program using and without using string instruction in assembly language programming.
2. Program for addition and subtraction in assembly language.
3. Program for data conversion in assembly language.

14+8 Hours

Unit II

8086 Operational Modes and Peripheral Interfacing

Procedures and macros, Stack Structure of 8086, Minimum and Maximum mode operations of 8086 with timing diagrams, Memory interfacing, 8255 Programmable Peripheral Interfacing.

Dynamic RAM, Direct memory access concept

Practical Components

1. Program to arrange three bytes in ascending and descending order in assembly language.
2. Program to reject negative numbers from a series of bytes in assembly language.

9+6 Hours

Unit III

8051 Microcontroller and Assembly Language Programming

Comparison between microprocessor and microcontroller, 8051 family microcontroller, RAM architecture of 8051, Integrated Development Environment (IDE), Pin description of 8051 microcontroller, Machine cycle. Addressing Modes, Instruction set of 8051: Data transfer instructions, Arithmetic instructions, Logical Instructions, Stack related instructions, Branching instructions. Programing and Applications of Timers, Interrupts, Universal Asynchronous Receiver Transmitter (UART).

External memory interfacing with 8051 microcontroller, various constituents of hex file

Practical Components

1. Program to perform arithmetic operations.

2. Program to toggle the LED in assembly language.
3. Programming and interfacing of traffic light logic in assembly language.

12+8 Hours

Unit IV

Interfacing with 8051 microcontrollers with External Peripherals

Interfacing with 8051 microcontrollers with: Keypad matrix, LCD, Seven segment displays, Stepper motor, Analog to Digital Converter (804), Digital to Analog Converter (808).

Interfacing of temperature sensor (LM 35) with 8051, interfacing of relay with 8051

Practical Components

1. Programming and interfacing of the key pad matrix.
2. Programming and interfacing of seven-segment display.
3. Programming and interfacing of the LCD.

10+8 Hours

Total: 45+30 Hours

Textbook (s)

1. A.K. Ray & K. M Bhurchandi, Advanced Microprocessors & peripherals, Tata McGraw-Hill, 3rd Edition, 2012
2. Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinlay, The 8051 Micro controller and Embedded systems: using assembles and C, Pearson, 2nd Edition,2007

Reference (s)

1. D.V.Hall, Microprocessor and Interfacing, Tata McGraw Hill Publishing Company, 2nd Edition 2006
2. N. Sentil Kumar, M Sarvanan, S Jeevananthan, Microprocessors and Microcontrollers, Oxford University Press, 1st Edition, 2010
3. Kenneth J Ayala, The 8051 Microcontroller Architecture, Programming and Applications, Thomson Publishers, 3rd Edition, 2004

Sample Question (S)

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Lab Examination (%)
Remember	25	25	--
Understand	35	35	--
Apply	40	40	100
Analyze	--	--	--
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

Remember

1. List out any four sixteen-bit registers of 8086 microprocessor which can't split into two eight bit registers.
2. State the advantages of memory segmentation.
3. State the significance of Reset pin of 8051 microcontroller.
4. List four differences between 8051 family of microcontroller.

Understand

1. Calculate the physical address generated by the 8086 microprocessor to fetch the code if CS = 2A40H & IP = AAAAH.
2. Explain the function of BIU and EU of 8086 microprocessor.
3. Explain the consequences of execution of MOV IP, #14H instruction of 8051 microcontroller.
4. Explain the structure of internal RAM of 8051 microcontroller.
5. Explain the significance of each bit of TMOD register of 8051 microcontroller.

Apply

1. Write a program for 8051 microcontroller in assembly language to generate a square wave of 10KHz from pin P2.1. Assuming frequency of crystal attached to the microcontroller is 12MHz.
2. Develop a program in assembly language for 8051 microcontroller to add five eight bit numbers.
3. Interface a seven-segment display with 8051 microcontroller and develop a program in assembly language to display even numbers from 0 to 9.
4. Interface a LCD with 8051 microcontroller and develop a program in assembly language to display a message in 1st row of LCD.

19CS502 Artificial Intelligence and Machine Learning

3 1 0 3

Course Outcomes

1. Illustrate the scope of Artificial Intelligence in the real world
2. Demonstrate various machine learning algorithms and its preliminaries
3. Summarize and learn various supervised learning algorithms
4. Model the concepts of classification and regression
5. Summarize and learn various unsupervised learning algorithms
6. Demonstrate and resolve complex clusters using dimensionality reduction

CO-PO Mapping:

COs	PO1	PO2	PSO1
1	3	2	1
2	3	2	1
3	1	3	2
4	1	2	3
5	1	3	2
6	1	2	3

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit -I: **10+4 Hours**

Artificial Intelligence Foundation to AI, Problem Solving- State Space Search, Constraint Satisfaction Problems, AI Problems, AI Types and Agents, AI Tasks, AI Techniques, Heuristic Search Techniques- Best First Search Techniques, Expert Systems – Rule based system, Model & Hybrid Based System. Reasoning in uncertain environment. Math for Machine Learning- Linear Algebra, Multi-Variable Calculus and Vectors

AI Models, AI Bots, Applications of AI, Applied AI

Unit -II: **11+4 Hours**

Machine Learning Foundation for Machine Learning – Types of Machine Learning, Machine Learning Process, Preliminaries- Over fitting, Training, Testing and Validating Sets, Splitting and Feature Scaling, Confusion Matrix, Accuracy Metrices, Data Pre-processing- Importing Libraries, Importing Datasets, Missing Data and Dependent Variables, Machine Learning Applications.
Rules of Probability, Bayes Theorem, Bias, Variance and Co-variance.

Unit -III: **12+4 Hours**

Supervised Learning Classification- Naïve Bayes, Support Vector Machines, Extension to SVM, K-Nearest Neighbours. Regression – Decision Tree, Classify Vs Predict, Linear Regression, Gradient Descent and Logistic Regression, Regularization, Classification and Regression Tree.
Margins and Vectors, Continuous and Discrete variables

Unit -IV: **12+3 Hours**

Unsupervised Learning Clustering- Iterative Distance based Clustering, Association Rule Learning, K-Means Clustering and Hierarchical Clustering, Measure of Quality Clustering. Dimensionality Reduction – Feature Selection, Principle Component Analysis, Independent Component Analysis and Linear Discriminant Analysis and Reinforcement Learning.
Similarity and Distance Measures, Gaussian and Normal Deviation

Total: 45+15 Hours

Text Book (s)

1. Russel and Norvig, Artificial Intelligence A modern Approach, 4th Edition, Pearson Education 2021
2. Raschka, Sebastian and Mirjalili, Vahid, Python Machine Learning, 3rd Edition, Packt Publishing., 2019
3. Stephen Marsland- Machine Learning – An Algorithmic Perspective – Second Edition – Chap Man & Hall CRC Press, 2015

Reference (s)

1. E. Rich K. Knight and B.Nair – Artificial Intelligence– Third Edition – Tata McGraw Hill, 2017
2. Tom M. Mitchell, —Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam [5] (%)
Remember	25	20	-
Understand	35	40	30
Apply	40	40	40
Analyze	-	-	30
Evaluate	-	-	-
Create	-	-	-
Total (%)	100	100	100

Sample question (s)

Remember

1. Define entropy.
2. What is pruning?
3. Define hypothesis

Understand

1. What is Machine Learning?
2. How KNN is different from K- means Clustering?
3. Explain confusion matrix with an example

Apply

1. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.
2. Apply *k*-Nearest Neighbour algorithm to classify the iris data set and print both correct and wrong predictions in it.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm.
4. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task.

Analyze

1. Implement the non-parametric locally weighted regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw the relevant graphs
2. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using *k*-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program

Open Book Question(s)

1. The issue of the possibility of self-improvement of the system of artificial intelligence, which gained autonomy, got out of human control and by downloading data from the Internet it is becoming an increasingly powerful and threatening system for humans since the 1990s in science fiction literature and film. With each subsequent year, the technology of artificial intelligence is developed and improved.

    a) Justify the detailed steps involved for getting the above scenario w.r.t. human brain and computer vision.
    b) Is it possible now or in the future to create an artificial intelligence that will draw knowledge directly from the analysis of Internet resources and learn this knowledge?

2. A large room is filled with mousetraps, arranged in a grid. Each mousetrap is loaded with two ping-pong balls, carefully placed so that when the mousetrap goes off they will be flung, land on other mousetraps and set them off. The walls of the room are sticky, so any balls that hit the walls of the room are effectively absorbed. Every mousetrap that gets hit sends the two ping-pong balls in the same way: their movement is determined by a X and Y displacement relative to the launching mousetrap. You then decide to launch a single ping-pong ball into the room. It hits a mousetrap, setting it off, and launching its two balls. These two balls then set off two more mousetraps, and now four balls fly off... When the dust settles, many of the mousetraps have been set off, but some have been missed by all the flying balls.

    a) Identify the attributes and the mousetraps which are involved in this process
    b) Justify and predict the common set offs in the process and identify which learning suits the above scenario.

19CS503 COMPUTER NETWORKS

3 0 2 4

Course Outcomes:

1. Illustrate the knowledge of the basic Data Communication System and Computer Network Systems.
2. Classify various wired and wireless transmission media for data communication networks
3. Demonstrate different techniques of error detection and correction to detect and solve error bit during data transmission
4. Illustrate the subnetting, routing mechanisms and congestion issues in network design.
5. Experiment with different network tools.
6. Summarize the internal functionalities of main protocols such as HTTP, SNMP, TCP, UDP, IP

CO-PO Mapping

COs	PO1	PO2	PO4	PO5
1	3	1	1	1
2	3	3	3	2
3	1	3	2	2
4	2	3	2	3
5	1	3	2	3
6	3	1	2	2

UNIT – I **11 + 6 hours**

Introduction to Data Communications: Components, Data Representation, Data flow

Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet.

Physical Layer: Transmission media: Guided media- twisted pairs, coaxial cable, fiber optics, unguided media-Wireless transmission, Switching Techniques: Circuit Switching-Packet Switching-Message Switching.

Taxonomy of networking devices

Practical Components:

1) a) Familiarization with Networking Components and devices: LAN Adapters - Hubs -Switches - Routers

   b) Familiarization with Transmission media and Tools: Co-axial cable - UTP Cable - Crimping Tool - Connectors etc.

2) Preparing the UTP cable for cross and direct connections using crimping tool.

UNIT – II **11 + 8 hours**

Design Issues: Framing-error detection and correction-CRC

Elementary Data link Protocols: Stop and wait-Sliding, Window protocols: Go-back-n-Selective Repeat, **Medium Access sub layer**: Channel allocation methods, Multiple Access protocols: ALOHA-CSMA-IEEE Standard 802.3 and Ethernet

Data Link Control Protocols: HDLC-SLIP-PPP

Practical Components:

1. Implement the data link layer farming methods: a. Character stuffing method b. Bit Stuffing method
2. Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism.

UNIT – III **12 + 6 hours**

Network Layer: Design issues, Routing algorithms: shortest path routing, distance vector routing, Flooding, Hierarchical routing, Broadcast, Multicast, Congestion Control Algorithms-Approaches to Congestion Control, Quality of Service- leaky bucket algorithm, token bucket algorithm, The Network layer in the internet-IPv4 Protocol, IP Addresses, Subnetting.

Internet control protocols

Practical Components:

1. Implement Dijsktra's algorithm to compute the shortest path through a network
2. Write a program for congestion control using Leaky bucket algorithm

UNIT – IV **11 + 10 hours**

Transport Layer: Transport Services, Elements of Transport protocols, Connection management, TCP and UDP protocols. Application Layer –Domain name system, SNMP, Electronic Mail, World Wide Web, HTTP

Proxy Servers, Data compression

Practical Components:

1. Wireshark
   i. Packet Capture Using Wire shark
   ii. Starting Wire shark
   iii. Viewing Captured Traffic
   iv. Analysis and Statistics & Filters.

2. Do the following using NS2 Simulator
   i. NS2 Simulator-Introduction
   ii. Simulate to Find the Number of Packets Dropped
   iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
   iv. Simulate to Find the Number of Packets Dropped due to Congestion
   v. Simulate to Compare Data Rate& Throughput.
   vi. Simulate to Plot Congestion for Different Source/Destination
   vii. Simulate to Determine the Performance with respect to Transmission of Packets

Total: 45+30 hours

Textbook (s)

1. Andrew S Tanenbaum, Computer Networks, 5th Edition, Pearson Education /PHI, 2013
2. Behrouz A. Forouzan, Data Communications and Networking, 5th Edition, Tata McGraw Hill Higher Education, 2013
3. Reference (s)
4. Willam Stallings, Data and Computer Communications, 8th Edition, Pearson Prentice Hall, 2007
5. W.A. Shay, Thomson, Understanding communications and Networks, 3rd Edition, Cengage Learning, 2005

Internal Assessment Pattern

Cognitive Level	Internal Test 1 (%)	Internal Test 2 (%)
Remember	25	20
Understand	40	40
Apply	35	40
Analyze	-	-
Evaluate	-	-
Create	--	--
Total (%)	100	100

Sample Questions

Remember

1. List the applications of Computer Networks
2. Write two differences between OSI and TCP/IP models.
3. State 5 key assumptions in Dynamic channel allocation?
4. State the purpose of DNS.
5. Define congestion.

Understand

1. Illustrate OSI Reference model.
2. Explain various design issues of data link layer

3. What are the responsibilities of Data Link layer and explain Pure Aloha and Slotted Aloha protocols.

4. Describe Distance Vector routing algorithm with example and explain count to infinity problem 5. Represent the Manchester encoding for the bit stream: 0001110101.

Apply

1. What is the check summed frame transmitted if the message is 1101011011 and the generator polynomial is x 4 + x + 1 using CRC

2. Can you think of any circumstances under which an open-loop protocol, (e.g., a Hamming code) might be preferable to the feedback-type protocols?

3. Assuming that all routers and hosts are working properly and that all software in both is free of all errors, is there any chance, however small, that a packet will be delivered to the wrong destination?

4. The following data fragment occurs in the middle of a data stream for which the byte-stuffing algorithm described in the text is used: A B ESC C ESC FLAG FLAG D. What is the output after stuffing?

5. The following character encoding is used in a data link protocol: A: 01000111; B: 11100011; FLAG: 01111110; ESC: 11100000 Show the bit sequence transmitted (in binary) for the four-character frame: A B ESC FLAG when each of the following framing methods are used:

(a) Character count.

(b) Flag bytes with byte stuffing.

(c) Starting and ending flag bytes, with bit stuffing.

19CS504 THEORY OF COMPUTATION

3 1 0 3

Course Outcomes:

1. Define State machines, languages and computations
2. Design a state machine with and without outputs
3. Compare regular grammars and regular languages
4. Relate Context free languages and Context free grammars
5. Design Pushdown automata for Context free languages
6. Illustrate decidable and un-decidable problems

CO–PO Mapping

CO	PO1	PO2
1	3	3
2	2	2
3	3	2
4	2	3
5	2	2
6	2	3

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I **12+4 Hours**

Finite Automata: Introduction to formal languages- language operations- Finite automata model- Deterministic Finite Automata – Nondeterministic Finite automata - Recognition of a language by an Automaton - Equivalence of DFA and NFA - Finite Automata with Null-Closure - Minimization of Finite Automata - Equivalence of FAs - Mealy and Moore Machine, Equivalence of Mealy and Moore machines.

Mathematical induction, strong principle, Complementation of Finite automata, Compound Automata

Unit II

11+4Hours

Regular Languages: Regular Sets-Regular expressions- Equivalence of Finite automata and regular expressions –Pumping Lemma for Regular Languages - Closure Properties of Regular sets. Regular Grammars: Right linear grammar- Left linear grammar- Equivalence of RLG and finite automata- Equivalence of LLG and finite automata.

Myhill-Nerode theorem –applications of regular expressions

Unit III **11+4 Hours**

Context free language- Closure Properties of Context free languages, pumping lemma for context free languages- Context-free grammar-simplification of Context free Grammar-Normal forms: Chomsky Normal form and Greibach Normal form.

Pushdown Automata: PDA Model-Design-Acceptance by empty stack and final state- Non-deterministic PDA. Context free grammar to Pushdown automata conversion.

Context Sensitive Languages, Linear bounded automata

Unit IV **11+3 Hours**

Turing Machine: Chomsky classification of languages- Turing Machine Model - Design of TM- Turing Machines variants–Undecidable languages - properties of Recursive and Recursively Enumerable Languages -Post Correspondence Problem - Halting Problem - Polynomial Reducibility, P – NP, NP – Complete and NP – Hard problems

Computable Functions - Constant Functions, Recursive Functions **Total 45+15 Hours**

Text Books:

1. J. E. Hopcroft and J. D. Ullman, Introduction to Automata Theory, Languages and Computation, 3rd Edition, Pearson/Addison Wesley, 2007
2. Mishra & Chandra Sekharan, Theory of Computer Science& Automata Language and Computation, 3rd Edition, Prentice Hall of India, 2007

Reference books:

1. P. Linz, Introduction to Formal Language and Computation, 2nd Edition, Narosa, 2006.
2. H. R. Lewis & C. H. Papadimitriou, Elements of the Theory of Computation, Prentice Hall of India,

2nd Edition - 2006.

Internal Assessment Pattern

Cognitive Level	Internal Test 1 (%)	Intnternal Test 2 (%)	Open Book Exam (%)
Remember	20	20	--
Understand	30	20	--
Apply	30	40	60
Analyze	20	20	40
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

1. Write the analytical representation of NFA.
2. Define context free grammar.
3. State Rice's theorem

Understand

1. Compare Mealy and Moore machine
2. Explain the closure properties of regular languages
3. Illustrate the Chomsky classification of languages.

Apply

1. Design pushdown automata for L={anbn/n>=1}.
2. Construct Turing machine for palindrome strings over ∑={a,b}

Analyse

1. How does a Mealy machine different from Moore machine?
2. Does PCP with 2 lists X={10,110,11} Y={1,01,0} has a solution? Justify your answer.

Open Book Exam Questions

1. Suppose r1 and r2 are regular expressions over the same alphabet Σ. We say r1 = r2 to denote equality of the languages represented by r1 and r2. In other words, every string in the language represented by r1 is also included in the language represented by r2 and vice versa. For each of the following pairs of regular expressions over Σ = {0, 1}, either prove that they represent the same language, or give a string that is present in the language of one but not in the language of the other. In the latter case, you must also describe why your solution string is in the language of one regular expression, but not in that of the other.
   (a) r1 = 1 ∗ (1 + 0) ∗0 ∗ and r2 = (0 ∗1 ∗) ∗
   (b) r1 = ((0 + 1) ∗0) ∗0 and r2 = (0 + 1) ∗0 ∗0
   (c) r1 = (0 + 1) ∗01(0 + 1) ∗ and r2 = 1 ∗ (0 + 1) ∗0(0 + 1) ∗1

2. When we say that a TM M accepts a language L by halting, we mean that if M is started with a word w on its tape, if halts if and only if w ∈ L. In class, we have seen how every binary string can be thought of as encoding a deterministic Turing machine (DTM) that accepts by halting. Recall also that with the encoding studied in class, every DTM can be encoded as a binary string with no two consecutive 0's. Similarly, every binary string can be thought of as an input string on a given (possibly different) alphabet. We will use [[w]]TM to denote the Turing machine encoded by w ∈ (0 + 1) ∗ . Similarly, we will use [[w]]Σ to denote the input string encoded by w ∈ (0 + 1) ∗ . Let L1 and L2 be as defined below:
   - L1 = {w | w ∈ (0 + 1) + and there is at least one input string on which [[w]]TM doesn't halt}.
   - L2 = {w100w2 | w1, w2 ∈ (0 + 1)∗ , w1 has no two consecutive zeros, and [[w1]]TM does not halt on [[w2]]Σ}.

   Which of the following statements are true? Justify your answer.
   (a) If L1 is recursively enumerable, then L2 is recursive.
   (b) L1 is co-recursively enumerable
   (c) The language L2 = {wwR | w ∈ L1} is recursive. Here, w R means the reverse of the word w.

19CS004 Principles of Programming Languages

3 1 0 3

Course Outcomes

13. Explain the concepts of programming languages.
14. Describe syntax and semantics of programming languages.
15. Explain data types, and basic statements of programming languages.
16. Illustrate the concept of subprogram.
17. Demonstrate the concepts of ADT and OOP.
18. Summarize the concept of exception handling and event handling.

CO–PO Mapping

CO	PO1	PO2	PO3	PO4
1	3	1	2	2
2	3	2	1	2
3	3	1	3	1
4	3	2	2	2
5	3	2	2	3
6	3	2	2	3

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I

Preliminary Concepts **11+4 Hours**

Reasons for studying concepts of programming languages, programming domains, language evaluation criteria, influences on language design, language categories, language design trade-offs, implementation methods, programming environments, Evolution of Major Programming Languages.

Syntax and Semantics: General problem of describing syntax, formal methods of describing syntax, attribute grammars, describing the meanings of programs.

Unit II

Data tpes, Expressions and Statements, Control Structure **11+4 Hours**

Names, Bindings, and Scopes: Introduction, names, variables, concept of binding, scope, scope and lifetime, referencing environments, named constants

Data types: Introduction, primitive, character, string types, user defined ordinal types, array, associative arrays, record, tuple types, list types, union types, pointer and reference types, type checking, strong typing, type equivalence

Expressions and Statements: Arithmetic expressions, overloaded operators, type conversions, relational and boolean expressions, short- circuit evaluation, assignment statements, mixed-mode assignment

Control Structures: introduction, selection statements, iterative statements, unconditional branching, guarded commands.

Unit III

Subprograms **11+4 Hours**

Subprograms: Fundamentals of subprograms, design issues for subprograms, local referencing environments, parameter passing methods, parameters that are subprograms, calling subprograms indirectly, overloaded subprograms, generic subprograms, design issues for functions, user defined overloaded operators, closures, co routines

Implementing subprograms: General semantics of calls and returns, implementing simple subprograms, implementing subprograms with stack-dynamic local variables, nested subprograms, blocks, implementing dynamic scoping.

Unit IV

ADT, OOP, Exception and Event Handling **12 + 3 Hours**

Abstract Data types: The concept of abstraction, introductions to data abstraction, design issues, language examples, parameterized ADT, encapsulation constructs, naming encapsulations

Object Oriented Programming: Design issues for OOP, OOP in Smalltalk, C++, Java, Ada 95, C#, Implementation of Object-Oriented constructs.

Exception Handling and Event Handling: Introduction, exception handling in Ada, C++, Java, introduction to event handling, event handling with Java and C#.

Total: 45+15 Hours

Textbook (s)

3. Robert W. Sebesta, "Concepts of Programming Languages", Tenth Edition, Addison Wesley, 2012.
4. Programming Languages, Principles & Paradigms, 2ed, Allen B Tucker, Robert E Noonan, TMH

Reference (s)

9. R. Kent Dybvig, "The Scheme programming language", Fourth Edition, MIT Press, 2009.
10. Jeffrey D. Ullman, "Elements of ML programming", Second Edition, Prentice Hall, 1998.
11. Richard A. O'Keefe, "The craft of Prolog", MIT Press, 2009.
12. W. F. Clocksin and C. S. Mellish, "Programming in Prolog: Using the ISO Standard", Fifth Edition, Springer, 2003

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam (%)
Remember	50	40	--
Understand	50	50	--
Apply	--	10	50
Analyze	--	--	50
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

1. Define programming language?
2. Define named constants?
3. Define subprogram?

Understand

7. Explain numeric types?
8. Summarize grammars for simple assignment statements.
9. Discuss language evaluation criteria and the characteristics that affect them.

Apply

1. Identity the exceptions occurred in C++ and Ada.
2. Construct BNF notation for following:
    a. For loop
    b. If-else condition
    c. Structure definition
3. Solve the given grammar is ambiguous or not.
   <assign> -><id>=<expr>
   <id>->A|B|C
   <expr>-><expr>+<expr>
   |<expr>*<expr>
   |(<expr>)
   |<id>

19CS005 Mobile Computing

3 1 0 3

Course Outcomes

1. Explain the basic concepts and fundamentals of mobile computing and telecommunication systems along with various standards.
2. Illustrate the techniques, protocols related to GSM and GPRS architecture to perform requirements analysis.
3. Explain major components of Mobile IP to improve the service qualities of a network
4. Compare various ad hoc routing protocols to examine the performance of network
5. Explain the architecture of Wireless Sensor Network and WLAN design issues and limitations.
6. Outline the basic knowledge in developing smart phone applications using various platforms, toolkits, APIs and third party libraries

CO–PO Mapping

COs	PO3	PO8
1	3	2
2	2	2
3	1	2
4	2	2
5	2	2
6	2	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I

Introduction to Mobile Communications **12+4 Hours**

Overview: Mobile Communication and Mobile Computing – Architecture; Generations of Telecommunications – 1G, 2G, 3G, 4G and 5G; Wireless Technologies – WPAN, WLAN, WMAN; Wireless Medium Access Control (MAC) – Overview, SDMA, TDMA, FDMA, CDMA;
2G Technologies: GSM – Services, Architecture, Radio Interface, Protocol Stack, Localization, Call Handling, Handover, Security; 2.5G – GPRS and 3G – EDGE.

Networking: Comunication Modes, Basic Network Designs, Cellular Infrastrures

Unit II

Mobile Network Layer and Transport Layer **11+4 Hours**

Mobile Network Layer: Mobile IP Overview, IP Packet delivery, Agent discovery and advertisement, Registration, Tunneling and Encapsulation, Optimizations, Security, and Dynamic Host Configuration Protocol (DHCP).
Mobile Transport Layer – Motivation, Traditional TCP, Classical TCP Approaches: Indirect TCP, Snooping TCP, Mobile TCP, Transaction-oriented TCP; Optimizations, TCP for 2.5G/3G.

Multi Task gadget: wide area mobile data - air link standards for data - wireless application environment

Unit III

Mobile Ad-hoc Network (MANET) **11+3 Hours**

Introduction to Mobile ad-hoc networks, Characteristics and features, Applications, Limitations; Routing protocols – Design Issues, Routing algorithms: Proactive (DSDV & OLSR) and Reactive (DSR & AODV), Security in ad hoc networks; Wireless LAN – IEEE 802.11 – System Architecture, Protocol Layers.
Wireless Sensor Network (WSN): Introduction, Architecture, Applications, Properties and Security.

Satellite systems: history - applications - basics - broadcast systems

Unit IV

Mobile Platforms and Applications **11+4 Hours**

Mobile OS: Overview on Mobile Device Operation Systems (Android, iOS, Black Berry) – Architecture, App development Kit; Introduction to Network Simulators: Charactestics, Applications, Limitations, Types of Simulators: Wireless Application Protocol (WAP): Introduction, Architecture, Applications.
Application layer Protocols – FTP, SMTP, HTTP, DNS; Windows 10.

Total: 45+15 Hours

Textbook (s)

1. Raj Kamal, Mobile Computing, Oxford press, Third Edition, 2018
2. Jochen Schiller, Mobile Communications, Pearson Eduction, Secon Edition, 2019

Reference (s)

1. Asoke K Talukder, Hasan Ahmad and Roopa Yavagal, Mobile Computing, Second Edition, McGraw Hill, 2010
2. Prasant Kumar Pattnail and Rajib Mall, Fundamentals of Mobile Computing, Second Edition, PHI Learning Pvt. Ltd., 2015
3. Frank Adelstein, et al., Fundamentals of Mobile and Pervasive Computing, McGraw Hill, 2005
4. http://www.isi.edu/nsnam/ns/doc/ns_doc.pdf (NS2 manual)

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam (%)
Remember	30	25	10
Understand	25	15	20
Apply	25	20	30
Analyze	20	20	30
Evaluate	--	10	10
Create	--	10	--
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

9. Define Mobile Computing
10. List the applications of mobile computing
11. List the limitations of mobile computing
12. Define Mobile Adhoc Network
13. List the MANET routing issues

Understand

8. Explain mobile computing with architecture
9. Explain tTDMA and FDMA with neat diagrams
10. Illustrate the different services provided by the GSM, Explain with system architecture
11. Explain IP Packet delivery with diagram
12. Describe DSSM (Direct Sequence Spread Spectrum)

Apply

10. Illustarte Registration process achieved in mobile network layer
11. Discuss the feature of tunneling and encapsulation
12. Illustrate the function of Dynamic Host Configuration Protocol (DHCP)
13. Discuss about security in Ad-hoc network
14. Illustarte the properties of MANETS

Analyze

1. Compare Snooping TCP and Indirect TCP
2. Analyze the performance of Dynamic Source Routing protocol
3. Compare about iOS and Blackberry Operating Systems
4. Compare NS2 and NS3 simulators
5. Explain about Android Operating System with architecture

Evaluate

1. Evaluate the performance of Wireless Datagram protocol
2. Evaluate the performance of DSDV
3. Evaluate the performance of DSR
4. How Traditional TCP is different from I-TCP
5. How localization and Call handling is performed

Open Book Exam Questions

Q1. Describe the functions of the MS and SIM. Why does GSM separate the MS and SIM? How and where is user-related data represented/stored in the GSM system? How is user data protected from unauthorized access, especially over the air interface? How could the position of an MS (not only the current BTS) be localized? Think of the MS reports regarding signal quality.

Q2. Describe the Concept of GPRS. Using the best delay class in GPRS and a data rate of 115.2 kbit/s – how many bytes are in transit before a first acknowledgement from the receiver could reach the sender (neglect further delays in the fixed network and receiver system)? Now think of typical web transfer with 10 Kbyte average transmission size – how would a standard TCP behave on top of GPRS (see chapters 9 and 10)? Think of congestion avoidance and its relation to the round-trip time. What changes are needed?

19CS006 Distributed Operating Systems

3 1 0 3

Course Outcomes

1. Summarize the fundamental concepts of Distributed Operating Systems.
2. Illustrate the Concepts of Message passing system and Remote Procedure Calls.
3. Design and Implementation of Distributed Shared Memory and Structures.
4. Utilize the Synchronization and Distributed File Systems.
5. Make use of Resource Management and Process Management Concepts.
6. Outline the concept of Naming and Security in Distributed Operating Systems.

CO–PO Mapping

CO	PO1	PO2
1	3	2
2	3	2
3	3	2
4	2	2
5	3	2
6	3	1

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I

Introduction and Communication in Distributed System **12+3 Hours**

Introduction: Design Issues - Distributed Computing Environment - Message Passing - Features of Good Message Passing System-Issues in IPC by Message Passing-Synchronization- Buffering

Remote Procedure Calls: The RPC Model - Transparency of RPC- Implementing RPC Mechanism - Stub Generation - RPC Messages - Marshaling Arguments and Results - Server Management - Parameter-Passing Semantics- Call Semantics

Communication Protocols for RPCs - Complicated RPCs - Client-Server Binding-Case Study: Sun RPC

Unit II

Distributed Shared Memory and Synchronization **11+4 Hours**

Distributed Shared Memory: General Architecture of DSM Systems- Design and Implementation Issues of DSM – Granularity - Structure of Shared Memory Space

Synchronization: Clock Synchronization - Event Ordering - Mutual Exclusion –Deadlocks- Election Algorithms

Consistency Models-Replacement Strategy - Thrashing

Unit III

Resource Management and Distributed File Systems **11+4 Hours**

Resource Management: Features of a Good Global Scheduling Algorithm - Task Assignment Approach – Load Balancing Approach – Load Sharing Approach

Distributed File Systems: Introduction -Desirable Features of a Good Distributed File System - File Models – File Accessing Models – File Sharing Semantics – File Caching Schemes - File Replication

Process Management - Process Migration- Threads- Case Study: DCE Distributed File Service

Unit IV

Naming and Security **11 + 4 Hours**

Naming: Desirable Features of a Good Naming System - Fundamental Terminologies and Concepts - System-Oriented Names - Object-Locating Mechanisms - Human-Oriented Names - Name Caches

Security: Potential Attacks to Computer Systems - Cryptography – Authentication

Access Control - Digital Signatures - Design Principles- Case Study: DCE Directory Service

Total: 45+15 Hours

Textbook (s)

1. Pradeep K Sinha, “Distributed Operating Systems: Concepts and Design”, Prentice Hall of India, 2009
2. Andrew S Tannebaum, ”Distributed Operating Systems”, Pearson Education, 2007

Reference (s)

1. George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems Concepts and Design", Fifth Edition, Pearson Education, 2012
2. Tanenbaum A.S., Van Steen M., "Distributed Systems: Principles and Paradigms", Pearson Education, 2007
3. Liu M.L., "Distributed Computing, Principles and Applications", Pearson Education, 2004.
4. Nancy A Lynch, "Distributed Algorithms", Morgan Kaufman Publishers, USA, 2003

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam (%)
Remember	40	40	--
Understand	30	40	--
Apply	30	20	50
Analyze	--	--	50
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

1. List any four advantages of Distributed operating systems
2. Define distributed operating systems.
3. List any five reasons why to build distributed operating System.
4. What are the features of good distributed file systems?
5. List the features of a Good Naming System

Understand

1. Explain the design issues of distributed operating systems.
2. Explain the role of Naming in distributed operating systems
3. Summarize the internal and external synchronization of Physical clocks
4. Differentiate Resource Management and Process Management
5. Explain in detail about security and authentication.

Apply

1. Construct the different protocols of RPC.
2. Identify the File shearing Semantics and file caching Schemes.
3. Develop the Bully and Ring Algorithm
4. Develop the scenario how might the clocks in two computers that are linked by a local network be synchronized without reference to an external time source
5. Utilize the various deadlock prevention techniques with suitable example?

Analyze

1. Analyze the Concept of exception handling in RPC.
2. Examine the Concept of Thread.
3. Compare Fault tolerance and Thrashing.
4. Classify the deadlock avoidance techniques.
5. Simplify an algorithm using multicast and logical clocks for mutual exclusion.

Open Book Exam Questions

Question 1:

A distributed system has DSM facility. The process-scheduling mechanism of this system selects another process to run when a fault occurs for the currently running process, and the CPU is utilized while the block is being fetched. Two system engineers arguing about how to better utilize the CPUs of this system have the following opinions:

(a) The first one says that if a large number of processes are scheduled for execution at a node, the available memory space of the node can be distributed among these processes so that almost always there will be a ready process to run when a page fault occurs. Thus, CPU utilization can be kept high.

(b) The second one says that if only a few processes are scheduled for execution at a node, the available memory space of the node can be allocated to each of the few processes, and each process will produce

fewer page faults. Thus, CPU utilization can be kept high. Whose argument is correct? Give reasons for your answer.

Question 2:

The password mechanism is used in a distributed system to authenticate users at login time. State the most suitable locations (according to you) for storing the login program and the password file in the following cases:

(a) The distributed system is based on the workstation-server model with each workstation having a small hard disk of about 20 megabytes capacity.

(b) The distributed system is based on the workstation-server model. Some of the workstations are diskless and others have a small hard disk of about 20 megabytes capacity.

(c) The distributed system is based on the processor-pool model.

19CS507 Artificial Intelligence and Machine Learning Laboratory

0 0 3 1.5

Course Outcomes:

1. Design and develop problem statements for solving real time problems using expert systems
2. Outline the role of data repositories and various data preprocessing tools
3. Illustrate the use of consistent data in implementing machine learning algorithms
4. Distinguish valid datasets for the machine learning algorithms
5. Identify and develop various machine learning algorithms suitable to the problem statement
6. Demonstrate and resolve complex clusters using dimensionality reduction

CO–PO Mapping

CO	PO4	PO5	PO8
1	3	2	2
2	3	3	2
3	3	1	3
4	2	2	2
5	2	2	3
6	1	2	3

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Expert System

Week 1: Develop a Rule Based system (Consider any Problem from the Annexure any Real Time)

Data Pre-Processing and Data Pre-Processing Tools

Week 2: Importing Libraries, Importing Datasets, Missing Data, Encoding Dependent Variable,
Week 3: Splitting Datasets to Training Dataset and Test Dataset, Feature Scaling

Classification:

Week 4: K-Nearest Neighbours, Support Vector Machines
Week 5: Naïve Bayes and Decision Tree Classification

Regression

Week 6: Simple Linear Regression, Multiple Linear Regressions
Week 7: Polynomial Regression, Logistic Regression

Clustering

Week 8: Association Rule Learning
Week 9: K Means Clustering
Week 10: Hierarchical Clustering

Dimensionality Reduction

Week 11: Principal Component Analysis
Week 12: Linear Discriminate Analysis

Text Book (s)

1. Raschka, Sebastian and Mirjalili, Vahid, Python Machine Learning, 3rd Edition, Packt Publishing., 2019
2. Stephen Marsland- Machine Learning – An Algorithmic Perspective – Second Edition – Chap Man & Hall CRC Press, 2015

Reference (s)

1. Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.
2. Machine Learning A-Z: Hands-On Python, Udemy.

Annexure:

1. Banking System
2. Weather System
3. Medical System
4. Gaming System
5. Dressing System
6. Disease Diagnose or Prediction System

Augmented Experiments:

1. Rule Based Expert System: Design, Suiting and Shirting for an event/ occasion
2. Gaming: Chess, Water Jug Problem, 8 Queens Problem
3. Real Time: Traffic Lights
4. Real Time: Banking Transactions (Only Debit and Credit)
5. Mathematical Approach for Theorem Proving
6. Financial Approach for Loans via Cash / Vehicle / Gold
7. Medical Expert Systems
8. Disease Classification Strategies
9. Disease Prediction Strategies
10. Work on a Real Dataset.

19CS508 Term Paper

0 0 3 1.5

Course Outcomes

1. Interpret the literature to link the earlier research with the contemporary technologies
2. Communicate effectively as an individual to present ideas clearly and coherently
3. Review the research findings and its correlation to the latest applications
4. Prepare documents and present the concepts clearly and coherently
5. Inculcate the spirit of enquiry for self-learning
6. Identify interdisciplinary oriented topics

COs – POs Mapping

COs	PO1	PO4	PO10	PO12
1	-	2	-	-
2	-	-	3	3
3	3	-	-	-
4	-	-	3	-
5	-	-	-	3
6	1	-	-	-

3–Strongly linked | 2–Moderately linked| 1–Weakly linked

Term Paper: The Term Paper is a self-study report and shall be carried out either during 5th or 6th semester in choice with Mini Project. Every student will take up this term paper individually and submit a report. The scope of the term paper could be an exhaustive literature review choosing any engineering concept with reference to standard research papers or an extension of the concept of earlier course work in consultation with the term paper supervisor. The report will be evaluated by a committee as nominated by HoD with the approval of CoE

19CS609 Employability Skills III

1 1 1 0

Course Outcomes

1. Demonstrate oral communication and writing skills as an individual to present ideas coherently
2. Introspect & develop life skills with constructive approach
3. Assess and improve analytical skills
4. Demonstrate behavioral etiquettes and personal grooming
5. Choose career path balancing passion and opportunities
6. Exhibit adaptive skills under agile environment

COs – POs Mapping

COs	PO1	PO6	PO8	PO10	PO12
1				3	
2				2	2
3	2				
4			2		
5					2
6		3			

3–Strongly linked | 2–Moderately linked| 1–Weakly linked

Soft Skills:

Sl No.	5th Semester (Topic & Content)	No. of Periods
1.	**Introduction to Campus Placements:** Stages of Campus Placement, Skills assessed in Campus Placements & How to get ready?	01
2.	**Motivational Talk on Positive Thinking:** Beliefs, Thoughts, Actions, Habits & Results (Success)	01
3.	**Resume Preparation:** Resume? Templates? Mistakes to be avoided in a Resume, Steps to be followed in preparing it.(with examples)	02
4.	**Group Discussions** (Recap)**:** GD? Stages of a GD, Skills assessed in a GD, Blunders to be avoided, How to excel in a GD? (through Practice Sessions)	02
5.	**Psychometric Tests:** Definition, Types of Psychometric Tests: Numerical Computation, Data Interpretation, Verbal Comprehension, Verbal Critical Reasoning and Personality Questionnaires	01
6.	**Exercises related to Communication:** Story Writing, TAT etc	01
	Total Periods	**08**

Quantitative Aptitude:

Sl No.	Semester-V (Topic)	No. of Periods
1.	Square &Cube roots	01
2.	Partnership	01
3.	Partnership	01
4.	Logarithms	01
5.	Progressions	01
6.	Mensuration	01
7.	Mensuration	01
8.	Data Sufficiency	01
	Total Periods	**08**

Domain Specific: (Data Mining using WEKA)

S.NO	Topic Name	No. of Periods
1	**Introduction to Data Mining and Warehousing** Overview of Data warehouse- Introduction to Data Mining	1
2	Basic Data Mining Tasks -Different sources of Data Mining-Types of Data-Data Pre-processing	3
3	1. Introduction to Graphical User Interface (GUI) of WEKA (Practical) 2. Creating ARFF files (Practical)	2
4	Statistical Perspective on Data Mining-Similarity and Dissimilarity Measures.	2

5	Perform Data Pre-processing on a sample data set. (Practical)	1
6	Examine the Similarity and Dissimilarity Measures of the given dataset (Practical)	1
7	**Mining Association Rules in Large Databases** Association Rule Mining-Mining Single-Dimensional Boolean Association Rules from Transactional Databases.	3
8	Perform Association Analysis to derive the association rules using Apriori and FP Growth Algorithms. (Practical)	2
	Total Periods	**15**

Textbook (s)

1. Pang, Ning Tan, Michael Steinbach, Vipin Kumar Introduction to Data Mining, 3rd Edition, Pearson Addison Wesley, 2016
2. Jiawei Han & Micheline Kamber, Data Mining Concepts and Techniques, 3rd Edition, Morgan Kaufmann, 2012

Reference (s)

1. Ian H. Witten, Eibe Frank, Mark A. Hall, Data Mining: Practical Machine Learning Tools and Techniques, 3rd Edition, Morgan Kaufmann Publishers, 2011
2. Margaret H Dunham, Data Mining Introductory and advanced topics, 2nd Edition, Pearson Education, 2004
3. Arun K Pujari, Data Mining Techniques, 2nd Edition, University Press, 1999.

19HSX112 CC & EC Activities II

0 0 1 0

Course Outcomes

1. Interpret and present the abstractive technical information through an activity
2. Think critically in providing solutions to the generic and common problems
3. Demonstrate the creative thinking in dealing with liberal arts
4. Instill team sprit through active engagement with the peer
5. Develop programs of common interest having social impact
6. Empower the under privileged through motivational activities

COs – POs Mapping

COs	PO6	PO7	PO9	PO10
1	-	-	-	3
2	3	2	-	-
3	3	-	-	-
4	-	-	3	-
5	3	-	-	-
6	3		-	-

Co-Curricular and Extra Curricular (CCEC) Activities:

Students shall acquire 1 credit each in 2nd and 3rd years with the following scheme:

Scheme of evaluation for the CCEC activities:

- No. of slots in each Semester @ 2 slots every week : 24
- No. of Stream (2-CC + 1-EC) : 3
- No. of slots allotted for each stream : 8

Requirement for the award of 1- Credit

- Students shall choose at least two streams of events in each semester
- Students shall secure 75% attendance in each stream of events to obtain a certificate
- Students shall obtain 2 certificates of Participation in each semester.

The credits earned through these courses will be indicated in the grade sheet and will not be aken into account for CGPA calculation.

19EC508 Summer Internship I

0 0 0 1.5

Course Outcomes

1. Demonstrate the application of knowledge and skill sets acquired from the course and workplace in the assigned job function/s
2. Solve real life challenges in the workplace by analyzing work environment and conditions, and selecting appropriate skill sets acquired from the course
3. Articulate career options by considering opportunities in company, sector, industry, professional and educational advancement
4. Communicate and collaborate effectively and appropriately with different professionals in the work environment through written and oral means
5. Demonstrate the ability to harness resources by examining challenges and considering opportunities
6. Demonstrate appreciation and respect for diverse groups of professionals by engaging harmoniously with different company stakeholders

COs – POs Mapping

COs	PO1	PO2	PO8	PO10	PO12
1	3	-	-	-	-
2	3	-	-	-	-
3	-	-	-	-	3
4	-	-	-	3	-
5	-	2	-	-	-
6	-	-	3	-	-

Summer Internship: As a part of curriculum in all branches of Engineering, it is mandatory for all students to undergo summer internship Programme at industries (core or allied) / R & D organization to get practical insight of their subject domain during summer break after the 4th semester. This summer internship Programme shall be availed to a maximum duration of 4 weeks and the assessment shall be carried out with both internal and external experts leading to "Satisfactory" and "Non-Satisfactory Performance", and it will not be accounted for the calculation of CGPA.

6th Semester

19CS601 COMPILER DESIGN

3 1 0 3

Course Outcomes

1. Explain different translators and acquire knowledge of compiler & its Phases
2. Identify formal grammars for specifying the syntax and Semantics of programming languages
3. Construct parse table for a given grammar
4. Examine the intermediate code for a given program
5. Illustrate the symbol table management and storage organization.
6. Develop code optimization techniques to improve the performance of a program

CO–PO Mapping

CO	PO1	PO2
1	3	2
2	3	2
3	3	2
4	2	2
5	2	2
6	3	3

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I **11+3 Hours**

Overview of Language Processing-Compiler-Assembler-Interpreters-Linkers & Loaders- Phases of a Compiler-Lexical Analysis-Role of Lexical Analysis-Token-Patterns and Lexemes-Lexical Errors- Regular definitions for the Language constructs- Transition diagrams for recognition of Tokens-Reserved Words and Identifiers.

Input buffering, LEX tool

Unit II **12+4 Hours**

Syntax Analysis-Top-down Parsing-First and Follow-Recursive predictive parsing- Non-Recursive Predictive Parsing- LL(1) Grammar-Bottom-up parsing-Shift Reduce Parsing-Model of an LR Parsers-Construction of SLR(1) Tables-Construction of CLR (1)-LALR(1)- Parsing tables

Handling Ambiguous grammars- Dangling ELSE ambiguity

Unit III **11+4 Hours**

Semantic Analysis-SDT: Synthesized and Inherited Attributes-Intermediate Code-Three Address Code-Quadruples-Triples-Indirect Triples-Abstract Syntax Trees-DAG for Expressions-Symbol Table management-Runtime Environment: Storage Organization-Storage Allocation strategies

Data structures used in symbol table, Three address code for control statements

Unit IV **11+4 Hours**

Machine Independent Code Optimization-Common Sub-expression Elimination-Constant Folding-Copy Propagation-Dead Code Elimination-Strength Reduction-Loop Optimization-Basic Blocks-Flow Graph-DAG for basic Blocks-Machine Dependent Code Optimization: Peephole Optimization-Register Allocation-Instruction Scheduling

Code generation algorithm-optimization among basic blocks

Text Books:-

1. Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers, Principles Techniques andTools,2nd Edition, Pearson, 2007.
2. V. Raghavan, Principles of Compiler Design, 2nd Edition, TMH, 2011.

Reference Books:-

1. Nandini Prasad, Principles of Compiler Design, 2nd Edition, Elsevier, 2012.
2. Yunlin Su Song Y. Yan, Principles of Compilers, A New approach to Compilers including the Algebraic Methods, Springer, 2011.

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam (%)
Remember	20	20	--
Understand	40	40	--
Apply	30	20	60
Analyze	10	20	40
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

1. Define Lexeme.
2. What is Bottom-up parsing?
3. What is inherited attribute?
4. What is constant folding?

Understand

1. Explain the phases of compiler.
2. Explain about various intermediate code representations.
3. Illustrate the machine independent code optimization techniques with an example for each.

Apply

1. Calculate the first and follow functions for the given grammar-
   $S \rightarrow (L) / a$
   $L \rightarrow SL'$
   $L' \rightarrow ,SL' / \in$
2. Construct CLR(1) parsing table for the following grammar
   $S' \rightarrow S$
   $S \rightarrow C\ C$
   $C \rightarrow c\ C$
   $C \rightarrow d$

Analyse

1. Compare and contrast different storage organization strategies.
2. How does machine dependent code optimization is different from machine independent code optimization?

Open book Questions

1. Construct the basic block and flow graph for the following C fragments

```
a=3;
        b=4;
        for(i=0;i<n;i++)
{
                a=a*b+5;
                a=a-4;
        }
        c=a+b*3;
```

2. Write the recursive C function to generate Fibonacci sequence. Represent the activation record for each recursive call in case of Fibonacci (8).

19CS602 Internet of Things (IoT)

3 1 0 3

Course Outcomes:
On completion of this course the students are able to:

1. Illustrate IoT framework, architecture and design principles of M2M Communication
2. Outline the design principles of Web and Internet Connectivity and its protocols
3. Summarize MAC and IP addressing in IoT, 6LowPAN and LoRaWAN protocols
4. Identify the suitable sensor technology for data collection and how to store and use it for Computing
5. Develop business models in IoT by identifying vulnerabilities and attacks involving in IoT
6. Inspect an application using IoT technology

CO-PO Mapping

COs	PO3	PO4	PO7
1	3	3	3
2	2	2	2
3	1	1	2
4	3	2	2
5	3	2	3
6	2	2	3

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

UNIT I **10 + 3 Hours**

Overview of IoT: Overview of Wireless Sensor Networks, Overview of Internet of Things, IoT Conceptual Framework, IoT Architectural View, Technology Behind IoT, Sources of IoT, M2M Communication.
Design Principles: IoT/M2M Systems Layers and Design Standardization, Communication Technologies, Data Enrichment, Data Consolidation and Device Management at Gateway

Examples of IoT, Ease of Designing and Affordability

UNIT II **12 + 4 Hours**

Design Principles for Web Connectivity: Introduction, Web Communication Protocols: Constrained Applications Protocol (CoAP), Lightweight Machine-to-Machine Communication**;** Message Communication Protocols: Message Queue Telemetry Transport (MQTT);
Internet Connectivity Principles: Introduction, Internet Connectivity, Internet-Based Communication, IP Addressing in the IoT, Media Access Control, Introduction to 6LowPAN and LoRaWAN

Application Layer Protocols*: HTTP, HTTPS, FTP and Telnet*

UNIT III **12 + 4 Hours**

Sensor Technology: Sensing the Real World using Analog and Digital Sensors, Industrial IoT, Automotive IoT, Actuator, RFID Technology – Principles, Architecture, Applications & Components, Web of Things of RFIDs. **Data Collection, Storage and Computing:** Introduction, Cloud computing Paradigm for Data Collection, Storage and Computing, Everything as a Service and Cloud Service Models for IoT

Sensor Data Communication Protocol: *Serial Bus – USB, CAN*

UNIT IV **12 + 3 Hours**

Business Models and Processes using IoT: Introduction, Business Models, Business Scenarios in IoT.
IoT Privacy, Security and Vulnerabilities Solutions: Security and Privacy Requirements, Threat Analysis, IoT Layered Attacker Model, Access Control and Secure Message Communication, Security Models
Case Studies: Smart Home, Smart City, Precision Agriculture

IoT Hardware: *Raspberry pi, Arduino*

Textbook:

1. Raj Kamal, "Internet of Things: Architecture and Design Principles". TMH Publications, 2017.
2. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014

Reference:

1. Ovidiu Vermesan & Peter Friess, "Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers Series in Communications, 2017.

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Assignment Test (%)
Remember	25	25	-
Understand	30	30	40
Apply	20	20	30
Analyze	25	20	30
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

Remember

1. Write the major significance of Internet of Things.
2. State the crucial requirement f IoT in terms of application and its supporting natures.
3. List the dominant technologies behind IoT development.
4. Identify two major differences between Internet of Everything and Industrial IoT.
5. Write about the data-center based cloud tools that use to run the machine learning algorithm internally.
6. Recognizes an alternative approach that results in better adaptivity in case of network fluctuations and increased latency. 7. Identify the on-demand processing and storage capabilities that is used to analyze the data generated by IoT objects in batch or stream format.

Understand

1. Identify the evolutionary terms of Internet of Things (IoT) that use to interact and live with the physical objects.
2. Illustrate the reference architecture of IoT that unifies the smart objects and human beings to provide the ubiquitous communication
3. Illustrate the service-oriented architecture of IoT that ensures the interoperability among the heterogeneous devices
4. Illustrate the API-Oriented Architecture of IoT that use SOAP and Remote Method Invocation (RMI) as a means for describing, discovering, and calling services
5. Discuss the resource capacity, selecting and provisioning the resources that greatly impact Quality of Service (QoS) of the IoT applications
6. Classify the taxonomy of resource management activities of IoT.
7. Report the standard requirement of real time analytics to fulfill the demand of real-time stream processing engine.

Apply

1. Interpret a study analysis on open-source prototyping platform for the industrial IoT.
2. Implement a suitable OPENIoT Architecture for IoT/Cloud Convergence that provides an abstract presentation of the functional elements of architecture.
3. Sketch W3C SSN-XG ontology and how to semantically enable real time sensor feeds.
4. Execute the two-tier data dissemination model for large-scale wireless sensor network.
5. Demonstrate SPARQL query caching in order to improve the performance of semantic web applications.

6. Illustrations a technique to cluster semantically similar QA pairs for retrieving an answer for a newly given query without asking the QA engine on the cloud side.

Analyze

1. Comparative analysis on real-time analytics in Cloud-IoT and fog computing.
2. Compare the communication efficiencies for the following protocols such as AMPQ, CoAP, DDS, MQTT, UPnP and XMPP in terms of Transport Layer Protocols.
3. Differentiate the major significances of nesC, keil C and Dynamic C.
4. Relate a set of minimal features to be fulfilled by the programming frameworks for IoT.
5. Comparative analysis on IoT programming approaches

Evaluate

1. Select an example that utilizes the device-collaboration framework for the proactive suggestion application
2. Appraise a semantic QA cache that implement the device/cloud collaboration framework to compute the probability of the on-device semantic QA cache to answer a given query correctly. Select a suitable example that use automatically tagging recognized images to display the additional information such as social sentiment in order to achieve similar performance improvement for speech-recognition application with DL through device/cloud collaboration framework
3. Critique on fog-computing assisted distributed analytics system that uses a set of fall-detection algorithms, including algorithms based on acceleration measurements and time-series analysis methods, as well as filtering techniques to facilitate the fall-detection process.
4. Defend the augmented reality applications in terms of Game based on Fog Computing and Linked Data

OBE Questions:

1. Whenever a person wants to find a parking space on the campus, he has to login to the application using his user id and password, a request message will then be sent to the server. The server will send back a response with the available parking details, real-time mapped directions and real-time parking space to allocate parking according to the size of the vehicle. The application would be smart enough to identify whether the car is heading towards the same parking space or not. If not, the application would re-route the same car to another nearest available parking space. The above mentioned will be applicable to those vehicles that have logged in to the system and used the navigating system. But we also need to consider those vehicles which have not logged in and are manually finding parking space and heading towards the same parking slot. Can you solve this problem? Develop a smart efficient application system to solve the problem related to real-time parking space.

2. From the underground storage tank, water is pumped using motors to overhead water tanks, which are placed at the highest elevated floor of the building for optimum pressure. The system should also continuously monitor the soil moisture along with rain predictions to water the landscapes in the campus. . How can the system work? The system should check water quality whether it is drinkable or brackish i.e. it should check PH-level, oxygen level, etc. It should check water level of over-head as well as lower-head tanks and control the pumping of water as per the required limit of the over-head tank. The system should also give real time water volume of both the tanks, through the android application. Watering system mobile app should display type of soil, which is being taken, how much water is needed, and its moisture level. It should check weather forecast online and act accordingly, verifying if the forecast was appropriate or not. Develop a smart efficient application system to solve the problem related to “Water Management System”

19CS603 Software Engineering

3 1 0 3

Course Outcomes

1. Explain the need of Software Life Cycle Models
2. Build end-user requirements into system and software requirements,
3. Summarize the system models of software engineering
4. Identify and apply appropriate software architectures and patterns to carry out high level design
5. Choose various testing techniques during software development
6. Categorize Risk management and Software quality for software products

CO–PO Mapping

CO	PO4	PO5	PO8	PO11	PSO1
1	3	3	2	2	2
2	3	3	2	2	2
3	3	2	2	2	2
4	2	2	2	2	2
5	2	3	2	2	2
6	2	3	2	2	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

UNIT – I **11+4 Hours**

Introduction to Software Engineering and SDLC, Software Myths, CMMI, Process models: Linear Sequential model, Prototyping model, Evolutionary models: Spiral model, Agile developmental methodologies-Scrum & XP

Incremental model, software development : Product based and application based

Unit II **11+4 Hours**

Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification.
Software Requirements Engineering Process, Feasibility studies, Requirements elicitation and analysis, requirements validation.
System models: Context models, behavioral models, data models, object models.

Structure of Software Requirements Document, Structured analysis methods

Unit III **11+4 Hours**

Design concepts, data design, software architecture, Architectural styles and patterns, User interface design - Golden rules, User interface analysis and design and steps. Conceptual model of UML, basic structural modeling, Sattic and Dynamic UML diagrams : class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, etc.,

Data Acquisition System - Monitoring and Control System

Unit IV **11+4 Hours**

Testing strategies and Risk Management: Testing levels: Unit testing, integration testing, system testing – alpha and beta testing, Testing Types: black box and white box testing techniques, Cyclomatic Complexity, debugging, Risk management - Risk types, strategies, estimation and Planning. Software Quality - Quality assurance and its techniques

Software measurement, metrics for software quality

Total: 45+15 Hours = 60 Hours

Textbook (s)

1. Roger S. Pressman, Software Engineering, A practitioner's Approach, 8th Edition, McGraw-Hill International Edition, 2015
2. I. Sommerville, Software Engineering, 7thEdition, Pearson education, 2004.
3. Rajib Mal, Fundamentals of software Engineering, 4th Edition, Eastern Economy Edition, 2014.

Reference(s)

1. K K Aggarwal and Yogesh singh, Software engineering,3rd Edition, New age international publication,2008

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam (%)
Remember	30	30	--
Understand	40	40	--
Apply	30	30	50
Analyze	--	--	50
Evaluate	--	--	--
Create	--	--	
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

1. Define software engineering.
2. List different types software myths.

Understand

1. Describe software architecture styles and patterns .
2. Illustrate golden rules for user interface design.

Apply

1. Applying the process of requirement analysis, discuss how the requirements can be collected for a project.
2. Applying debugging strategy fin an error from a code?

Analyze

1. Compare and Contrast software life cycle models.

2. Analyze risk types in the risk management.

Open Book Exam Questions

Assume that 10 errors have been introduced in the requirements model and that each error will be amplifi ed by a factor of 2:1 into design and an addition 20 design errors are introduced and then amplifi ed 1.5:1 into code where an additional 30 errors are introduced. Assume further that all unit testing will find 30 percent of all errors, integration will fi nd 30 percent of the remaining errors, and validation tests will fi nd 50 percent of the remaining errors. No reviews are conducted. How many errors will be released to the field.

19IT503 Cloud Computing

4 1 0 4

Course Outcomes

1. Interpret the architecture and infrastructure models of cloud computing, strengths, and limitations of cloud computing.
2. Understand the virtualization concepts of machines and data centers.
3. Infer the design concepts of cloud ready applications
4. Compare different cloud center's implementation
5. Understand the concepts of cloud scaling and disaster recovery
6. Analyze the performance, scalability, and availability of the underlying cloud technologies and software

CO – PO Mapping

COs	PO_2	PO_6	PO_7	PO_8
1	3	2	3	1
2	3	1	2	3
3	2	3	1	2
4	2	3	3	1
5	2	3	1	2
6	2	3	3	3

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I **12+4 Hours**

Introduction to Cloud Computing

Overview of Computing Paradigm: Recent Trends in Computing, Evolution of Cloud Computing. Introduction to Cloud Computing: Cloud Computing (NIST Model), Properties, Characteristics & Disadvantages, Role of Open Standards.

Cloud Computing Architecture: Cloud Computing Stack, Service Models (XaaS), Deployment Models.

Infrastructure as a Service (IaaS): Introduction to IaaS, Resource Virtualization.

Platform as a Service (PaaS): Introduction to PaaS, Cloud Platform and Management.

Software as a Service (SaaS): Introduction to SaaS, Web services, Web 2.0, Web OS.

Companies in the Cloud Today, Amazon Web Servies, Google services, IBM Cloud, Windows Azure, Tata Cloud, Salesforce.com

Unit II **13+4 Hours**

Virtualization & Design

Virtualization, Virtual machine, Implementation Levels of Virtualization, Virtualization Structures/Tools and Mechanisms, Virtualization of CPU, Memory, and I/O Devices, Virtual Clusters and Resource Management, Data centre, Virtualization for Data-Centre Automation. Service Levels for Cloud Applications Ready for the cloud: Web Application Design, Machine Image Design, Privacy Design, Database Management.

V*arious hypervisors like VMware, KVM, oracle VM,*

Unit III **10+4 Hours**

Service Management in Cloud Computing

Service Level Agreements (SLAs), Billing & Accounting, Comparing Scaling Hardware: Traditional Vs. Cloud, Economics of Scaling: Benefitting enormously, Managing Data: Looking at Data, Scalability & Cloud Services, Database & Data Stores in Cloud, Large Scale Data Processing.

Cloud Security: Infrastructure Security, Data Security and Storage, Identity & Access Management, Access Control, Trust, Reputation, Risk.

Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and Business Considerations.

Unit IV **10+3 Hours**

Cloud Service Providers

EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue ,service, Microsoft, Windows Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM, Cloud Models, IBM Smart Cloud, SAP Labs, SAP HANA Cloud Platform, Virtualization Services Provided by SAP, Sales force, Sales Cloud, Service Cloud: Knowledge as a Service, Rack space, VMware, Manjra soft, Aneka Platform

Total: 45+15 Hours

Textbook (s)

1. Barrie Sosinsky, Cloud Computing Bible, Wiley-India, 2010
2. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Cloud Computing: Principles and Paradigms, Editors: Wiley, 2011
3. Nikos Antonopoulos, Lee Gillam, Cloud Computing: Principles, Systems and Applications, Springer, 2012
4. Ronald L. Krutz, Russell Dean Vines, Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Wiley-India, 2010

Reference (s)

1. Michael Miller, Cloud Computing-Web Based Applications that change the way you work and collaborate online, 1st Edition, Pearson Education, Publishing, 2011
2. Kai Hwang, Geoffrey C Fox and Jack J. Dongarra, Distributed & Cloud Computing from Parallel Processing to the Internet of Things, 1st Edition, MK Publishing, 2010
3. David S Linthicum, Cloud Computing and SOA Convergence in Your Enterprise: A Step-by-Step Guide, 1st Edition, Addison-Wesley, 2009
4. Tim Mather, Subra Kumaraswamy, Shahed Latif, Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, O'Reilly, SPD, rp2011.

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Examination[3] (%)
Remember	40	45	20
Understand	40	45	60
Apply	20	10	--
Analyze	--	--	20
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

1. Define Cloud Computing.
2. List types of virtualizations.
3. Define proactive scaling.
4. What is CIA Triad?

Understand

1. Explain different cloud Infrastructure models.
2. Explain different levels of virtualization.
3. Explain about cloud Network security in detail.
4. Explain about Recovery Point Objective.
5. With neat diagram explain the functioning of Xen Architecture.
6. List and explain various cloud service providers risks.

Analyze

1. Compare cloud center and service infrastructure.
2. Analyze different cloud services provided by Amazon

19CS008 Cryptography and Network Security

3 1 0 3

Course Outcomes

1. Explain the fundamentals of cryptography, encryption and decryption algorithms
2. Make use of the symmetric and public key cryptographic algorithms
3. Choose the various authentication applications for security
4. Interpret the functionalities of IP and web Security
5. Demonstrates the functionalities of firewalls
6. Explain various non-cryptographic protocol vulnerabilities

CO–PO Mapping

CO	PO3	PO6	PO8
1	2	2	3
2	2	2	3
3	2	1	3
4	2	1	2
5	2	2	3
6	2	2	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

UNIT – I **11+4 Hours**

Introduction: Security Attacks, Security Goals, Computer criminals, Methods of Defence, Security Services, Security Mechanisms. **Basics of Cryptography:** Symmetric Cipher Model, Substitution Techniques, Transportation, Techniques, Other Cipher Properties- Confusion, Diffusion, Block and Stream Ciphers. Block Cipher Design Principles and Modes of Operations, **Symmetric Key Cryptosystems:** Principles of Private Key System, Data Encryption Standard (DES), Strength of DES, Triple DES, International Data Encryption algorithm, Advanced Encryption Standard (AES).

Blowfish, CAST-128.

Unit II **11+4 Hours**

Public Key Criptography: Principles of Public Key Cryptosystems, RSA Algorithm, Diffie-Hellman Key Exchange. **Cryptographic Hash Functions:** Principles of Cryptographic Hash functions, Applications of Cryptographic Hash Functions, Secure Hash Algorithm (SHA), Message Authentication Codes – Message Authentication Requirements and Functions, HMAC, Digital Signatures, Elgamal digital Signature schame.
Digital Signature Standards.

Unit III **11+4 Hours**

Authentication Applications: Kerberos, Key Management and Distribution, X.509 Directory Authentication service, Electronic Mail Security: Pretty Good Privacy, S/MIME. **IP Security:** Overview, Architecture, Authentication Header, Encapsulating Security Payload, Combining security Associations, Internet Key Exchange, Web Security: Web Security Considerations, Secure Sockets Layer and Transport Layer Security.

HTTPS, Electronic Payment.

Unit IV **11+4 Hours**

IDS and Firewalls: Intruders, Intrusion Detection, Password Management, Firewalls-Characteristics, Types of Firewalls, Placement of Firewalls, Firewall Configuration, Trusted Systems. **Non-cryptographic protocol Vulnerabilities:** DoS, DDoS, Session Hijacking and Spoofing, Software Vulnerabilities- Phishing, Buffer Overflow.

Format String Attacks, SQL Injection, Cybercrime and Computer Crime, Intellectual Property

Total: 45+15 Hours

Text Books:

1. William Stallings, "Cryptography And Network Security – Principles and Practices", 7th edition, Pearson Education Limited 2017.
2. Atul Kahate, "Cryptography and Network Security", 2nd edition, Tata McGraw-Hill, 2003.
3. Behourz A Forouzan, Cryptography and Network Security, 2nd edition, Tata McGraw-Hill, 2011.

Reference Books:

1. Matt Bishop ,"Computer Security art and science ", Second Edition, Pearson Education, 2002
2. Wade Trappe and Lawrence C. Washington, "Introduction to Cryptography with Coding Theory" Second Edition, Pearson Education, 2007
3. Jonathan Katz, and Yehuda Lindell, Introduction to Modern Cryptography, CRC Press, 2007
4. Douglas R. Stinson, "Cryptography Theory and Practice", Third Edition, Chapman & Hall/CRC, 2006
5. Wenbo Mao, "Modern Cryptography – Theory and Practice", Pearson Education, First Edition, 2006.
6. OWASP top ten security vulnerabilities: http://xml.coverpages.org/OWASPT opTen.pdf

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam (%)
Remember	30	30	--
Understand	40	40	--
Apply	30	30	
Analyze	--	--	50
Evaluate	--	--	50
Create	--	--	
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

1. Mention any two security attacks
2. List any two goals of security.
3. Define Hash function.

Understand

1. Differentiate between asymmetric and symmetric key cryptography.
2. How do we achieve authentication?
3. Differentiate between the two applications of hash function.

Apply

1. How do we Apply PGP to the Email Security?
2. Implement firewall using iptables command.
3. Can message encryption itself provide measure of authentication?

Open Book Exam Questions

Question 1:

A man named Jones wanted to chat with his girlfriend Goldie. But he can see that all his family is around him and even his girlfriend is also with her parents. So, he thought to send a secret message to his girlfriend. They usually love to meet in the "Central Park". Now jones wants to send a message to Goldie as "Hi Goldie. How are you. Because you are with your parents, and I am with my parents we cannot speak with each other. But I want to meet you at our favorite place central park tomorrow after your class". Help jones to convert the message to unreadable format using the key of their favorite place. Also suggest him how would jones tell Goldie that the letter is originated from jones only.

Question 2:

You have decided to start a startup after graduation. But you alone cannot be doing this, so you have to ask help from your friends. Suggest what techniques you require and which sort of people you would select so that your company will be a huge success. Explain the techniques clearly to your friends and tell them what they have to do in detail.

19CS009 E-Commerce

3 1 0 3

Course Outcomes:

1. Explain the fundamentals and technology used for of E-Commerce applications
2. Summaries consumer-oriented E-Commerce.
3. Interpret different categories of E-Services.
4. Outline Electronic Data Interchange.
5. Explain different electronic payment systems
6. Decide the suitable security measures for E-Commerce

Co-Po mapping:

COs	PO2	PO3
1	1	2
2	3	2
3	3	1
4	3	2
5	3	2
6	2	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

UNIT - I **11+3 Hours**

E-commerce and its Technological Aspects:

Overview of developments in Information Technology and Defining E-Commerce: The scope of E commerce, Electronic Market, Electronic Data Interchange, Internet Commerce, benefits, and limitations of E-Commerce, Produce a generic framework for E-Commerce, Architectural framework of Electronic Commerce, Web based E Commerce Architecture.

UNIT – II **11+3 Hours**

Consumer Oriented E Commerce:

E-Retailing: Traditional retailing and e-retailing, Benefits of e-retailing, Key success factors, Models of e-retailing, Features of e-retailing. E-services: Categories of e-services, Web-enabled services, matchmaking services, Information-selling on the web, e-entertainment, Auctions, and other specialized services.

UNIT-III **12+4 Hours**

Business Electronic Commerce:

Electronic Data Interchange: Benefits of EDI, EDI technology, EDI standards, EDI communications, EDI Implementation, EDI Agreements, EDI Security. **Electronic Payment System:** Need of Electronic Payment System, Study and examine the use of Electronic Payment system and the protocols used, Study Electronic Fund Transfer and secure electronic transaction protocol for credit card payment. Digital economy: Identify the methods of payments on the net – Electronic Cash, cheques, and credit cards on the Internet.

UNIT-IV: **11+5 Hours**

Security in E Commerce:

Threats in Computer Systems: Virus, Cyber Crime Network Security: Encryption, Protecting Web server with a Firewall, Firewall and the Security Policy, Network Firewalls and Application Firewalls, Proxy Server. Issues in E Commerce Understanding Ethical, Social and Political issues in E-Commerce: A model for Organizing the issues, Basic Ethical Concepts, Analyzing Ethical Dilemmas, Candidate Ethical principles Privacy and Information Rights: Information collected at E-Commerce Websites, The Concept of Privacy, Legal protections Intellectual Property Rights: Types of Intellectual Property protection, Governance.

Total: 45+15 Hours

Text Books:

1. Elias. M. Awad, " Electronic Commerce", Prentice-Hall of India Pvt Ltd.
2. RaviKalakota, Andrew B. Whinston, "Electronic Commerce-A Manager's guide", Addison-Wesley.

References:

1. Efraim Turban, Jae Lee, David King, H.Michael Chung, “Electronic Commerce–A Managerial Perspective", Addison-Wesley.
2. Elias M Award, “Electronic Commerce from Vision to Fulfilment”, 3rd Edition, PHI,

3. Judy Strauss, Adel El-Ansary, Raymond Frost, "E-Marketing", 3RDEdition, Pearson Education.

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Examination[1] (%)
Remember	40	30	--
Understand	40	20	--
Apply	20	30	80
Analyze	--	20	20
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

Remember
1. Define E-commerce
2. What is EDI
3. State the approaches of Supply chain management
4. List the factors Digital Video electronic Commerce

Understand
1. Demonstrate mercantile models.
2. Illustrate Electronic payment systems
3. InterpretAdvertising models for marketing

Analyze
1. Distinguish Desktop video processing and desktop video conferencing
2. Categorize advertising models
3. Analyze Commerce Catalogue

19CS606 Case Tools Lab

0 0 3 1.5

Course Outcomes

1. Interpret the concepts of UML
2. Design various Use cases to showcase the functional Requirements of the system
3. Construct UML diagrams for Static and Dynamic view of the system
4. Inference various case studies and design the model
5. Construct the code from Model for the given application
6. Demonstrate and deploy the solutions for various real time problems.

COs–POs Mapping

CO	PO4	PO5	PO11
1	3	2	2
2	3	3	2
3	3	1	3
4	2	2	2
5	2	2	3
6	1	2	3

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

List of Experiments

CASE TOOLS (UML) LAB EXPERIMENTS:

Case studies given below should be Modelled using Rational Rose tool in different views i.e. Use case diagram, Class diagram, Sequence Diagram, Collaboration Diagram, State Diagram, Activity Diagram, Component Diagram, Deployment Diagram and Forward and Reverse Engineering.

CASE STUDY 1:

LIBRARY MANAGEMENT SYSTEM:

This case study on the library management system gives us the complete information about the library and the daily transactions done in a Library. We need to maintain the record of new s and retrieve the details of books available in the library which mainly focuses on basic operations in a library like adding new member, new books, and up new information, searching books and members and facility to borrow and return books.

CASE STUDY 2:

A HOSPITAL MANAGEMENT SYSTEM:

Entry in the hospital management system is done through system users. Master form for users is used to create user profile. Whole system is display in user's selected language. For example if user knows Germany then whole hospital management system is display in German language after login. Above all modules are related to patient. So when patient is admit then patient information is enter from patient entry form like patient name, patient initial, patient sex, patient birth date, blood group, patient ID.

CASE STUDY 3:

AUTOMATED TELLER MACHINE (ATM)

Software is designed for supporting a computerized ATM banking network. All the process involved in the bank is computerized these days. All the accounts maintained in the bank and also the transactions effected, including ATM transactions are to be processed by the computers in the bank. An ATM accepts a relevant cash card, interacts with user, communicates with the central system to carry out the transaction, dispenses cash, and prints receipts. The system to be designed and implemented must include appropriate record keeping and security provisions. The system must handle concurrent access to the same account.

CASE STUDY 4:

DESIGN A STUDENT REGISTRATION SYSTEM :

Each student has access to his or her course and grade information only and must be authenticated prior to viewing or updating the information. A course instructor will use the system to view the list of courses he or she is assigned for a given semester or has taught previously, view the list of students registered for the course(s) he or she is teaching and record final grades for each student in the course(s). TA assignments will also be viewable through this system. Instructors must also be authenticated prior to viewing or updating any information.

List of Augmented Experiments

1. Create a UML model for Passport automation system.
2. Create a UML model for Book bank
3. Create a UML model for Exam Registration
4. Create a UML model for Stock maintenance system.
5. Create a UML model for Online course reservation system
6. Create a UML model for E-ticketing
7. Create a UML model for Credit card processing
8. Create a UML model for e-book management system
9. Create a UML model for Recruitment system
10. Create a UML model for Quiz system

Reading Material (s)

1. Case tools Lab manual, Department of CSE, GMRIT, Rajam

19EC604 Mini Project

0 0 3 1.5

Course Outcomes

1. Identify a contemporary engineering application to serve the society at large
2. Use engineering concepts and computational tools to get the desired solution
3. Justify the assembled/fabricated/developed products intended
4. Organize documents and present the project report articulating the applications of the concepts and ideas coherently
5. Demonstrate ethical and professional attributes during the project implementation
6. Execute the project in a collaborative environment

COs – POs Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2				3	2						3	3
2	3	3			3								3	3
3	3	3	3	2							2		3	3
4										3		2	3	3
5								3					3	3
6									3				3	3

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Mini Project: The curriculum offers Mini Projects in two different forms viz: (i) Mini Project as a mandatory component in all lab courses (ii) 2 credit Mini Project during 5th or 6th semester. With respect to second one (ii) student will take mini project batch wise and the batches will be divided as similar to lab courses. The report will be evaluated by a committee as nominated by CoE constituted with internal & external panels

19CS609 Employability Skills IV

1 1 1 3

Course Outcomes

1. Demonstrate oral communication and writing skills as an individual to present ideas coherently
2. Introspect & develop life skills with constructive approach
3. Assess and improve analytical skills
4. Demonstrate behavioral etiquettes and personal grooming
5. Choose career path balancing passion and opportunities
6. Exhibit adaptive skills under agile environment

COs – POs Mapping

COs	PO1	PO6	PO8	PO10	PO12
1	-	-	-	3	-
2	-	-	-	2	2
3	2	-	-	-	-
4	-	-	2	-	-
5	-	-	-	-	2
6	-	3	-	-	-

3–Strongly linked | 2–Moderately linked| 1–Weakly linked

Soft Skills:

Sl No.	6th Semester (Topic & Content)	No. of Periods
1.	**Resume (Recap):** Resume? Templates? Mistakes to be avoided in a Resume and Steps to be followed in preparing it.	**01**
2.	**Group Discussions (Recap) & Practice:** GD? Stages of a GD, Skills assessed in a GD, Blunders to be avoided, How to excel in a GD? Practice sessions and sharing Feedback. (Screening sample Videos)	**01**
3.	**Interview Skills:** Interview? Types of Interviews, Dos & Don'ts, Skills assessed in an Interview, Mistakes to be avoided, How to equip oneself to excel? How to handle the Typical Interview Questions? (with Examples)	**03**
4.	**Mock Interviews**: Practice sessions with Feedback.	**02**
5.	**Exercises related to Communication:** Email Writing, Voice Versant., etc.	**01**
	Total Periods	**08**

Quantitative Aptitude:

Sl. No.	Semester-VI (Topic)	No. of Periods
1.	Time and Distance	01
2.	Time and Distance	01
3.	Problems on Trains	01
4.	Problems on Trains	01
5.	Blood relations	01
6.	Ratio and Proportions	01
7.	Calendars	01
8.	Clocks	01
	Total Periods	**08**

Domain Specific: (Data Mining using WEKA)

Sl. No	Topic	No. of Periods
1.	**Classification of Data** General Approach to Solving Classification Problem-Decision Tree Induction -Regression- Nearest- Neighbor Classifiers -Bayesian Classifiers	3
2.	Implement the Classification using Decision Tree Induction Algorithm. (Practical)	2
3.	Implement the Classification using Regression (Practical)	2
4.	Implement the Bayesian Classification Algorithm (Practical)	1
5.	**Cluster analysis & Mining Complex Types of Data** Cluster analysis -K-means-Agglomerative Hierarchical Clustering	4
6.	1. Implement K-means clustering Algorithm. (Practical) 2. Implement Hierarchical clustering Algorithm (Practical)	3
	Total Periods	**15**

Textbook (s)

1. Pang, Ning Tan, Michael Steinbach, Vipin Kumar Introduction to Data Mining, 3rd Edition, Pearson Addison Wesley, 2016
2. Jiawei Han & Micheline Kamber, Data Mining Concepts and Techniques, 3rd Edition, Morgan Kaufmann, 2012

Reference (s)

1.Ian H. Witten, Eibe Frank, Mark A. Hall, Data Mining: Practical Machine Learning Tools and Techniques, 3rd Edition, Morgan Kaufmann Publishers, 2011
2. Margaret H Dunham, Data Mining Introductory and advanced topics, 2nd Edition, Pearson Education, 2004
3. Arun K Pujari, Data Mining Techniques, 2nd Edition, University Press, 1999.

19HSX112 CC & EC Activities II

0 0 1 1

Course Outcomes

1. Interpret and present the abstractive technical information through an activity
2. Think critically in providing solutions to the generic and common problems
3. Demonstrate the creative thinking in dealing with liberal arts
4. Instill team sprit through active engagement with the peer
5. Develop programs of common interest having social impact
6. Empower the under privileged through motivational activities

COs – POs Mapping

COs	PO6	PO7	PO9	PO10
1	-	-	-	3
2	3	2	-	-
3	3	-	-	-
4	-	-	3	-
5	3	-	-	-
6	3		-	-

Co-Curricular and Extra Curricular (CCEC) Activities:

Students shall acquire 1 credit each in 2nd and 3rd years with the following scheme:

Scheme of evaluation for the CCEC activities:

- No. of slots in each Semester @ 2 slots every week : 24
- No. of Stream (2-CC + 1-EC) : 3
- No. of slots allotted for each stream : 8

Requirement for the award of 1- Credit

- Students shall choose at least two streams of events in each semester
- Students shall secure 75% attendance in each stream of events to obtain a certificate
- Students shall obtain 2 certificates of Participation in each semester.

The credits earned through these courses will be indicated in the grade sheet and will not be aken into account for CGPA calculation.

Career Path I (Artificial Intelligence & Machine Learning)

19CSC11 Exploratory Data Analysis

3 1 0 3

Course Outcomes

1. Explain the Data Analysis Fundamentals
2. Illustrate various data Visual aids
3. Categorize different data transformation and descriptive statistics
4. Identify different Correlation and Inferences from statistical tests
5. Make use of the concept Hypothesis Testing
6. Classify different Multivariate Analysis techniques

CO–PO Mapping

CO	PO1	PO4
1	3	2
2	3	3
3	3	2
4	2	3
5	3	3
6	3	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I

Exploratory Data Analysis Fundamentals **11+4 Hours**

Understanding data science, significance of EDA, steps in EDA. types of analysis (univariate, bivariate, multivariate). Making sense of data: Numerical data-Discrete&continuous data,categorical data, Measurment scales-Nominal, Ordinal,Interval, Ratio. Comparing EDA with classical and Bayesian analysis, getting started with EDA: Numpy, Pandas,Scipy, and Matplotlib.

Grouping data: groupby mechanics, rearranging, reshaping data structures, data aggregation methods, and cross-tabulation methods.

Objectives of Exploratory data Analysis, The applications of EDA.

Unit II **11+4 Hours**

Visual aids for EDA

Line chart, Bar charts,Box plot,residual plot, Scatter plot-bubble chart, scatterplot using seaborn, Area plot, stacked plot, and stem-and-leaf plot, pie chart, table chart, polar chart, histogram, lollipop chart, choosing the best chart.

Data transformation and descriptive statistics

Transformation techniques- performing data deduplication,replacing values, handling missing data, renaming axis indexes, outlier detection and filtering. Permutation and random sampling, computing indicators/dummy variables, string manipulations.

Descriptive statistics: Understanding statistics, distribution function (uniform, normal, exponential, binomial), cumulative distribution function, measure of central tendenacy, measure of dispersion (standard deviation, variance, skewness, kurtosis, percentiles, quartiles)

Violin Plots, Inter Quartile Range, Discretizaion & binning, heatmaps

Unit III **11+4 Hours**

Correlation and Inferences from statistical tests :

Introducing correlation, covariance, Pearson's Correlation, Spearman's Rank Correlation.

Hypothesis Testing: Testing a difference in mean, testing a correlation, chi-squared tests, errors, power. Model development and evaluation with regression techniques.

Correlation vs causation, ANOVA

Unit IV **12 + 3 Hours**

Multivariate Analysis: overview, Factor Analysis, Cluster Analysis, Discriminant analysis, EDA Case Study

Multidimensional Scaling, MANOVA vs ANOVA

Total: 45+15 Hours

Textbook (s)

13. Daniel J. Denis: Univariate, Bivariate, and Multivariate Statistics Using R: Quantitative Tools for Data Analysis and Data Science, Wiley,2020
14. Mukhiya Suresh Kumar Mukhiya, Ahmed Usman Ahmed: Hands-On Exploratory Data Analysis with Python: Perform EDA techniques to understand, summarize, and investigate your data, Packt, 2020
15. Downey, Allen. Think stats: exploratory data analysis. " O'Reilly Media, Inc.", 2014.
16. Neil H. Spencer: Essentials of Multivariate Data Analysis, CRC Press,2014

Reference (s)

6. Wes McKinney : Python for Data Analysis 2nd Edition,Wiley,2013
7. Glenn J. Myatt, Wayne P. Johnson: Making Sense of Data I: A Practical Guide to Exploratory Data Analysis and Data Mining, 2nd Edition,Wiley,2014
8. Wendy L. MartinezAngel R. MartinezJeffrey L. Solka: Exploratory Data Analysis with MATLAB, 2nd Edition,CRC Press,2011
9. Radhika Datar, Harish Garg : Hands-On Exploratory Data Analysis with R , Packt,2019
10. Joseph F Hair, Barry J. Babin, Rolph E. Anderson, William C. Black: Multivariate Data Analysis Cengage, 2018

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam (%)
Remember	50	40	--
Understand	30	40	--
Apply	20	20	50
Analyze	--	--	50
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

1. What is data science.
2. Define purpose of different data visualtion aids
3. List any two steps involved in EDA.

Understand

1. Explain different data represenation
2. Explain the role of various data grouping methods
3. Explain purpose of hypothesis testing in detail

Apply

1. Apply various visual aids to identify behavior of data
2. Make use of Multivariate Analysis methods for data nanlysis
3. Examine data with various distribution function

Analyze

4. Comapre and contrast varius data grouping methods.
5. Distinguish various methods to address problems with dummy variables
6. Examine various string handling methods

Evaluate

4. Evaluate the statistics of a given dataset
5. Justify the importance of data skewness

6. Measure data dispersion methods on a dataset

Open Book Exam Questions

Question 1:

Perform below analysis on a house price prediction dataset.

a) Univariate Analysis
    i. Analysis of a numerical feature
    ii. Analysis of a categorical feature
b) Bivariate Analysis
    i. Relationship of a numerical feature with another numerical feature
    ii. Relationship of a numerical feature with a categorical feature

Question 2:

Perform below analysis on weather prediction dataset.

c. Correlation Analysis
    i. Correlation Heat Map
    ii. Zoomed Heat Map
d. Investgation of missing values
    i. What's missing? to what extent?
    ii. Visualizing missing values in a dataframe

19CSC12 Deep Learning

3 0 2 4

Course Outcomes

1. Explain the fundamental of Artificial Neural Networks
2. Identify different data representations for Neural Networks
3. Mak use of different CNN models.
4. Compare different character encoding techniques.
5. Exemplify different Deep unsupervised models
6. Examine different deep learning applications.

CO–PO Mapping

CO	PO1	PO2	PO4	PSO1
1	3	2	1	1
2	2	3	1	1
3	3	2	2	2
4	2	3	1	3
5	1	3	2	3
6	1	2	3	1

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I

Introduction to Neural Networks **11+7 Hours**

Artificial Neural Networks: Introduction, Neuron Model, Neural Network Architecture, Learning Rules, Single Layer Perceptrons, Multilayer Perceptrons, adaptive resonance theory (ART), Back propagation Networks : Kohnen's self organizing networks, Hopfield network, Applications of NN, Data representations for neural networks : 0D tensors, 1D tensors, 2D tensors, tensor attributes, data tensors (Vector data, Timeseries data,images,video), tensor operations.

Model Parameters vs Hyperparameters, Types of activation functions, Gradient descent ,delta rule

Practical Component:

1. Build a Neural Network with backpropagation algorithm and test the same using appropriate dataset.
2. The implementation of tensors and various operations on tensors.

Unit II **11+8 Hours**

convolution networks: Building blocks of CNNs, Architectures, Filters and Feature Maps, pooling layers, Convolutions over volumes, Softmax regression, Deep Learning frameworks, Training and testing on different distributions, Bias and Variance with mismatched data distributions, Transfer learning, Multi-task learning, end-to-end deep learning.
CNN models: AlexNet, VGG –16, Residual Networks,YOLO

Keras ,tensorflow, data augmentation, Batch Normalization, Dropout

Practical Component:

1. Digit and Character recognizer using CNN
2. Explore AlexNet
3. Explore YOLO

Unit III

Recurrent Networks **11+7 Hours**

One-hot encoding of words and charcters, using word embedings, Recurrent Neural Network Model, Vanishing gradients with RNNs, Gated Recurrent Unit (GRU), LSTM (long short term memory), Encoder Decoder sequence to sequence architectures,

Deep Unsupervised Learning: Autoencoders, variational Autoencoders, Generative adversarial network, Deep Boltzmann Machines

n-grams ,bag-of-words, Bi directional RNN, Exploding gradient

Practical Componet:

1. One-hot encoding of words and characters using word embedings.
2. Study the construction and working of Recurrent Neural Network
3. Explore LSTM and GRU to predict stock prices based on historic data.

Unit IV

Applications of Deep Learning **12 + 8 Hours**

Image segmentation, object detection, automatic image captioning, Image generation with Generative adversarial networks, video to text with LSTM models. Attention models for computer vision tasks

Batch Gradient Descent vs Stochastic Gradient Descent, limitations of deep learning

Practical Component:

1. Explore applications like Image segmenation and object detection.
2. Automatic image captioning and video to text models.

Total: 45+30 Hours

Textbook (s)

1. Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep Learning." An MIT Press book in preparation. (2015).
2. Fundamentals of Deep Learning: Designing Next-generation Machine Intelligence Algorithms by Nicholas Locascio and Nikhil Buduma O'Reilly Media; 1 edition (June 29, 2017)
3. Simon S. Haykin, Neural Networks, Prentice Hall, 2nd edition
4. B. Yegnanrayana , "Artificial Neural Networks" , PHI.

Reference (s)

1. Franchois Chollet, Deep Learning with Python
2. Deep Learning: A Practitioner's Approach by Adam Gibson and Josh Patterson Shroff/O'Reilly; First edition (2017)
3. Python Deep Learning by Daniel Slater and Gianmario Spacagna, Packt Publishing; 2/e (January 16, 2019)
4. Bishop, C., M., Pattern Recognition and Machine Learning, Springer, 2006
5. Kevin P. Murphy.,Machine Learning:A Probabilistic Perspective

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)
Remember	40	40
Understand	30	40
Apply	30	20
Analyze	--	--
Evaluate	--	--
Create	--	--
Total (%)	100	100

SAMPLE QUESTION (S)

Remember

1. What is neuron.
2. List any two learning rules.
3. Define Convolution neural network
4. Define one-hot encoding technique
5. Define LSTM

Understand

1. Explain Multilayer perceptron
2. Explain data representation through tensors
3. Outline different character encoding techniques

4. Illustrate usage of autoencoders
5. Construct Gated Recurrent Unit (GRU)

Apply

1. Apply 2D tensors to represent image data
2. Develop CNN model to classify digits.
3. Build a CNN model to recognize images
4. Apply LSTM to extract text from a video
5. Build an appropriate DL model for image segmentation

Analyze

1. Examine differences between ANN and CNN.
2. Compare ML with DL
3. Compare and contract different activation functions.

Evaluate

1. Evaulate performace of DL and ML for an image classification problem.

Open Book Exam Questions

Question 1:

List out any four datasets avaialbe in keras API and explain the features of each dataset and take an handwritten "**mnist**" numeric numbers dataset from keras API to classify handwritten digits.

Question 2:

Take a dataset which consists student photos and apply appropriate CNN models to disply name of each student or object which appears on image. Note: Each image in a dataset consists group of mixed objects.

Career Path II (Full Stack Developer)

19CSC21 Web Programming Languages

3 1 0 3

Course Outcomes

At the end of the course, students will be able to

7. Understand what are web applications.
8. Analyze the templates and common scenarios of web development.
9. Examine various web programming languages and their usages.
10. Analyze the flow of data through various layers of web.
11. Identify the use of data management and compatibility of web browsers.
12. Identify the need of security and performance for a web application.

CO – PO Mapping s

COs	PO1	PO2	PO7	PO12
1	3	3	2	2
2	3	3	2	2
3	3	3	2	2
4	3	3	2	2
5	3	3	1	2
6	3	1	1	1

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Syllabus

Unit I **12+4 Hours**

Overview of the web

Web application Overview: Basic concepts of web, Hyper Text Mark-up Language (HTML) and Cascading stylesheets (CSS), Web programming languages

Web server: Introduction, Anatomy of HTTP transaction, Request and response structures, REST APIs.

Data management: Browser storage - Local storage & Session storage, Database storage.

HTML, CSS, HTTP, Status codes

Unit II **11+4 Hours**

Web programming in JavaScript

Introduction: Basic concepts – Arrays, objects, functions, classes and interfaces, ES6 JavaScript standard.

Node JS: Introduction, Node packages, HTTP web server – Creating a HTTP server that supports Create, Read, Update and Delete operations via various HTTP methods, Adding common request parser

Express: Creating a web server with express and body parser packages

NodeJS, ES6, Node packages.

Unit III **11+4 Hours**

Web programming in Java

Introduction: Basic concepts – Arrays, objects, methods, classes and interfaces, Extensible Markup Language (XML).

Web programming techniques – Servlets, Java Server Pages (JSP)

Servlets: Introduction, creating a HTTP servlet for Create, Read, Update and Delete operations

Java Server Pages (JSP): Introduction, creating a JSP for Create, Read, Update and Delete operations

Servlet, XML, JSP

Unit IV **11+3 Hours**

Web programming in Python

Introduction: Basic concepts – Arrays, objects, methods, classes and interfaces, Python's HTTP package

HTTP server: Introduction, creating a server that supports Create, Read, Update and Delete operations

HTTP server, Python packages

Total: 45+15 Hours

Textbook (s)

4. Learn Web Development with Python, Fabrizio Romano, Gaston C. Hillar, Arun Ravindran, 1st Edition, 2018.
5. Learn Java for Web Development, Vishal Layka, 1st Edition, 2014.
6. Node.js, John Bach, Alexander Aronowitz, 3rd Edition, 2021

Reference (s)

5. HTML 5 in simple steps, Kogent Learning Solutions Inc, Dreamtech Press.
6. Beginning HTML, XHTML, CSS, and JavaScript, John Duckett, Wiley India.
7. Beginning CSS: Cascading Style Sheets for Web Design, Ian Pouncey, Richard York, Wiley India.
8. Web Designing & Architecture-Educational Technology Centre, University of Buffalo.

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam (%)
Remember	20	20	--
Understand	30	10	--
Apply	30	30	40
Analyze	10	20	30
Evaluate	10	20	30
Create	--	--	--
Total (%)	100	100	100

Sample Question(s)

Remember

4. List any four HTML tags and CSS properties
5. Define web server
6. List four browser storage methods

Understand

4. What HTTP method should be used for updating data in a server?
5. Explain the of CSS in web development
6. Illustrate the working of a HTTP server

Apply

3. When user opens a website, the underlying web application wants to store browser specific data. What is a good approach for saving the data?
4. Give an example of a scenario that might benefit from browser storage instead of backend storage.

Analyze

4. There is a common body parsing workflow that every request to a server must obey. What is a good way to implement it?
5. Compare Servlet and Java Server Page
6. Analyze the general strategy behind cookies and session management.

Evaluate

3. Assuming the server received a permission error from the database, what is the best way to propagate it to the user?
4. Describe how to implement user authentication in a web server.

Open Book Exam Questions

3. A file is to be stored in the web server. However, the access to this file is to be limited to specific set of users. How can once achieve this using a web server?

4. Consider a request that yields data of high cardinality. How can one send the data without affecting the performance of the website?

19CSC22 Web Application Developments Framework

3 0 2 4

Course Outcomes

At the end of the course, students will be able to

1. Understand the fundamentals of web framework.
2. Classify model, view and controller layers of a web application.
3. Design a web application using a framework.
4. Know the concept of Java web framework.
5. Understand and analyze how modern-day web applications are different from web sites.
6. Learn the technologies of Python web framework.

CO-PO Mapping

COs	PO_1	PO_3	PO_4
1	3	3	2
2	3	2	2
3	3	3	3
4	3	3	2
5	3	2	3
6	2	3	3

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

UNIT- I **10+6 Hours**

Fundamentals of Web Framework

Web framework- History, Types of framework architectures, Model–view–controller (MVC), Three-tier organization

Introduction to frameworks- Framework applications, General-purpose website frameworks-Server-side, Client-side features

MVC, Three-tier organisation, Framework

Practical Components

1. Realisation of separation of data, data fetch and representation logics
2. Realization of mark-up language and it's styling

UNIT- II **12+8 Hours**

AngularJS – JavaScript web framework

Introduction – Angular MVC, Model, View, Controller, Ajax, Data binding

Angular concepts - Directives, Scopes, Controllers, Modules, Expressions

Developing a simple To-Do application using AngularJS

MVC, Ajax, Data binding

Practical Components

1. Implementation of angular directives
2. Implementation of scope and controller
3. Implementation of custom/user-defined directive

Unit III **12+6 Hours**

Struts - Java web framework

Introduction-The Struts Framework, The Struts Tag Libraries, Struts Configuration Files, Applying Struts Struts and Agile Development - Basic Configuration, Actions and Action Support, Results and Result Types, OGNL, The Value Stack, and Custom Tags, Form Tags, Form Validation and Type Conversion-Exceptions and Logging

Struts, OGNL, Value stack

Practical Components

1. Simple Hello world application using Struts

Unit IV **11+10 Hours**

Django – Python web framework

Introduction to Django- History-Django Components-Alternate Components-MVC Architecture in Django MVC creation in Django – Configuring Django, Creating model, view and controller in Django, REST in Django and templates

MVC, Django, REST

Practical Components

1. Creating models for database queries
2. Writing Django templates for rendering data
3. Implementation of REST API using Django

Total: 45+30 Hours

Textbook (s)

1. Angular: Up and Running, Shyam Seshadri, 1st Edition, O'Reilly, 2018
2. Struts the Complete Reference, James Holmes, 2nd Edition, Mc. Graw Hill Professional, 2006.
3. Programming with Django, Wiley Publishing

Reference (s)

1. Angular 6 for Enterprise-Ready Web Applications, Doguhan Uluca, 1st edition, 2018
2. The Definitive Guide to Django, Adrian Holovaty, Jacob Kaplan-Moss, Apress, 2009.
3. Struts 2 In Action, Donald Brown, Chad Michael Davis, Scott Stanlick, Dreamtech press, 2008.

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Assignment Test (%)
Remember	20	10	--
Understand	50	40	--
Apply	30	30	--
Analyze	--	20	--
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	--

Sample Question (S)

Remember

1. Explain model, view and controller
2. List any 4 directives in Angular
3. List the Struts Tag Libraries.
4. Define a scope in Angular
5. Define a template in Django

Understand

1. Write a template in Django that conditionally renders data.
2. Write an example custom tag in Struts
3. Illustrate form validation in Struts.
4. Illustrate the use of ng-filter directive in AngularJS
5. Write an example snippet for ng-if directive in AngularJS
6. Differentiate between plain-validator and field-validator in Struts.
7. For a single Struts application, can we have multiple struts-config.xml files?

Apply

1. Write a snippet that uses ng-for, ng-if and compare it with usage of ng-filter directives in AngularJS
2. Write a sample code for creating a User model in Django that has the following properties:
   a. Name (string)
   b. Age (number
   c. Email (email)
   d. Phone number (number)
3. Write a sample Django template that renders the User data whose age is > 15.
4. Create an actionForm bean in Struts.
5. Ilustrate the steps required for setting up validator framework in Struts.

Analyse

1. What does the following code snippet in struts-config.xml do?

```
<exception
    key="stockdataBase.error.invalidCurrencyType"
    path="/AvailbleCurrency.jsp"
    type="Stock.account.illegalCurrencyTypeException">
</exception>
```

2. When can global scope be used over local scope in AngularJS?
3. Why is ng-filter more preferrable than ng-if in AngularJS?
4. What happens to existing data in the database when models are edited in Django?

5. Write User and Group models with relevant attributes, where a User can be part of multiple groups. Ensure that when a User is queried, the groups he belongs too are also part of the response.

Career Path II (Cyber Security)

19ITC31 Fundamentals of Security

3 1 0 3

Course Outcomes

1. Explain the fundamental concepts of information security
2. Illustrate the use of cryptography and its functions
3. Identify different types of Cryptography methods
4. List out different types of Security Threats and Vulnerability
5. Make use of the concept of network security
6. Outline transport and network layer security

CO–PO Mapping

CO	PO1	PO2
1	3	1
2	3	3
3	1	2
4	2	3
5	3	2
6	3	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I

Security concepts **11+4 Hours**

What is security, Data vs Information vs Cyber security, Goals of Information Security, Computer Security Concepts, threats,attacks,and assets, security functional requirements, fundamental security design principles , computer security strategy, networking, benefits of networking.

protocols suite,hacking, network sniffing, social engineering

Unit II

Cryptography **11+4 Hours**

Introduction to cryptography, Cryptographic functions(Authentication, Nonrepudiation, confidentiality, integrity), Cryptanalysis. Types of Cryptography: Symmetric key and Asymmetric Key Cryptography, Message Integrity, Encryption and Decryption Techniques, Digital Signatures, Email Standards: MIME and PGP

Applications of Cryptography, cipher types, steganography

Unit III

Security Threats and Vulnerabilities **11+4 Hours**

Overview of Security Threats and Vulnerability: Types of attacks on Confidentiality, Integrity and Availability, Types of malware, Buffer Overflow

Security Counter-Measures: Passwords, Access Control (Authenticating users, Handling User Access), Antivirus Software, Firewalls, Intrusion Detection Systems and IPS.

Types of firewalls, advanced persistant threat

Unit IV

Network Security **12 + 3 Hours**

TCP/IP Suite, DNS, MITM, Attacks on TCP and DNS, VPN, Application layer security (PGP, S/MIME), Transport layer security (TLS), Network layer security (IPSec) Anonymous networks: Tor,I2P.

TCP Vulnerabilities, SSH vs SSL,

Total: 45+15 Hours

Textbook (s)

1. William Stallings, Lawrie Brown, Computer Security Principle sand Practice Third Edition,2015
2. Nihad A. Hassan, Rami Hijazi, Digital Privacy and Security Using Windows: A Practical Guide, Apress, 2017

Reference (s)

1. Michael T. Goodrich and Roberto Tamassia, Introduction to Computer Security, Addison Wesley, 2011.
2. Ross Anderson, Security Engineering: A Guide to Building Dependable Distributed, 3rd Edition, John Wiley & Sons Inc, 2021.
3. Kozierok, Charles M. The TCP/IP guide: a comprehensive, illustrated Internet protocols reference, 2005
4. Harris, Shon, "CISSP all-in-one exam guide." Sixth edition (2013).

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam (%)
Remember	50	40	--
Understand	30	40	--
Apply	20	20	50
Analyze	--	--	50
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

1. What is security.
2. Define cyber security
3. List any four computer security concepts
4. Define threat
5. Define intrusion

Understand

1. Explain Cryptographic functions
2. Explain the role of Symmetric key cryptography
3. Illustrate hashing techniques
4. Outline the purpose of digital signatures

Apply

1. RSA algorithm with example
2. Digital signature
3. Buila a firewall mechanism to protect laptop

Analyze

4. Compare and contrast RSA and ECC.
5. Distinguish differences between Symmetric and Asymetric key cryptography.
6. Examine the key sharing techniques in both Symmetric and Asymetric key cryptography techniques

Evaluate

4. Justify the ECC is best public key cryptosystem than other public key approaches.
5. Explain the importance of IPSec protocol.
6. Explain the importance of I2P protocol

Open Book Exam Questions

Question 1:

In a public-key system using RSA, you intercept the ciphertext C=10 sent to a user whose public key is e=5, and n=35. What is the plaintext M? and Perform encryption and decryption using the RSA algorithm for the following: 1. P=3; q=11, e=7; M=5. 2. P=17; q=31, e=7; M=2.

Question 2:

Suppose we have a set of blocks encoded with the RSA algorithm and we don't have the private key. Assume n=pq, e is the public key. Suppose also someone tells us they know one of the plaintext blocks has a common factor with n. Does this help us in any way?

19ITC32 Cybernet Security

3 0 2 4

Course Outcomes

1. Explain the fundamental concepts of Cyber security
2. Demonstrate the web security and different attacks
3. Identify different network scanning and security measures
4. List out different types of Intrusion detection.
5. Model different types of Intrusion prevention systems
6. Outline different cyber crimes, IT laws and acts.

CO–PO Mapping

CO	PO1	PO3	PO4	PO5	PSO1
1	3	3	1	1	1
2	3	3	1	3	1
3	1	2	3	3	2
4	3	1	1	3	3
5	1	3	3	3	3
6	1	3	2	1	1

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I

Introduction to Cyber Security **11+7 Hours**

What is Cyber Security, its need, cyber-threats, Cyber Warfare-Cyber Crime-Cyber terrorism-Cyber Espionage), Career Growth, Statistics, Inferences, Need for a Comprehensive Cyber Security Policy, Classification of Cyber Crimes,kinds of cyber crimes, Reasons for Cyber Crimes, Cyber Security Tools : Nmap, Metasploit, wireshark, tcpdump, snort.

Cyber security awareness, social engineering, cyber stalking

Practical Components

1. Lab Activity: Study the use of network reconnaissance tools like WHOIS, dig, ping, hping, traceroute, nslookup to gather information about networks and domain registrars.
2. Lab Activity: Study of packet sniffer tools like tcpdump , wireshark etc.

Unit II

Web security **11+8 Hours**

Same origin Policy, Cross Origin Resource Sharing, DDOS, SQL Injection, XSS, Homograph, Generating and storing session tokens.

Networking Scanning & Security Measures:

Packet Sniffing and spoofing, Network scanning types, port scanning & its tools, and Network Architecture

Security Measures : IPtables(firewalls) , Webservers (Nmap & Metasploit for securing webservers), Cyber Threats and Attacks (Malware, DOS, MITM, Social engineering attacks, Spoofing, Phishing)

Cross-Site Request Forgery (XSRF/CSRF), spear phishing.

Practical Components

1. Lab Activity: Perform port scanning using Nmap
2. Lab Activity: Penetration Testing and Exploiting with Metasploit, Armitage and msfconsole
3. Lab Activity: Simulate DOS and DDOS attacks using various tools.
4. Lab Activity: Study of SQLMap to explore SQL Injection attacks

Unit III

Intrusion Detection System **11+8 Hours**

Intruders, Intrusion Detection, Analysis Approaches, Network-Based IDS, Host-Based IDS, signature based IDS, anomaly based IDS, advantages and disadvantages of NIDS and HIDS

Intrusion Detection Tools, snort architecture, snort rules, case studies of intrusion detection systems,Intrusion detection exchange format.

Honeypots, different types of honeypots, benefits and dangers of honeypots

firewall vs IDS, Physical IDS, honeynet

Practical Components

1. Lab Activity: Use iptables in linux to create firewalls..
2. Lab Activity: Use Snort as packet sniffer and write your own IDS rules

Unit IV

Cyber Laws and Digital Forensics **12 + 7 Hours**

Digital Forensics: Introduction to Digital Forensics, historical background of digital forensics, Forensic Software, and Hardware, need for computer forensics science, special tools and techniques digital forensic life cycle, challenges in digital forensic.

Law Perspective: Introduction to the Legal Perspectives of Cybercrimes and Cybersecurity, Cybercrime and the Legal Landscape around the World, Why Do We Need Cyber laws, The Indian IT Act, Cybercrime Scenario in India, Digital Signatures and the Indian IT Act.

Cybercrime and Punishment

Practical Components

1. Lab Activity: Write a security policy for password protection
2. Lab Activity: Case Study on Indian IT ACT 2000

Total: 45+30 Hours

Textbook (s)

5. Wenliang Du, Computer & Internet Security: A Hands-on Approach, (2019)
6. William Stallings, Lawrie Brown, Computer Security Principle sand Practice Third Edition,2015
7. Sunit Belapure and Nina Godbole, Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives, Wiley India Pvt. Ltd, 2011.
8. Nelson Phillips and Enfinger Steuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi

Reference (s)

1. Pande, Jeetendra. "Introduction to Cyber Security.", (2017)
2. Pavan Duggal, Cyber frauds, cybercrimes & law in India.
3. Ali A. Ghorbani, Network intrusion detection and prevention concepts and techniques, Springer, 2010
4. Roberto Di Pietro, Luigi V. Mancini (2008), Intrusion Detection System, Springer
5. Dafydd Stuttard and Marcus Pinto. The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws, Wiley Publication

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)
Remember	50	40
Understand	30	40
Apply	20	20
Analyze	--	--
Evaluate	--	--
Create	--	--
Total (%)	100	100

SAMPLE QUESTION (S)

Remember

1. What is cyber security.
2. Define security policy.
3. List classification in cyber security.
4. Define network scanning.
5. What is digital forensics.

Understand

1. Explain security policy for password protection.
2. Explain reasons for cyber crime.
3. Outline SQL injection attack.
4. Classify different approaches for packet filtering using firewall.

5. Explain IP Spoofing.

Apply

1. Apply IPS methods to prevent introduter.
2. Apply snort rules to detect intrusion
3. Identify open ports in a network using namp.
4. Plan to filter unauthorized packets using iptables
5. Build host based IPS.

Analyze

1. Comapre and contrast iptables and snort.
2. Comapre and contrast different tools to address DOS.
3. Examine different post scanning methods.
4. Distinguish nmap and metasploit.
5. Comapre different tools related to digital forensics

Open Book Exam Questions

Question 1:

	Source Address	Source Port	Dest Address	Dest Port	Action
1	Any	Any	192.168.1.0	> 1023	Allow
2	192.168.1.1	Any	Any	Any	Deny
3	Any	Any	192.168.1.1	Any	Deny
4	192.168.1.0	Any	Any	Any	Allow
5	Any	Any	192.168.1.2	SMTP	Allow
6	Any	Any	192.168.1.3	HTTP	Allow
7	Any	Any	Any	Any	Deny

The above table shows a sample of a packet filter firewall ruleset for an imaginary network of IP address that range from 192.168.1.0 to 192.168.1.254. Describe the effect of each rule.

Question 2:

Perform following activities using nmap tool:

c) Write an nmap command to check/find list of open ports for “gmrit.org” website.
d) Nmap to reveal open services and ports by IP address as well as by domain name(Note: IP number is of your choice).
e) Nmap commad to scan multiple hosts at once.
f) Nmap commad to find OS information of a host(host IP address is of your choice).
g) Nmap commad to check firewall settings of a host(host IP address is of your choice).

B. Tech. (Honors)
Domain I (Data Engineering)

19CSH11 Advanced Data Structures

4 0 0 4

Course Outcomes

At the end of the course, students will be able to

1. Recognize the variations in implementation of fundamental linear data structures
2. Describe and implement different types of search and balanced trees
3. Demonstrate the concepts and implementations of heaps and its types
4. Identify heap data structure for appropriate use cases
5. Outline the applications of hash table data structure
6. Illustrate the use of data structure for strings

CO-PO Mapping

CO	PO2	PO3	PO4
1	2	3	2
2	3	3	3
3	3	3	3
4	3	3	3
5	3	3	3
6	2	3	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I

Elementary Data Structures: Review **10+3 Hours**

List – Stack – Queue – Double Ended Queue – Dynamic Allocation of nodes – Shadow copies of Array based structures – Generic List

Unit II

Search Trees and Balanced Trees **12+4 Hours**

Two models of search trees – General properties and Transformations – Height of search tree – Basic insert, delete operations – Dealing with non-unique keys – Building Optimal search trees – Converting trees into lists – Height balanced trees – Weight balanced trees – Red-Black trees – Splay trees – Skip lists – Interval trees – Segment trees

Unit III

Heaps **12+4 Hours**

Balanced search trees as heaps – Array based heaps – Heaps as trees – Leftlist heaps – Skew heaps – Binomial heaps – Changing keys in heaps – Fibonacci heaps – Heaps of optimal complexity – Double ended heap structures

Unit IV **11+4 Hours**

Hash Tables and Data Structures for Strings

Hash Tables

Basic hash tables and collision resolution – Universal families of hash functions – perfect hash functions – hash trees – Extendible hashing – Bloom filters

Tries and Compressed tries – Dictionaries – Suffix trees – Suffix arrays

Textbook (s)

1. Peter Brass, “Advanced Data Structures”, Cambridge University Press, 2008
2. Thomas H Cormen, Charles E Leiserson, Ronald L Rivest, Clifford Stein, “Introduction to Algorithms”, MIT Press, Cambridge, 2009

Reference (s)

1. Alfred L Aho, John E Hopcroft, Jeffery D Ullman, “Data Structures and Algorithms, Pearson Publications, 2016
2. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, Pearson Education, 2002
3. Michael Main, Walter Savitch, Data Structures and other objects using C++, 4th Edition, Addison Wesley, 2018

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Test (%)
Remember	20	20	--
Understand	35	35	--
Apply	25	25	40
Analyze	20	20	40
Evaluate	--	--	20
Create	--	--	--
Total (%)	**100**	**100**	**100**

SAMPLE QUESTION (S)

Remember

1. List out linear data structures
2. Name the basic operations of stack data structure
3. Define balance factor of AVL tree
4. Define complete binary tree
5. What is self-referential structure?
6. Name two basic operations on stack data structure supports
7. Define a double linked list structure
8. What are advantages and disadvantages of circular linked list?

Understand

1. Explain Bubble Sort Process with an example
2. Demonstrate with neat diagram and algorithm to insert a node before the given key
3. Explain Deletion process using an example binary search tree
4. Explain why the selection sort is more efficient than the bubble sort
5. Explain with suitable example of LL rotation after inserting a new node into an AVL tree
6. Demonstrate the application of singly linked lists for the addition of the polynomials P1 and P2

Apply

1. Construct a symbol parse tree for the key words of following program

```
void main()
{
      long int n,num,d;
      char prime;
      clrscr();
      printf("Enter the range for prime no");
      scanf("%ld",&n);
for(num=2;num<=n;num++)
{
      prime='t';
      for(d=2;d<=sqrt(num);d++)
       if (num%d==0)
       {
                  prime='f';
            break;
       }
 if(prime==t)
       printf("%10ld",num);
}
getch();
}
```

2. Develop an algorithm to concatenate two single linked lists
3. Construct a priority queue and implement all basic operations to demonstrate priority queue
4. Build a recursive procedure to count the number of nodes in a binary tree
5. Develop a queue using single linked list data structure

Analyze

1. Analyze the efficiency of insertion sort for the following inputs to sort
A={12, 23, 3, 11, 56, 6, 78, 7} B={12, 14, 23, 45, 56, 67, 78, 81}
2. Analyze the efficiency of BST deletion to delete a node with two children
3. Compare BST deletion and AVL deletion methods according to time efficiency.
4. Choose a suitable data structure to implement a linked stack
5. Analyze the efficiency of BFS graph traversal method

Evaluate

1. Justify that the height of the AVL tree is O (log n) where n is the no of nodes in the tree
2. Prove that the height of a complete, balanced binary tree of 'n' nodes is "log (n+1)"
3. The worst time complexity of binary search is O(log n), Justify
4. Choose a suitable data structure to implement double ended queue
5. Compare the height by successive insertion of following numbers if inserted into a BST and AVL tree

{12, 14, 23, 45, 56, 67, 78, 81}

19CSH12 Advanced Databases

4 0 0 4

Course Outcomes:

1. Interpret Distributed Databases and its architectures
2. Utilize various fragmentation techniques given a database
3. Illustrate query optimization and Transaction Management in DDBMS
4. Compare various approaches to concurrency control in Distributed database
5. Choose various algorithms and techniques for deadlock and recovery in Distributed database
6. Explain about data on external storage and indexing

COs – POs Mapping

COs	PO_2	PO_3	PO_4
1	3	2	1
2	3	3	2
3	3	2	1
4	2	2	2
5	3	2	1
6	3	3	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I **9+3 Hours**

Introduction to DDBMS: Distributed data processing; what is a DDBS; Features of Distributed versus Centralized Databases, Advantages and disadvantages of DDBS; Principles of Distributed Databases, Levels of Distribution Transparency, Distributed DBMS Architecture.

Distributed Database Design: Top-Down Design Process, Distribution design issues, fragmentation, allocation, Data Directory.

UNIT – II **7+4 Hours**

Optimization of Access Strategies, A Framework for Query Optimization, Join Queries, General Queries. The Management of Distributed Transactions, A Framework for Transaction Management, Supporting Atomicity of Distributed Transactions, Concurrency Control for Distributed Transactions.

UNIT-III **8+3 Hours**

Concurrency Control, Foundation of Distributed Concurrency Control, Distributed Deadlocks, and Concurrency Control based on Timestamps, Optimistic Methods for Distributed Concurrency Control. Basic Concepts of reliability, Non-blocking Commitment Protocols, Reliability and concurrency Control, Determining a Consistent View of the Network, Detection and Resolution of Inconsistency, Checkpoints and Cold Restart, Distributed Database Administration.

UNIT-IV **7+4 Hours**

Data on External Storage: File Organization and Indexing, Clustered Indexing, Primary and Secondary Indexes, Index Data Structures, Hash-Based Indexing, Hash Tables, Tree-Based Indexing, B-Tress, Comparison of File Organization.

Total: 45 Hours

Textbook (s)

1. Principles of Distributed Database Systems, M. Tamer Özsu, and Patrick Valduriez Prentice-Hall, 4th Edition, 2019.
2. Distributed Databases Principles & Systems, Stefano Ceri, Giuseppe Pelagatti, Tata Mcgraw-Hill, 2017.
3. Database System Concepts, Silberschatz Korth, McGraw hill, 7th Edition, 2019

Reference (s)

1. Distributed Database Systems, D. Bell and J. Grimson, Addison-Wesley.
2. Distributed Database Management Systems: A Practical Approach, Saeed K. Rahimi, Frank S. Haug, Willey, 2015.
3. Principles of Transaction Processing, Philip A. Bernstein, Eric Newcomer, 2nd Edition, Elsevier, 2009.

4. Distributed Database Systems, Chhanda Ray, Pearson Education
5. Distributed Database Systems, D. David Arthur Bell, Jane B. Grimson, Addison-Wesley

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam (%)
Remember	40	40	--
Understand	30	40	--
Apply	30	20	50
Analyze	--	--	50
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

1. List any two types of fragmentation
2. Define data directory
3. Define clustered indexing
4. List the 4 properties of Transaction

Understand

1. Explain advantages and disadvantages of Distributed Databases
2. Explain the levels of distributed transparency
3. Illustrate about join queries
4. Explain about B+ trees

Apply

1. Apply fragmentation on any example data and show the results.
2. Illustrate the Commit and Rollback operations of Distributed Transactions
3. Compare various File organizations.

Open Book Exam Questions

Question 1:

Consider a database consisting of a single relation R:

A	B
1	10
2	0

(a) The following two transactions run concurrently on this database:

Line	T1	T2
1	begin transaction;	begin transaction;
2	update R set B = B-10 where A=1;	select sum(B) from R;
3	update R set B = B+10 where A=2;	commit;
4	commit;	

Is it ever possible for T2 to see a value of zero in its output? Explain why or why not.

(b) The following two transactions run concurrently on this database:

Line	T1	T2
1	begin transaction;	begin transaction;
2	insert into R values (3,150)	select sum(B) from R;
3	commit	select sum(B) from R;
4		commit;

Is it ever possible for T2 to see a different value as the output of the select sum(B) from R statements?

Question 2:

1. SELECT DISTINCT name, address FROM Repayment WHERE borrower_id = ?;
2. SELECT * FROM Repayment WHERE borrower_id = ? AND repayment_date > ?;
3. SELECT borrower_id, loanamount FROM Repayment WHERE loanamount BETWEEN ? AND ?;

4. INSERT INTO Request VALUES (?,?,?,?,?,?,?);

Suggest one or more indexes, taking into account of the above. State the indexed attributes for each index, along with the index type (primary or secondary). Argue shortly for your choices. Emphasis is on the suggested indexes supports the SQL commands as effectively as possible.

19CSH13 Programming, Data Structures and Algorithms Using Python

4 0 0 4

Course Outcomes:

1. Recall the fundamental Concepts of Python Programming
2. Identify the various data structures in Python
3. Illustrate sorting techniques by using python language
4. Recall the basic algorithmic notations and complexity analysis
5. Differentiate algorithmic approaches for problem solving
6. Experiment exception handling mechanism using Object Oriented paradigm

CO-PO Mapping

CO	PO2	PO3	PO4	PO5
1	2	2	2	2
2	2	2	2	2
3	3	3	3	3
4	3	3	3	3
5	3	3	3	3
6	2	2	2	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit-1 **12+4 Hours**

Basic Python Fundamentals:

Introduction to programming, algorithms and data structures; Python: variables, operations, control flow - assignments, conditionals, loops, functions Python: types, expressions, strings, lists, and tuples. Python memory model: names, mutable and immutable values; Inductive function definitions: numerical and structural induction.

Python functions: optional arguments, default values Passing functions as arguments Higher order functions on lists: map, filter, and list comprehension.

local, global, nonlocal names Nested functions.

Unit-2 **11+4 hours**

Data structures: lists, Dictionaries, Tuples, Sets, stack, queue, heaps
Linked lists: find, insert, delete; Binary search trees: find, insert, delete; Height-balanced binary search trees

Sorting Techniques:
Elementary inductive sorting: selection, Insertion sort In-place sorting, Merge sort, Quicksort, Stable sorting
Disjoint Sets, heaps

Unit-3 **12+4 hours**

Basic algorithmic analysis: input size, asymptotic Notation and complexity;
Algorithmic Approaches: Backtracking: N Queens, recording all solutions; Brute Force: Maximum element; Divide and Conquer: Maximum Subarray Sum; Greedy Approach: Huffman Codding Dynamic programming: Longest Common Subsequence, Coin Change Problem;
Back tracking, Branch and Bound

Unit-4 **10+3 hours**

Exception Handling: Exception handling, Basic input/output, Handling files, String processing

Object Oriented Programming: Abstract data types, Classes and Python Object; Inheritance in Python Class, Encapsulation, Polymorphism, Data abstraction

Operator Overloading, Regular Expression

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Test (%)
Remember	30	30	--
Understand	35	35	--
Apply	35	35	50
Analyze	--	--	50
Evaluate	--	--	--
Create	--	--	--
Total (%)	**100**	**100**	**100**

Text Books:

1. Martin C. Brown, 1st Python: The Complete Reference, Edition, Publisher: Osborne/McGraw-Hill , 2018
2. Introduction to Algorithms, second edition, T.H.Cormen, C.E.Leiserson, R.L. Rivest, and C.Stein,PHI Pvt. Ltd./ Pearson Education
3. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekaran, University press.

References:

1. Introduction to The Design and Analysis of Algorithms, 3rd Edition, Anany Levitin, Pearson Education, 2017.
2. R. Nageswara Rao, "Core Python Programming", 2nd Edition: DreamTech Press, 2019

Weblink:

Programming, Data Structures and Algorithms Using Python - Course (nptel.ac.in)

Domain II (Modern Software Engineering)

19CSH21 DevOps

4 0 0 4

Course Outcomes:

On completion of this course the students are able to:

1. Illustrate the need of Improvement and value of DevOps
2. Outline the Value Stream using DevOps
3. Describe the Organizational Change and transformation
4. Illustrate the Concept and Goal of Accelerate Flow
5. Outline Feedback Loops and its usage
6. Demonstrate the Concept and Goal of Learning

CO-PO Mapping:

COs	PO1	PO3	PO5	PO8	PO10
1	3	3	3	3	3
2	2	2	2	2	2
3	1	2	1	1	2
4	3	2	2	1	2
5	3	3	3	3	2
6	2	3	2	1	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

UNIT I **12+4 Hours**

Introduction to DevOps: Understanding Improvement, The Convergence, History, and Value of DevOps; **Understanding the Value Stream using DevOps:** Analyzing the technology Value Stream; The ways of DevOps: Flow, Feedback Loops, Culture of Continual Experimentation and Learning.

UNIT II **11+4 Hours**

Value Stream in DevOps: Concept and Goals of Streams, Picking a Value Stream, Understanding Organizational Change, Enabling Transformation;

UNIT III **12+4 Hours**

Accelerate Flow: Concept and Goal of Accelerate Flow, Continuous Delivery Patterns and Practices, the Deployment Pipeline, Creating Consistency in the Pipeline, Automated Testing, Deployment Strategies; **Amplifying the Feedback Loops:** Concept and Goals of Feedback Loops, Creating a Service Reliability Culture, Fast Feedback, Understanding Monitoring, Understanding Complexity

UNIT IV **10+3 Hours**

Learning Acceleration with DevOps: Concept and Goal of Learning, Learning Organizations, Communication, Blameless Culture.

Text Books:

1. Kim, G., Behr, K., and Spafford, G. (2013). The Phoenix Project: A Novel About IT, DevOps, and Helping Your Business Win. IT Revolution Press
2. Kim, G., Humble, J., Debois, P., and Willis, J. (2016). The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations. IT Revolution Press

Reference Books:

1. Julian Fish, The Practical Guide to Enterprise DevOps and Continuous Delivery

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	OBE Test (%)
Remember	25	25	
Understand	40	30	40
Apply	20	20	30
Analyze	15	20	30
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

Sample Questions

Remember

1) What is DevOps
2) Define Value Stream
3) What is **Accelerate Flow**

Understand

1) Explain about Ways of DevOps
2) Explain Picking Value Stream min DevOps
3) Describe Feedback Loops

Apply

1) Give Some Real Time Applications of DevOps

19CH22 Design Patterns

4 0 0 4

Course Outcome:
At the end of the course students are able to:

1. Explain the catalogue of design patterns
2. Exemplify the appropriate pattern to solve object-oriented design problems using design patterns
3. Identify design solution using creational patterns
4. Identify structural patterns to solve design problems.
5. Design solutions by using behavioural patterns.
6. Choose a design pattern from the Pattern Community

COs–POs Mapping:

COs	PO2	PO3	PO5
1	3	3	1
2	2	2	1
3	3	3	2
4	2	2	1
5	3	2	2
6	3	3	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

UNIT – I **10+4 Hrs**

Introduction: What Is a Design Pattern? Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

UNIT – II **13+3 Hrs**

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns. Structural Pattern Part-I: Adapter, Bridge, Composite.

UNIT-III **11+4 Hrs**

Structural Pattern Part-II: Decorator, Façade, Flyweight, Proxy. Behavioral Patterns Part-I: Chain of Responsibility, Command, Interpreter, Iterator

UNIT-IV **11+4 Hrs**

Behavioral Patterns Part-II: Mediator, Memento, Observer, State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns. What to Expect from Design Patterns: A Brief History, the Pattern Community an Invitation, A Parting Thought.

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Test (%)
Remember	20	20	--
Understand	35	35	--
Apply	25	25	50
Analyze	20	20	50
Evaluate	--	--	--
Create	--	--	--
Total (%)	**100**	**100**	**100**

TEXT BOOK:

1. Erich Gamma, Design Patterns, Pearson Education, 2015

REFERENCE BOOKS:

1. Mark Grand, Pattern's in JAVA Vol-I, Wiley Dream Tech, 1998
2. Mark Grand, JAVA Enterprise Design Patterns Vol-III, Wiley Dream Tech.2001
3. Eric Freeman, Head First Design Patterns, Oreilly-SPD, 2004
4. Alan Shalloway, Design Patterns Explained, Pearson Education, 2004

Remember

1. Define Prototype
2. Define Decorator pattern

Understand

1. List the Related patterns of Observer
2. Define Intent of State Pattern
3. Explain about motivation, Structure, Participants and consequences of Observer pattern
4. Explain about motivation, Structure, Participants and consequences of Mediator pattern

Apply

1. Identify all the Participants for Proxy Pattern.
2. Develop the Motivation, Structure, Collaborations and Implementation of Prototype and Singleton Pattern
3. Develop the Intent, Applicability, Sample code, and Known uses of the Factory Method

Analyze

1. Formulate the benefits of design Patterns to the Young Designers
2. Formulate Pattern community features
3. Analyze the Flyweight pattern in detail

19CSH23 Advanced Software Engineering

4 0 0 4

Course Outcomes:

1. Explain various system models, their prototyping and specifications
2. Demonstrate the different phases involved in Agile models
3. Outline and understand Various types of System Architectures
4. Outline Object-Oriented Design Process required for software development
5. Utilise the Verification and Validation techniques to software project
6. Interpret various Agile testing Methods

CO–PO Mapping:

CO	PO1	PO2	PO3	PO4	PSO1
1	3	3	2	2	2
2	3	3	2	2	2
3	3	2	2	2	2
4	2	2	2	2	3
5	2	3	2	2	3
6	2	3	2	2	2

Unit-1 **10+4 Hours**

System Models and Software Prototyping and Specifications: System Models, Software Prototyping and Specifications System models: Context, Behavioural, Data, and Object models, CASE Workbenches; Software Prototyping: Prototyping in the Software Process, Rapid Prototyping Techniques, User Interface Prototyping; Specifications: Formal Specification in the Software Process, Interface Specification, Behavioural Specification, ,

Agile models, Phases of agile models, When to use the Agile Model?, Advantages and Disadvantages of Agile Method.

Unit-2 **10+4 Hours**

Architectural Design: Introduction: System Structuring; Control Models; Modular Decomposition; Domain- Specific Architectures; Distributed Systems Architectures: Multiprocessor Architectures; Client-Server Architectures, Distributed Object Architectures; CORBA (Common Object Request Broker Architecture)

Unit-3 **10+3 Hours**

Software Design: Object Oriented Design: Objects and Object Classes, Object-Oriented Design Process, Design Evolution; Real Time Software Design: Systems Design, Real-Time Executives, Monitoring and Control Systems, Data Acquisition Systems; Design with Reuse: Component-Based Development, Application Families

Unit-4 **10+4 Hours**

Verification, Validation and Testing: Verification and Validation (V & V): Static and Dynamic V & V, V & V Goals, V & V vs. Debugging, Software Inspections / Reviews, Clean-Room Software Development; Software Testing: Defect Testing, Integration Testing, Interface Testing, Object-Oriented Testing, Testing Workbenches, Agile testing Methods.

Total: 45+15 Hours

Text Books:

1. J.F.Peters and W. Pedrycz, Software Engineering: An Engineering Approach, 1st edition, John Wiley and Sons, 2000

2. Roger Pressman and Bruce R. Maxim, Software Engineering: A Practitioner's Approach, 8th Edition, McGraw-Hill, 2019

3. Rajesh R V, Becoming an Agile Software Architect: Strategies,

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam (%)
Remember	40	40	--
Understand	50	40	--
Apply	10	20	50
Analyze	--	--	50
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

1. Define software engineering.
2. List different types software myths.

Understand

1. Describe software architecture styles and patterns .
2. Illustrate golden rules for user interface design.

Apply

1. Applying the process of requirement analysis, discuss how the requirements can be collected for a project.
2. Applying debugging strategy fin an error from a code?

Analyze

1. Compare and Contrast software life cycle models.
2. Analyze risk types in the risk management.

Open Book Exam Questions

Assume that 10 errors have been introduced in the requirements model and that each error will be amplifi ed by a factor of 2:1 into design and an addition 20 design errors are introduced and then amplifi ed 1.5:1 into code where an additional 30 errors are introduced. Assume further that all unit testing will find 30 percent of all errors, integration will fi nd 30 percent of the remaining errors, and validation tests will fi nd 50 percent of the remaining errors. No reviews are conducted. How many errors will be released to the field.

Domain III (Security)

19CSH31 Fundamentals of System Security

4 0 0 4

Course Outcomes

1. Explain the fundamental concepts of computer security
2. Illustrate hacking and defense
3. Choose appropriate confidentiality policies
4. Identify different Secure architecture principles
5. Identify various Web security methods
6. Choose appropriate internet security methods

CO–PO Mapping

CO	PO1	PO2
1	3	1
2	3	3
3	1	2
4	2	3
5	3	2
6	3	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I

Computer System Security Introduction: **11+4 Hours**

Introduction, What is computer security and what to l earn? Sample Attacks, The Marketplace for vulnerabilities, Error 404 Hacking digital India part 1 chase.

Hijacking & Defense: Control Hijacking, More Control Hijacking attacks integer overflow, More Control Hijacking attacks format string vulnerabilities, Defense against Control Hijacking -Platform Defenses, Defense against Control Hijacking - Run-time Defenses, Advanced Control Hijacking attacks.

Unit II **11+4 Hours**

Confidentiality Policies:

Confinement Principle, Detour Unix user IDs process IDs and privileges, More on confinement techniques, System call interposition, Error 404 digital Hacking in India part 2 chase, VM based isolation Confinement principle, Software fault isolation, Rootkits, Intrusion Detection Systems.

Unit III

Secure architecture principles isolation and leas: **11+4 Hours**

Access Control Concepts, Unix and windows access control summary, other issues in access control, Introduction to browser isolation.

Web security landscape: Web security definitions goals and threat models, HTTP content rendering. Browser isolation, Security interface, Cookies frames and frame busting, Major web server threats, Cross site request forgery, Cross site scripting, Defenses and protections against XSS, Finding vulnerabilities, Secure development.

Unit IV

Internet Infrastructure: **12 + 3 Hours**

Basic security problems, Routing security, DNS revisited, Summary of weaknesses of internet security, Link layer connectivity and TCP IP connectivity, Packet filtering firewall, Intrusion detection.

Total: 45+15 Hours

Textbook (s)

1. William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall, 4th edition, 2010.
2. Michael T. Goodrich and Roberto Tamassia, Introduction to Computer Security, Addison Wesley, 2011.

Reference (s)

1. William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall, 4th edition, 2010.
2. Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, Handbook of Applied Cryptography, CRC Press, 2001.

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam (%)
Remember	50	40	--
Understand	40	40	--
Apply	10	20	50
Analyze	--	--	50
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

1. What is security.
2. Define cyber security
3. List any four computer security concepts
4. Define threat
5. Define intrusion

Understand

1. Explain Cryptographic functions
2. Explain the role of Symmetric key cryptography
3. Illustrate hashing techniques
4. Outline the purpose of digital signatures

Apply

1. RSA algorithm with example
2. Digital signature
3. Buila a firewall mechanism to protect laptop

Analyze

1. Compare and contrast RSA and ECC.
2. Distinguish differences between Symmetric and Asymetric key cryptography.
3. Examine the key sharing techniques in both Symmetric and Asymetric key cryptography techniques

Evaluate

7. Justify the ECC is best public key cryptosystem than other public key approaches.
8. Explain the importance of IPSec protocol.
9. Explain the importance of I2P protocol

19CSH32 Python Programming for Security

4 0 0 4

Course Outcomes:

After completion of the course, students can able to:

1. Explain the basic data structures and multithreading in python
2. Outline about Socket Programming
3. Experiment with Client server approach using TCP and UDP.
4. Analyze Network Traffic using python
5. Identify proper Authentication and Authorization.
6. Choose appropriate Password management approach.

COs-POs Mapping

Cos	PO_1	PO_3	PO_4
CO_1	3	2	1
CO_2	3	2	2
CO_3	1	1	3
CO_4	3	1	2
CO_5	3	1	2
CO_6	2	1	3

3-Strongly linked|2-Moderately linked| 1-Weakly linked

Unit -1: **11+4 Hours**

Python Introduction: python data structures, functions, classes, inheritance, Managing exceptions, modules and packages, managing dependencies and virtual environment, working with file system, managing threads: multi-threading and concurrency, working with socket.

Unit -2: **10+3 Hours**

Socket Programming: Network Sockets in python, TCP/IP Suite, Implementing a simple TCP client and TCP server, implementing a simple UDP client and UDP server.

Unit-3: **11+4 Hours**

Network Traffic Analysis with Python: Scapy: Capturing and injecting packets, Port-scanning and traceroute, reading, writing and sniffing a pcap files; network monitoring: PySNMP for SNMP, data visualization pygal, matplotlib, graphviz for network monitoring.

Unit-4: **13 + 4 Hours**

Authentication and Authorization: HTTP session management: HTTP session, HTTP cookies, Session-state persistence; User authentication: User registration, authentication and testing; User password management: Password-change workflow, Password storage, configuring password hashing, Password-reset workflow; Authorization: Application-level authorization, enforcing authorization.

Total: 45+15 Hours

Text Books:

1. José Manuel Ortega (2018). Mastering Python for Networking and Security. Packt Publishing Ltd
2. Dennis Byrne (2021) Full Stack Python Security by Manning Publications Co
3. Chou, E. (2017). Mastering Python Networking. Packt Publishing Ltd.

References:

1. O'Connor, T. J. (2012).Violent Python:A Cookbook for Hackers, Forensic Analysts, Penetration Testers and Security Engineers, Syngress (Elsevier)
2. Sarker, M. F., & Washington, S. (2015). Learning Python Network Programming. Packt Publishing Ltd.

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam (%)
Remember	40	40	--
Understand	50	40	--
Apply	10	20	50
Analyze	--	--	50
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

Remember

1. What are the benefits of Python?
2. What is an Interpreted language?
3. List any four string handling functions

Understand

1. Explain lists and tuples?
2. Differentiate between the two?
3. What are Dict and List comprehensions?

Apply

1. Explain user defined exception
2. Justify multiple inheritance is supported in python?
3. Design a simple GUI page using Tkinter

Open Book Exam Questions

1. Write a program which accepts a sequence of comma-separated numbers from console and generate a list and a tuple which contains every number.Suppose the following input is supplied to the program: 34, 67, 55,33,12,98.
   Then, the output should be:
   ['34', '67', '55', '33', '12', '98']
   ('34', '67', '55', '33', '12', '98')

2. A website requires the users to input username and password to register. Write a program to check the validity of password input by users.Following are the criteria for checking the password:
   At least 1 letter between [a-z]
   At least 1 number between [0-9]
   At least 1 letter between [A-Z]
   At least 1 character from [$#@]
   Minimum length of transaction password: 6
   Maximum length of transaction password: 12
   Your program should accept a sequence of comma separated passwords and will check them according to the above criteria. Passwords that match the criteria are to be printed, each separated by a comma.
   Example: If the following passwords are given as input to the program:
   ABd1234@1,a F1#,2w3E*,2We3345
   Then, the output of the program should be:
   ABd1234@1

19CSH33 Management of Information Security

4 0 0 4

Course Outcomes:
After completion of the course, students are able to:

1. Explain the basic requirement of managing security
2. Outline the strategies of planning of security system
3. Define the Security policies.
4. Develop and implement the security programs in an organization
5. Identify a proper framework of security management
6. Define the risk management and ethics of the security management for an organization.

COs–POs Mapping

COs	PO3	PO6	PO7
1	3	1	
2	3	2	3
3	2	2	
4	3	1	2
5	1	1	1
6	1	3	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

UNIT-1 **12+4 Hours**

Introduction to ISMS: what is Security and management definition, Principles of information security management; Project management, applying project management to security; Project management tools. **Planning for Security:** Introduction, the role of planning; Precursors to planning; Strategic planning; Information security governance; Planning for information security implementation.

UNIT-2 **11+3 Hours**

Planning for contingencies: Introduction, Fundamentals and Components of contingency planning. **Information Security Policy:** Introduction, Why policy?, EISP; ISSP, SSSP, Guidelines for effective policy.

UNIT-3 **12+4 Hours**

Developing the Security Program: Organizing for security: Placing for information security within an organization, Components of the security program; Information security roles and titles; Implementing Security Education, Training and Awareness Programs.

Security Management Models: Blueprints, Frameworks, and Security Models**,** Access Control Models, Security Architecture, and management Models.

UNIT-4 **10+4 Hours**

Risk-Management: Risk management, Identification and assessment, Documenting the Results of Risk Assessment; Risk control strategies, managing risk; Feasibility and cost benefit analysis, Recommended risk control practices.

Laws and Ethics: InfoSec and the Law, Ethics in InfoSec, Professional Organizations and their Codes of Ethics, Organizational Liability and the Need for Counsel, Managing Investigations in the Organization.

Total: 45+15 Hours

Text Book:

1. Michael E. Whitman and Herbert J. Mattord, Management of Information Security, 6th Edition, Cengage Learning. 2018

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam (%)
Remember	40	40	--
Understand	50	40	--
Apply	10	20	50
Analyze	--	--	50
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

Remember

1. List the various security metrics
2. List advantages of security audit
3. Define Vulnerability.

Understand

1. Explain need of configurations
2. Explain Identification of Digital Evidence,
3. Write about NIST sample metrics
4. Discuss about vulnerability scanning.

Apply

1. Apply any auditing tool to perform security audit.

2. Apply different network scanning tools to collect vulnerable information.

Analyze

1. Analyze log files of IDS&IPS tools to find level of risk

Domain IV (User Interface Design)

19CSH41 Computer Graphics

4 0 0 4

Course Outcomes

At the end of the course, students will be able to

1. Demonstrate fundamental concepts of computer graphics and interpret mathematical foundation of computer graphics
2. Examine Filled area primitives , two-dimensional transformations and Viewing pipeline
3. Identify the usage of various clipping algorithms
4. Recall Three-dimensional object representation and Projection
5. Differentiate between 2-D and 3-D transformations and Viewing pipeline
6. Illustrate the Animation Design techniques and hidden surface elimination methods

COs–POs Mapping

COs	PO1	PO2	PO3	PO4
1	3	2	1	1
2	2	3	2	2
3	3	2	2	2
4	3	3	2	2
5	3	2	2	2
6	2	3	3	3

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

UNIT I: **10+3 Hours**

Introduction: Application of Computer Graphics, raster scan systems, random scan systems, raster scan display processors.
Output primitives : Points and lines, line drawing algorithms(Bresenham's and DDA Line derivations and algorithms), mid-point circle and ellipse algorithms.
Filled area primitives: Scan line polygon fill algorithm, boundary-fill and flood-fill algorithms, inside and outside tests.

UNIT II: **12+4 Hours**

2-D geometrical transforms: Basic transformations (translation, scaling, rotation, reflection and shear), matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems.
2-D viewing: The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm.

UNIT III: **12+4 Hours**

3-D object representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces.
3-D Geometric transformations and Viewing: Translation, rotation, scaling, reflection and shear transformations, composite transformations. 3D Viewing pipeline, clipping, projections (Parallel and Perspective).

UNIT IV: **11+4 Hours**

Visible surface detection methods: Classification, back-face detection, depth-buffer, scan-line, depth sorting, BSPtree methods, area sub-division and octree methods.

Computer animation: Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications.

Total: 45+15 Hours

TEXT BOOKS:

1. Donald Hearn and Pauline Baker M, —Computer Graphics", Prentice Hall, New Delhi, 2007
2. Newman W.M. and Sproull R.F., Principles of Interactive Computer Graphics, 2ndEdition, Tata McGraw Hill Publishing Company Limited, New Delhi, 1997

REFERENCE BOOKS:

1. S. Harrington, Computer Graphics, A Programming Approach, MGH Publication, New Delhi, 1994
2. J.D. Foley et. Al, A Fundamental of Computer Graphics, Addition Wesley, London, 1993

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Test (%)
Remember	20	20	--
Understand	35	35	--
Apply	25	25	40
Analyze	20	20	40
Evaluate	--	--	20
Create	--	--	--
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

1. List the applications of computer graphics
2. Write 2D transformation matrix for translation, rotation and scaling
3. Define parallel projection
4. List the steps to design computer animation

Understand

1. Explain Bresenham's Line drawing algorithm
2. Explain Sutherland-Hodgeman polygon clipping algorithm
3. Write about Depth sorting visible surface detection method

Apply

1. Draw a circle with center (5,8) and radius 7 units using Midpoint circle generation algorithm
2. Obtain the reflection of a point A(10, 10) with respect to the line y=x+2
3. Use Cohen Sutherland clipping algorithm to clip two lines p1p2 and p3p4 with p1(40,15) p2(75,45) p3(70,20) p4(100,10) against window a(50,10) b(80,10) c(80,40) d(50,40).
4. Clip the polygon v1-v6 against the window ABCD. Assume any convenient numerical values for the vertices preserving the information containing the figure. Employ Sutherland-Hodgeman algorithm.

Analyze

1. Compare raster scan and random scan systems
2. Write the functionalities of B-spline curves
3. Test the Bresenham's line drawing algorithm to draw a line between the points (20,10) and (30,18)
4. Compare and contrast parallel and perspective projection

Open Book Exam

Question 1:

a) Write a procedure to compute the elements of the matrix for transforming object descriptions from one Cartesian coordinate system to another. The second coordinate system is to be defined with an origin point Po and a vector V that gives the direction for the positive y-axis of this system
b) Develop a procedure, based on a back-face detection technique, for identifying all the visible faces of a convex polyhedron that has different-colored surfaces. Assume that the object is defined in a right-handed viewing system with the xy-plane as the viewing surface.

Question 2:

a) Write a procedure to display a line graph for any input set of data points in any selected area of the screen, with the input dam set scaled to fit the selected screen area. Data points are to be displayed as asterisks joined with straight line segments, and the x and y axes are to be labeled according to input specifications. (Instead of asterisks. small circles or some other symbols could be used to plot the data points.)

b) Write a routine to visualize a two-dimensional, vector data set using an arrow representation for the vector values. Make all arrows the same length, but display the arrows with different colors to represent the different vector magnitudes

19CSH42 Multimedia Systems

4 0 0 4

Course Outcome:

1. Explain the different realizations of multimedia tools.
2. Interpret the types of signals.
3. Make use of the Action Scripts to design multimedia systems
4. Illustrate various multimedia applications
5. Categorize various compression techniques.
6. Choose a video compression technique for real time application.

COs – POs Mapping

COs	PO_3	PO_4
1	3	2
2	3	3
3	3	2
4	2	2
5	3	2
6	3	3

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

UNIT-I **12+4 Hours**

Fundamental concepts in Text and Image: Multimedia and hypermedia, World Wide Web, overview of multimedia software tools. Graphics and image data representation graphics/image data types, file formats

Colour in image and video: colour science, color models in images, colour models in video.

Fundamental concepts in video and digital audio: Types of video signals, analog video, digital video, digitization of sound, MIDI

UNIT – II **11+4 Hours**

Action Script I: ActionScript Features, Object-Oriented ActionScript, Datatypes and Type Checking, Classes, Authoring an ActionScript Class.

Action Script II: Inheritance, Authoring an ActionScript 2.0 Subclass, Interfaces, Packages, Exceptions.

UNIT – III **11+4 Hours**

Application Development: An OOP Application Framework using Components with Action Script Movie Clip Subclasses.

Multimedia Data Compression: Lossless compression algorithm: Run-Length Coding, Variable Length Coding, Dictionary Based Coding, and Arithmetic Coding.

UNIT – IV **12+3 Hours**

Basic Video Compression Techniques: Introduction to video compression, video compression based on motion compensation, search for motion vectors, MPEG.

Total: 45+15 Hours

TEXT BOOKS:

1. Fundamentals of Multimedia by Ze-Nian Li and Mark S. Drew PHI/Pearson Education.
2. Essentials ActionScript 2.0, Colin Moock, SPD O, REILLY.

REFERENCES:

1. Digital Multimedia, Nigel chapman and jenny chapman, Wiley-Dreamtech
2. Macromedia Flash MX Professional 2004 Unleashed, Pearson.
3. Multimedia and communications Technology, Steve Heath, Elsevier (Focal Press).

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam (%)
Remember	45	40	--
Understand	35	30	--
Apply	20	30	50
Analyze	--	--	50
Evaluate	--	--	--
Create	--	--	--

Total (%)	100	100	--

SAMPLE QUESTION (S)

Remember

1. Define Multimedia.
2. What is Hypermedia?
3. Define Inheritance.
4. Define Video.

Understand

1. Illustrate ActionScript Features
2. Illustrate Object-Oriented ActionScript
3. Formulate overview of interaction diagrams

Apply

1. Choose the best algorithm for data compression.
2. Demonstrate an Authoring script in ActionScript Class
3. Construct a sample Action Script for a small movie.

Analyse

1. Categorise the different Action Script features.
2. Examine the suitability of the different colour schemes applied in the application.

19CSH43 Human Computer Interaction

4 0 0 4

Course Outcomes

1. Demonstrate the capabilities of both humans and computers from the viewpoint of human information processing.
2. Interpret typical human–computer interaction (HCI) models, styles, and various historic HCI paradigms.
3. Choose an interactive design process and universal design principles to designing HCI systems
4. Make use of HCI design principles, standards and guidelines.
5. Examine and identify user models, user support, socio-organizational issues, and stakeholder requirements of HCI systems
6. Categorize and discuss HCI issues in groupware, ubiquitous computing, virtual reality, multimedia, and Word Wide Web-related environments.

COs–POs Mapping

COs	PO2	PO3
1	1	1
2	1	1
3	2	2
4	1	2
5	2	1
6	2	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I **10+5 Hours**

Introduction

Importance of user Interface-definition, importance of good design, Benefits of good design, A brief history of Screen design, The graphical user interface-popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user-Interface popularity, characteristics-Principles of user interface.

Unit II **10+3 Hours**

Design process

Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions, Screen Designing:-Design goals-Screen planning and purpose, organizing screen elements, ordering of screen data and content-screen navigation and flow-Visually pleasing composition amount of information-focus and emphasis-presentation information simply and meaningfully-information retrieval on web-statistical graphics-Technological consideration in interface design.

Unit III **12+4 Hours**

Windows

New and Navigation schemes selection of window, selection of devices based and screen based controls, Components-text and messages, Icons and increases-Multimedia, uses problems, choosing colors.

Unit IV **13+3 Hours**

Software tools &Interaction Devices

Specification methods, interface-Building Tools, Keyboard and function keys, pointing devices-speech recognition digitization and generation-image and video displays-drivers.

Total: 45+15 Hours

Textbook (s)

1. Wilbert O Galitz, Wiley Dream Tech, The essential guide to user interface design,3rd Edition,Wiley Computer Publishing, 2007
2. Ben Shneidermann, Designing the user interface, 3rd Edition, Pearson Education Asia, 2008

Reference (s)

1. Alan Dix, Janet Fincay, GreGoryd, Abowd, Russell Bealg, Human Computer Interaction.,4th Edition, Pearson Education, 2018

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Examination (%)
Remember	40	30	--
Understand	40	40	--
Apply	20	30	50
Analyze	--	--	50
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

1. Define Human Computer Interaction.
2. What is the basic goal of Human Computer Interaction?
3. State the long term goal of HCI
4. List the factors HCI designers must consider for User Interface Design

Understand

1. Demonstrate the HCI importance.
2. Extend the Trouble faced by human with Computers.
3. Illustrate Psychological Responses to Poor Design
4. Interpret Human-factor variables used in Comparison of pointing devices.

Apply

1. Identify the amount of Information need to Present in a page.
2. Organize the different Software tool specification methods.
3. Model out the six types interaction tasks properties of Pointing devices

Analyze

1. Distinguish the Focus and Emphasis of visual elements in web page design.
2. Categorize the Formatting of Menus.
3. Analyze organizational structure of Keyboard layouts

7th Semester

Career Path I (Artificial Intelligence & Machine Learning)

19CSC13 Natural Language Processing

3 1 0 3

Course Outcomes

1. Understand the fundamentals & building blocks of Natural Language Processing
2. Understand different text representations & labelling methods
3. Apply different Natural Language models and named entities
4. Understand Recurrent neural network for NLP
5. Make use of GRUs and LSTM models for translation
6. Understand different applications of NLP

CO–PO Mapping:

CO	PO1	PO4	PO12
1	3	2	1
2	3	3	2
3	3	2	2
4	2	3	1
5	3	3	2
6	3	2	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I

Introduction to NLP: **11+4 Hours**

Definition, History,NLP in the real world, Building blocks of language,Approaches to NLP, NLP Pipeline,NLP Challenges, Deeplearning in NLP, Morphology fundamentals;

Objectives of NLP, The applications of NLP.

Unit II

Text Representation and Sequence Labelling **11+4 Hours**

Basic Vectorization approaches- One-Hot Encoding, Bag of Words, Bag of N-Gram, TF-IDF; Distributed universal text and handcrafted feature Representations, Neural language models,N-gram language model

Sequence labeling for POS and Named Entities: POS tagging, Named Entities tagging, hidden markov models, conditional Random Fields Visualizing Embeddings, Viterbi algorithm.

Evaluation of Named Entity Recognition, Markov chains.

Unit III

Deep learning architectures for NLP: **11+4 Hours**

RNN for language model, Sequence Labeling and Sequence Classification, Encoder-Decoder with RNNs and Transformers, GRUs and LSTMs for machine translation, Convolutional neural networks for sentence classification.

Transformers as Autoregressive Language Models, Potential Harms from Language Models.

Unit IV

Case Stuy on NLP: **12 + 3 Hours**

sentiment analysis, machine translation, automated speech recognition systems, question-answering based systems, topic modelling, Text Generation and Summarization.

Semantic Role Labeling Lexicons for Sentiment, Affect, and Connotat.

Total: 45+15 Hours

Textbook (s)

1. Dan Jurafsky and James H. Martin. Speech and Language Processing (3rd ed. draft)
2. Yoav Goldberg. Neural Network Methods for Natural Language Processing
3. Vajjala, Sowmya, Bodhisattwa Majumder, Anuj Gupta, and Harshit Surana. Practical Natural Language Processing: A Comprehensive Guide to Building Real-World NLP Systems. O'Reilly Media, 2020.

Reference (s)

1. Rajesh Arumugam, Rajalingappaa Shanmugamani :Hands-On Natural Language Processing with Python
2. Manning C.,SchützeH ,Foundations of Statistical Natural Language Processing–.(MITPress)
3. Jacob Eisenstein. Natural Language Processing.

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam (%)
Remember	50	40	--
Understand	30	40	--
Apply	20	20	50
Analyze	--	--	50
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

1. What is Naltural language processing.
2. Define purpose of different building blocks of NLP
3. List any two challenges in NLP.

Understand

1. Explain different Basic Vectorization approaches
2. Explain the role of various Named Entities
3. Explain purpose of Viterbi algorithm

Apply

1. Apply various Deep lerning models for NLP
2. Make use of RNN for text translation

Analyze

1. Comapare and contrast GRUs and LSTMs for machine translation.
2. Distinguish various methods to Convolutional neural networks for sentence classification.

Evaluate

1. Evaluate the statistics of a sentiment analysis
2. Design an automated speech recognition systems

Open book Question:

1. Design a model to analyse a given sentence is negative, positive or neutral for a given dataset.
2. Design and develop a model to translate a text to speech for a given set of statements.

Career Path II (Full Stack Developer)

19CSC23 Web Application Databases

3 1 0 3

Course Outcomes

At the end of the course, students will be able to

1. Understand how web-based client-server applications work.
2. Analyze architecture of various web-based applications.
3. Examine the requirements of structured and un-structured data.
4. Identify the structure of modern-day web applications.
5. Identify the use advanced querying techniques to enable faster data transfer.
6. Analyze the security issues in data transfer via the web.

CO – PO Mapping

COs	PO_1	PO_2	PO_7	PO_{12}
1	3	3	2	2
2	3	3	2	2
3	3	3	2	2
4	3	3	2	2
5	3	3	1	2
6	3	1	1	1

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Syllabus

Unit I **12+4 Hours**

Overview of Web databases

Web application Overview: Basic concepts of web, Web database architectures, Web database gateways,
Web-database programming: Client-side and server-side web database programming
Database gateways, CGI, Browser extensions

Unit II **11+4 Hours**

Structured and unstructured Web databases

Structured databases: Structured data, Data models, Relational database management systems, MySQL – Introduction, querying, updating and deleting data, Challenges of structured data.
Unstructured databases: Unstructured data and its usages, NoSQL databases, MongoDB- Introduction, querying, updating and deleting data, Challenges of unstructured data- Cassandra, GraphQL
Structured data, unstructured data, Relational database, Document-based database

Unit III **11+4 Hours**

Database connections & data operations

Connecting to database: Native database APIs, Database-independent APIs, Template-driven database access packages, Third-party class libraries.
CRUD operations: Querying web database, User driven querying, writing to web databases – create, delete and update.
JDBC, ODBC, template parsing.

Unit IV **11+3 Hours**

Authentication, Authorization and Communication in web services

Web requests: Structure of web requests, JavaScript Object Notation (JSON), Request methods – GET, POST, PUT, DELETE, response status codes
State management: Session management, cookies, request and response headers.
Security: User authentication, User authorisation, Proxy servers, Digital signatures, Digital certificates, SSL and HTTPS.
Kafka, RabbitMQ

JSON, User authentication and authorisation

Total: 45+15 Hours

Textbook (s)
1. Web Database Applications with PHP and MySQL, Hugh E. Williams, David Lane, 2nd Edition, O'Reilly, 2004.
2. NoSQL Distilled, Pramod Sadalage, Martin Fowler, 1st Edition, 2012

Reference (s)
1. Getting Started with NoSQL, Gaurav Vaish, Paperback, Packt, 2013.
2. Fundamentals of Database Systems, Elmasri Navathe Pearson Education.
3. An Introduction to Database systems, C.J. Date, A.Kannan, S.Swami Nadhan, Pearson, 8th Edition.
4. Web Application Security, Andrew Hoffman, O'Reilly, 2020.

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam (%)
Remember	20	20	--
Understand	30	10	--
Apply	30	30	40
Analyze	10	20	30
Evaluate	10	20	30
Create	--	--	--
Total (%)	100	100	100

Sample Question(s)

Remember
1. List various database architecture layers
2. Define structured and unstructured data
3. List various database connections

Understand
1. Explain Data models
2. Explain the difference between structured and unstructured data
3. Illustrate how state management is achieved for web database requests

Apply
1. When the incoming data varies from request to request, storing and querying it appropriately is a critical problem. Apply the concept of databases to solve this problem.
2. Give an example of a scenario that might benefit from a database that supports authorisation.

Analyze
1. Data needs to be secured from various users using authentication. How can this be achieved?
2. Compare various database connection techniques.
3. Analyze the general strategy behind state management and its importance.

Evaluate
1. Assuming the database has recognised an unusual activity, what can it do to protect the data?
2. Describe how to implement authorisation using SSL.

Open Book Exam Questions
1. Data is to be shared among various people of an organization with various roles. Data can be viewed by anyone with proper authentication whereas only people with certain designation can update or delete data. Write an authorization technique that can help achieve this.
2. Consider a messaging application that is built using a NoSQL database:
    - Suggest a good type of NoSQL storage technique that can help improve performance
    - If we use key-value based approach, what are the pitfalls of it?

Career Path III (Cyber Security)

19ITC33 Cloud Security

3 1 0 3

Course Outcomes

1. Understand core concepts of the cloud computing paradigm
2. Learn about characteristics, advantages and challenges brought by the various models and services in cloud computing.
3. Identify the known threats, risks, vulnerabilities and privacy issues associated with Cloud based services.
4. Understand security challenges, threats and risks involved in the cloud application
5. Anlayze the Security Requirements for the Architecture in cloud services
6. Understand Data Security and best practices involved in securing the cloud.

CO–PO Mapping

CO	PO1	PO2	PO4
1	3	1	1
2	2	2	2
3	2	1	2
4	3	2	2
5	2	3	3
6	3	2	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I **10+4 Hours**

Cloud Computing Fundamentals and Architecture- Understanding and Roots of Cloud Computing, Essential Characteristics, Cloud Reference Architecture, Cloud Service Models: SaaS, Paas, IaaS, Cloud Deployment Models, Expected Benefits, Forming Clouds with example.

Unit II **12+4 Hours**

Cloud Computing Software Security Fundamentals- Cloud Information Security Objectives, Cloud Security Services, Relevant Cloud Security Design Principles,

Secure Cloud Software Requirements, Security Concerns, Risk Tolerance, Legal and Regulatory Issues

Unit III **12+4 Hours**

Cloud Computing Risk Issues and Security Challenges:

The CIA Triad,Privacy and Compliance Risks,Threats to Infrastructure, Data, and Access Control,Cloud Service Provider Risks

Security Challenges- Security Policy Implementation, Virtualization Security Management, VM Security Recommendations, VM-Specific Security Techniques.

Unit IV **11+3 Hours**

Securing the cloud: Architecture and Data Security

Security Requirements for the Architecture, Security Patterns and Architectural Elements, Cloud Security Architecture, Planning Key Strategies for Secure Operation .

Overview of Data Security in Cloud Computing, Data Encryption: Applications and Limits, Cloud Data Security: Sensitive Data Categorization, Cloud Data Storage, Cloud Lock-in, Key strategies to secure the cloud, Best practices for cloud computing, security monitoring

Total: 45+15 Hours

Textbook (s)

1. Russell Dean Vines and Ronald L. Krutz, Cloud Security: A Comprehensive Guide To Secure Cloud Computing, Wiley India Pvt Ltd, 2010
2. Vic Winkler (J.R.), Securing The Cloud: Cloud Computing Security Techniques and Tactics, Syngress/Elsevier ,2011

Reference (s)

1. Thomas Erl, Cloud Computing Design Patterns, Prentice Hall, 2015

2. Barrie Sosinsky, Cloud Computing Bible, Wiley India, 2011
3. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley, 2011

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	OBE
Remember	50	40	-
Understand	30	40	-
Apply	20	20	50
Analyze	--	--	50
Evaluate	--	--	-
Create	--	--	-
Total (%)	100	100	100

Remember
1. Define Cloud Computing.
2. List Cloud Service Models
3. List Cloud Information Security Objectives
4. What is cloud foundry?

Understand
1. Identify Cloud Computing Risk Issues and Security Challenges
2. Explain the Data Security
3. Explain all session management techniques
4. Explain different cloud service models

Apply
1. Demonstrate the process for war file deployment in the cloud.
2. How does Sensitive Data Categorization happens in Cloud?

Analyze
1. Justify your answer which technique is used for Session management.
2. Deploy Security Challenges

19IT010 Social Network Analysis (Elective V)

3 1 0 3

Course Outcomes

At the end of the course, students will be able to

1. Acquire Knowledge to analyze Social Networks
2. Model, Aggregate and Represent Knowledge for Semantic Web
3. Use Extraction and Mining tools for Social Networks
4. Apply Reality Mining to Predict Human Behaviors for Social Communities
5. Apply various Algorithms for Evolution and Opinion Mining in Social Networks
6. Write algorithms and systems for expert location in social networks

CO – PO Mapping

COs	PO_1	PO_2	PO_7	PO_{12}
1	2	2	3	2
2	2	2	3	2
3	2	1	3	3
4	2	1	2	2
5	2	2	3	2
6	2	2	2	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Syllabus

Unit I **9+3 Hours**

Introduction

Introduction to Web, Limitations of current Web, Development of Semantic Web, Emergence of the Social Web, Statistical Properties of Social Networks, Network analysis, Development of Social Network Analysis-Key concepts and measures in network analysis, Discussion networks-Blogs and online communities-Web-based networks

Case Studies of Social Network sites like Facebook-Twitter-Linkedin etc.

Unit II **12+4 Hours**

Evolution

Evolution in Social Networks– Framework, Tracing Smoothly Evolving Communities, Models and Algorithms for Social Influence Analysis, Influence Related Statistics, Social Similarity and Influence, Influence Maximization in Viral Marketing, Link Prediction in Social Networks, Feature based Link Prediction

Neurons &Social Actor-Advanced techniques in Link Prediction

Unit III **12+4 Hours**

Mining Communities and Opinion Mining

Applications of Community Mining Algorithms, Node Classification in Social Networks

Opinion Extraction–Sentiment Classification and Clustering, Temporal Sentiment Analysis-Irony Detection in Opinion Mining-Wish Analysis–Product Review Mining–Review Classification

Tracking Sentiments towards Topics over Time

Unit IV **12+4 Hours**

Modelling and Visualization

Visualizing Online Social Networks, A Taxonomy of Visualizations, Graph Representation-Centrality-Clustering-Node-Edge Diagrams-Visualizing Social Networks with Matrix-Based Representations-Node-Link Diagrams, Hybrid Representations, Modelling and Aggregating Social Network Data, Random Walks and their Applications, Ontological representation of Social Individuals and Relationships.

Use of Hadoop and MapReduce-Gephi

Total: 45+15 Hours

Textbook (s)

1. Charu C. Aggarwal, Social Network Data Analytics, Springer, 2011
2. Peter Mika, Social Networks and the Semantic Web, Springer, 1st Edition, 2007.

Reference (s)

1. BorkoFurht, Handbook of Social Network Technologies and Applications, Springer, 1st Edition, 2010.
2. Guandong Xu, Yanchun Zhang and Lin Li, Web Mining and Social Networking, Techniques and applications, Springer, 1st Edition, 2011.
3. Giles, Mark Smith, John Yen, Advances in Social Network Mining and Analysis, Springer, 2010.
4. Ajith Abraham, Aboul Ella Hassanien, VáclavSnášel, Computational Social Network Analysis: Trends, Tools and Research Advances, Springer, 2009.

SAMPLE QUESTION (S)

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Comprehensive Test1 (%)
Remember	35	20	-
Understand	35	30	-
Apply	20	40	70
Analyze	10	10	20
Evaluate	--	-	10
Create	--	-	-
Total (%)	100	100	100

Sample Question (S)

Remember

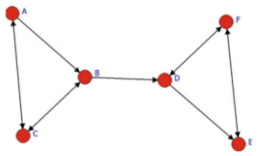
1. What are the limitations of current web?
2. List the statistical properties of social networks
3. Define social similarity.
4. What are the two different measures in influence related statistics

Understand

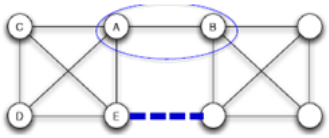
1. Explain about development of semantic web in research.
2. Demonstrate web based networks.
3. Illustrate the ways of visualizing social networks with matrix based representation and node – link diagram.
4. Explain core methods of community detection and mining.
5. Explain algorithms and systems for expert location in social networks.
6. Outline the models and algorithms for social influence analysis.

Apply

1. Make use of the following graph to solve Degree Centrality, Between-ness Centrality and Cliques.



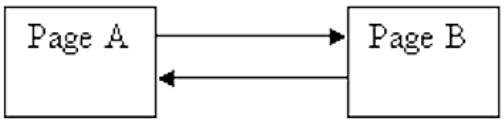
2. Solve Path, Length and Distance between nodes (i.e., Density measures) using SNA Data Processing Tools.
3. Make use of the above graph to solve network density and cut points.
4. Develop random graphs using Erdos Reini Model
5. Solve Weak Ties,Traidic closure for the following graph.



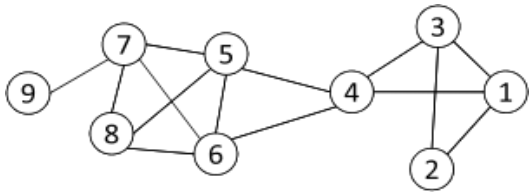
Analyse

[1]Comprehensive test should contain only questions related to Higher Order Thinking (HOT) Skills Pertaining to this course

1. Compute PageRank for the following figure.



2. Discover Spectral Clustering steps for the following graph.



3. Examine the ways to visualize community's hubs and node centrality measures using sna package.
4. Analyze positive, moderate and negative feeds using sentiment analysis on twitter data.

Open Book Exam Questions

1. Visualization of team data in Gephi-What should be my considerations?
2. How do we calculate data processing time using cloud analyst?

19CS011 Optimization Techniques (Elective V)

4 0 0 4

Course Outcomes

At the end of the course, students will be able to

1. Explain the need of optimization of engineering systems.
2. Formulate and solve linear programming problems.
3. Solve the problems on network models such as transportation and assignment.
4. Analyze the complexity of solutions to an optimization problem.
5. Apply unconstrained optimization and constrained non-linear programming
6. Illustrate about dynamic programming and modern optimization techniques.

CO-PO Mapping

CO	PO11	PO12
1	2	2
2	2	1
3	3	2
4	2	1
5	1	3
6	3	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I **11+3 Hours**

Introduction to Optimization & Classical Optimization Techniques:

Engineering Applications of Optimization, Statement of Optimization Problem.

Classical Optimization Techniques: Single variable optimization, multivariable optimization with no constraints, multivariable optimization with equality constraints, multivariable optimization with inequality constraints, convex programming problem.

Optimization techniques, Engineering Optimization Literature.

Unit II **11 + 4 Hours**

Linear Programming & Transportation Problems:

Applications of Linear Programming, Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – simplex algorithm.

Introduction to Transportation problems, various methods of Transportation problem, Variations in Transportation problem,

Two phases of simplex method

Unit III **12 + 4 Hours**

Assignment Problems & Unconstrained Nonlinear Programming:

Introduction to Assignment problems, variations in Assignment problems. Transportation Problem: Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems.

Introduction, Random Search Methods, Grid Search method, Univariate method, Powell's Method, Simplex Method, Gradient of a Function, Steepest descent method. Newton's Method.

Marquardt Method, Quasi-Newton Methods

Unit IV: Dynamic Programming & Modern methods of Optimization: **11 + 4 Hours**

Multistage decision process, Concept of suboptimization and principle of optimality, computational procedure in dynamic programming, Examples of calculus and tabular method of solutions.

Modern methods of optimization: Genetic Algorithms, particle swarm optimization and Ant colony optimization.

Simulated Annealing, neural network-based optimization

Total: 45+15 Hours

Textbook (s)

1. Singiresu S. Rao, Engineering Optimization: Theory and Practice, Wiley, 4th edition, 2009.

Reference (s)

1. Deb K. - Optimization for Engineering Design Algorithms and Examples, PHI - 2000
2. George Bernard Dantzig, Mukund Narain Thapa, Linear programming, Springer series in operations research 3rd edition, 2003.
3. H.A. Taha, Operations Research: An Introduction, 8th Edition, Pearson/Prentice Hall, 2007.
4. Kalyanmoy Deb, Optimization for Engineering Design-Algorithms and Examples, PHI Learning Pvt. Ltd., New Delhi, 2005.
5. Arora J, Introduction to Optimization Design, Elsevier Academic Press, New Delhi, 2004
6. Saravanan R, Manufacturing Optimization through Intelligent Techniques, Taylor & Francis (CRC Press), 2006
7. Hardley G., Linear Programming, Narosa Book Distributors Private Ltd., 2002

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Examination (%)
Remember	30	30	--
Understand	30	30	30
Apply	40	40	50
Analyze	--	--	20
Evaluate	--	--	---
Create	--	--	--
Total (%)	100	100	100

Understand

1. Explain about soft computing?
2. Classify supervised learning and unsupervised learning?
3. Summaise the difference between conventional control system and Fuzzy control

Apply

1. Demonstratre the application of Fuzzy logic in Indusrtial manfacturing?
2. Show the differences between Traditional Algorithms and Genetic Algorithm
3. A genetic algorithm is to be used to evolve a binary string of length n containing only 1s. The initial population is a randomly generated set of binary strings of length n. Give a suitable fitness function for this problem.

Analyze

1. If the population size in a genetic algorithm is restricted to 1, what search algorithm does it correspond to? Justify your answer.
2. Consider two fuzzy sets X and Y with the following membership functions: X = {(x1/0.4, (x2/0.7), (x3/0.8), (x4/1)} Y = {(x1/0.3), (x2/0.6), (x3/0.5), (x4/).9)} Resolve: X∪Y, X∩Y, X-Y, X+Y, X*Y

Open Book Examination Question

Evaluate

1. Suppose a genetic algorithm uses chromosomes of the form x = abcdefgh with a fixed length of eight genes. Each gene can be any digit between 0 and 9. Let the fitness of individual x be calculated as: f(x) = (a + b) - (c + d) + (e + f) - (g + h) and let the initial population consist of four individuals with the following chromosomes: x1 = 6 5 4 1 3 5 3 2 x2 = 8 7 1 2 6 6 0 1 x3 = 2 3 9 2 1 2 8 5 x4 = 4 1 8 5 2 0 9 4. Evaluate the fitness of each individual, showing all your workings, and arrange them in order with the fittest first and the least fit last.

2. Suggest a suitable evolutionary computing technique for finding optimized Economic Load Dispatch. Support your answer by providing detailed analysis

3. Consider four travel packages offered by Thomas Cook, Club Mahindra, World around, and Himalaya Travels. We want to choose one. Their costs are INR 100,000, INR 200,000, INR 150,000 and INR 175,000. Their trave time in hours are 1 l 50, 200, 100,and 125 respectively. They are viewed as interesting with degrees 0.4 , 0.3 ,0.6 ,0.5. Define your own fuzzy set of acceptable travel times. Then determine the fuzzy set of interesting travel packages. whose cost and travel times are acceptable and use this set to choose one of your own packages

19CS012 Wireless Adhoc Network (Elective V)

3 1 0 3

Course Outcomes

1. Understand the various challenging issues of wireless Ad hoc networks
2. Apply the MAC protocols using reservation and scheduling mechanism
3. Apply the routing protocols and transport layer protocol using various TCS mechanism in wireless Ad hoc networks
4. Understand the issues of MAC and network layer solution to provide quality of service
5. Understand the significances of various battery management schemes for wireless Ad hoc networks
6. Analyze the security requirements and secure routing in wireless Ad hoc networks

COs–POs Mapping

COs	PO3	PO5	PO6
1	2	3	1
2	3	2	2
3	3	3	2
4	2	3	1
5	1	3	1
6	2	3	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

UNIT I **11+4 Hours**

Wireless Ad Hoc Networks: Introduction, Properties, applications, limitations, Issues in Ad Hoc Wireless Networks, Ad Hoc Wireless Internet. **MAC Protocols:** Introduction, Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention - Based Protocols, Contention - Based Protocols with reservation Mechanisms.
Contention – Based MAC Protocols with Scheduling Mechanisms

UNIT II **12+4 Hours**

Routing Protocols: Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Proactive/ Table–Driven Routing Protocols, Reactive/ On–Demand Routing Protocols, Hybrid Routing Protocols, Hierarchical Routing Protocols, Power – Aware Routing Protocols. **Transport Layer:** Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks.
Other Transport Layer Protocol for Ad Hoc Wireless Networks.

UNIT III **11+3 Hours**

Quality of Service: Introduction, Issues and Challenges in Providing QoS in Ad Hoc Wireless Networks, Classification of QoS Solutions, MAC Layer Solutions, Network Layer Solutions, QoS Frameworks for Ad Hoc Wireless Networks. **Energy Management:** Introduction, Need for Energy Management in Ad Hoc Wireless Networks, Classification of Ad Hoc Wireless Networks, Battery Management Schemes, Transmission Power Management Schemes.
System Power Management Schemes.

UNIT IV **11+4 Hours**

Security Protocols: Network Security Requirements, Issues and Challenges in Security Provisioning, NetworkSecurity Attacks, Key Management, Secure Routing in Ad Hoc Wireless Networks.

Wireless Sensor Networks: Introduction, Sensor Network Architecture, Data Dissemination, Data Gathering, Location Discovery.
Quality of a Sensor Network, Evolving Standards, Other Issues

Total: 45+15 Hours

Textbook (s)

1. Ad Hoc Wireless Networks: Architectures and Protocols - C. Siva Ram Murthy and B.S.Manoj, 2004, PHI.
2. Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control - Jagannathan Sarangapani,CRC Press

Reference(s)

1. Wireless Sensor Networks - C. S. Raghavendra, Krishna M. Sivalingam, 2004, Springer.
2. Ad- Hoc Mobile Wireless Networks: Protocols & Systems, C.K. Toh ,First ed. Pearson Education

SAMPLE QUESTION (S)
Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Assignment Test[8] (%)
Remember	40	50	20
Understand	35	30	20
Apply	25	20	60
Analyze	--	--	--
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

Remember

1. Find out the major significance of cellular wireless networks and Ad hoc wireless networks.
2. List few latest application systems of Ad hoc wireless networks.
3. Identify the challenging issues in Ad hoc network configuration and maintenance.
4. Show the proactive steps to solve the hidden terminal problem.
5. List the transmission impediments of wireless channel.
6. List the issues that affect the design deployment and performance of ad hoc wireless system.
7. List the benefits when deployment of a commercial ad hoc wireless networks compared to wired network
8. Write the advantages of hybrid wireless networks.
9. Define Scalability.
10. Write the design goals of MAC protocol for ad- hoc networks.
11. Describe the issues of MAC protocol for ad hoc networks in brief.
12. Show the classifications of MAC protocol.
13. Identify the effects of exposed terminal problem in wireless networks.
14. Relate the advantages of directional antennas of MMAC over MACAW.
15. Name the mechanisms used in MAC layer.
16. List any two specific requirements of real- time MAC protocol.
17. Give the classification of contention-based protocol.
18. State the major challenges in designing routing protocols.
19. List the characteristics of a routing protocol for ad hoc wireless networks.
20. Mention any four qualities of service metrics that are used to evaluate the performance of the network.
21. List the types of hybrid routing protocols.

[8] Assignment test should contain only questions related to Higher Order Thinking (HOT) Skills pertaining to this course

22. Draw the structure of layered architecture.
23. Find out the components of WSN.
24. Define LEACH.

Understand

1. Summarize the issues that affect the deployment and performance of ad hoc wireless system.
2. Outline the benefits when deployment of a commercial ad hoc wireless networks compared to wirednetwork.
3. Compare Ad-hoc Networks and Wireless LAN.
4. Compare the efficiency of the packet queuing mechanism adopted in MACA and MACAW.
5. Relate contention-based protocols with reservation mechanism and contention based protocols withscheduling mechanism by means of packet delivery, reception and acknowledgement ratio.
6. Describe the design strategies of MACAW protocol.
7. Illustrate various steps involved in five phase reservation protocol with its frame format.
8. Compare the differences of Ad hoc on demand Distance vector routing protocol (AODV) and dynamicsequence routing protocol (DSRP).
9. Identify any four reasons that lead to the quick power drain of nodes in mobile ad hoc network.
10. Explain the sensor network architecture with a suitable illustration.

Apply

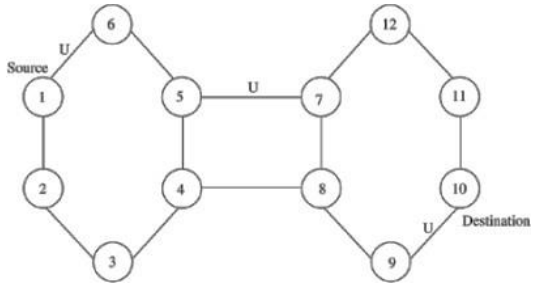
1. Calculate the maximum achievable data rate over a 9 KHz channel whose signal to noise ratio is 20dB.
2. Think of four scenarios where wireless networks can replace wired networks in order to improve the efficiency of people at their workplace. Briefly describe how in each case a wireless network will fit the role better than a wired network.
3. Determine the transfer time of a 22 KB file with a mobile data network (a) with a transmission rate of 10 Kbps and (b) repeat the same for 802.11 WLAN operating at 2 Mbps. (c) What is the length of the file that WLAN can carry in the time that mobile data service carried a 20 KB file? (d) Whatdo you infer from the answers to the above questions?
4. Assume that in one slot in Bluetooth 256 bits of payload could be transmitted. How many slots are needed if the payload size is (a) 512 bits, (b) 728 bits, and (c) 1,024 bits. Assume that the non-payload portions do not change.
5. With reference to the discussion on scatternets, illustrate the trade-off of synchronization and bandwidth using a timing diagram. (Hint: Consider the case when a Bluetooth device acts as a master in one piconet and as a slave in another.)
6. Calculate the probability of data packet collision in the MACA protocol. Assume that Tc is the control packet transmission and propagation delay, Tw is the optimal maximum back-off time, $\hat{I}^2$ is the percentage of ready nodes, and R is the transmission range of each node.

Analyze

1. Discuss the deployment scenarios for various HIPERLAN standards in the ETSI BRAN system.
2. Compare the EY-NPMA and the CSMA/CA mechanisms.
3. In the serial communications, the baud rate of transmission is specified. Legacy applications on Bluetooth devices specify the baud rate. In the case of the old serial communications, the data rate is the specified baud rate, but in the case of Bluetooth serial communications, it is not so. Why?
4. Identify and elaborate some of the important issues in pricing for multi-hop wireless communication.
5. Channel quality estimation can be done both at the sender and the receiver. Which is more advantageous? Why?
6. Compare an ad hoc network and a cellular network with respect to bandwidth usage and cost effectiveness.
7. Compare the pros and cons of using scheduling-based MAC protocols over reservation- based MAC protocols.

Evaluate

1. Consider the topology given in below to s imulate DSR, SSA, and ABR protocols for path establishment from node 1 to node 10, find the paths found and the ratio of the number of *Route Request* packets sent in the network. (Links labeled "U" refer to unstable ones.)



2. Justify whether the LCC algorithm (when run consistently with node degrees or node IDs) give a deterministic result? If so, prove the above fact. Otherwise, give a counter-example.
3. Critique on how content-based multicasting (CBM) could be advantageous or disadvantageous as far as the bandwidth utilization of the network is concerned.
4. Discuss how network security requirements vary in the following application scenarios of ad hoc wirelessnetworks:
    A. Home Network
    B. Classroom Network
    C. Military Network
    D. Emergency Search and Rescue Network
5. Discuss how security provisioning in ad hoc wireless networks differs from that in infrastructure-basednetworks?

19CS014 Green Computing (Elective VI)

3 1 0 3

Course Outcomes

At the end of the course, students will be able to

1. Understand green IT with its different dimensions and strategies.
2. Analyze green devices and hardware along with its green software methodologies.
3. Examine the green IT standards for enhancing environmental sustainability.
4. Analyze the various green enterprise activities, functions and their role with IT.
5. Identify the various laws, standards and protocols for regulating green IT.
6. Identify the various key sustainability and green IT trends.

CO – PO Mapping

COs	PO_6	PO_7	PO_8
1	3	3	2
2	3	3	2
3	3	3	2
4	3	3	2
5	3	3	1
6	3	2	1

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Syllabus

Unit I **11+4 Hours**

Fundamentals

Introduction, Environmental Concerns and Sustainable Development, Environmental Impacts of IT, Green IT, Holistic Approach to Greening IT, Greening IT, Applying IT for enhancing Environmental Sustainability, Green IT Standards and Eco-Labeling of IT.

Enterprise Green IT strategy, Green IT: Burden or Opportunity?

Unit II **11+3 Hours**

Green Devices and Hardware with Green Software

Green Devices and Hardware: Introduction, Life Cycle of a device or hardware, Reuse, Recycle and Dispose. Green Software: Introduction, Energy-saving software techniques, Evaluating and measuring software Impact to platform power.

Research the sustainability of paper use in an organization.

Unit III **11+4 Hours**

Green Enterprises and the Role of IT

Introduction, Organization and Enterprise Greening, Information systems in Greening Enterprises, Greening Enterprise: IT Usage and Hardware, Inter-Organizational Enterprise activities and Green Issues, Enablers and making the case for IT and Green Enterprise.

Analyze an organization's IT sustainability.

Unit IV **12+4 Hours**

Managing and Regulating Green IT

Introduction, Strategizing Green Initiatives, Implementation of Green IT, Information Assurance, Communication and Social media.

Laws, Standards and Protocols : 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.

Total: 45+15 Hours

Textbook (s)

1. Harnessing Green IT Principles and Practices , San Murugesan, G.R. Gangadharan, Wiley Publication, ISBN:9788126539680,2012.

Reference (s)

1. Foundation of Green IT, Marty Poniatowski, Prentice Hall Publication, ISBN:9780137043750,2009.

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam (%)
Remember	40	40	--
Understand	30	30	--
Apply	30	30	50
Analyze			50
Evaluate			--
Create	--	--	--
Total (%)	100	100	100

Sample Question (S)

Remember

1. Define Green IT
2. Define Green Software

Understand

1. Explain the Life Cycle of a Green device or hardware.
2. Illustrate the concept of process re-engineering in a simple way from a green perspective.

Apply

1. Identify the several key standards for process and product of Green IT.
2. Apply ERP system with modules and relationships in any recent trend.

Analyze

1. Analyze and give recommendations on how green strategies can be implemented in Homes to make a greener world. Explain about the same in your perspective.
2. Classify the major categories of information systems within an organization? Provide examples of greening enterprise activities at each level.

Evaluate

1. Recommend with a case study to depict the ways in which a green enterprise transformation (GET) can be applied for a service organization. For the selected service organization, briefly explain the following:
   i) the practical aspects of a preliminary green IT audit.
   ii) the green business objectives.
   iii) a high-level SWOT analysis from a GET perspective.
2. Choose the UML diagrams to present the following models of green information systems:
   i) use case diagram for "emissions benchmark maintenance".
   ii) state machine diagram for "class-emission report".

Open Book Exam Questions

1. What is the meaning of Green Computing, gather statistics, or develop a list of ways to practice green computing; now expand the discussion to determine if Green Computing is possible, if it can make a difference, or if it is a marketing term used by large organizations in today's environmentally friendly society.
2. "Green computing or green IT is the study and practice of environmentally sustainable computing or IT"
   i. In your own words, explain the term Green IT.
   ii. Summarise the challenges in making Green IT a reality. Consider environmental factors such as political, economic, social, technological, legal and echological in your answer.
   iii. Cite 2 examples of success stories on Green IT. Evaluate if the same effort is achievable in your origin country.

19CS015 SOFTWARE PROJECT MANAGEMENT (Elective VI)

3 1 0 3

Course Outcomes

1. Explain the concepts and issues of Software Project Management
2. Illustrate various Software Architectures
3. Classify Software Risks and Risk Management Strategies
4. Design effective software development model to meet organizational needs
5. Experiment with appropriate methodologies to develop a project schedule
6. Experiment with appropriate techniques to assess ongoing project performance

CO–PO Mapping

COs	PO3	PO5	PO6	PSO2
1	1	1	2	1
2	2	2	2	2
3	1	1	1	3
4	3	3	1	2
5	3	3	1	3
6	3	3	1	3

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I **12+4 Hours**

Conventional Software Management: The Waterfall Model, Conventional Software Management Performance. **Transition:** The principles of conventional software Engineering, Principles of Modern software management, transitioning to an iterative process.

Evolution of Software Economics: Software Economics, Software Cost Estimation. **Improving Software Economics:** Reducing Software Product Size, Improving Software Processes, Improving Team Effectiveness, Improving Automation, Achieving Required Quality, Peer Inspections.

Software Development Phases, Procedural vs Object Oriented Paradigm.

Unit II **11+4 Hours**

Life Cycle Phases: Engineering and Production Stages, Inception, Elaboration, Construction, Transition Phases.

Artifacts of Software Process: The Artifact Sets, Types of Artifacts.

Software Architectures: A Management Perspective and Technical Perspective,

Workflows of the process: Software Process Workflows, Iteration Workflows.

Off-the-Shelf Components, Requirement Specification Document, Methods of Specification.

Unit III **11+4 Hours**

Checkpoints of the Process: Major Milestones, Minor Milestones, Periodic Status Assessments.

Iterative Process Planning: Work breakdown Structures, Planning Guidelines, Cost and Schedule Estimating process, Iteration Planning Process.

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, Evolution of Organizations.

Process Automation: Automation Building Blocks, The Project Environment.

CASE Tools for Requirements Specification, Planning and Estimation, Pragmatic Planning.

Unit IV **11+3 Hours**

Project control and Process Instrumentation: The Seven Core Metrics, Management Indicators, Quality Indicators, Life Cycle Expectations, Pragmatic Software Metrics, Metrics Automation, Tailoring the Process.

Future Software Project Management: Modern Project Profiles, Next Generation Software Economics, The COCOMO Cost Estimation Model: Basic COCOMO

Bugs of testing, Bug tracking tools

Textbook (s)

1. Walker Royce, "Software Project Management – A Unified Framework", 1stEdition, Pearson Education, 2005.
2. Pankaj Jalote, "Software Project Management in Practice", 1stEdition, Pearson Education, 2002.

Reference (s)

1. Bob Hughes, "Mike Cotterell, Rajib Mall, Software Project Management", 5thEdition, McGraw-Hill Higher Education, 2011.
2. Joel Henry, "Software Project Management", 1st Edition, Pearson Education, 2004.
3. Norman E. Fenton, Shari Lawrence Pfleeger, "Software Metrics: A Rigorous and Practical Approach ", 1st Edition, PWS Publishing Company, 1997.

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam (%)
Remember	40	30	--
Understand	40	40	--
Apply	20	30	50
Analyze	--	--	50
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

1. Define Software Process
2. List the phases of Software Development.
3. What is an Artifact?
4. What is Process Automation?

Understand

1. Explain various formal methods of specification.
2. Explain COCOMO II Model.
3. Explain Critical Path Methods to schedule a software project.

Apply

1. Identify the amount of Information need to present in a page.
2. Organize the different Software tool specification methods.
3. Assume that the size of an organic type software product has been estimated to be 32,000 lines of source code. Assume that the average salary of software engineers be Rest. 15,000/- per month. Determine the effort required to develop the software product and the nominal development time.

Open Book Questions

1. Calculate the effort and development time for the model related to your mini-project which was developed in previous semester using COCOMO basic cost estimation model. (Take your mini-project size in KLOC)[Apply]

2. Analyze your mini-project with respect to changes using Type 0, Type 1, Type 2, Type 3 & Type 4 categories. [Apply]

19CS016 Soft Computing(Elective VI)

3 1 0 3

Course Outcomes

1. Identify an appropriate soft computing technique to build an Intelligent Machine
2. Understand supervised learning methods for neural network models for pattern classification and regression problems
3. Demonstrate the use of various Associative Memory Networks
4. Understand unsupervised learning methods for neural network models for storing and pattern classification
5. Determine the solutions of modeled networks using soft computing approaches for a given problem
6. Explain fuzzy logic and Genetic Algorithm to handle uncertainty

COs – POs Mapping

COs	PO_1	PO_2	PO_3	PO_4	PO_9
1	3	3	2	2	2
2	2	3	2	2	2
3	2	2	3	3	3
4	3	3	2	2	3
5	3	3	2	2	2
6	3	2	3	3	3

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I **11+3 Hours**

Basic elements of Soft Computing: Difference between Hard Computing & Soft Computing - Introduction to Neural Networks - Fuzzy Logic - Genetic Algorithms - Hybrid Systems.

Artificial Neural Networks: Introduction to Artificial Neural Networks - Evolution of Neural Networks - Basic Models of Neural Networks - McCulloch-Pitts Neuron - Hebb Network.

Basics of Artificial Intelligence and Computational Intelligence.

Unit II **11+4 Hours**

Supervised Learning Network: Artificial Neural Networks: Introduction - Perceptron Networks - Back Propagation Network. Radial Basis Function Network.

Associative Memory Networks: Auto-associative Memory Network - Hetero auto-associative Memory Network - Bidirectional Associative Memory (BAM) - Hopfield Networks.

Functional Link Neural Network.

Unit III **11+4 Hours**

Unsupervised Learning Network: Introduction - Fixed Weight Competitive Nets -Kohonen Self-Organizing Feature Maps - Learning Vector Quantization - Counter Propagation Networks – Basic Concepts on Adaptive Resonance Theory Networks (ART-1 & ART-2).

Support Vector Machines and their applications for Classification.

Unit IV **12+4 Hours**

Introduction to Fuzzy Sets: Difference between Classical Sets & Fuzzy Sets – Properties.

Classical Relations and Fuzzy Relations: Cartesian product of Relations - Classical Relations - Fuzzy Relations Membership Functions: Features of Membership Functions -Fuzzification - and Defuzzification

Genetic Algorithm: Basic Concepts on Genetic Operators.

Concepts on Fuzzy Controller and its applications - a Simple Application of Genetic Algorithm for function Optimization.

Total: 45+15 Hours

Textbook (s)

1. S. N. Sivanandam, S N Deepa, Principles of Soft Computing, 2nd Edition, Wiley India, 2007
2. V. Kecman, Learning and Soft Computing, Pearson Education, India**,** 2006

Reference(s)

1. J-S R Jung, C-T Sun and E. Mizutani, Neuro Fuzzy and Soft Computing, Pearson Education, India**,** 2015
2. G. J. Klir and Bo Yuan, Fuzzy sets and Fuzzy Logic, Prentice Hall, USA, 1995
3. D. E. Goldberg, Genetic Algorithms: Search, Optimization and Machine Learning, Addison Wesley, N.Y, 1989
4. S. Haykins, Neural networks: a comprehensive foundation Pearson Education, India, 2002
5. A. P. Engelbrecht, Computational Intelligence: An Introduction, John Wiley & Sons, 2007.

6. X. Yu and M. Gen, Introduction to Evolutionary Algorithms, Springer Verlag, 2010.

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	OBE# (%)
Remember	25	15	--
Understand	35	15	--
Apply	20	20	40
Analyze	20	30	40
Evaluate	--	20	20
Create	--	--	--
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

1. Define Chromosome
2. List two methods in which the information flows in a nervous system
3. List five unsupervised learning algorithms
4. List the difference between classical logic and fuzzy logic
5. List the computational units of ART

Understand

1. Explain the components of Soft Computing
2. Explain the role of activation function in exhibiting the output from a neuron
3. Construct the 5 node pattern {0,1,1,0,1} by Hopfield network and explain the procedure for recalling and storing
4. Explain Adaptive Resonance Theory and its type
5. Explain CPN and illustrate the steps involved in training algorithm of full CPN

Apply

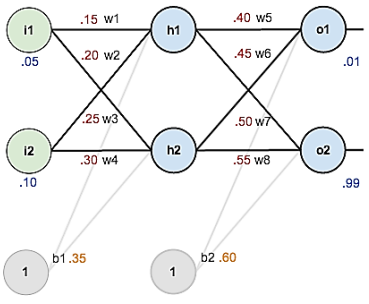
1. Construct a ANN circuit which makes the flow of data using multilayered and multilevel networks
2. Apply clusters of various datasets maintained by learning approach considering live example
3. Draw the neat architecture of hamming network and trace the inhibitory and excitatory neurons by considering an inconsistent vector
4. Find the Max-min and Max Product composition of the fuzzy relation matrices $R=\{0.6,0.3,0.2,0.9\}_{(2x2)}$ $S=\{1,0.5,0.3,0.8,0.4,0.7\}_{(2x3)}$
5. Find the cardinality for the matrices $R=\{1,4,6,7\}_{(2x2)}$ $S=\{5,2,3,7\}_{(2x2)}$

Analyze

1. Differentiate between learning and training algorithms considering multilayer perceptron network and trace the different types of networks obtained.
2. Differentiate between Counter Propagation Network and Adaptive Resonance Theory

Evaluate

1. Evaluate using Back Propagation algorithm for the below map considering weights , inputs and outputs



2. Evaluate the instance , that the 2 dimensional input vector X is presented to the three-neuron Kohonen network, x=[0.52 0.12]. The initial weight vectors, W_j are given by

   W_1=[0.27 , 0.81]
   W_2=[0.42 , 0.70]
   W_3=[0.43 , 0.21]

   in a form of 2 X 1 matrix. Find the winning neuron using the Euclidean distance and apply kernel self-organization map. State the differences between register machines and stack machine?

19CS003 Data Science for Engineering Applications

3 1 0 3

Course Outcomes:

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

1. Understand the fundamentals of data science.
2. Explain how data is collected, managed, and stored for data science.
3. Analyze the data by applying various techniques.
4. Explore data visualization techniques.
5. Explore the technologies for data visualization
6. Investigate several applications in data science.

COs–POs Mapping

CO	PO2	PO3	PO4
1	1	2	2
2	3	2	2
3	3	1	2
4	3	2	2
5	3	2	2
6	2	2	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit-I: Fundamentals of Data science **11+4 Hours**

Introduction to core concepts and technologies: Introduction, Terminology, data scienceprocess, data science toolkit, Types of data, Example applications.

Data collection and management: Introduction, Sources of data, Data collection andAPIs, Exploring and fixing data, Data storage and management, using multiple data sources.

Unit-II: Data analysis **12+4 Hours**

Basics of Data Analysis: Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT.

Algorithms: Basic machine learning algorithms, Linear regression, SVM, Naive Bayes.

Unit-III: Data visualization **11+4 Hours**

Introduction, Types of data visualization, Data for visualization: Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings.

Unit-IV: Data Science-Applications **11+3 Hours**

Applications of Data Science, Technologies for visualisation, Bokeh (Python), Recent trends in various data collection and analysis techniques, various visualization techniques, application development methods of used in data science.

Total 45+15 = 60 Hours

Textbook:

1. Jeffrey S. Saltz, Jeffrey M. Stanton, "An Introduction to Data Science", SAGE Publications, 2018.
2. Anil K. Maheshwari, "Data Analytics Made Accessible", 2015 (Online)
3. Laura Igual ,Santi Seguí, "Introduction to Data Science A Python Approach to Concepts, Techniques and Applications", Springer Publications,2014

Reference(s)

1. Glenn J. Myatt, Wayne P. Johnson: Making Sense of Data I: A Practical Guide to Exploratory Data Analysis and Data Mining, 2nd Edition,Wiley,2014
2. Joseph F Hair, Barry J. Babin, Rolph E. Anderson, William C. Black: Multivariate Data Analysis Cengage, 2018

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Examination[2] (%)
Remember	40	30	--
Understand	40	20	--
Apply	20	30	80
Analyze	--	20	20
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

1. What is data science.
2. Define purpose of different data visualtion aids
3. List any two steps involved in EDA.

Understand

1. Explain different data represenation
2. Explain the role of various data grouping methods
3. Explain purpose of hypothesis testing in detail

Apply

1. Apply various visual aids to identify behavior of data
2. Make use of Multivariate Analysis methods for data nanlysis
3. Examine data with various distribution function

Analyze

1. Comapre and contrast varius data grouping methods.
2. Distinguish various methods to address problems with dummy variables
3. Examine various string handling methods

Evaluate

1. Evaluate the statistics of a given dataset
2. Justify the importance of data skewness
3. Measure data dispersion methods on a dataset

Open Book Exam Questions

Question 1:

Perform below analysis on a house price prediction dataset.

a. Univariate Analysis
    i. Analysis of a numerical feature
    ii. Analysis of a categorical feature
b. Bivariate Analysis
    i. Relationship of a numerical feature with another numerical feature
    ii. Relationship of a numerical feature with a categorical feature

Question 2:

Perform below analysis on weather prediction dataset.

a. Correlation Analysis
    i. Correlation Heat Map
    ii. Zoomed Heat Map
b. Investgation of missing values
    i. What's missing? to what extent?
    ii. Visualizing missing values in a dataframe

[2]Assignment test should contain only questions related to Higher Order Thinking (HOT) Skills

19CS704 Summer Internship #II

` **0 0 0 1.5**

Course Outcomes

At the end of the summer internship students will be able to

1. Demonstrate communication skills to meet the requirement of industry
2. Develop logical thinking and analytical skills to thrive in competitive examinations
3. Use mathematical concepts to solve technical quizzes
4. Develop technical skills to work out real time problems
5. Develop algorithms for different applications
6. Solve industry defined problems using appropriate programming skills

CO–PO Mapping

COs	PO1	PO2	PO5	PO6	PO10	PO12
CO1	-	-	-	-	3	-
CO2	3	1	-	-	-	-
CO3	3	-	3	-	-	2
CO4	3	1	-	-	-	-
CO5	3	1	3	3	-	1
CO6	3	1	3	-	-	1

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

19CS705 PROJECT

0 0 16 8

Course Outcomes

At the end of the project work the students will be able to

1. Identify a contemporary engineering application to serve the society at large
2. Use engineering concepts and computational tools to get the desired solution
3. Justify the assembled/fabricated/developed products intended.
4. Organize documents and present the project report articulating the applications of the concepts and ideas coherently
5. Demonstrate ethical and professional attributes during the project implementation.
6. Execute the project in a collaborative environment.

CO–PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	3	2	-	-	-	-	-
CO2	3	3	-	-	3	-	-	-	-	-	-	-
CO3	3	3	3	2	-	-	-	-	-	-	2	-
CO4	-	-	-	-	-	-	-	-	-	3		2
CO5	-	-	-	-	-	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-		3	-	-	-

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

8th Semester

19CS017 Fundamentals of Social Networks Analysis (Elective VIII)

3 1 0 3

Course Outcomes

1. Explain the fundamental principles of social networking
2. Identify the architectures and challenges in building social networks
3. Interpret the capabilities and limitations of the existing network analysis methods
4. Model the knowledge to analyze real-world networks
5. Demonstrates the knowledge of basic mathematical models used in the analysis of social networks
6. Understand human behaviour in social web and related communities.

CO–PO Mapping

CO	PO2	PO4
1	3	1
2	3	1
3	1	3
4	3	1
5	1	3
6	1	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I **10+4 Hours**

Introduction to social network analysis and Descriptive network analysis: Introduction to new science of networks. Networks examples. Graph theory basics. Statistical network properties. Degree distribution, clustering coefficient.

Frequent patterns. Network motifs. Cliques and k-cores.

Unit II **12+4 Hours**

Network structure, Node centralities and ranking on network: Nodes and edges, network diameter and average path length.

Node centrality metrics: degree, closeness and betweenness centrality. Eigenvector centrality and PageRank. Algorithm HITS.

Unit III **11+4 Hours**

Network communities and Affiliation networks: Networks communities. Graph partitioning and cut metrics. Edge betweenness. Modularity clustering.

Affiliation network and bipartite graphs. 1-mode projections. Recommendation systems

Unit IV **12+3 Hours**

Predicting human behaviour and privacy issues: Understanding and predicting human behaviour for social communities - User data management - Inference and Distribution - Enabling new human experiences - Reality mining - Context - Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.

Applications of SNA: covert networks , community welfare, collaborative networks, co-citation networks

Total: 45+15 Hours

Textbook (s)

1. David Easley and John Kleinberg, Networks, Crowds, and Markets: Reasoning About a Highly Connected World, Cambridge University Press 2010.
2. Stanley Wasserman and Katherine Faust, Social Network Analysis. Methods and Applications, Cambridge University Press, 1994

Reference (s)

1. Matthew O. Jackson, Social and Economic Networks, Princeton University Press, 2010.
2. Eric Kolaczyk, Gabor Csardi, Statistical Analysis of Network Data with R, Springer, 2014.
3. Mark Newman, Networks: An Introduction, Oxford University Press, 2010.

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	OBE
Remember	50	40	-
Understand	30	40	-
Apply	20	20	50
Analyze	--	--	50
Evaluate	--	--	-
Create	--	--	-
Total (%)	100	100	100

Remember

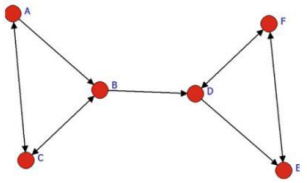
1. What are the limitations of current web?
2. List the statistical properties of social networks
3. Define social similarity.
4. What are the two different measures in influence related statistics

Understand

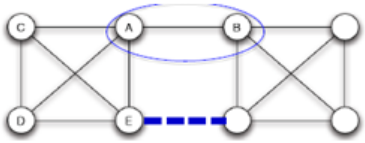
1. Explain about development of semantic web in research.
2. Demonstrate web based networks.
3. Illustrate the ways of visualizing social networks with matrix based representation and node – link diagram.
4. Explain core methods of community detection and mining.
5. Explain algorithms and systems for expert location in social networks.
6. Outline the models and algorithms for social influence analysis.

Apply

1. Make use of the following graph to solve Degree Centrality, Between-ness Centrality and Cliques.



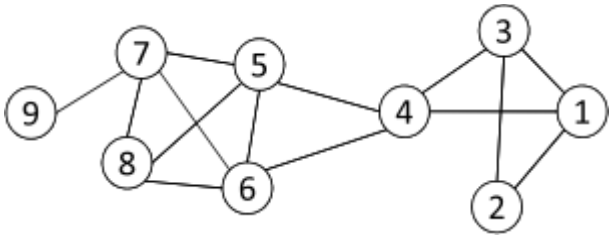
2. Solve Path, Length and Distance between nodes (i.e., Density measures) using SNA Data Processing Tools.
3. Make use of the above graph to solve network density and cut points.
4. Develop random graphs using Erdos Reini Model
5. Solve Weak Ties,Traidic closure for the following graph.



Analyze

1. Compute PageRank for the following figure.

2. Discover Spectral Clustering steps for the following graph.



3. Examine the ways to visualize community's hubs and node centrality measures using sna package.
4. Analyze positive, moderate and negative feeds using sentiment analysis on twitter data.

19CS018 Information Retrieval Systems (Elective VIII)

3 1 0 3

Course Outcomes

1. Explain the Objectives of Information Retrieval Systems and its relation to Digital Libraries and Data warehouse
2. Illustrate various System Search Browse and Miscelleneous Capabilities
3. Explain Automatic Indexing, Information Extraction methods
4. Demonstrate Inverted file structures, N-gram data structure, and PAT data structure
5. Interpret Classical techniques of Information Retrieval, and additional techniques employed by Web search engines
6. Learn to develop a small information retrieval system by using user search techniques and text search Algorithms

CO–PO Mapping

COs	PO3	PO6	PO8
1	3	2	2
2	3	2	2
3	2	3	1
4	2	3	1
5	2	3	1
6	3	3	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I **11+3 Hours**

Introduction: Definition, Objectives, Functional Overview, Relationship to DBMS, Digital libraries and Data Warehouses.
Information Retrieval System Capabilities: Search, Browse, Miscellaneous.
Miscellaneous capabilities.

Unit II

Cataloging and Indexing: Objectives, Indexing Process, Automatic Indexing, Information Extraction.
Data Structures: Introduction, Stemming Algorithms, Inverted file structures, N-gram data structure, PAT data structure, Signature file structure, Hypertext data structure.
Signature file structure, Hypertext data structure.

Unit III

Automatic Indexing: Classes of automatic indexing, Statistical indexing, Natural language, Concept indexing, Hypertext linkages
Document and Term Clustering: Introduction, Thesaurus generation, Item clustering, Hierarchy of clusters.
Measurement Example-TREC Results.

Unit IV

User Search Techniques: Search statements and binding, Similarity measures and ranking, Relevance feedback, Selective dissemination of information search, Searching the Internet and hypertext, Information Visualization
Text Search Algorithms: Introduction, Software text search algorithms, Hardware text search systems.
Hardware text search systems

Textbook (s)

1. Kowalski, Gerald, Mark T Maybury: Information Retrieval Systems: Theory and Implementation, Kluwer Academic Press, 1997.
2. http://nlp.stanford.edu/IR-book/html/htmledition/evaluation-in-information-retrieval-1.html

Reference (s)

1. Frakes, W.B. and RicardoBaeza Yates, Information Retrieval Data Structures and Algorithms, 1st Edition Prentice Hall, 1992.
2. Robert Korfhage, Information Storage & Retrieval, 1st Edition, John Wiley & Sons, 2005

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam (%)
Remember	30	30	--
Understand	40	40	--
Apply	10	20	80
Analyze	20	10	20
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

1. Define measures for IRS
2. Define PAT
3. State Browse capabilities
4. List automatic indexing
5. Recall term clustering algorithms

Understand

1. Explain Functional Overview
2. Explain Stemming algorithms
3. Summarize Brute force algorithms
4. Illustrate S/w text search Algorithms
5. Interpret standard test collection
6. Classify S/w & H/w text search system

Apply

1. Demonstrate Precision
2. Design a hybrid Indexing Data Structure
3. Use stemming Algorithms for IRS

Analyze

1. Analyze s/w and h/w indexing methods
2. Analyze search and Browse capabilities
3. Compare Pat and Stemming algorithms
4. Analyze Term clustering Algorithms

Evaluate

1. Determine Which of the indexing algorithm is efficient
2. Check all automatic indexing methods for its efficiency
3. Compare S/w text search and H/w text search algorithms

19CS019 Fundamentals of Dev-Ops (Elective VIII)

3 1 0 3

Course Outcomes:

1. Illustrate the need of Improvement and value of DevOps
2. Outline the Value Stream using DevOps
3. Describe the Organizational Change and transformation
4. Illustrate the Concept and Goal of Accelerate Flow
5. Outline Feedback Loops and its usage
6. Demonstrate the Concept and Goal of Learning

CO-PO Mapping:

COs	PO1	PO3	PO5	PO8	PO10
1	3	3	3	3	3
2	2	2	2	2	2
3	1	2	1	1	2
4	3	2	2	1	2
5	3	3	3	3	2
6	2	3	2	1	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

UNIT I **11+4 Hours**

Introduction to DevOps: Understanding Improvement, The Convergence, History, and Value of DevOps; **Understanding the Value Stream using DevOps:** Analyzing the technology Value Stream; The ways of DevOps: Flow, Feedback Loops, Culture of Continual Experimentation and Learning;

UNIT II **11+4 Hours**

Value Stream in DevOps: Concept and Goals of Streams, Picking a Value Stream, Understanding Organizational Change, Enabling Transformation;

UNIT III **12+4 Hours**

Accelerate Flow: Concept and Goal of Accelerate Flow, Continuous Delivery Patterns and Practices, the Deployment Pipeline, Creating Consistency in the Pipeline, Automated Testing, Deployment Strategies;
Amplifying the Feedback Loops: Concept and Goals of Feedback Loops,Creating a Service Reliability Culture, Fast Feedback, Understanding Monitoring, Understanding Complexity

UNIT IV **11+3 Hours**

Learning Acceleration with DevOps: Concept and Goal of Learning, Learning Organizations, Communication, Blameless Culture;

Total: 45+15 Hours

Text Books:

1. Kim, G., Behr, K., and Spafford, G. (2013). The Phoenix Project: A Novel About IT, DevOps, and Helping Your Business Win. IT Revolution Press
2. Kim, G., Humble, J., Debois, P., and Willis, J. (2016). The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations. IT Revolution Press

Reference Books:

1. Julian Fish ,The Practical Guide to Enterprise DevOps and Continuous Delivery

Internal Marks Assessment:

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	OBE Test (%)
Remember	25	25	
Understand	40	30	40
Apply	20	20	30
Analyze	15	20	30
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	100

Sample Questions

Remember

1) What is DevOps
2) Define Value Stream
3) What is **Accelerate Flow**

Understand

1) Explain about Ways of DevOps
2) Explain Picking Value Stream min DevOps
3) Describe Feedback Loops

Apply

1) Give Some Real Time Applications of DevOps

19CS020 Applications of Artificial Intelligence (Open Elective IV)

3 1 0 3

Course Outcomes

1. Illustrate the scope of Artificial Intelligence (AI) in gaming and expert systems.
2. Demonstrate various applications of AI related to perception and biometrics.
3. Summarize and learn different case studies in classification and recognition systems.
4. Describe and apply natural language processing techniques for designing AI Bots,
5. Illustrate the role of AI in robotics.
6. Demonstrate the state of AI in solving human labor problems for social equity.

CO-PO Mapping:

COs	PO2	PO3	PO6	PO7
1	3	3	3	1
2	3	3	3	1
3	3	3	2	1
4	2	2	2	2
5	2	1	1	2
6	1	1	1	3

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit -I **10+4 Hours**

AI for Everyone, Gaming and Expert Systems

AI for Everyone- What is AI? AI Explosion, AI at work, AI at Society, Applications of AI**. Gaming –** Games as search problems**-** Mini Max Search, Alpha Beta Cutt-Offs, State of the Art Games- Chess & Checkers Problem. **Expert Systems-** Representing and using domain knowledge, Expert System Shells, Explanation and Knowledge Acquisition. **Case Study:** MYCIN expert system using AI to identify bacteria causing Infections.

AI in fashion, Ethics and Laws for Holding AI,

Unit -II **11+4 Hours**

Perceptions and Biometrics

Perceptions-Image formation, Image Processing Operations, Object Recognition by appearance, Reconstructing the 3D world, Object recognition from structural information. Using Vision for manipulation and navigation. **Biometrics-** Understanding the Biometric fingerprints, facials, voice, iris, palm, and finger vein patterns Identifies Challenges in Biometric Systems. **Case Study I**: Text Classification System **Case Study II:** Face Recognition System.

AI in Health Care, Medical Imaging, Role, Benefits and Tools of AI

Unit -III **12+4 Hours**

Natural Language Processing and Natural Language Communication

Natural Language Processing- Language Models, Text Classification, Information Retrieval and Information Extraction. **Natural Language Communication-** Phrase Structure Grammars, Syntactic Analysis, Augmented Grammars and Semantic Analysis, Machine Translation and Speech Recognition. Case Study: Automatic Speech Recognition System. **Case Study I**: Understand the development and deployment of AI Chat Bots.

Question and Answer Problem, Information extraction and Translation, Corpus,

Unit -IV **12+3 Hours**

Robotics and Impact of AI on Human Labor and Social Equity

Robotics- Robot Hardware- Robot Perception- Planning to Move- Planning Uncertain Movements- Planning Moves- Robotic Software Architectures and Domains. **Impact of AI on Human Labor and Social Equity** - Benefits on this Technological Revolution- Need and Necessity of Labor based Economy and Society- Distribute future assets more equitably-Support for Unemployed.

Future Impacts of AI, Fault Detection, Diagnosis and Optimization.

Total: 45+15 Hours

Text Book (s)

1. Russel and Norvig, Artificial Intelligence A Modern Approach, 4th Edition, Pearson Education 2021.
2. Stevan Finaly, Artificial Intelligence for Everyone, Relativistic Publications, Great Britan,2020.
3. E. Rich K. Knight and B.Nair – Artificial Intelligence– Third Edition – Tata McGraw Hill, 2017.
4. Jerry Kaplan, Artificial Intelligence- What everyone needs to know, Oxford University Press,2016.

Reference (s)

1. Artificial intelligence: a very short introduction; Margaret A. Boden; Oxford University Press; 2018.
2. Artificial Intelligence and Social Work; Milind Tambe, Eric Rice; Cambridge University Press; 2018.
3. Artificial Unintelligence; Meredith Broussard; The MIT Press; 2018.
4. Tom M. Mitchell, —Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Exam [5] (%)
Remember	25	20	-
Understand	35	40	30
Apply	40	40	40
Analyze	-	-	30
Evaluate	-	-	-
Create	-	-	-
Total (%)	100	100	100

Sample question (s)

Remember

1. Define AI.
2. List any five AI applications.
3. Define a curve matrix.

Understand

1. What is an Expert System??
2. How perception and biometrics differ w.r.tAI?
3. Explain confusion matrix with an example

Apply

1. Write a program to convert text to speech.
2. Develop a robot using an AI simulating software.
3. Write a program to demonstrate the working of the expert system to trace its decision.

Analyze

1. Implement a fake product monitoring system using biometrics.
2. Develop and Automatic Attendance Monitoring System.
3. Design and AI BOT to pay Snake game between two players.

Open Book Question(s)

1. Mr Neerukonda is a famous real estate agent and always busy with uplift of houses in the nearby villages and small cities. He one day popped with his busy schedule, came into a decision to build a model to predict House prices by taking a coder help called Mr Trevedhi, who was a gem in Artificial Intelligence. Mr Neerukonda, started off by collecting data on the houses in the areas which he is most interested and nearby too. Assuming that thousands of sample houses data is collected, where each sample contained information on a given house's properties and handed over the details to Mr Trivedhi. Among these

properties include the number of bedrooms, number of bathrooms and square footage. Common sense would lead anyone to believe that there is relationship between the number of bedrooms, the number of bathrooms and the square footage of the house. In other words, anyone can easily suspect that the higher the square footage of a house, the more bedrooms, and bathrooms it contains. If the properties are highly correlated, is it necessary that should we have three individuals for the same underlying property in size, do explain and help Mr Trivedhi to resolve this and provide a solution to Mr Neerukondas Query. Apply relevant common-sense reasoning and help Mr Trivedhi to determine which of the variables accounts for the most variance in house price, suggesting him an algorithm for solving the same representing with both procedure and pictorial model.

2. Vamsi and Tirumalesh are two best friends, who does all the activities in parallel either in college or in their room. It might depend on various factors like whether or not these two get free from the college on time and able to leave on time, whether they can reach room before 7 pm in the evening depending upon traffic or whether their roommates have some other activity already scheduled that day; in all the cases, their decision to go out to play a game, tennis with their roommates depends mainly upon the particular day and its endure. If everything is fine, and if they are free from college and reach the room in time and if their roommates doesn't have any other class, may want to go out to the tennis court with them. If they reach on time but already has some other activity scheduled that day, they might want to just relax at room, writing the record. Determine and suggest the best algorithm for solving the same.

19CS803 Full Semester Internship (FSI)

0 0 0 9

Course Outcomes

At the end of the Full Semester Internship the students are able to

1. Use the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
2. Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
3. Select appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
4. Use ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
5. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
6. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

COs-POs Mapping:

COs	PO1	PO2	PO5	PO8	PO9	PO10	PSO1	PSO2
CO1	3	-	-	-	-	-	3	3
CO2	-	3	-	-	-	-	3	3
CO3	-	-	3	-	-	-	3	3
CO4	-	-	-	3	-	-	-	-
CO5	-	-	-	-	3	-	-	-
CO6	-	-	-	-	-	3	-	-

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

B. Tech. (Honors)

Domain I (Data Engineering)

19CSH14 Bioinformatics

4 0 0 4

Course Outcomes:

1. Understand different types of bioinformatics data (gene, protein, disease, etc.), including their biological characteristics and relationships
2. Understand the differences between genomics and proteomics
3. Analyze processed data with the support of analytical and visualization tools
4. Apply advisement, including systems biology, structural bioinformatics and proteomics
5. Understand and analyse how to solve the biological problems using computational approach
6. Understand and analyse internet packages of bioinformatics.

CO–PO Mapping

COs	PO3	PO7	PSO1
1	3	3	1
2	2	2	1
3	1	2	2
4	3	2	2
5	3	3	2
6	2	3	1

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

UNIT –I **11+3 Hrs**

Introduction: Definitions, Sequencing, Biological sequence/structure, Genome Projects, Pattern recognition and prediction, Folding problem, Sequence Analysis, Homology and Analogy.

Protein Information Resources:

Biological databases, Primary sequence databases, Protein Sequence databases, Secondary databases, Protein pattern databases, and Structure classification databases.
DNA sequence databases, specialized genomic resources

Unit-II **11+4 Hrs**

Genome Information Resources: DNA Sequence Analysis:

Importance of DNA analysis, Gene structure and DNA sequences, Features of DNA sequence analysis, EST (Expressed Sequence Tag) searches, Gene hunting, Profile of a cell, EST analysis, Effects of EST data on DNA databases

Unit-III **12+4 Hrs**

Pairwise Alignment Techniques:

Database searching, Alphabets and complexity, Algorithm and programs, Comparing two sequences, subsequence's, Identity and similarity, The Dot plot, Local and global similarity, different alignment techniques, Dynamic Programming, Pair wise database searching.

Multiple Sequence Alignment:

Definition and Goal, the consensus, computational complexity, Manual methods, Simultaneous methods, Progressive methods, Databases of Multiple alignments and searching

Unit-IV **11+4 Hrs**

Secondary Database Searching:

Importance and need of secondary database searches, secondary database structure and building a sequence search protocol

Analysis Packages:

Analysis package structure, commercial databases, commercial software, comprehensive packages, packages specializing in DNA analysis, Intranet Packages, Internet Packages.

Total: 45 + 15 Hours

Text Books:

1. Introduction to Bioinformatics, by T K Attwood & D J Parry-Smith Addison Wesley Longman, 1999. ISBN: 0-582-32788-1
2. Bioinformatics a Beginner's Guide Paperback, by Jean Michael Claverie, Cerdic Notredame, Wiley India Private Limited, 2003 ISBN-13: 978-8126503803

Reference Books:

1. Introduction to Bioinformatics by Arthur M. Lesk, Third Edition, Oxford University Press, 2009

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Examination (%)
Remember	30	30	--
Understand	35	35	--
Apply	35	35	50
Analyze	--	--	50
Evaluate	--	--	--
Create	--	--	--
Total (%)	**100**	**100**	**100**

Sample question (s)

Remember

1. Which of the tools are used for the identification of motifs?
2. Define Bioinformatics.
3. List the gene in Bioinformatics.

Understand

1. Explain the DNA sequence
2. Differentiate Primary sequence databases and Secondary databases.
3. Explain the Importance and need of secondary database searches.

Apply

1. Make use of Dynamic Programming to Pair wise database searching.
2. Model an Algorithm to Comparing two sequences

Analyze

1. Analysis the various package structure used in DNA structure.

Domain II (Modern Software Engineering)

19CSH24 Robotic Process Automation

4 0 0 4

Course Outcomes

1. Outline the Robotic Process Automation technology
2. Illustrate the usage of Recording and advance UI Interaction
3. Identify UiPath programming techniques to deploy robot configurations
4. Summarize various data extraction techniques and perform integrations with various popular applications
5. Develop a programmed robot that includes logging and exception handling
6. Inspect Deploy and control Bots with UiPath Orchestrator

CO–PO Mapping

COs	PO3	PO7	PSO1
1	3	3	1
2	2	2	1
3	1	2	2
4	3	2	2
5	3	3	2
6	2	3	1

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I **11+4 Hours**

Introduction to Robotic Process Automation (RPA)

Introduction: What is Robotic Process Automation (RPA), Scope & techniques of Automation, Benefits of RPA, Components of RPA,UiPath Studio, Installation of UiPath Studio, Learning UiPath Studio, **Sequence, Flowchart & Control Flow**: Sequencing the Workflow, Activities, Flowchart, Control Flow for Decision making. Data Manipulation: Variables, Collection, Arguments, Data Table, Clipboard management, File operations

Applications of RPA,RPA platforms

Unit II **11+4 Hours**

Controls: Finding the control, waiting for a control, Act on a control, UiExplorer, Handling Events **Recording and advanced UI Interaction** Basic recording, Desktop recording, Web recording, Citrix, Screen Scraping, When to use OCR, How to use OCR Avoiding typical failure points, **Plugins and Extensions**: Terminal plugin, Java plugin, Java plugin with UiPath Studio, Citrix automation, Citrix environment, Mail plugin, , Web integration, Excel and Word plugins, Credential management Extensions

Types of OCR available, PDF plugin

Unit III **11+4 Hours**

Handling User Events and Assistant Bots: What are assistant bots, Monitoring system event triggers: Hotkey trigger, Mouse trigger, Monitoring image and element triggers, Launching an assistant bot on a keyboard event,

Exception Handling, Debugging, and Logging: Exception handling, Common exceptions and ways to handle them, Logging and taking screenshots Debugging techniques, Setting breakpoints, Slow step, Highlighting, Break, Collecting crash dumps: Enabling crash dumps, Disabling crash dumps, Error reporting: Enterprise Edition customers, Community Edition users.

Exception Handling, System trigger

Unit IV **12 + 3 Hours**

Managing and Maintaining the Code: Project organization, Picking an appropriate layout for each workflow, Breaking the process into smaller parts, Using exception handling, Making your workflow readable, Keeping it clean, Nesting workflows, Reusability of workflows, Templates, Commenting techniques, State Machine, When to use Flowcharts State Machines or Sequences.

Deploying and Maintaining the Bot: Publishing using publish utility, Overview of Orchestration Server, Using Orchestration Server to control bots, Using Orchestration Server to deploy bots,Activating and uploading a license to Orchestrator, Publishing and managing updates, Packages, Managing packages

Reusability of workflows, License management

Total: 45+15 Hours

Textbook (s)

3. Alok Mani Tripathi, Learning Robotic Process Automation, Publisher: OReilly Publishing, 2018, ISBN: 9781788470940.
4. Frank Casale (Author), Rebecca Dilla (Author), Heidi Jaynes (Author), Lauren Livingston (Author), Introduction to Robotic Process Automation: a Primer, Institute of Robotic Process Automation, Amazon Asia-Pacific Holdings Private Limited, 2018

Reference (s)

1. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant, Amazon Asia-Pacific Holdings Private Limited, 2018
2. Srikanth Merianda, Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation, 1st Edition, Consulting Opportunity Holdings LLC, 2018
3. https://www.uipath.com/rpa/robotic-process-automation
4. https://www.udemy.com/robotic-process-automation

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Open Book Test (%)
Remember	40	40	--
Understand	30	40	--
Apply	30	20	50
Analyze	--	--	50
Evaluate	--	--	--
Create	--	--	--
Total (%)	100	100	**100**

SAMPLE QUESTION (S)

Remember

4. List any four application of RPA
5. Define Control flow
6. List RPA platforms

Understand

4. Explain Data manipulation with suitable example
5. Explain the Control flow for Decision making
6. Illustrate the techniques of Automation

Apply

4. How to use OCR Avoiding typical failure points
5. Give some real-world applications of Recotding and Advance UI
6. Create how to Launching an assistant bot on a keyboard event,

Domain III (Security)

19CSH34 Computer Forensics

4 0 0 4

Course Outcomes

1. Understand the real time computer forensic issue.
2. Understand data recovery, forensics lab certification and physical requirements.
3. Identify different storage formats for data acquisition.
4. Analyze various data acquisition tools for collecting digital evidence.
5. Apply various strategies to secure digital evidences.
6. Identify and apply various computer forensics tools to solve the computer forensic cases.

CO-PO Mapping:

COs	PO2	PO3	PO5
1	1	1	2
2	2	1	2
3	2	1	2
4	2	2	2
5	2	2	3
6	2	2	3

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

UNIT I **11+4 Hours**

Computer Forensics and Investigations & Investor's Office and Laboratory

Understanding Computer Forensics, Preparing for Computer Investigations, Taking A Systematic Approach, Procedure for Corporate High-Tech Investigations, Understanding Data Recovery Workstations and Software, Understanding Forensics Lab Certification Requirements, Determining the Physical Requirements for a Computer Forensics Lab, Selecting a Basic Forensic Workstation.

Nature and scope of cybercrime-categories of cybercrime, social engineering

UNIT II **11+4 Hours**

Data Acquisition& Processing Crime and Incident Scenes

Understanding Storage Formats for Digital Evidence, Determining the Best Acquisition Method, Contingency Planning for Image Acquisitions, Using Acquisition Tools, Validating Data Acquisition, Performing RAID Data Acquisition, Using Remote Network Acquisition Tools, Using Other Forensics Acquisition Tools.

Open source data acquisition tools

UNIT III **12+3 Hours**

Digital Evidence

Identifying Digital Evidence, Collecting the Evidence in Private-Sector Incident Scenes, Processing law, Enforcement Crime Scenes, Preparing for a Search, Securing a Computer Incident or Crime Scene, Sizing Digital evidence at the Scene, Storing Digital evidence, obtaining a Digital Hash.

Selecting a basic forensic work station, methodologies to store digital evidence

UNIT IV **11+4 Hours**

Current Computer Forensics Tools

Evaluating Computer Forensics Toll Needs, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating and Testing Forensics Software.; Computer Forensics Analysis and Validation: Determining What Data to Collect and Analyze, Validating Forensic Data, Addressing Data-Hiding Techniques, Performing Remote Acquisition.

Digital evidence handling procedures, Linux system forensics, windows system forensics

Total: 45+15 Hours

Textbook (s)

1. Nelson, Phillips Eninger, Steuart, Computer Forensics and Investigations, Cengage Learning, 4th Edition, 2009
2. Man Young Rhee, Internet Security: Cryptographic Principles, Algorithms and Protocols, Wiley Publications, 2003

Reference (s)

1. John R. Vacca, Computer Forensics, Cengage Learning, 2005
2. MarjieT. Britz, Computer Forensics and Cyber Crime: An Introduction, 3rdEd, Prentice Hall, 2013

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Assignment Test4 (%)
Remember	30	20	-
Understand	35	30	-
Apply	30	30	-
Analyze	15	20	50
Evaluate	--	--	50
Create	--	--	-
Total (%)	100	100	100

SAMPLE QUESTION (S)

Remember

1. List the various disk storage formats
2. List some digital evidences
3. List some tools used for digital evidences
4. List different type of compression methods.

Understand

1. Explain RAID Data Acquisition
2. Explain Identification of Digital Evidence,
3. Write about Locating and Recovering Graphics
4. Discuss about Mobile Device Forensics

Apply

1. Apply any different digital forensics tool to create OS image.
2. Apply different networking tools to collect evidences.

Analyze

1. Compare different digital forensic open-source tools to select a suitable tool which identifies hidden data.

Evaluate

1. Evaluate the performance of dd and dfcldd LINUX commands
2. Evaluate the performance of Widows based tools when compared with LINUX

Create

1. Use any open-source tool to create ISO image of a disk

Domain IV (User Interface Design)

19CSH44 MOBILE PROGRAMMING

4 0 0 4

Course outcomes:

1. Understand the basic concepts and principles in Mobile Computing
2. Demonstrate the use of various frameworks of Mobile Programming
3. Understand the basic OS architecture and building Applications
4. Explain the Mobile application frameworks and handling the Power Management
5. Apply the Augmented Reality for Mobile Applications
6. Understand the security issues in Mobile Applications

COs–POs Mapping

COs	PO3	PO4
1	1	1
2	1	1
3	2	2
4	1	2
5	2	1
6	2	2

3–Strongly linked | 2–Moderately linked | 1–Weakly linked

Unit I **11+4 Hours**

Introduction to Mobile Devices:

Mobile vs. desktop devices and architecture -Power Management-Screen resolution –Touch interfaces -Application deployment -App Store, Google Play, Windows Store –Development environments-XCode- Eclipse -VS2012-PhoneGAP-Native vs. web applications

HTML5/JS/CSS3

Quick recap of technologies -Mobile-specific enhancements -Browser- detection-Touch interfaces - Geolocation -Screen Orientation-Mobile browser "interpretations"(Chrome/Safari/Gecko/IE)- Case studies.

Unit II **12+3 Hours**

Mobile OS Architecture

Comparing and Contrasting architectures of all three – Android, iOS and Windows-Underlying OS (Darwin vs. Linux vs. Win 8) -Kernel structure and native level programming -Runtime (Objective-C vs. Dalvik vsWinRT) -Approaches to power management - Security

Android/iOS/Win 8 Survival and basic

Building Application(IOS, Window, Android).- App structure, built-in Controls, file access, basic graphics Android/iOS/Win8 inbuilt APP- DB access, network access, contacts/photos

Unit III **11+4 Hours**

Underneath the frameworks:

Native level programming on Android -Low-level programming on (jailbroken) iOS-Windows low level APIs

Power Management:

Wake locks and assertions -Low-level OS support -Writing power-smart applications

Unit IV **11+4 Hours**

Augmented Reality (AR) and Mobile Security:

Web and AR-User interface-Mobile AR-evaluation of AR- standardization-GPS-Accelerometer - Camera -Mobile malware -Device protections - Mobile Security - overview of the current mobile threat landscape-An assessment of your current mobile security solution- complete analysis of your current risks- Recommendations on how to secure your company's mobile devices from advanced threats and targeted attacks

Total: 45+15 Hours

Text Book(s):

1. Rajiv Ramnath, Roger Crawfis, and Paolo Sivilotti, Android SDK3 for Dummies, Wiley, 2011.

Reference Books

1. Valentino Lee, Heather Schneider, and Robbie Schell, Mobile Applications: Architecture, Design, and Development, Prentice Hall, 2004.
2. Brian Fling, Mobile Design and Development O"Reilly Media,2009
3. Maximiliano Firtman, Programming the Mobile Web, O"Reilly Media, 2010.
4. Christian Crumlish and Erin Malone, Designing Social Interfaces, O"Reilly Media, 2009

Internal Assessment Pattern

Cognitive Level	Int. Test 1 (%)	Int. Test 2 (%)	Assignment Test4 (%)
Remember	30	20	-
Understand	35	30	-
Apply	30	30	50
Analyze	15	20	50
Evaluate	--	--	-
Create	--	--	-
Total (%)	100	100	100

Remember

1. Why XML is used for frontend development in Android?
2. What's Activity in Android?
3. Define AR.

Understand

1. Explain the components of the Android Application?
2. Explain the working structure of Android App.
3. Illustrated the Service in android?
4. Explain the various security issues of Mobile Programming.

Apply

1. Utilize the Android Kernel structure for your program.
2. Select the best language among HTML5/JS/CSS3 to designe mobile applications and give the benefits.

Analyse

1. Examine the various current mobile security solutions.