

RAMAIAH Institute of Technology

CURRICULUM

Outcome Based Education

Academic year 2023 – 2024

INFORMATION SCIENCE AND ENGINEERING

V & VI SEMESTER B.E.

RAMAIAH INSTITUTE OF TECHNOLOGY

(Autonomous Institute, Affiliated to VTU) Bangalore – 560054.

About the Institute

Dr. M. S. Ramaiah a philanthropist, founded 'Gokula Education Foundation' in 1962 with an objective of serving the society. M S Ramaiah Institute of Technology (MSRIT) was established under the aegis of this foundation in the same year, creating a landmark in technical education in India. MSRIT offers 17 UG programs and 15 PG programs. All these programs are approved by AICTE. All eligible UG and PG programs are accredited by National Board of Accreditation (NBA). The institute is accredited with 'A⁺' grade by NAAC in March 2021 for 5 years. University Grants Commission (UGC) & Visvesvaraya Technological University (VTU) have conferred Autonomous Status to MSRIT for both UG and PG Programs since 2007. The institute has also been conferred autonomous status for Ph.D. program since 2021. The institute is a participant to the Technical Education Quality Improvement Program (TEQIP), an initiative of the Government of India. The institute has 380 competent faculty out of which 67% are doctorates. Some of the distinguished features of MSRIT are: State of the art laboratories, individual computing facility for all faculty members, all research departments active with sponsored funded projects and more than 300 scholars pursuing Ph.D. To promote research culture, the institute has established Centre of Excellence for Imaging Technologies, Centre for Advanced Materials Technology, Centre for Antennas and Radio Frequency systems (CARFS), Center for Cyber Physical Systems, Schneider Centre of Excellence & Centre for Bio and Energy Materials Innovation. Ramaiah Institute of Technology has obtained "Scimago Institutions Rankings" All India Rank 107 & world ranking 600 for the year 2022.

The Entrepreneurship Development Cell (EDC) and Section 8 company "Ramaiah Evolute" have been set up on campus to incubate startups. **M S Ramaiah Institute of Technology is recognized by Atal Ranking of Institutions on Innovation Achievements (ARIIA), MoE, Govt. of India.** MSRIT has a strong Placement and Training department with a committed team, a good Mentoring/Proctorial system, a fully equipped Sports department, large air-conditioned library with good collection of book volumes and subscription to International and National Journals. The Digital Library subscribes to online e-journals from Elsevier Science Direct, IEEE, Taylor & Francis, Springer Link, etc. The Institute is a member of DELNET, CMTI and VTU E-Library Consortium. The Institute has a modern auditorium, recording studio, and several hi-tech conference halls with video conferencing facilities. The institute has excellent hostel facilities for boys and girls. MSRIT Alumni have distinguished themselves by occupying high positions in India and abroad and are in touch with the institute through an active Alumni Association.

As per the National Institutional Ranking Framework (NIRF), MoE, Government of India, Ramaiah Institute of Technology has achieved 78th rank among 1314 top Engineering Institutions & 23rd Rank for School of Architecture in India for the year 2023.

About the Department:

The Department of Information Science and Engineering (ISE) was established in the year 1992 with an objective of producing high quality professionals to meet the demands of the emerging field of Information Technology. Department offers Bachelor's program in Information Science and Engineering (B. E), Master's program in Data Science (MTech) and Doctoral program (Ph.D.). The Department of Information Science and Engineering, is a progressive department that has made significant contributions to Academics, Research and Innovation. Under Graduate (UG) is accredited by the National Board of Accreditation in 2001, 2004, 2010, 2015, 2018 and reaccredited in 2022 under Tier-1 till 2028. The department has highly qualified and competent faculty members committed to innovative teaching learning and quality research. Department has 8 well-equipped state of the art laboratories which meets the requirement of curriculum, innovation and research. Collaboration with industries such as Apple, Unisys, Mindtree, Intel, Google, SECO, IBM, NVIDIA etc, has a significant impact on the curriculum, computing infrastructure, teaching & learning and research. The curriculum is centered around Data Science, Artificial Intelligence, IOT, Cloud & Distributed Computing, System Programming, Computer Security and Software development. Curriculum and the teaching learning process ensure that the students demonstrate technical competence, ethical reasoning, creativity in identification & formulation of the problems and develop solutions by using appropriate tools & techniques. Department has established technical clubs/ professional student chapters to provide collaborative learning platform for the students. Echo system has been built to initiate start-ups/Innovation at the department level along with the mentorship program. The activities of the Department led to high profile placements, motivation to become an entrepreneur, and encouragement for higher learning.

VISION OF THE INSTITUTE

To be an Institution of International Eminence, renowned for imparting quality technical education, cutting edge research and innovation to meet global socio-economic needs

MISSION OF THE INSTITUTE

MSRIT shall meet the global socio-economic needs through

- 1. Imparting quality technical education by nurturing a conducive learning environment through continuous improvement and customization
- 2. Establishing research clusters in emerging areas in collaboration with globally reputed organizations
- 3. Establishing innovative skills development, techno-entrepreneurial activities and consultancy for socio-economic needs

QUALITY POLICY

We at MS Ramaiah Institute of Technology strive to deliver comprehensive, continually enhanced, global quality technical and management education through an established Quality Management System complemented by the synergistic interaction of the stake holders concerned

VISION OF THE DEPARTMENT

To evolve as an outstanding education and research center of Information Technology to create high quality Engineering Professionals for the betterment of Society

MISSION OF THE DEPARTMENT

Department of Information Science and Engineering shall create high quality IT Engineering Professionals for the betterment of society by:

- Providing education through an ever improving curriculum and effective pedagogy techniques.
- Encouraging extra and co-curricular activities to develop their overall personality along with technical skills.
- Collaborating with industry and academia for strengthening research, innovation and entrepreneurship ecosystem.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Become competent Information Technology professionals with continuous progress in career or learning.

PEO2: Productively engage with society by practicing research or entrepreneurship.

PEO3: Function effectively as professionals in a team environment or individually.

PROGRAM OUTCOMES (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

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

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

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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

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

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Apply Mathematical models, programming paradigms and software development practices to solve real world problems

PSO2: Adopt computing and communication models for developing IT solutions.

PSO3: Acquire data engineering skills to develop intelligent systems in a multidisciplinary environment.

Semester wise Credit Breakdown for B.E Degree Curriculum

Batch 2021-25

Semester Course Category	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Total Credits
Basic Sciences (BSC)	08	08	03	03					22
Engineering Sciences (ESC)	09	11							20
Humanities, Social Sciences and Management (HSMC)	02		01	01	03	03			10
Ability Enhancement Course (AEC)	01	01	01	01	01		03		08
Universal Human Values (UHV)			02						02
Professional Core Courses (PCC)			11	12	11	05	04		43
Integrated Professional Core Course (IPCC)			03	03	03		04		13
Professional Elective Courses (PEC)					03	06	03		12
Institutional Open Elective Courses (IOE)						03	03		06
Internship (INT)				02		02		05	09
Mini Project / Project Work (PW)						03	03	09	15
Non Credit Mandatory Courses (NCMC)			Yes		Yes				
Total Credits	20	20	21	22	21	22	20	14	160

SCHEME OF TEACHING

V SEMESTER

	Subject		Taaahing		(edits	Total	
Sl. No.	Subject	Donartmont	Category	T	Ŧ	р	Tatal	contact	
	Code		Department		L	1	r	Total	hours /week
1	IS51	Software engineering	ISE	PCC	3	0	0	3	3
2	IS52	Artificial Intelligence	ISE	IPCC	2	0	1	3	4
3	IS53	Computer Networks	ISE	PCC	3	0	0	3	3
4	IS54	Theory of Computation	ISE	PCC	2	1	0	3	4
5	ISE55x	Program Elective Course – 1	ISE	PEC	3	0	0	3	3
6	ISL56	Python Programming Lab	ISE	PCC	0	0	1	1	2
7	ISL57	Advanced Java Lab	ISE	PCC	0	0	1	1	2
0	AT 58	Research Methodology &	ISE	HSMC	2	0	0	2	2
0	0 AL38	Intellectual property rights	ISE	пымс	5	U	0	5	3
9	AEC510	Ability Enhancement Course – V	ISE	AEC	1	0	0	1	1
				Total	14	1	3	21	26
10	HS59	Environmental Studies *		NCMC	0	0	0	0	1

Programme Electives Course - 1

Sl.No	Code	Subject				
1	ISE551	Operations Research				
2	ISE552	Mobile Application Development - 1				
3	ISE553	Computer Vision				
4	ISE554	Distributed System				
5	ISE555	Software design patterns				

SCHEME OF TEACHING

VI SEMESTER

	Subject		Credits				Total		
Sl. No.	Code	Subject	Department	Category	L	Т	Р	Total	contact hours /week
1	AL61	Management & Entrepreneurship	ISE	HSMC	3	0	0	3	3
2	IS62	Machine Learning	ISE	PCC	3	0	0	3	3
3	ISE63x	Program Elective Course – 2	ISE	PEC	3	0	0	3	3
4	ISE64x	Program Elective Course – 3	ISE	PEC	3	0	0	3	3
5	ISL65	Machine Learning Lab	ISE	PCC	0	0	1	1	2
6	ISL66	DevOps Lab	ISE	PCC	0	0	1	1	2
7	ISOE0X	Institutional Open Elective - 1		IOE	3	0	0	3	3
8	ISP67	Mini Project	ISE	PW	0	0	3	3	-
9	INT68	Innovations/ societal/ Entrepreneurship based Internships	ISE	INT	0	0	2	2	-
		Total			15	0	7	22	19

Programme Electives Course – 2

Sl.No	Code	Subject
1	ISE631	Mobile Application Development - 2
2	ISE632	Internet of Things
3	ISE633	Block chain essentials and DApps
4	ISE634	System Simulation and Modeling

Programme Electives Course - 3

Sl.No	Code	Subject
1	ISE641	Business analytics
2	ISE642	Storage Area Networks
3	ISE643	Natural Language Processing
4	ISE644	Cloud Computing

V SEMESTER

SOFTWARE ENGINEERING

Course Code: IS51

Prerequisite: Nil

Credits: 3:0:0

Contact Hours: 42

Course Coordinator: Dr. Pushpalatha M N

Course Content

Unit I

Introduction: Professional software development, Software engineering ethics, Case studies. Software processes: Software process models, Process activities, coping with change, The Rational Unified process. Agile Software Development: Agile methods, Plan-driven and agile development, Extreme programming. Agile Project Management and Scaling Agile Methods

Unit II

Requirements engineering: Functional and Non-functional requirements, the software requirements document, Requirements specification, Requirements Engineering Processes, Requirements elicitation and analysis, Requirements validation, Requirements management.

Unit III

Architectural Design: Software Design and Implementation, Architectural design decisions, Architectural views, Architectural patterns, Application architectures. Design and implementation: Object-oriented design using the UML, Implementation issues, Open source development.

Unit IV

A Perspective on Testing- Basic Definitions, Test Cases, Insights from a Venn Diagram, Identifying Test Cases- Specification-Based Testing, Code-Based Testing, Specification-Based versus Code-Based Debate, Fault Taxonomies, Levels of Testing, UNIT TESTING, Boundary Value Testing-Normal Boundary Value Testing, Robust Boundary Value Testing, Worst-Case Boundary Value Testing, Special Value Testing, Examples- Test Cases for the Triangle Problem, Test Cases for the NextDate Function, Equivalence Class Testing- Equivalence Classes, Traditional Equivalence Class Testing, Improved Equivalence Class Testing, Equivalence Class Test Cases for the Triangle Problem, Equivalence Class Test Cases for the NextDate Function

Unit V

Software Management: Project management: Risk management, Managing people, Teamwork. Project planning: Software pricing, Plan-driven development, Project scheduling, Agile planning, Quality management: Software quality, Software measurement and metrics.

Course outcomes (COs):

At the end of the course, the student will be able to:

- 1. Understand the concepts of software engineering and development processes. (PO-1,8,9,10,11,12) (PSO-1)
- 2. Analyze the functional and non-functional requirements for the given problem (PO-1,2,9,10,11,12) (PSO-1)
- 3. Apply software architectural design for the given scenario (PO-1,2, 3,9,10,11,12)(PSO-1)
- 4. Understand Software testing and evolution processes. (PO-1, 9,10,11,12) (PSO-1)
- 5. Analyze Software Project Management issues and process improvement. (PO-1,2,11) (PSO-1)

Suggested Learning Resources:

Text Books:

- 1. Ian Sommerville, Software Engineering, 9th Edition, Pearson Education, 2011.
- 2. Paul C. Jorgensen, Software Testing, A Craftsman^s Approach, 4th Edition, Auerbach Publications, 2017.
- 3. Roger S. Pressman, Software Engineering-A Practitioners approach, 8th Edition, McGraw-Hill,2014.
- 4. Shari Lawrence Pfleeger, Joanne M. Atlee, Software Engineering Theory and Practice, Third Edition, Pearson Education, 2006.
- 5. Waman S Jawadekar, Software Engineering Principles and Practice, Tata McGraw Hill, 2004.
- 6. Douglas Bell, Software Engineering for Students, A Programming Approach, 4th Edition, Pearson Education.

Web links and Video Lectures (e-Resources):

- 1. https://www.youtube.com/watch?v=Z6f9ckEElsU
- 2. https://www.youtube.com/watch?v=AN5I6fFxyfs
- 3. https://www.youtube.com/watch?v=vn6QvTb-TuQ
- 4. https://www.youtube.com/watch?v=krsvQHIGhvc
- 5. https://www.youtube.com/watch?v=IPIP2R7I-Nc&t=2s
- 6. https://www.youtube.com/watch?v=wEr6mwquPLY
- 7. https://www.youtube.com/watch?v=Q50ZyydS7pI

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

• Case study based on all phases of software engineering project based learning

ARTIFICIAL INTELLIGENCE

Course Code: IS52

Credits : 2:0:1

Prerequisite: Nil

Contact Hours: 28L+28P

Course Coordinator: Dr. Rajeshwari S B

Course Content

Unit I

Introduction: Definition of AI. Foundation of Artificial Intelligence. Intelligent Agents: Agents and Environments, Rationality, The Nature of Environments, The Structure of Agents.
Problem-solving by search: Problem-Solving Agents, Uninformed Search Strategies: Bidirectional Search. Informed Search Strategies: A* Search, Heuristic Functions.

Unit II

Adversarial Search: Games, Optimal Decisions in Games, Alpha Beta Pruning, Imperfect Real-Time Decision. Logical Agents: Knowledge-Based Agents, The Wumpus World, Logic,
Propositional Logic: A very simple logic, Effective Propositional Model Checking, Agents Based on Propositional Logic. First Order Logic: Wumpus World representation, Knowledge Engineering in First-Order Logic.

Unit III

Interference in First-order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward chaining, Backward Chaining. Resolution. **Classical Planning:** Definition, Algorithms for Planning as State-Space Search, Planning Graphs, Other Planning Approaches.

Unit IV

Knowledge Representation: Ontological Engineering, Categories and Objects, Events, Mental Objects and Modal Logic, Reasoning Systems for Categories **Uncertainty**: Acting under Uncertainty, Inference using Full Joint Distributions, Independence

Unit V

Uncertainty: The Wumpus World Revisited, Learning from Examples: Forms of Learning. **Robotics:** Introduction, Hardware, Perception, Planning to Move, Planning Uncertain Movement, Moving, Robotic Software Architecture, Application Domains.

Implement the following Artificial Intelligence Problems in Python:

- 1. Implement and demonstrate 8-Puzzle problem.
- 2. Implement and demonstrate Tic-Tac-Toe game.
- 3. Implement and demonstrate Water-Jug problem.
- 4. Implement and demonstrate Monkey Banana Problem.
- 5. Implement and demonstrate Missionaries-Cannibals Problem.
- 6. Implement and demonstrate Hill Climbing Algorithm.

- 7. Implement and demonstrate Travelling Salesman Problem (TSP) using heuristic approach (A* Search algorithm).
- 8. Implementation of the problem solving strategies: either using Forward Chaining or Backward Chaining.
- 9. Implement resolution principle on First Order Predicate Logic (FOPL) related problems.
- 10. Implement and demonstrate simple Chatbot with minimum 10 conversations.

Course outcomes (COs):

At the end of the course, the student will be able to:

- 1. Identify the fundamental characteristics and challenging issues of Artificial Intelligence (AI) systems (PO-1,2,3,4,12, PSO-2)
- 2. Apply various general purpose search algorithm as solutions for various problem-solving agents (PO -1,2,3,4,12, PSO-2)
- 3. Apply various symbolic knowledge representation to specify domains and reasoning tasks of a situated intelligent agent. (PO 4,5,9,12, PSO-2)
- 4. Apply algorithmic approach for planning and solving AI solutions that require problem solving, inference, perception, knowledge representation, and learning. (PO-1,4,5,6,7, PSO-2)
- 5. Extract conclusions on learning and quantify the uncertainty in the conclusions obtained from uncertain knowledge. (PO-5,9, PSO-2)

Text Book:

- Stuart Russel, Peter Norvig: Artificial Intelligence A Modern Approach, 3rd Edition, Pearson Education, 2012.
- 2. Elaine Rich, Kevin Knight, Shivashankar B Nair: Artificial Intelligence, 3rd Edition, Tata McGraw Hill, 2011.

References:

- 1. Peter Jackson, "Introduction to Expert Systems", 3rd Edition, Pearson Education, 2007.
- 2. Deepak Khemani "Artificial Intelligence", Tata Mc Graw Hill Education 2013.
- 3. http://nptel.ac.in

COMPUTER NETWORKS

Course Code: IS53

Credits: 3:0:0

Prerequisite: Nil

Contact Hours: 42

Course Coordinator: Mr. Suresh Kumar K R

Course Content

Unit I

Data communication Fundamentals: Introduction, Networks, Network types (LAN, WAN, MAN, Internet), Protocol Layering, TCP/IP protocol suite, OSI Model.

Physical layer: Data and Signals, Basics of Periodic analog signals and digital signals, Transmission impairments, Data rate limits, Performance, Line coding schemes (unipolar, polar, bipolar) in digital-to-digital conversion

Unit II

Data Link layer: Introduction, Link layer addressing, Error detection and correction: Introduction, block coding, cyclic codes, checksum, Data link control: DLC services, Data-Link layer protocols, Media Access Control: Random Access, Controlled Access, Channelization.

Unit III

Network layer: Network layer services, Packet switching, Network-Layer Performance, IPV4 Addressing, Internet protocol (IP), Routing algorithms, Unicast routing protocols

Unit IV

Network Layer: IPV6 addressing, The IPV6 Protocols, Transition from IPV4 to IPV6, **Transport Layer**: Introduction, Transport layer Protocols, User Datagram Protocol (UDP)

Unit V

Transport Layer: Transmission control Protocol: TCP Services, Segment, TCP Connection, Flow control, Error control, and TCP Congestion control. **Application Layer:** Electronic Mail, Domain Name System (DNS)

Course outcomes (COs):

At the end of the course, the student will be able to:

- 1. Understand the fundamentals of communication models, protocol stacks, topologies and solve problems associated with data and signals. (PO 1, 2, 5) (PSO 2)
- 2. Apply different error detection, error correction and flow control strategies to solve issues induced during data communication. (PO 1, 2) (PSO 2)
- 3. Use different protocols to achieve Address mapping, Error reporting and make routing decisions (PO 1, 2, 5, 9, 10, 12) (PSO 2)
- 4. Solve the problems associated with IPV4, IPV6 and their transition (PO 1, 2) (PSO 2)
- 5. Illustrate the working principles of different transport and application layer protocols (PO 1, 5, 9, 10, 12) (PSO 2)

Suggested Learning Resources:

Text Books:

- 1. Behrouz A. Forouzan Data Communications and Networking, 5th Edition, Tata McGraw-Hill, 2013
- 2. Alberto Leon-Garcia and Indra Widjaja Communication Networks –Fundamental Concepts and Key architectures, Tata McGraw-Hill, 2004.
- 3. William Stallings Data and Computer Communication, Eight Edition, Pearson Education, 2007.

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/106105082
- https://onlinecourses.nptel.ac.in/noc22_ee61/preview

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

• Network simulation using NS2

THEORY OF COMPUTATION

Course Code: IS54

Credits: 2:1:0

Prerequisite: Nil

Contact Hours: 28L + 28T

Course Coordinator: Dr. S R Manisekhar

Course Content

Unit I

Finite Automata and Regular Expressions: Introduction to Finite Automata: central concepts of Automata theory, Deterministic finite automata, Nondeterministic finite automata, application of finite automata, Finite automata with Epsilon-transitions.

Unit II

Regular Languages, Properties of Regular Languages: Regular expressions; Finite Automata and Regular Expressions, Equivalence and minimization of automata.

Unit III

Context-Free Grammars and Languages: Context free grammars, Parse trees: Constructing parse trees, The yield of a parse tree, Applications, Ambiguity in grammars and Languages, Normal forms for CFGs.

Unit IV

Pushdown Automata: The Pushdown automata: The languages of a PDA, Equivalence of PDA"s and CFG"s, Deterministic Pushdown Automata.

Unit V

Introduction to Turing Machine: The turning machine: Programming techniques for Turning Machines, Extensions to the basic Turning Machines, Turing Machine and Computers. Introduction to NP HArd and NP complete

Tutorial Contents:

- 1. Practice the design of Deterministic Finite Automata problems.
- 2. Design of Non- Deterministic Finite Automata problems.
- 3. Construct E-Non- Deterministic Finite Automata problems.
- 4. Show the steps for converting NFA to DFA.
- 5. Show the Converting step from E-NFA to DFA problems.
- 6. Construct Regular expression for the given a regular language.
- 7. Design problems on Minimization of DFA.
- 8. Construct Context free grammar given a context free language.
- 9. Normal forms for CFGs
- 10. Find the Ambiguity in grammars and Languages.
- 11. Design Deterministic Push down Automata problems

- 12. Design Non Deterministic Push down Automata problems
- 13. Show the steps for converting PDA to CFG and Viceversa.
- 14. Design of Turing Machine problems

Course outcomes (COs):

At the end of the course, the student will be able to:

- 1. Design finite state machine using the concept of automata theory (PO-1,2,3,5,9,10,12; PSO-2)
- 2. Apply Regular Expression for the given finite Automata and vice versa. (PO-1,2,3,5,9,10,12; PSO-2)
- 3. Apply Context Free Grammar (CFG) for the given Normal Forms. (PO-1,2,3,5,9,10,12; PSO-2)
- 4. Design Push Down Automata for the given CFG and vice versa. (PO-1,2,3,5,9,10,12; PSO-2)
- 5. Design Turing Machine for a given language.

Text Book:

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman: Introduction to Automata, Theory, Languages and Computation, 3rd Edition, Pearson education, 2014

Reference Books:

- 1. John C Martin: Introduction to Languages and Automata Theory, 3rd Edition, Tata McGraw-Hill, 2007.
- 2. Daniel I.A. Cohen: Introduction to Computer Theory, 2nd Edition, John Wiley & Sons, 2004.

Web links and Video Lectures (e-Resources):

• https://onlinecourses.nptel.ac.in/noc21_cs83/preview

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

• problem solving

OPERATIONS RESEAR	СН
Course Code: ISE551	Credits: 3:0:0
Prerequisite: Nil	Contact Hours: 42
Course Coordinator: Mrs. Savita K Shetty	

Unit I

Introduction to Operations Research (OR) and Linear Programming (LP): OR Models, Solving the OR Model, Phases of an OR Study; Modeling with Linear Programming (LP), Two variable LP Model, Graphical LP solution, Solution of a Maximization/Minimization Model, Computer solution with Excel Solver; LP Model in Equation Form, Transition from Graphical to Algebraic Solution; TORA Tool.

Unit II

The Simplex Method: The Simplex Method, Special cases in the Simplex Method, Degeneracy, Alternative optima, Unbounded solutions, Non-existing solutions; Artificial Variable Techniques: Two Phase Method, Big-M method; TORA Tool.

Unit III

Duality and Game Theory: Introduction: Concept of Duality; Definition of Primal Dual Problems; General Rules for Converting any Primal into its Dual; Introduction to Dual Simplex Method; Computational Procedure of Dual Simplex Method; Illustrative Examples. Introduction of Game Theory, Characteristics of Games Theory; Minimax (Maximin) Criterion and Optimal Strategy; Saddle Point, Optimal Strategies and the value of game; Solution of Games with Saddle Point(s); Rectangular Games without Saddle Point; Arithmetic Method for (2x2) Games, Gambit tool for Game theory.

Unit IV

Project Management by PERT-CPM: Introduction, Applications of PERT/CPM Techniques, Basic Steps in PERT/CPM Techniques; Network Diagram representation, Rules for Drawing Network Diagram, Labeling Fulkerson"s "I-J" Rule; Time Estimates and Critical Path in Network Analysis; Project Evaluation and Review Technique; TORA tool

Unit V

Transportation and Assignment Problems: Mathematical Formulation of transportation problem (TP); Matrix Form of TP; Feasible Solution, Basic Feasible Solution and Optimum Solution; Tabular Representation; Special Structure of Transportation Table and their Problems; Initial Basic Feasible Solution to TP; Moving Towards Optimality; Degeneracy in TP; Unbalanced TP; Mathematical Formulation of Assignment Problem (AP); Fundamental Theorems; Hungarian Method for AP; TORA tool

Course outcomes (COs):

At the end of the course, the student will be able to:

- 1. Formulate linear programming model for a given problem. (PO-1,2,3) (PSO-2,3)
- 2. Solve a linear programming model using appropriate methods. (PO-1,2,5,9,10,12) (PSO-2,3)
- 3. Apply game theory to model, analyze and solve the given problems. (PO-1,2,3,5,9,10,12) (PSO-2,3)
- 4. Analyze a Project network using PERT and CPM techniques. (PO-1,2,3,5,9,10,12) (PSO-2,3)
- 5. Apply transportation and assignment techniques to solve the given problems. (PO-1,2,3,5,9,10,12) (PSO-2,3)

Suggested Learning Resources:

Text Books:

- 1. Operations Research: An Introduction Hamdy A Taha 9th Edition, Pearson Education, India, 2011.
- 2. Operations Research S.D. Sharma 16th Edition, KNRN Publications, 2009.

Reference:

1. Introduction to Operations Research – Frederick S. Hillier and Gerald J. Lieberman – 9th Edition, Tata McGraw Hill,2009

Web links and Video Lectures (e-Resources):

- <u>https://www.youtube.com/watch?v=a2QgdDk4Xjw&list=PLjc8ejfjpgTf0LaDEHgLB3gCHZ</u> <u>YcNtsoX&index=1</u>
- <u>https://www.youtube.com/watch?v=qxls3cYg8to&list=PLjc8ejfjpgTf0LaDEHgLB3gCHZYc</u> <u>NtsoX&index=4</u>
- <u>https://www.youtube.com/watch?v=Q31jKiEXxdc&list=PLjc8ejfjpgTf0LaDEHgLB3gCHZY</u> <u>cNtsoX&index=13</u>
- <u>https://www.youtube.com/watch?v=BUGIhEecipE&list=PLjc8ejfjpgTf0LaDEHgLB3gCHZY</u> <u>cNtsoX&index=16</u>
- http://a.impartus.com/ilc/#/course/171022/1205
- http://a.impartus.com/ilc/#/course/221208/1205

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

• Problem solving using TORA and Excel solver tools.

MOBILE APPLICATION DEVELOPMENT - I

Course Code: ISE552

Credits : 3:0:0

Pre-requisite: None

Contact Hours: 42

Course Coordinator: Dr. Shashidhara H S

Course Content

Unit I

Getting Started with App Development - basics of data, operators, and control flow in Swift, debugging, Xcode, building, running and debugging an app, Interface Builder, Swift strings, Guided project - Light.

Unit II

Introduction to UI Kit - functions, structures, collections, and loops. UIKit—the system views and controls that make up a user interface and display data using Auto Layout and stack views. Guided project - Apple Pie

Unit III

More Swift – Collections, Structures, Classes, Closures, Variadics

Unit IV

Navigation and Workflows - build simple workflows and navigation hierarchies using navigation controllers, tab bar controllers, and segues, optionals and enumerations, type casting, Guided project - Personality Quiz

Unit V

Tables and Persistence - scroll views, table views, and building complex input screens, save data, share data to other apps, work with images in the user's photo library. Guided project - List, a task-tracking app that allows the user to add, edit, and delete items in a familiar table- based interface.

Course outcomes (COs):

At the end of the course, the student will be able to:

- 1. Design applications using swift as language and Xcode as IDE (PO 1, 2, 3, 5) (PSO 1, 2)
- 2. Create simple user interfaces using UIKit (PO 1, 2, 3, 5) (PSO 1, 2)
- 3. Design applications using advanced constructs of swift like class, structures, enums (PO 1, 2, 3, 4, 5) (PSO 1, 2)
- 4. Create multiple views and connect them using segues and navigation (PO -1, 2, 3, 4, 5) (PSO -1, 2)
- 5. Create apps using table view and scroll views (PO 1, 2, 3, 4, 5) (PSO 1, 2)

Suggested Learning Resources:

Text Books:

- 1. Develop in Swift Fundamentals, Apple Books
- 2. Develop in Swift Data Collections, Apple Books

Web links and Video Lectures (e-Resources):

- 1. https://books.apple.com/us/book/develop-in-swift-fundamentals/id1511184145
- 2. https://www.apple.com/in/education/higher-education/app-development/
- 3. Swift Programming Tutorial | FULL COURSE | Absolute Beginner https://www.youtube.com/watch?v=CwA1VWP0Ldw

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

• UI Design for an iOS App using Adobe XD or Figma

COMPUTER VISION	
Course Code: ISE553	Credits : 3:0:0
Prerequisite: Nil	Contact Hours: 42
Course Coordinator: Mr. Prashanth Kambli	

Unit I

Introduction: Computer vision, Imaging modalities, Fundamental steps in image processing, Applications of computer vision. **Digital Image Fundamentals:** Image formation model, Sampling and quantization, Relationships between pixels. Mathematical tools used in image processing.

Unit II

Spatial Filtering: Intensity transformation functions, Histogram processing (Histogram equalization, Histogram matching), Fundamentals of spatial filtering (Mechanics of spatial filtering, correlation and convolution), Smoothing spatial filters, Sharpening spatial filters.

Unit III

Image Segmentation: Fundamentals, Detection of isolated points, line and basic edge, Thresholding, Region-based segmentation. **Representation and Description:** Representation (border following, chain codes, minimum-perimeter polygons) Boundary descriptors (simple descriptors, shape numbers), Region descriptors (simple descriptors, topological descriptors, texture).

Unit IV

Object Recognition: What Should Object Recognition Do? Feature, Geometric and semantic questions, Patterns and pattern classes, Recognition based on decision-theoretic methods, Matching, Optimum statistical classifier, Neural networks.

Unit V

Morphological Processing: Erosion and Dilation, Opening and closing, Hit-or-miss transform, Morphological algorithms (Boundary extraction, Hole filling, Extraction of connected components). **Compression Techniques:** Fundamentals, Compression methods (Huffman, Arithmetic, Runlength coding)

Course outcomes (COs):

At the end of the course, the student will be able to:

- 1. Describe the fundamental concepts of a computer vision (PO-1) (PSO-3).
- 2. Apply spatial domain filters to improve the quality of the image (PO-1,2,3,5) (PSO-3).
- 3. Use segmentation, description, and recognition techniques for object identification in the image. (PO-1,2,3,5) (PSO-3).
- 4. Apply morphological operations and compression techniques in processing the image. (PO-1,2,3,5) (PSO-3).
- 5. Design solution for the identified problem by applying appropriate computer vision algorithm

(PO-1,2,3,5,9,10,11,12) (PSO-3).

Suggested Learning Resources:

Text Books:

- 1. Rafael C.Gonzalez, Richard E. Woods, "Digital Image Processing", 3rd ed., Pearson.
- 2. Computer Vision: A modern approach, D.A. Forsyth, J.Ponce, Pearson Education, 2015

Web links and Video Lectures (e-Resources):

- <u>https://www.tutorialspoint.com/dip/index.html</u>
- <u>https://www.mathworks.com/support/learn-with-matlab-tutorials.html</u>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Group discussions
- Design and development of solutions for the given problem

DISTRIBUTED SYSTEMS

Course Code: ISE554

Credits : 3:0:0

Pre - requisite:

Contact Hours: 42

Course Coordinator: Dr. Sanjay H A

Course Content

Unit I

CHARACTERIZATION OF DISTRIBUTED SYSTEMS: Introduction, Focus on resource sharing, Challenges **REMOTE INVOCATION:** Introduction, Request-reply protocols, Remote procedure call, Introduction to Remote Method Invocation

Unit II

DISTRIBUTED FILE SYSTEMS: Introduction, File service architecture,

NAME SERVICES: Introduction, Name services and the Domain Name System, Directory services

Unit III

TIME AND GLOBAL STATES: Introduction, Clocks, events and process states, Synchronizing physical clocks, Logical time and logical clocks, Global states

Unit IV

COORDINATION AND AGREEMENT: Introduction, Distributed mutual exclusion, Elections, Coordination and agreement in group communication, Consensus and related problems

Unit V

DISTRIBUTED TRANSACTIONS: Introduction, Flat and nested distributed transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery

REPLICATION: Introduction

Course outcomes (COs):

At the end of the course, the student will be able to:

- 1. Understand the goals and challenges of distributed system (PO 1) (PSO 2)
- 2. Demonstrate the remote invocation techniques for communication (PO 1, 2, 3, 9, 10) (PSO -2)
- 3. Describe the architecture of distributed file systems and name services (PO 1, 9, 10, 12) (PSO -2)
- 4. Apply clock synchronization algorithms to monitor and order the events. (PO 1, 3, 9, 10) (PSO -2)
- 5. Analyse the performance of mutual exclusion, election and consensus algorithms. (PO 1, 2, 9, 10, 12) (PSO -2)

6. Illustrate the fundamental concepts and algorithms related to distributed transactions and replication (PO -1, 9, 10, 12) (PSO -2)

Suggested Learning Resources:

Text Books:

1. George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems Concepts and Design", Fifth Edition, Pearson Education, 2012.

Web links and Video Lectures (e-Resources):

<u>https://www.youtube.com/watch?v=Azyizl9w2xo&list=PLrjkTql3jnm9FEOXHA_qjR-TMODlaIk-W</u>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Programming Assignment
- Case Studies

SOFTWARE DESIGN PATTERNS					
Course Code: ISE555	Credits: 3:0:0				
Pre - requisite: Object Oriented Programming, Software Engineering	Contact Hours: 42				
Course Coordinator: Mrs. Evangeline D					

Unit I

The Object Oriented Paradigm – Functional Decomposition, The Problem with Requirements, Dealing with Changes, The OO Paradigm; The UML—The Unified Modeling Language: Overview, What Is the UML?, Why Use the UML?, The Class Diagram, Interaction Diagrams; The Principles and Strategies of Design Patterns: The Open-Closed principle, Designing from Context, Encapsulating Variation, Abstract classes vs Interfaces, The principle of Healthy Skepticism

Unit II

An Introduction to Design Patterns: Overview, Design Patterns Arose from Architecture and Anthropology, Moving from Architectural to Software Design Patterns, Why Study Design Patterns?, Other Advantages to Studying Design Patterns, Summary; The Facade Pattern: Overview, Introducing the Façade Pattern, Learning the Façade Pattern, Field Notes: The Façade Pattern; The Adapter Pattern: Overview, Introducing the Adapter Pattern, Learning the Adapter Pattern, Learning the Adapter Pattern, Field Notes: The Adapter Pattern; Expanding Our Horizons – Objects: Traditional Vs New Views, Encapsulation: Traditional Vs New Views, Finding Varying Concept and Encapsulating, Commonality and Variability Analysis and Abstraction

Unit III

The Strategy Pattern: Overview, The International E-Commerce System Case Study: Initial Requirements, Handling New Requirements, The Strategy Pattern; **The Bridge Pattern:** Overview, Introducing the Bridge Pattern, Learning the Bridge Pattern – An example, An Observation About Using Design Patterns, Learning the Bridge Pattern – Deriving It, The Bridge Pattern in retrospect; **The Abstract Factory Pattern:** Overview, Introducing the Abstract Factory Pattern, Learning the Abstract Factory Pattern – Implementing It

Unit IV

The Observer Pattern: Overview, Categories of Patterns, More Requirements for the International E-Commerce Case Study, The Observer Pattern, Applying the Observer to the Case Study; The Template Method Pattern: Overview, More Requirements for the International E-Commerce Case Study, The Template Method Pattern, Applying the Template Method to the International E-Commerce Case Study, Using the Template Method Pattern to Reduce Redundancy

Unit V

Lessons from Design Patterns: Factories – Factories, The Universal Context Revisited, Factories Follow our Guidelines; The Singleton Pattern and the Double-Checked Locking Pattern: Overview, Introducing the Singleton Pattern, Applying the Singleton Pattern to the Case Study; A Variant: The Double-Checked Locking Pattern, Reflections, Use the Singleton and Double-Checked Locking Patterns if applicable for a given problem; The Factory Method Pattern: Overview, More Requirements for the Case Study, The Factory Method Pattern, Factory Method Pattern and Object-Oriented Languages

Course outcomes (COs):

At the end of the course, the student will be able to:

- 1. Design solution to the given problem definition using UML notations (PO 1, 2, 3) (PSO 1)
- 2. Apply Façade and Adapter patterns to given problem with traditional design (PO 1, 2, 3, 9, 10, 12) (PSO 1)
- 3. Apply Strategy, Bridge and Abstract Factory patterns to the given scenario (PO 1, 2, 3, 9, 10, 12) (PSO 1)
- 4. Apply Template Method, Observer and Decorator patterns for a given problem design (PO 1, 2, 3, 9, 10, 12) (PSO 1)
- 5. Use Singleton, Double checked locking pattern and Factory method pattern for a given problem design (PO 1, 2, 3, 9, 10, 12) (PSO 1)

Suggested Learning Resources:

Text Books:

- Alan Shalloway, James R Trot, "Design Patterns Explained A New Perspective on Object-Oriented Design", Pearson, 2nd Edition, 4th Impression 2010
- 2. Eric Freeman, Elisabeth Freeman, "Head First Design Patterns", O'reilly Publications, October 2004, 1st Edition
- 3. Satzinger, Jackson, Burd, "Object Oriented Analysis and Design with Unified Process", Thomson Learning, 1st Indian Reprint 2007.

Web links and Video Lectures (e-Resources):

- <u>https://www.udemy.com/course/design-patterns-java/</u>
- <u>https://nptel.ac.in/courses/106105224</u>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Case Study Discussion
- Programming assignment

PYTHON PROGRAMMING LAB

Course Code: ISL56

Credits : 0:0:1

Prerequisite: Nil

Contact Hours: 14

Course Coordinator: Mr. Shivananda S

Course Content

Session	List of Experiments					
1	BASIC OPERATORS:					
	Write a Python program to compute					
	1. Euclidean distance between two point .					
	2. Calculate the electricity bill.					
	for example, electricity charges and rates.					
	1 - 100 unit - 1.5 ₹/unit + additional charges=25.00₹					
	101-200 unit - 2.5₹/unit+ additional charges=50.00₹					
	201-300 unit - 4₹/unit + additional charges=5.00₹					
	300 - 350 unit - 7₹/unit + additional charges=100.00₹					
	above 300 - fixed charge 1500₹					
2.	CONTROL STRUCTURES:					
	Read your email id and write a program to display the no of vowels, consonants,					
	digits and white spaces in it using ifelifelse statement.					
	Find the sum of all the primes below two million.					
3.	LIST:					
	Read a list of numbers and print the numbers divisible by x but not by y (Assume x =					
	4 and $y = 5$).					
	Read a list of numbers and print the sum of odd integers and even integers from the					
	list.(Ex: [23, 10, 15, 14, 63], odd numbers sum = 101, even numbers sum = 24)					
	Read a list of numbers and print numbers present in odd index position. (Ex: [10, 25,					
	30, 47, 56, 84, 96], The numbers in odd index position: 25 47 84).					
	Read a list of numbers and remove the duplicate numbers from it. (Ex: Enter a list					
	with duplicate elements: 10 20 40 10 50 30 20 10 80, The unique list is: [10, 20, 30,					
	40, 50, 80])					
4.	TUPLES:					
	1. Given a list of tuples. Write a program to find tuples which have all elements					
	divisible by K from a list of tuples. test_list = $[(6, 24, 12), (60, 12, 6), (12, 18, 12), (60, 12, 6), (12, 18, 12), (60, 12, 6), (12, 18, 12), (12, 18), (12, 12), (12$					
	21)], K = 6, Output : $[(6, 24, 12), (60, 12, 6)]$					
	2. Given a list of tuples. Write a program to filter all uppercase characters tuples					
	from given list of tuples. (Input: test_list = [("GFG", "IS", "BEST"), ("GFg",					
	"AVERAGE"), ("GfG",), ("Gfg", "CS")], Output : [(,,GFG", ,,IS",,,BEST")]).					
	3. Given a tuple and a list as input, write a program to count the occurrences of					
	all items of the list in the tuple. (Input : tuple = ('a', 'a', 'c', 'b', 'd'), list = ['a', 'b'],					
	Output : 3)					

5.	DICTIONARY:
	 Write a program to do the following operations: Create a empty dictionary with dict() method Add elements one at a time Update existing key"s value Access an element using a key and also get() method Deleting a key value using del() method Write a program to create a dictionary and apply the following methods: pop() method popitem() method clear() method Given a dictionary, write a program to find the sum of all items in the dictionary. Write a program to merge two dictionaries using update() method.
6.	OOPS:
	a) Create a class called CAR, data members (model_name, color, price, top_speed)
	method: read above details using constructor (int) and without constructor.
	Display above detail
	Python Object and Class
	Class Object Lamborghisi Car Car Car Car Car Car Car Car
	b) Write a python program to implement the following using Inheritance
	Base Class: BANK Attribute: Bank_Name, Number_Cust;
	Derived Class: GOVT_BANK Derived Class: PRIVATE_BANK Attribute: Attribute:
	Branch_name, IFSC_Code, IFSC_Code,

7.	OOPS:
	Write python program class TIME member hour, minute, second
	add two TIME object by using operator overloading [by usingadd () magic

subtract add two TIME object by using operator overloading [by usingsub ()						
	subtract add two TIME object by using operator overloading [by usingsub ()					
magic method						
8. FILE HANDLING:	FILE HANDLING:					
1. Write a program to read a filename from the user, open the file (say						
firstFile.txt) and then perform the following operations:	firstFile.txt) and then perform the following operations:					
• Count the sentences in the file.						
• Count the words in the file.						
• Count the characters in the file. 2 Create a new file (Hello tyt) and convite text to other file called target tyt						
The target.txt file should store only lower case alphabets and display the number of lines copied.						
3. Write a Python program to store N student's records containing name, roll						
number and branch. Print the given branch student"s details only.						
9. STRINGS:						
1. Given a string, write a program to check if the string is symmetrical and						
palindrome or not. A string is said to be symmetrical if both the halves of the	e					
string are the same and a string is said to be a palindrome string if one half	f					
the string is the reverse of the other half or if a string appears same when re	d					
forward or backward	u					
2 White a maximum to mail a stain and a scatter and the second term of a second last the second term of the second last term of terms of the second last term of terms of term						
2. Write a program to read a string and count the number of vowel letters and print all letters except 'e' and 's'.						
3. Write a program to read a line of text and remove the initial word from give	n					
text. (Hint: Use split() method, Input : India is my country. Output : is my						
country)						
4 Write a program to read a string and count how many times each letter						
appears (Histogram)						
appears. (mstogram).	appears. (Histogram).					
PARTB						
1. Python statistics module for given data set (label x, label y) (.csv or .xlsx file forma	ts)					
i. Scatter all point graph by matplotlib						
ii. Calculates the mean (average) of the given data set						
iii. Calculates the median (middle value) of the given data.						
iv. Calculates the standard deviation						
v Calculates the variance						
vi Calculate slop btw points						
VI. Calculate slop bitw points						
V11. Draw regression line						

2.	Data visualization with using python (Pandas, matplotlib, Seaborn)								
	Tips database(tips.csv) is the record of the tip given by the customers in a restaurant for								
	two and a half months in the early 1990s. It contains 6 columns such as total bill, tip.								
	sex smoker day time size								
	50X, 5111	oker, duy, th	110, 5120	•					
		total_bill	tip	sex	smoker	day	time	size	
	0	10.34	1.01	Female	No	Sun	Dinner	2	
	2	21.01	3.50	Male	No	Sun	Dinner	3	
	3	23.68	3.31	Male	No	Sun	Dinner	2	
	4	24.59	3.61	Female	No	Sun	Dinner	4	
	5	25.29	4.71	Male	No	Sun	Dinner	4	
	6	8.77	2.00	Male	No	Sun	Dinner	2	
	7	26.88	3.12	Male	No	Sun	Dinner	4	
	8	15.04	1.96	Male	No	Sun	Dinner	2	
	9	14.78	3.23	Male	No	Sun	Dinner	2	
	•	reading the c	latabase	and display	the top 10) rows (1	using panda	us)	
		Scatter Plot	(day ys	tin)	1	,	01	,	
			1 ·						
	•	Line Chart (day agai	nst tip)					
	Bar chart with day against tip								
	•	histogram of	total b	ills					
		8	—						
3.	Write P	vthon progra	m resul	t analvsis w	ith data vis	ualizatio	on on (Pano	las. Mat	plotlib
•		,		j ··				,	F
	Seaborn	1)							
	• Read data from the given result file (.csv format or excel format)								
	• Count the number of pass, and fail each subject and the overall result analyze [
	by using list and dictionary data type]								
	• Visualize output (Scatter Plot, Line Chart, Bar Chart, Histogram, etc)								
4.	Write a Python program that uses MySQL to create a stand-alone application:								
	i. Create a table namely,								
	Customer (CustNo, CustName, Age, Gender, Salary) in MySQL database. CustNo is								
	the primary key								
	-								
	ii. Insert	t values in a	table(5	customer de	etails)				
	iii. Disp	lay Custome	er inforn	nation when	the Salary	is abov	e 80,000. A	And cou	nt the
	number	of male and	female	customers.					
5.	Write a	program to i	nterface	Python wit	h an SQL	database	. Perform l	Insert, U	pdate,
	Delete (Dueries using	o Cursor	and Displa	v Data By	Using fe	etchone() a	nd fetch	all(). Use
	Rowcow	int and Croo	te Datal	ase 2 ispin	<i>, D y</i>				
	Rowcou	int, and Crea		Juse.					
6.	Since a	Login syster	n is core	e for all web	apps that	allow us	er input. er	eate a D	liango
0.	Locim	ustom with a	antim	notion amail		ano // ub	•••	cute u D	J~1150
	Login s	ystem with a	comm	iation emai	l .				

Course outcomes (COs):

At the end of the course, the student will be able to:

- 1. Use internal and external Python libraries, data structures, and functions inherent to Python in-order to handle data. (PO-1, 2, 5, 6, 9,10,12) (PSO-1, 2, 3)
- 2. Identify object-oriented programming constructs for developing large, modular and Apply reusable real-time programs. (PO-1, 2, 5, 6, 9,10,12) (PSO-1, 2, 3)
- 3. Apply Python as a scripting language to analyze huge datasets, and apply data science related statistics to datasets. (PO-1, 2, 5, 6, 9,10, 12) (PSO-1, 2, 3)

Reference Books:

- 1. Michael H Goldwasser, David Letscher, "Object Oriented Programming in Python", Prentice Hall, 1st Edition, 2007.
- 2. Yashavant Kanetkar, Aditya Kanetkar, "Let us Python", BPB publication, 1st Edition, 2019.
- 3. Ashok Kamthane, Amit Kamthane, "Programming and Problem Solving with Python", McGraw Hill Education(India) Private Limited, 2018.
- 4. Taneja Sheetal, Kumar Naveen, "Python Programming A modular approach", Pearson, 2017.
- 5. R Nageswara Rao, "Core Python Programming", Dreamtech press, 2017 Edition.

Web References:

- 1. https://realpython.com/python3-object-oriented-programming/
- 2. https://python.swaroopch.com/oop.html
- 3. https://python-textbok.readthedocs.io/en/1.0/Object_Oriented_Programming.html
- 4. https://www.programiz.com/python-programming/
- 5. https://www.geeksforgeeks.org/python-programming-language/

ADVANCED JAVA LAB

Course Code: ISL57	Credits : 0:0:1
Prerequisite: Object Oriented Programming using Java	Contact Hours: 14

Course Coordinator: Mr. Shivananda S

Course Content

Sl.NO	List of Experiments
1	Write Java program to
	Create a collection of contact lists (contact number and name)
	Accept missed calls from the user and store them in another list. If the caller details
	exist in the contact list, retrieve the caller details else store as "private caller". Store
	them in the order.
	User can trace the missed call list and display them if required.
	Delete the number if user specifies a number to delete.
	Write main program to test the class.
2	Write a Java program using user-defined storage classes to create a book database and
	store it in a Collection List. Books collection should include title, author, publisher
	and price.
	Write method to sort the books in ascending order of price and store it in another List.
	Maintain the book details with respect to a unique book id.
	Prompt for an author name and list all the books with the same author's name.
	Create a new list holding all the book details with price greater than a user specified
	price.
	For a given value by the user, find all the books that match either the whole or a part
	of the book title.
	Identify a publisher and print books from a particular publisher. Update the publisher
	details based on a title.
3	Create a desktop java application using swings to enable a user to enter student
	information such as name, USN, age, address, sgpa of 4 semesters, category.
	Perform validations on age and sgpa. Display appropriate messages in pop up boxes
	to indicate wrong entries.
	On clicking of the "compute" button, find the cgpa based on the obtained sgpa's.
	On clicking of the "done" button, place the student details in a collection.
	A click on the "display" button should display the collection in a textarea.

4	Write a java program using Swings to validate user login information using dialog
	boxes.
	Once validated, allow the user to enter the customer id, if the person is a new
	customer, else check whether the customer exists in a collection and obtain the
	customer id.
	The customer id can be obtained given a mobile number. Allow the user to enter the
	item purchased by giving the item id and quantity purchased.
	On clicking of a button, the item name and the total cost should appear in the
	corresponding GUI components.
	Using option dialog box, indicate the types of discount available for the customer.
	On clicking on the print button, print the details in information dialog box.
5	Write a program that uses Java Swing and JDBC to create a stand-alone application:
	Create a table namely, Customer (CustNo, CustName, State, Credit_Limit, RepNo)
	in MySQL database. CustNo is the primary key
	Use appropriate Swing components to insert values in a form.
	Display Customer information when Credit_Limit is above 15,000.
6	Create a Servlet to file IT returns that accepts personal information, salary
	information and Tax deduction details from the user. Write the information into a
	file. Accept the name of the person and display in on the page.
7	Create a servlet that accepts patient information in a hospital such as patient id,
	patient name, and age, date of admission, cause of admission, doctor diagnosed, and
	treatment proposed. Use HTML for front end.
	Place the details into a database. Allow options to insert and view the contents in the
	database.
8	Create the following application with JSP and Servlet.
	Create a Telephone Directory database that searches the database based on phone
	number or name. Inserting values to the table obtaining the data from the front end.
	Directory Table should include attributes: Phone_Number, Name, Address,
	Company, Pin_Code.
9	Write a Java Program that creates two threads object of Thread class. where one
	thread asks the user to enter a number not less than four digits. Split the digits of the
	number and display in words the value of the number. $\Sigma_{\rm eff} = 0$
	Ex: 1 – One. Second thread finding the number of vowels in a word. Ex: JAVA –
10	Vowel - A, Count – 2.
10	
1	

Course outcomes (COs):

At the end of the course the student will be able to:

- 1. Develop solutions for the given problem using Java and J2EE (PO-1, 2, 3, 5, 6) (PSO-1(3))
- Apply java and J2EE concepts to provide solutions in various domains. (PO-1, 2, 3, 4, 5, 6, 9, 10, 11, 12) (PSO-1)
- 3. Interpret the results and produce the substantial document. (PO-1, 2, 4, 10) (PSO-1)

RESEARCH METHODOLOGY AND INTELLECTUAL PROPERTY RIGHTS

Course Code: AL58

Credits : 3:0:0

Contact Hours: 42

Prerequisite: Nil

Course Coordinator:

Course Content

Unit I

Research Methodology

Introduction: Meaning of Research, Objectives of Research, Types of Research, Ethics in Research, Types of Research Misconduct. Literature Review and Technical Reading, New and Existing Knowledge, Analysis and Synthesis of Prior Art, Bibliographic Databases, Conceptualizing Research, Critical and Creative Reading. **Citations:** Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge flow through Citations, Acknowledgments, and Attributions.

- Pedagogy: Chalk and Talk, PowerPoint Presentations
- Links: <u>https://onlinecourses.nptel.ac.in/noc22_ge08/preview</u>

Unit II

Research Design: Need for Research Design, Important Concepts Related to Research Design: Dependent and Independent Variables, Extraneous Variable, Variable, Common Control, Confounded Relationship, Research Hypothesis, Experimental and Control Groups, Treatments. **Experimental Designs:** Introduction to Randomised Block Design, Complete Randomised Design,

Latin Square Design, and Factorial Design.

- Pedagogy: Chalk and Talk, PowerPoint Presentations
- Links: <u>https://onlinecourses.nptel.ac.in/noc22_ge08/preview</u>

Unit III

Method of Data Collection: Primary and Secondary Data Collection.

Sampling Design: Sampling fundamentals, Measurement, and Scaling Techniques, Criteria of Selecting a Sampling Procedure, Characteristics of a Good Sample Design, and Types of Sample Design. **Data Analysis:** Testing of Hypotheses: Null Hypothesis, Alternative Hypothesis, Type I and Type II Errors, Level of Significance. Procedure for Hypothesis Testing: Mean, Variance, Proportions. Chi-square Test, Analysis of Variance (One Way ANOVA), and Covariance (ANOCOVA)

- Pedagogy: Chalk and Talk, PowerPoint Presentations
- Links: <u>https://onlinecourses.nptel.ac.in/noc23_ge36/preview</u>

Unit IV

Intellectual Property Rights

Introduction to IPR: Different forms of IPR, Role of IPR in Research and Development. TRIPS Agreement, Patent Cooperation Treaty (PCT).**Patents:** Brief history of Patents-Indian and Global Scenario, Principles Underlying Patent Law, Types of Patent Applications in India, Procedure for

Obtaining a Patent. Non Patentable Inventions. Rights Conferred to a Patentee, Basmati Rice Patent Case.

- Pedagogy: Chalk and Talk, PowerPoint Presentations
- Links: <u>https://archive.nptel.ac.in/courses/110/105/110105139/</u>

Unit V

Design: What is a Design? Essential Requirements for a Registrable Design, Procedure of Registration of a Design, **Trademarks:** Essentials of a Trademark, Registration, and Protection of Trademarks, Rights Conferred by Registration of Trademarks, Infringements, Types of Reliefs, Case Studies. **Copyrights:** Characteristics of Copyrights, Rights Conferred by Registration of Copyrights, Registration of Copyrights, Case studies

- Pedagogy: Chalk and Talk, PowerPoint Presentations
- Links: <u>https://archive.nptel.ac.in/courses/110/105/110105139/</u>

Textbooks:

- 1. C. R Kothari, Gourav Garg, Research Methodology Methods and Techniques. New Age International Publishers.
- 2. Dr. B L Wadehra Law relating to Intellectual property. Universal Law Publishing Co.
- Dipankar Deb, Rajeeb Dey, Valentina E. Balas "Engineering Research Methodology", ISSN 1868-4394 ISSN 1868-4408 (electronic), Intelligent Systems Reference Library, ISBN 978-981-13-2946-3 ISBN 978-981-13-2947-0 (eBook), <u>https://doi.org/10.1007/978-981-13-2947-0</u>.

Reference Books:

1. David V. Thiel "Research Methods for Engineers" Cambridge University Press, 978-1-107-03488-4

Course Outcomes (COs):

At the end of the course, the student will be able to:

- 1. Possess the knowledge of research and conduct a literature review. (PO-8, PO-10, PO-12)
- Apply the knowledge of research design and design of experiments. (PO-4, PO-8, PO 10, PO-12)
- 3. Analyse data collection methods, analysis, and sampling design. (PO-4, PO-8, PO-10, PO-12)
- Understand the global and Indian scenarios of patents and patent applications. (PO-8, PO-10, PO-12)
- 5. Acquire the requirements of registration and infringements related to trademarks, copyrights, and designs. (PO-8, PO-10, PO-12)

ABILITY ENHANCEMENT COURSE - V			
Course Code: AEC510 Credits: 1:0:0			
Prerequisite: Nil	Contact Hours: 14L		
Course Coordinator: Any Department			

Ability Enhancement Courses (AEC) are the generic skill courses which are basic and needed by all to pursue any career. These courses are designed to help students enhance their skills in communication, language, and personality development. They also promote a deeper understanding of subjects like social sciences and ethics, culture and human behaviour, human rights and the law.

Every student shall register for AEC course under the supervision of his/her proctor. For III, IV & V semester, the student shall select the Ability Enhancement Course online such that the selected course does not overlap with any professional core/ elective course offered by the parent department of the student. After selection, the registration of the course has to be done by the student at his/her parent department.

ENVIRONMENTAL STUDIES

Credits : 0:0:0 Course Code: HS59 Pre - requisite: Nil

Contact Hours: 14L

Course Content

Unit I

Environment, Ecology and Biodiversity

Definition, scope and importance. Multidisciplinary nature of Environmental studies. Food chain and food web. Energy flow and material cycling in ecosystem. Biodiversity and threats to biodiversity. Concept of sustainable development: Definition, objectives and applications.

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Videos, Models
- Link: https://youtu.be/I bnGkviWOU •
- Link: https://youtu.be/Ar04qG1P8Es

Unit II

Natural resources

Forest resources: Ecological importance of forests. Water resources: Global water resources distribution. Mineral resources: Environmental effects of extracting and processing Mineral resources. Food resources: Effects of modern agriculture. Land resources: Soil erosion and Desertification.

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Videos
- Link: https://youtu.be/vsXv3anIBSU
- Link: https://youtu.be/1rOVPqaUyv8

Unit III

Energy sources

Growing energy needs. Conventional and non conventional / Renewable and Non-renewable energy sources. Bio energy-Ethanol and Bio mass energy. Energy of the future - Hydrogen fuel cells and Nuclear enegry. Environmental Impact Assessment (EIA): Definition, Objectives and benefits. Step by step procedure of conducting EIA.

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Animations, • Models
- Link: https://youtu.be/mh51mAUexK4
- Link: https://youtu.be/XS-eXqppf_w

Unit IV

Environmental pollution

Definition, Causes, Effects and control measures of Water pollution, Air pollution and Soil/ land pollution. Management of Municipal solid Waste and treatment methods of municipal solid waste.

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Videos
- Link: https://youtu.be/NRoFvz8Ugeo
- Link: https://youtu.be/DAQapF-F4Vw

Unit V

Environmental protection

Global warming and Climate change, Acid rain, Ozone layer depletion. Salient features of Environmental Protection Act, Air & Water Acts. Functions of Central and State Pollution Control Boards.

- Pedagogy/Course delivery tools: Chalk and Talk, Power point presentations, Opens source softwares
- Link: https://youtu.be/iV-BvYwl4Y8
- Link: https://youtu.be/BYqLRGawoH0

Text Books:

1. Dr. S M Prakash – Environmental Studies, Elite Publishers, 2007.

Reference Books:

1. **P. Venugopala Rao** – Principles of Environmental Science & Engineering Prentice Hall of India, 1st edition, 2006.

Web links and video Lectures (e- Resources):

- 1. https://youtu.be/I_bnGkviWOU
- 2. https://youtu.be/vsXv3anIBSU
- 3. https://youtu.be/mh51mAUexK4
- 4. https://youtu.be/NRoFvz8Ugeo
- 5. https://youtu.be/iV-BvYwl4Y8

Course Outcomes (COs):

At the end of the course, the student will be able to:

- 1. Describe the importance of environmental studies, sustainable development and biodiversity (PO-1, 7)
- 2. Explain the importance and conservation of impacts of natural resources (PO-1, 7)
- 3. Distinguish the energy sources and identify the alternative energy sources for sustainable development (PO-1, 7)
- 4. Identify the causes, effects and control measures of pollution in developmental activities (PO-1, 7)
- 5. Outline the current environmental issues and the role of the agencies for environmental protection (PO-1, 7)

VI Semester

MANAGEMENT & ENTREPRENEURSHIP

Course Code: AL61

Pre - requisite: Nil

Credits : 3:0:0

Contact Hours: 42

Course Coordinator: Dr. M Rajesh/Dr. Siddhartha Kar

Course Content

Unit I

Introduction to Management: Definition of Management, Its nature and purpose, Contributions of F.W. Taylor and Henry Fayol to management theory, Functions of managers.

Planning: Types of plans, Steps in planning, the planning process, Management By Objectives (MBO)

Organizing: The nature and purpose of organizing, Formal and informal organization.

Organization levels and Span of management, Principle of span of management, the structure and process of organizing

- **Pedagogy:** Chalk board, power point presentations
- Links: https://onlinecourses.nptel.ac.in/noc23_mg33/preview https://www.digimat.in/nptel/courses/video/110107150/L01.html

Unit II

Staffing: Situational factors affecting staffing.

Leading: Human factors in managing, definition of leadership, Ingredients of leadership **Controlling:** Basic control process, Critical control points and standards, Control as a feedback system, Feed forward control, Requirements for effective controls.

- **Pedagogy:** Chalk board, power point presentations
- Links: https://nptel.ac.in/courses/110107150

Unit III

Introduction to Entrepreneurship: The Foundations of Entrepreneurship: What is an Entrepreneurship?, The benefits of Entrepreneurship, The potential drawbacks of Entrepreneurship; Inside the Entrepreneurial Mind: From Ideas to Reality: Creativity, Innovation and Entrepreneurship, Creative Thinking, Barriers to Creativity

- **Pedagogy:** Chalk board, power point presentations
- Links:

https://www.youtube.com/watch?v=Hgj_kRrvbhQ&list=PL7oBzLzHZ1wXW3mtolxV5nIG n48NLKwrb

Unit IV

The Entrepreneurial Journey: Crafting a Business Plan: The benefits of creating a business plan, The elements of a business plan; Forms of Business Ownership and Buying an Existing Business: Sole proprietorships and partnership.

Pedagogy: Chalk board, power point presentations

• Links:

https://www.youtube.com/watch?v=Tzzfd6168jk&list=PLyqSpQzTE6M8EGZbmNUuUM7 Vh2GkdbB1R

Unit V

Launching the Business: Franchising and the Entrepreneur: Types of Franchising, The benefits of buying a Franchise; E-Commerce and the Entrepreneur: Factors to consider before launching into E-commerce, Ten Myths of E-Commerce.

- Pedagogy: Chalk board, power point presentations
- Links: https://www.youtube.com/watch?v=5RMqxtMwejM&list=PLyqSpQzTE6M9zMKj_PSm81 k9U8NjaVJkR

Textbooks:

- 1. Harold Koontz, H. Weihrich, and A.R. Aryasri, Principles of Management, Tata McGraw-Hill, New Delhi, 2004.
- 2. Essentials of Entrepreneurship and Small Business Management Norman Scarborough & Jeffrey Cornwall (Pearson, 2016)

References:

- 1. Innovation & Entrepreneurship Peter Drucker (Harper, 2006)
- 2. Entrepreneurship: The Art, Science, and Process for Success Charles Bamford & Garry Bruton (McGraw-Hill, 2015)
- 3. Managent and Enterpreneuship-NVR Naidu, T Krishna Rao, I.K. International Publishing House Pvt. Ltd., 2008
- 4. Poornima M Charantimath, Entrepreneurship Development and Small Business Enterprises, Pearson Education, 2006.

Course Outcomes (COs):

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

- 1. Plan and organize for the manpower in the given type of organization (PO: 6,9,11)
- 2. Use staffing Leading and controlling function for the given organization. (PO: 6,8,9,10)
- 3. Understand the fundamentals of entrepreneurship with the goal of fulfilling the requirements of the industries and holding the responsibilities towards the society. (PO-6,7,8)
- 4. Design a basic business plan by considering case studies and show the involvement of ownership in Business. (PO-3,7,8,11)
- 5. Start a new small business with the help of E-Commerce and the current available technologies. (PO-5,11)

MACHINE LEARNING				
Course Code: IS62	Credits: 3:0:0			
Pre - requisite: Nil	Contact Hours: 42			
Course Coordinator: Dr. Karthik V				

Unit I

Introduction to Machine Learning: Learning Paradigms

Getting to Know Your Data: Data Objects and Attribute Types, Nominal Attributes, Binary Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes,

Measuring Data Similarity and Dissimilarity: Data Matrix versus Dissimilarity Matrix, Proximity Measures for Nominal Attributes, Proximity Measures for Binary Attributes, Dissimilarity of Numeric Data: Minkowski Distance, Proximity Measures for Ordinal Attributes, Dissimilarity for Attributes of Mixed Types, Cosine Similarity

Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias. Problems on Candidate Elimination and Find-S.

Unit II

Data Preprocessing: Data Cleaning, Missing Values, Noisy Data, Data Cleaning as a Process
Data Integration: Redundancy and Correlation Analysis, Tuple Duplication
Data Reduction: Principal Components Analysis, Attribute Subset Selection
Evaluation Metrics: ROC Curves, Confusion Metrics, Precision, Recall, F Measure
Supervised Learning: Linear and Non-Linear examples – Multi-Class & Multi-Label classification
– Linear Regression – Multilinear Regression

Unit III

Naïve Bayes Classifier, Decision Trees: ID3, CART, K-NN classifier, Logistic regression, Perceptrons – Single layer & Multi-layer, Support Vector Machines – Linear & Non-linear.

Unit IV

Clustering basics: Partitioned (K-Means clustering, K-Mode clustering), Hierarchical (Agglomerative versus Divisive Hierarchical Clustering), and Density-based (DBSCAN: Density-Based Clustering Based on Connected Regions with High Density), Expectation maximization.

Unit V

Introducing Ensemble Methods: Bagging and Boosting (Random forests, Adaboost, XG boost inclusive), Outlier Analysis (Z-Score)

Model selection & evaluation: Holdout Method and Random Subsampling, Cross-Validation, Bootstrap, Model Selection Using Statistical Tests of Significance

Course outcomes (COs):

At the end of the course, the student will be able to:

- 1. Understand various types of data and their preprocessing methods. (PO-1) (PSO-3)
- 2. Analyze the various performance metrics used in machine learning. (PO- 1, 2, 9, 10) (PSO- 3)
- 3. Use supervised learning methods for Classification and Regression (PO- 1, 2, 3, 9,10,12) (PSO- 3)
- 4. Apply appropriate clustering techniques for a given scenario (PO- 1, 2, 3, 9,10,12) (PSO- 3)
- 5. Understand various validation methods for appropriate model selection (PO-1) (PSO-3)

Suggested Learning Resources:

Text Books:

- 1. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Prentice Hall of India, Third Edition 2014.
- 2. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar "Foundations of Machine Learning", MIT Press, 2012.

References:

- 1. Tom Mitchell, —Machine Learning, McGraw Hill, 3rd Edition, 1997.
- 2. Charu C. Aggarwal, —Data Classification Algorithms and Applicationsl, CRC Press, 2014.
- 3. Christopher M. Bishop, —Pattern Recognition and Machine Learning, Springer 2011 Edition.
- 4. Jiawei Han, Micheline Kamber and Jian Pei, Data Mining: Concepts and Techniques, 3rd ed, The Morgan Kaufmann Series in Data Management Systems Morgan Kaufmann Publishers, July 2011.

Web links and Video Lectures (e-Resources):

https://www.coursera.org/specializations/machine-learning-introduction

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Programming Assignments
- Literature Review/MOOC

MACHINE LEARNING LAB

Course Code: ISL65

Credits : 0:0:1

Pre - requisite: Python

Contact Hours: 28

Course Coordinator: Dr. Karthik V

Course Content

 Model Measurement Analysis: Create a dataset of your choice with at least 10 records. E.g. Corona Virus patients who were tested, Student assignments subjected to plagiarism check. Assume a sample size of 100. Record the values of TP, TN, FP, FN with varying thresholds set. At each step of varying thresholds calculate the values of Precision, Recall, F1 Score as well as the TPR and FPR. Plot the ROC Curve. Analyze, Interpret. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples
 records. E.g. Corona Virus patients who were tested, Student assignments subjected to plagiarism check. Assume a sample size of 100. Record the values of TP, TN, FP, FN with varying thresholds set. At each step of varying thresholds calculate the values of Precision, Recall, F1 Score as well as the TPR and FPR. Plot the ROC Curve. Analyze, Interpret. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples
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 FN with varying thresholds set. At each step of varying thresholds calculate the values of Precision, Recall, F1 Score as well as the TPR and FPR. Plot the ROC Curve. Analyze, Interpret. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples
 values of Precision, Recall, F1 Score as well as the TPR and FPR. Plot the ROC Curve. Analyze, Interpret. 2 For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples
Curve. Analyze, Interpret. 2 For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples 2 Write a group to demonstrate the working of the decision trac head ID2 algorithm
2 For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples
demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples
all hypotheses consistent with the training examples
2 White a new group to down strate the working of the desigion trace based ID2 algorithms
3 Write a program to demonstrate the working of the decision tree based in 3 algorithm.
Use an appropriate data set for building the decision tree and apply this knowledge to
classify a new sample.
4 Supervised Learning Algorithms - Decision Trees: Implement decision trees
considering a data set of your choice.
a. Create a CART Decision Tree
b. Compare and Contrast the two
5 Supervised Learning Algorithms - Linear Regression: Consider a dataset from
Derived the secret on the test data and output PMSE and P Squared Secret Include
appropriate code spippets to visualize the model. Interpret the result
6 Probabilistic Supervised Learning - Naive Bayes: Create a dataset from the sample
given to you (e.g. "Play Tennis Probability" "Shonner Buying Probability" etc.)
Perform the necessary are processing steps such as encoding. Train the model using
Naiva Payas Classifier, Give new test data and predict the classification output
Naive Bayes Classifier. Give new test data and predict the classification output.
Handcode the classification probability and compare with the model output. Analyze
and write the inference.
7 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. You can use Java/Python ML library classes/API.
8 Un-Supervised Learning Algorithms - K-Means Clustering: Build a K-Means
Model for the given dataset. In K-Means choosing the K value that gives a better
model is always a challenge. We increase the value of K with a dataset having N
points, the likelihood of the model increases, and obviously K <n, or<="" rank="" so="" th="" to=""></n,>
maximize the likelihood we use BIC (Bayesian Information Criterion. Now,
(a) Build a K-Means Model for the given Dataset (You can use the library functions)
(b) Implement the BIC function that takes the cluster and data points and returns BIC
(c) Implement a function to nick the best K value, that is maximize the RIC

	(d) Visualize the pattern found by plotting K v/s BIC.
9	Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10	Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Course outcomes (COs):

At the end of the course the student will be able to:

- 1. Understand the implementation procedures for the machine learning algorithms. (PO -1, 2, 3, 4, 5) (PSO -1, 3)
- 2. Design Java/Python programs for various Learning algorithms. (PO 1, 2, 3, 4, 5) (PSO -1, 3)
- Apply appropriate data sets to the Machine Learning algorithms. (PO 1, 2, 3, 4, 5) (PSO 1, 3)
- Identify and apply Machine Learning algorithms to solve real world problems. (PO 1, 2, 3, 4, 5) (PSO 1, 3)

DEVOPS LAB	
Course Code: ISL66	Credits : 0:0:1
Pre - requisites:	Contact Hours: 28
Course Coordinator: Mr. Jagadeesh Sai D	

Sl.NO	List of Experiments
1	Write code for a simple user registration form for an event.
2	Explore Git and GitHub commands
3	Practice source code management on GitHub. Experiment with the source code
	written in exercise 1.
4	Jenkins installation and setup, explore the environment.
5	Demonstrate continuous integration and development using Jenkins
6	Explore Docker commands for content management.
7	Develop a simple containerized application-using Docker.
8	Integrate Kubernetes and Docker
9	Automate the process of running containerized applications developed in exercise7
	using Kubernetes.
10	Install and explore Selenium for automated testing.
11	Write a simple program in JavaScript and perform testing using Selenium.
12	Develop test cases for the above-containerized application using selenium.

Course outcomes (COs):

At the end of the course, the student will be able to:

- 1. Demonstrate the DevOps culture by illustrating application's cloud infrastructure and configuration management with Ansible. (PO-2, 3, 5, 9, PSO-3)
- 2. Apply the DevOps pipeline process starting with continuous integration and continuous deployment principles. (PO-2, 3, 5, 9, PSO-3)
- 3. Demonstrate how to create and run a container from a Docker file and deploy a complex application on Kubernetes. (PO-2, 3, 5, 9, PSO-3)

MINI-PROJECT				
Course Code: ISP67	Credits: 0:0:4			
Pre - requisites:	Contact Hours:			
Course Coordinator: Internal Guide				

Guidelines:

Students have to work in a group of 3/4 to solve a problem in the specific domain. An Internal Guide is allotted per batch based on their domain of expertise who guides and monitors the project progress. The Internal Guide can arrange for doubt clarification classes if requested by his/her project student and records the same.

Following are the Rubrics considered for Evaluation of mini-project:

Relevance of Project: Student are expected to clearly state the relevance of project to current IT environment and Society in general

Literature Survey: Student need to study research articles/ existing projects to identify the gaps in the identified problem statement.

Design: Student should prepare design document by considering class/use case/component diagram/state model/sequence model/activity/Interaction model.

Implementation: Student need to implement the designed model using the suitable techniques.

Presentation: Periodically student need to present their progress in front of the evaluation committee. Depending upon the quality of ppt, depth of coverage, answering capabilities to questions raised and division of labor identified during presentation and team work, evaluation committee will be deciding score in this criteria for individual students.

Report: Each group need to prepare the project report and submit the same to the department. Reports need to be adhered to the standard format defined by the department.

Course Outcomes (COs):

At the end of the course Students will be able to:

- 1. Identify a problem, review research literature and analyze requirements (POs 1,12) (PSO 1, 2, 3)
- 2. Schedule milestone and deliverables using appropriate project management techniques (POs 8,9,10,11).
- 3. Design and implement the solution to selected problem using standard models and processes (POs 1,2,3,4,5,6,7,8,9, 10,11,12) (PSO 1,2, 3)
- 4. Analyze the results and produce substantial written documentation (POs 1,2,4,,8,9, 10,11,12)(PSO 1,2,3)

MOBILE APPLICATION DEVELOPMENT-II

Course Code: ISE631

Credits : 3:0:0

Pre - requisites: Nil

Contact Hours: 42

Course Coordinator: Dr. Shashidhara H S

Course Content

Unit I

Scroll View and Table View Controllers

Protocols - CustomStringConvertible, Equatable, Comparable, Codable, Creating Protocol, Delegation, App Anatomy and Life-Cycle - Stages of App Life-Cycle, AppDelegate Methods, SceneDelegate Methods, Example code - App Event Count, Model-View-Controller - Meal List TableView Controller, Project Organisation, Example code - Favorite Athletes, Scroll Views - Example code - I Spy, Table Views - Anatomy of a TableView, Custom TableView Cells, Edit TableViews, Add and Edit Emoji, Example code - Favorite Books.

Unit II

System view controllers and data persistence

Saving Data - Encoding and Decoding using Codable, Writing Data to a File, Example code - Remember your Emoji, System View Controllers - Share with the Activity Controller, Use Safari Services to Display Web Contents, present an AlertController, Access the Camera, Send Email from your App, Example Code - Home Furniture Sharing, Complex Input Screens - Date Pickers, Binary Input, Predefined Options, Employee Roaster Example

Unit III

Closures - Syntax, Passing Closures as Arguments, Additional Syntactic Sugars while using Closures as Parameters, Collection Functions using Closures (map, reduce, filter and sort(by:)), Extensions - Adding Computed Properties, Adding Instance or Type Methods, Organizing Code using Extensions, Practical Animations - Uses of Core Animation in Apps, Animation Closures, The Transform Property, Animation at work using Music App Template, HTTP and URL - Creating URLs, Creating and Executing a Network Request, Processing the Response, Work with API, Modify a URL with URL Components, Decoding JSON - JSON Basics, Decoding into Swift Types, Decoding into Custom Model Objects, Write a Completion Handler, Addressing Failure, Concurrency - Concurrency and Grand Central Dispatch, App Transport Security and HTTP Protocol

Unit IV

Collection View - Anatomy of a Collection View, Collection View Layout, Emoji Dictionary App, Swift Generics - Generic Types, Generic Functions, Morse Code App, Dynamic Data - Adding a Search Controller, Handling Data Changes, Diffable Data Source, Compositional Layout Components, Supplementary and Decoration Views, Multiple Layouts, Local Notifications - Best Practices, Requesting Permissions, Handling and Responding to Notifications, Actionable Notifications, Foreground Notification Handling

Unit V

Guided Projects - List (using Tables and Persistence), Restaurant (using Web), Habits (using Advanced Data Display), App Personality, -App Icons Best Practices, Launch Screens, Color, Images and Icons, Animation, Typography, The Design Cycle

Course outcomes (COs):

At the end of the course, the student will be able to:

- 1. Create lists using scroll view and table view controllers (PO 1, 2, 3, 5)(PSO 1, 2)
- 2. Use system view controllers and build complex views (PO 1, 2, 3, 4, 5)(PSO 1, 2)
- 3. Encode and decode data to and from web (PO 1, 2, 3, 5)(PSO 1, 2)
- 4. Work with Collection Views (PO 1, 2, 3, 5)(PSO 1, 2)
- 5. Design, prototype and architect a project (PO 1, 2, 3, 4, 5)(PSO 1, 2)

Suggested Learning Resources:

Text Books:

1. Develop in Swift Data Collections, Apple Books

Web links and Video Lectures (e-Resources):

- https://books.apple.com/us/book/develop-in-swift-data-collections/id1581183203
- https://www.youtube.com/@iOSAcademy

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

• Design and develop a fully functional iOS App

INTERNET OF THINGS	
Course Code: ISE632	Credits : 3:0:0
Pre - requisites: Nil	Contact Hours: 42
Course Coordinator: Mr. Jagadeesh Sai D	

Unit I

Introduction to Internet of Things Definition & Characteristics of IoT, Physical Design of IoT Things in IoT, IoT Protocols, Logical Design of IoT, IoT Functional Blocks, IoT Communication Models, IoT Communication APIs, IoT Enabling Technologies, Communication Protocols, Embedded Systems IoT Levels & Deployment Templates, IoT Levels

Unit II

IoT and M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT, Software Defined Networking, Network Function Virtualization, IoT System Management with NETCONF-YANG, Need for IoT Systems Management, Simple Network Management Protocol (SNMP)

Unit III

IoT Platforms Design Methodology: IoT Design Methodology, Purpose & Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specifications, IoT Level Specification, Functional View Specification, Operational View Specification, Device & Component Integration, Application Development, **IoT Systems** - Logical Design using Python ,Functions Modules ,Packages ,File Handling Operations Classes, Python Packages of Interest for IoT.

Unit IV

Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces, Serial SPI, I2C, Programming Raspberry Pi with Python, Controlling LED with Raspberry Pi , Interfacing an LED and Switch with Raspberry, Interfacing a Light Sensor (LDR) with Raspberry Pi ,Other IoT Devices, pcDuino, Beagle Bone Black, Cubie board.

Unit V

Python Web Application Framework – Django, Django Architecture, Starting Development with Django, Designing a RESTful Web API, Amazon Web Services for IoT, Amazon EC2, Amazon AutoScaling, Amazon S3, Amazon RDS Amazon DynamoDB, Amazon Kinesis, Amazon SQS, Amazon EMR, SkyNet IoT Messaging Platform, INTEL Gen2, UDDO Board example.

Course outcomes (COs):

At the end of the course, the student will be able to:

- 1. Understand the design issues and fundamentals of IoT (PO-1,9,10,12) (PSO-2,3)
- 2. Design various methodologies for M2M and SDN architectures. (PO-1,9,10,12) (PSO-2,3)
- 3. Distinguish different cloud-based solution for IoT (PO-1,2,9,10,12) (PSO-2,3)
- 4. Develop IoT-based solutions for real-world problems. (PO-1,2,3,4,5,6,9,10,12)(PSO-2,3)
- 5. Analyze the various data analytical tools in IoT (PO-1,2,9,10,12) (PSO- 2,3)

Suggested Learning Resources:

Text Books:

1. Internet of Things (A Hands-on-Approach) by Arshdeep Bagha, Vijay Madisetti University press 2015.

Web links and Video Lectures (e-Resources):

• https://nptel.ac.in/courses/106105166

Activity Based Learning (Suggested Activities in Class)/ Practical Based Learning

Project-based learning

BLOCKCHAIN ESSENTIALS & DAPPS	
Course Code: ISE633	Credits : 3:0:0
Pre - requisites: Nil	Contact Hours: 42L
Course Coordinator: Dr. Sanjay H A	

Unit I

Distributed systems, CAP theorem, Byzantine Generals problem, Consensus. The history of blockchain, Introduction to blockchain, Various technical definitions of blockchains, Generic elements of a blockchain, Features of a blockchain, Applications of blockchain technology, Tiers of blockchain technology, Consensus in blockchain, CAP theorem and blockchain, Benefits and limitations of blockchain

Unit II

Decentralization using blockchain, Methods of decentralization, Blockchain and full ecosystem decentralization, Smart contract, Decentralized organizations, Decentralized autonomous organizations, Decentralized autonomous corporations, Decentralized autonomous societies Decentralized applications, Platforms for decentralization,

Cryptographic primitives: Symmetric cryptography, Asymmetric cryptography, Public and private keys Hash functions: Compression of arbitrary messages into fixed length digest, Easy to compute, Pre-image resistance, Second pre-image resistance, Collision resistance, Message Digest (MD), Secure Hash Algorithms (SHAs), Merkle trees, Patricia trees, Distributed hash tables (DHTs), Digital signatures, Elliptic Curve Digital signature algorithm (ECDSA)

Unit III

Bitcoin, Bitcoin definition, Transactions, The transaction life cycle, The transaction structure, Types of transaction, The structure of a block , The structure of a block header, The genesis block, The bitcoin network, Wallets, Smart Contracts-History, Definition, Ricardian contracts, Smart contract templates, Oracles, Smart Oracles, Deploying smart contracts on a blockchain, The DAO

Unit IV

Ethereum 101, Introduction, Ethereum clients and releases, The Ethereum stack, Ethereum blockchain, Currency (ETH and ETC), Forks, Gas, The consensus mechanism, The world state, Transactions, Contract creation transaction, Message call transaction, Elements of the Ethereum blockchain, Ethereum virtual machine (EVM), Accounts, Block, Ether, Messages, Mining, The Ethereum network Hands-on: Clients and wallets -Geth

Unit V

Hyperledger, Hyperledger as a protocol, Fabric, Hyperledger Fabric, Sawtooth lake, Corda

Course outcomes (COs):

At the end of the course, the student will be able to:

- 1. Illustrate the Blockchain terminologies with its applications. design (PO 1) (PSO 2)
- 2. Analyze the working principles of Blockchain (PO 1, 2, 9, 10, 12) (PSO 2)
- 3. Comprehend the principles and methodologies used in Bitcoin (PO 1, 9, 10, 12) (PSO 2)
- 4. Create Ethereum Network, Wallets, Nodes, Smart contract & DApps (PO 1, 2, 3, 5, 9, 10, 12) (PSO 2)
- 5. Develop Blockchain Based Application Architecture using Hyperledger (PO 1, 2, 3, 5, 9, 10, 12) (PSO 2)
- 6. Illustrate the Smart Contract Lifecycle (PO 1, 2, 3, 9, 10, 12)(PSO 2)

Text books:

1. Imran Bashir. "Mastring BlockChain", Packt

Reference:

1. Mastering Bitcoin: Programming the Open Blockchain Paperback – 2017 by Andreas M. O'rielly

Web links and Video Lectures (e-Resources):

• https://nptel.ac.in/courses/106104220

Activity Based Learning (Suggested Activities in Class)/ Practical Based Learning

- Project-based learning
- Tool Demonstration

SYSTEM SIMULATION AND MODELING	
Course Code: ISE634	Credits: 3:0:0
Pre - requisites: Engineering Mathematics	Contact Hours: 42
Course Coordinator: Mushtaq Ahmed D M	

Unit I

Introduction to Simulation: When simulation is the appropriate tool and when it is not appropriate, Advantages and disadvantages of Simulation, Areas of application, Systems and system environment, Components of a system, Discrete and continuous systems, Model of a system, Types of Models, Discrete-Event System Simulation, Steps in a Simulation Study; Simulation examples: Simulation of queuing systems, Simulation of inventory systems

Unit II

Concepts in Discrete-Event Simulation: The Event-Scheduling / Time-Advance Algorithm, World Views, Manual simulation Using Event Scheduling; List processing, Simulation in Java, Simulation in GPSS; **Statistical Models in Simulation:** Review of terminology and concepts, Discrete distributions, Continuous distributions-Uniform distribution, Exponential distribution, Normal distribution.

Unit III

Queuing Models: Characteristics of queuing systems, Queuing notation, Long-run measures of performance of queuing systems, Steady-state behavior of M/G/1 queue, Networks of queues: **Input Modeling**: Data Collection, Identifying the distribution with data, Parameter estimation, Goodness of Fit Tests, Selecting input models without data, Time Series Input Model.

Unit IV

Random-Number Generation: Properties of random numbers, Generation of pseudo-random numbers; Techniques for generating random numbers; Tests for Random Numbers. **Random Variate Generation**: Inverse transform technique-Exponential Distribution, Uniform Distribution, Discrete Distributions, **Acceptance-Rejection technique**: Poisson Distribution, Convolution method.

Unit V

Measures of performance and their estimation: Output analysis for terminating simulations Continued., Output analysis for steady-state simulations. **Verification and Validation of Simulation Models:** Model building, verification and validation, Verification of simulation models, Calibration and validation of models, **Estimation of Absolute Performance**: Types of simulations with respect to output analysis, Stochastic nature of output data; Absolute measures of performance and their estimation,

Course outcomes (COs):

At the end of the course, the student will be able to:

- 1. Understand the concepts used to develop simulation models. (PO 1,2) (PSO-2)
- 2. Apply discrete event and statistical models simulation techniques to solve the given problem. (PO-1,2,3) (PSO-2)
- 3. Apply various techniques for random number and random variate generation. (PO-1,2,3) (PSO-2)
- 4. Analyze Queueing and Input modeling techniques. (PO-1,2) (PSO-2)
- 5. Understand the concepts of verification, validation and estimation of simulation models. (PO 1) (PSO-2)

Suggested Learning Resources:

Text Book:

1. Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol: Discrete-Event System Simulation, Fifth Edition, Pearson Education, 2013.

References:

- 1. Lawrence M. Leemis, Stephen K. Park: Discrete Event Simulation: A First Course, Pearson Prentice-Hall, 2006.
- 2. Sheldon M. Ross: Simulation, Fourth Edition, Elsevier, 2006.
- 3. Averill M. Law: Simulation Modeling and Analysis, Fourth Edition, Tata McGraw-Hill, 2007

Web links and Video Lectures (e-Resources):

 <u>https://www.youtube.com/watch?v=zmbS_TmNDP4&list=PLSGws_74K01-</u> <u>4rcWuB5BEATHSsOrBd1ye</u>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning \cdot Case Studies on different simulation applications.

- Quizzes
- Seminar

BUSINESS ANALYTICS	
Course Code: ISE641	Credits : 3:0:0
Pre - requisites: Nil	Contact Hours: 42L
Course Coordinator: Mushtaq Ahmed D M	

Unit I

Introduction: Overview of the strategic impact of BAI across key industries-Analytics 3.0-the nature of analytical competition- what makes an analytical competitor- analytics and business performance- Competing on Analytics with Internal and external Processes- A Road Map to Enhanced Analytical Capabilities- Managing Analytical People- The Architecture of Business Intelligence –Essential Practice Skills for High-Impact Analytics Projects: Listening to client, Framing the central problem, Scoping a project, Defining metrics for success, Creating a work plan, Assembling data and expert sources.

Unit II

Descriptive Analytics: Data Types and Scales, Types of Data Measurement Scales, Population and Sample, Measures of Central Tendency, Percentile, Decile, and Quartile, Measures of Variation, Measures of Shape –Skewness and Kurtosis, Data Visualization.

Unit III

Data Mining: Data Mining, application of data mining, Anomaly Detection, Association Rule Learning, Cluster Analysis, Statistical Classification, Regression Analysis, Automatic Summarization, Examples of Data Mining.

Unit IV

Data Warehousing: Data Warehouse, Data Mart, Master Data Management, Dimension (Data Warehouse), Slowly Changing Dimension, Data Vault Modeling, Extract, Transform, Load, Star Schema, Mapping problems to machine learning tasks, Evaluating models, Validating models.

Unit V

Essential Aspects of Business Intelligence: Context Analysis, Business Performance Management, Business Process Discovery, Information System, Organizational Intelligence, Data Visualization, Data Profiling, Data Cleansing, Process Mining, Competitive Intelligence, Operational Intelligence, Business Activity Monitoring, Complex Event Processing, Business Process Management, Metadata, Root Cause Analysis.

Course outcomes (COs):

At the end of the course, the student will be able to:

- 1. Understand various elements of analytics: business context, technology and data science. (PO-1, 2, 3, 12) (PSO-2)
- 2. Understand the emergence of analytics as a competitive strategy. (PO-1, 2, 3, 12) (PSO-2)

- 3. Manipulate data preprocessing, data Warehouse and OLAP technology, data cube technology; mining frequent patterns and association, classification, clustering, and outlier detection. (PO-1, 2, 3, 4, 12) (PSO-2)
- 4. Analyse effective communication using analytics. (PO-1, 2, 3, 4, 12) (PSO-2)
- 5. Analyse various tools and techniques in analytics with business applications. (PO-1, 2,3, 4, 5, 12) (PSO-2)

Suggested Learning Resources:

Text Books:

- 1. Sharda R, Delen D, Turban E, Aronson J, Liang T. P, (2014), Business Intelligence and Analytics: Systems for Decision Support, 10th edition, Pearson Education.
- 2. Drew Bentley, "Business Intelligence and Analytics" Library Press publication -2017
- 3. U. Dinesh kumar, "Business Analytical The science of data driven decision
- 4. making", Wiley 2017

Reference Books:

- 1. Glenn J. Myatt, "Making Sense of Data : A Practical Guide to Exploratory Data Analysis and Data Mining", John Wiley & Sons, Second Edition, 2014.
- 2. Carlo-Vercellis, "Business intelligence datamining and optimization for decision making", First Edition.
- 3. An Introduction to Business Analytics, Ger Koole, Lulu.com, 2019.

Web links and Video Lectures (e-Resources):

https://nptel.ac.in/courses/110106050

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- MOOC Course
- Business Analysis on Social Media Plat form.

STORAGE AREA NETWORKS	
Course Code: ISE642	Credits : 3:0:0
Pre - requisites: Computer Networks	Contact Hours: 42L
Course Coordinator: Dr. Anitha P	

Unit I

Introduction to Information Storage and Management: Information Storage, Evolution of Storage Technology and Architecture, Data Center Infrastructure. Data Protection: RAID - Implementation of RAID, RAID Array Components, RAID Levels, RAID Comparison, RAID Impact on Disk Performance

Unit II

Intelligent Storage System: Components of an Intelligent Storage System, Intelligent Storage Array. **Direct-Attached Storage and introduction to SCSI:** Types of DAS, DAS Benefits and Limitations, Disk Drive Interfaces, Introduction to Parallel SCSI.

Unit III

Storage Area Networks: Fibre Channel: Overview, The SAN and Its Evolution, Components of SAN, Zoning, **Network-Attached Storage:** General-Purpose Servers vs. NAS Devices, Benefits of NAS, NAS File I/O, Components of NAS, NAS Implementations, NAS File-Sharing Protocols.

Unit IV

IP SAN: iSCSI, FCIP **Storage Virtualization:** Forms of Virtualization, Storage Virtualization Configurations, Storage Virtualization Challenges, Types of Storage Virtualization.

Unit V

Introduction to Business Continuity: Information Availability, BC Terminology, BC Planning Lifecycle, Business Impact Analysis, case study on EMC PowerPath. **Backup and Recovery:** Backup Purpose, Backup Considerations, Backup Granularity, Backup Methods, Backup and Restore Operations, Backup Topologies.

Course outcomes (COs):

At the end of the course, the student will be able to:

- 1. Understand the architecture, components and data protection of storage subsystems. (PO 1) (PSO 2)
- 2. Explain the components of intelligent storage systems and DAS. (PO 1, 9, 10, 12) (PSO 2)
- Describe various storage network technologies and concept of NAS. (PO 1, 9, 10, 12) (PSO 2)
- 4. Understand the concept of IP SAN and storage virtualization (PO 1, 9, 10, 12) (PSO 2)
- 5. Describe Business Continuity, Backup and recovery. (PO 1, 9, 10, 12) (PSO 2)

Suggested Learning Resources:

Text Book:

1. EMC Education Services, "Information Storage and Management", Wiley India Publications, 2009. ISBN: 9781118094839

References:

 Paul Massiglia, Richard Barker, "Storage Area Network Essentials: A Complete Guide to Understanding and Implementing SANs Paperback", 1st Edition, Wiley India Publications, 2008

Web links and Video Lectures (e-Resources):

• https://www.youtube.com/watch?v=akEr8cUAd5g

Activity Based Learning (Suggested Activities in Class)/ Practical Based Learning

- Quiz
- Case study

NATURAL LANGUAGE PROCESSING	
Course Code: ISE643	Credits : 3:0:0
Pre - requisites: Nil	Contact Hours: 42
Course Coordinator: Dr. Rajeshwari S B	

Unit I

NLP-A Primer: NLP in the Real World, NLP Tasks, What is Language?, Building Blocks of Languages, Why is NLP Challenging?, Machine Learning, Deep Learning, Learning, and NLP: An Overview, Approaches to NLP, Heuristics-Based NLP, Machine Learning for NLP, Deep Learning for NLP, Why Deep Learning Is Not Yet the Silver Bullet for NLP, **NLP Pipeline**.

Unit II

Text Representation: Vector Space Models, Basic Vectorization Approaches, One-Hot Encoding, bag of Words, bag of N-Grams, TF-IDF, Distributed, Representations, Word Embeddings, Going Beyond Words, Distributed Representations Beyond Words and Characters, Universal Text Representations, Visualizing Embeddings, Handcrafted Features Representations.

Unit III

Text Classification: Applications, A Pipeline for Building Text Classification Systems, One Pipeline-Many Classifiers, Using Neural Embeddings in Text Classification, Deep learning for Text Classification, Interpreting Text Classification models, Learning with No or Less Data and Adapting to New Domains, Case Study: Corporate Ticketing.

Unit IV

Information Extraction: IE Applications, IE Tasks, The General Pipeline for IE, Keyphrase Extraction, Implementing KPE, Practical Advice, Named Entity Recognition, Building an NER System, NER using an Existing Library, NER using Active Learning, Practical Advice, Named Entity Disambiguation and Linking, NEL using Azure API, Relationship Extraction, Approaches to RE, RE with the Watson API, Other Advanced IE Tasks, Temporal Information Extraction, Event Extraction, Template Filling, Chatbots.

Unit V

BERT: Starting Off with the BERT, A Primer on Transformers, Understanding the BERT Model, Getting Hands-On with BERT.

Course outcomes (COs):

At the end of the course, the student will be able to:

- 1. Understand the NLP fundamentals and different approaches to build NLP Models. (PO 1) (PSO 3)
- 2. Illustrate the different approaches of text representation in NLP. (PO 1, 9, 10, 12) (PSO 3)
- 3. Describe text classification and interpretation of NLP Models. (PO 1, 9, 10, 12) (PSO 3)

- 4. Build NER system requitred for IE. (PO 1, 2, 3, 5) (PSO 3)
- 5. Evaluate various NLP models using BERT. (PO 1, 2, 3, 4, 5, 9, 10, 12) (PSO 3)

Suggested Learning Resources:

Text Books:

- 1. Practical NLP : A Comprehensive Guide to Building Real-World NLP Systems, Sowmya, Vajjala, Bodhisattwa Majumder, Anuj Gupta & Harshit Surana, O'Reilly, 2020.
- 2. Getting Started with Google BERT: Build and Train State-of-the-Art NLP Models using BERT, Sudharsan Ravichandiran, 2021.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=bDPULOFFlaI
- <u>https://www.youtube.com/watch?v=iY-YRQp-UD0</u>

Activity Based Learning (Suggested Activities in Class)/ Practical Based Learning

- Programming Assignment
- Case Study

CLOUD COMPUTING	
Course Code: ISE644	Credits: 3:0:0
Pre - requisites: Nil	Contact Hours: 42
Course Coordinator: Dr. S R Manisekhar	

Unit I

Introduction: Network centric computing and network centric content, Peer-to-peer systems, Cloud Computing, Cloud Computing delivery models & Services, Ethical issues, Cloud vulnerabilities, Challenges. **Cloud Infrastructure:** Amazon, Google, Azure & online services, open source private clouds. Storage diversity and vendor lock-in, intercloud, Energy use & ecological impact of data centers, service level and compliance level agreement, Responsibility sharing, user experience, Software licensing.

Unit II

Cloud Computing: Applications & Paradigms, Challenges, existing and new application opportunities, Architectural styles of cloud applications, Workflows: Coordination of multiple activities, Coordination based on a state machine model – the ZooKeeper, The MapReduce programming model, A case study: the GrepTheWeb application, Clouds for science and engineering, High performance computing on a cloud, cloud computing for biological research, Social computing, digital content, and cloud computing.

Unit III

Cloud Resource Virtualization: Virtualization, Layering and virtualization, Virtual machine monitors, Virtual machines, Performance and security isolation, Full virtualization and paravirtualization, Hardware support for virtualization, Case study: *Xen* -a VMM based on paravirtualization, Optimization of network virtualization in *Xen* 2.0, *vBlades* -paravirtualization targeting a *x86-64* Itanium processor, A performance comparison of virtual machines, The darker side of virtualization, Software fault isolation.

Unit IV

Cloud Resource Management and Scheduling: Policies and mechanisms for resource management, Applications of control theory to task scheduling on a cloud, Stability of a two-level resource allocation architecture, Feedback control based on dynamic thresholds, Resource bundling, combinatorial auctions for cloud resources, Scheduling algorithms for computing clouds, fair queuing, Cloud scheduling subject to deadlines.

Unit V

Storage systems: Storage models, file systems, databases, DFS, General parallel File system, GFS, Apache Hadoop, Locks & Chubby, TPS & NOSQL databases, Bigdata, Mega store. **Cloud security:** Risks, Security, privacy and privacy impacts assessments, Trust, VM Security, Security of virtualization, Security risks in shared images.

Course outcomes (COs):

At the end of the course, the student will be able to:

- 1. Apply the concepts of cloud delivery models and services. (PO-1,2,3,5,7,9,10,12) (PSO-2,3)
- 2. Build various cloud based applications. (PO-1,2,3,5,7,9,10,12) (PSO-2,3)
- 3. Illustrate different cloud resource virtualization strategies with case studies. (PO-1,7) (PSO-2,3)
- 4. Describe cloud resource management and scheduling policies (PO-1,7) (PSO-2,3)
- 5. Create cloud instances by applying storage models and security aspects. (PO-1,2,3,5,7,9,10,12) (PSO-2,3)

Suggested Learning Resources:

Text Book:

1. Dan Marinescu, Cloud Computing: Theory and Practice, 1st edition, MK Publishers, 2013.

References:

- 1. Kai Hwang, Jack Dongarra, Geoffrey Fox, Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, 1st edition, MK Publishers, 2012.
- 2. Anthony T. Velte, Toby J. Velete, Robert Elsenpeter, Cloud Computing: A Practical Approach, Tata McGraw Hill, 2010.

Web links and Video Lectures (e-Resources):

• <u>https://onlinecourses.nptel.ac.in/noc21_cs14/preview</u>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Tool demonstration

INNOVATION/SOCIETAL/ENTREPRENEURSHIP BASED INTERNSHIP	
Course Code: INT68	Credits: 0:0:2
Prerequisite: Nil	Contact Hours: -
Course Coordinator: Information Science and Engineering Faculty	

Students are required to carry out training in an Information technology or research organization or with a start-up firm for not less than four weeks after 4th or during 5th semester. The internship addresses innovation/societal contributions or should evolve a student's entrepreneurial skill sets. Students are required to present their internship work in front of department committee and submit a report in the format provided by the industrial training committee at the department. The students will be evaluated by the industrial training committee based on the rubrics informed to students by the committee.

Course Outcomes (COs):

On successful completion of this course, students will be able to

- 1. Understand the functioning of the information technology process, gain knowledge on the recent developments in the area, and integrate his theoretical knowledge with practical processes. (PO-1, 2, 3, 4, 5, 7, 11, 12, PSO-1,2,3)
- 2. Enhance the communication skills to work in interdisciplinary teams in industry. (PO-9, 10)
- 3. Realize the professional and ethical responsibility. (PO-6, 7, 8)