RAMAIAH
Institute of Technology

CURRICULUM

for the Academic year 2021 – 2022

INFORMATION SCIENCE AND ENGINEERING

VII & VIII 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 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 60% 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. **M S Ramaiah Institute of Technology has obtained "Scimago Institutions Rankings" All India Rank 65 & world ranking 578 for the year 2020.**

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 secured All India Rank 8th for the year 2020 for Atal Ranking of Institutions on Innovation Achievements (ARIIA), by 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. MSRIT is a member of DELNET, CMTI and VTU E-Library Consortium. MSRIT has a modern auditorium 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, M S Ramaiah Institute of Technology has achieved 65th rank among 1143 top Engineering institutions of India for the year 2021 and is 1st amongst the Engineering colleges affiliated to VTU, Karnataka.**

About the Department:

Information Science and Engineering department is established in the year 1992 with an objective of producing high-quality professionals to meet the demands of the emerging field of Information Science and Engineering. Department also started M.Tech program in Software Engineering in the year 2004 and has been recognized as R&D center by VTU in 2012. The department is accredited by the NBA in 2001, 2004, 2010, 2015 and reaccredited in 2018 under Tier-1 till 2022. Department has highly qualified and motivated faculty members and well equipped state of the art laboratories. All faculty members are involved in research and technical papers publications in reputed journals, conferences across the world. Strong collaboration with industries and high profile institutions is in place for curriculum updates, more hands on training, practical's, project based learning, EPICS, expert lectures, partial course deliveries by industry experts and student interns to enhance the skills in emerging areas to keep an inclusive and diverse academic environment. Department is regularly conducting seminars, conferences and workshops for students and academicians in the emerging areas of Information Technology. Introduced EPICS in senior projects. Some of the laboratories have also been set up in collaboration with industries such as Intel, Microsoft, Apple, SECO, Honeywell, EMC^2, NVIDIA, IBM, Green Sense Werks, Tech Machinery Labs, Sesovera Tech Pvt. Ltd., and Ramaiah Medical College (Emergency department). Also, an echo system is built to initiate start-ups at the department level along with the mentorship. All the above potential activities have 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

- Imparting quality technical education by nurturing a conducive learning environment through continuous improvement and customization
- Establishing research clusters in emerging areas in collaboration with globally reputed organizations
- 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

- To provide a conducive environment that offers well balanced Information Technology education and research.
- To provide training and practical experience in fundamentals and emerging technologies.
- To nurture creativity for overall personality development.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

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

PEO2: Enhance the skills in developing computing systems using modern tools and technologies.

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: Problem Solving Skills, ability to understand and analyze the Information Technology problems and develop computer programs.

PSO2: Applied Engineering Skills, ability to apply standard practices and strategies in Software Development.

PSO3: Communication and Higher Learning, ability to exchange knowledge and Continue learning advances in the field of Information Technology.

Semester wise Credit Breakdown for B E Degree Curriculum

Batch 2018-22

Semester / Course Category	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Total Credits
Basic Sciences (BSC)	9	8	4	4					**25**
Engineering Sciences (ESC)	11	10							**21**
Humanities, Social Sciences and Management (HSMC)		2			3		3		**8**
Professional Courses – Core (PCC)			21	21	15	11	10		**78**
Professional Courses– Elective (PEC)					3	6	6	3	**15**
Other Open Elective Courses (OEC)					3	3			**6**
Project Work (PROJ), Internship (IN)						4	1	14	**22**
Total Credits	**20**	**20**	**25**	**25**	**24**	**24**	**20**	**17**	**175**

SCHEME OF TEACHING

VII SEMESTER

Sl.No	Course Code	Course	Category	Credits				Contact Hours
				L	T	P	Total	
1	IS71	Data Science	PC-C	4	0	0	4	04
2	IS72	Distributed Storage Technologies	PC-C	3	0	0	3	03
3	IS73	Management and Entrepreneurship	PC-C	3	0	0	3	03
4	ISE74X	Professional elective - 4	PC-C	3	0	0	3	03
5	ISE75X	Professional elective - 5	PC-C	3	0	0	3	03
6	ISL76	Data Science Lab	PC-E	0	0	1	1	02
7	ISL77	Parallel Programming Lab	PC-E	0	1	1	2	04
8	ISSE	Seminar	PC-E	0	0	1	1	-
			Total	**16**	**1**	**3**	**20**	**22**

Professional Electives:

4	ISE741	Deep Learning
	ISE742	Virtual and Augmented Reality
	ISE743	Soft Computing

5	ISE751	Information Security
	ISE752	Bioinformatics
	ISE753	Bio-Inspired Computing

SCHEME OF TEACHING
VIII SEMESTER

Sl.No	Course Code	Course	Category	Credits				Contact Hours
				L	T	P	Total	
1	ISIN	Internship/NPTEL Course	IN	0	0	3	3	-
2	ISP	Project work	PROJ	0	0	14	14	-
			Total	**0**	**0**	**17**	**17**	**-**

VII Semester

DATA SCIENCE

Course Code: IS71 **Credit: 4:0:0**
Prerequisite: Nil **Contact Hours: 56L**
Course Coordinator: Dr. P M Krishna Raj

Course Content

UNIT-I

Introduction: What is Data Science? Big Data and Data Science hype – and getting past the hype, Why now? – Datafication, Current landscape of perspectives, Skill sets. Needed Statistical Inference: Populations and samples, Statistical modelling, probability distributions, fitting a model, Introduction to R.

UNIT-II

Exploratory Data Analysis and the Data Science Process: Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The Data Science Process, Case Study: Real Direct (online real estate firm). Three Basic Machine Learning Algorithms: Linear Regression, k-Nearest Neighbours (kNN), k-means.

UNIT-III

One More Machine Learning Algorithm and Usage in Applications: Motivating application: Filtering Spam, Why Linear Regression and k-NN are poor choices for Filtering Spam, Naive Bayes and why it works for Filtering Spam, Data Wrangling: APIs and other tools for scrapping the Web.

UNIT-IV

Feature Generation and Feature Selection (Extracting Meaning from Data): Motivating application: user (customer) retention. Feature Generation (brainstorming, role of domain expertise, and place for imagination), Feature Selection algorithms. Filters; Wrappers; Decision Trees; Random Forests. Recommendation Systems: Building a User-Facing Data Product, Algorithmic ingredients of a Recommendation Engine, Dimensionality Reduction, Singular Value Decomposition, Principal Component Analysis, Exercise: build your own recommendation system.

UNIT-V

Mining Social-Network Graphs: Social networks as graphs, Clustering of graphs, Direct discovery of communities in graphs, Partitioning of graphs, Neighbourhood properties in graphs, Data Visualization: Basic principles, ideas and tools for data visualization. Data Science and Ethical Issues, Discussions on privacy, security, ethics, Next-generation data scientists

Text Books:

1. Doing Data Science Cathy O'Neil and Rachel Schutt Straight Talk from The Frontline.O'Reilly 2014
2. Mining of Massive Datasets. V2.1 Jure Leskovek, Anand Rajaraman and Jeffrey Ullman Cambridge University Press 2014

Reference Books:

1. Data Mining: Concepts and Techniques Jiawei Han, Micheline Kamber and Jian Pei Third Edition 2012.
2. Machine Learning: A Probabilistic Perspective Kevin P. Murphy 2013

Course Outcomes (COs):

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

1. Define data science and its fundamentals (PO-1) (PSO-1)
2. Demonstrate the process in data science (PO-1, 2, 3) (PSO-1, 2)
3. Explain machine learning algorithms necessary for data sciences (PO-2, 3, 4) (PSO-1, 2)
4. Illustrate the process of feature selection and analysis of data analysis algorithms (PO- 2, 3, 4) (PSO-1, 2)
5. Visualize the data for data exploration (PO-3, 4, 5) (PSO-1, 2)

DISTRIBUTED STORAGE TECHNOLOGIES

Course Code: IS72 **Credit: 3:0:0**
Prerequisite: Computer Networks **Contact Hours: 42L**
Course Coordinator: Dr. Siddesh G M

Course Content

UNIT-I

Introduction: Information Storage, Evolution of Storage Architecture, Data Centre Infrastructure, Virtualization and Cloud Computing.
Data Centre Environment: Application, DBMS, Host, Connectivity, Storage, Disk Drive Components, Disk Drive Performance, Host Access to Data, Direct-Attached Storage, Storage Design Based on Application, Disk Native Command Queuing, Introduction to Flash Drives.

UNIT-II

Data Protection: RAID Implementation Methods, Array Components, Techniques, Levels, Impact on Disk Performance, Comparison, Hot Spares.
Intelligent Storage System: Components, Storage Provisioning, Types.

UNIT-III

Fibre Channel Storage Area Networks: FC Overview, Evolution, Components, FC Connectivity, Ports, FC Architecture, Fabric Services, Login Types, Zoning, FC Topologies, Virtualization in SAN. **IP SAN and FCoE:** iSCSI, FCIP, FCoE.

UNIT-IV

Network-Attached Storage: Benefits, Components, NAS I/O Operation, Implementations, File Sharing Protocols, Factors Affecting NAS Performance, File-Level Virtualization.
Object Based and Unified Storage: Object Based Storage Devices, Content Addressed Storage, CAS Use Cases, Unified Storage.

UNIT-V

Business Continuity: Information Availability, Terminology, Planning Lifecycle, Failure Analysis, Impact Analysis, Solutions.
Cloud Computing: Cloud Enabling Technologies, Characteristics, Benefits, Service Models, Deployment Models, Infrastructure, Challenges, Adoption Considerations.

Securing the Storage Infrastructure: Framework, Risk Triad, Domains.
Managing the Storage Infrastructure: Monitoring, Management Activities, Management Challenges, Information Lifecycle Management, Storage Tiering.

Text Book:

1. Somasundaram G, Alok Shrivastava, (EMC Education Services), Information Storage and Management, 2e, Wiley India, 2012, ISBN 9788126537501.

References:

1. Robert Spalding; Storage Networks: The Complete Reference, Tata McGraw Hill, 2003.
2. https://education.emc.com/ISMbookv2/resources_content.aspx

Course Outcomes (COs):

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

1. Describe storage architectures, and the logical and physical components of storage infrastructure including storage subsystems. (PO-1,2,3,5,10,12) (PSO-1,3)
2. Describe RAID levels and intelligent storage systems. (PO-1,2,3,5) (PSO-1,3)
3. Illustrate storage networking technologies such as FC SAN, IP SAN, and FCoE. (PO-1) (PSO-3)
4. Discuss NAS, and object-based and unified storage. (PO-1) (PSO-3)
5. Describe business continuity, cloud computing, storage security, storage monitoring and management activities. (PO-1,2,6,7) (PSO-3)

MANAGEMENT AND ENTREPRENEURSHIP

Course Code: IS73 **Credit: 3:0:0**
Prerequisite: Nil **Contact Hours: 42L**
Course Coordinator: Mr. Suresh Kumar K R

Course Content

UNIT-I

MANAGEMENT: Nature and Functions of Management, Importance, Definition, Management Functions, Levels of management, Roles of a Senior Manager, Managerial Skills, **Development of Management Thought** – Early Classical approaches-Scientific Management, Administrative Management, Bureaucracy.

UNIT-II

PLANNING: Nature, Importance, Types of plans (Definitions and Meaning only), Steps in planning, strategic planning process, **DECISION MAKING:** Meaning, Types, Steps in rational decision making, difficulties in decision making, **COORDINATION:** Need for Coordination, Requisites for Excellent Coordination, and types of Coordination.

UNIT-III

DIRECTION AND SUPERVISION: Requirements of Effective Direction, Giving Orders, Motivation- Meaning, Nature, Motivation Theories-Maslow's Theory, Herzberg's Theory, McClelland's Need for Achievement Theory, **ORGANISATION:** Meaning, Characteristics, Typology, Process, Principles, **MANAGERIAL CONTROL:** Steps in a Control Process, Need for Control System, Benefits of Control, Essentials of Effective Control System.

UNIT-IV

COMMUNICATION: Purposes, Formal Communication, Forms of Communication, Informal communication, barriers to communication, **LEADERSHIP:** Difference between a Leader and a Manager, Characteristics of Leadership, Functions of a Leader; **ENTREPRENEURSHIP**: Importance of entrepreneurship, Concepts, Characteristics of a Successful Entrepreneur, Creative process, capacity building for entrepreneurship. **Case Study:** Profiles of successful entrepreneurs

UNIT-V

SETTING UP A SMALL BUSINESS: Formalities of Setting a Small Business Enterprise – Flowchart, Selection of Project, Product of Service Selection, Project Feasibility Study (flow chart and explanation), Business Plan Preparation, Decide on the Constitution, Registration, Project Report Preparation, Implement the Project and obtain Final Clearances, **Case Study:** Support to entrepreneurs through MSME, KSSIDC, KIADB, KSFC and TECKSOK

Text Books:

1. P.C. Tripathi, P.N.Reddy, Principles of Management, 5th Edition, Tata McGraw-Hill, 2012
2. Poornima M Charanthimath, Entrepreneurship Development Small business enterprises, Pearson Education, 2008

References:

1. Ramesh B Rudani, Principles of Management, Tata McGrawHill, 2013
2. Robert Lusier, Management Fundamentals – Concepts, Application, Skill Development, 5th Edition, Cengage Learning, 2012
3. S.S. Khanka, Entrepreneurial Development, S. Chand & Company Limited, 2012, ISBN 10: 8121918014 / ISBN 13: 9788121918015
4. Kanishka Bedi, Management and Entrepreneurship, Oxford University Press-2017

Course Outcomes (COs):

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

1. Analyze the various approaches of management (PO- 8, 11) (PSO-1, 2)
2. Apply the administrative skills of planning, decision making and coordination (PO-8, 10, 11) (PSO-1, 2)
3. Analyze motivation theories and apply them to direct and supervise employees and organization (PO-8, 10, 11) (PSO-1, 2)
4. Apply effective communication and leadership skills (PO-8, 9, 10, 11, 12) (PSO- 2, 3)
5. Identify the skills required to become a successful entrepreneur (PO-8, 9, 10, 11, 12) (PSO- 2, 3)

DATA SCIENCE LABORATORY

Course Code: ISL76 **Credit: 0:0:1**
Prerequisite: Nil **Contact Hours: 14P**
Course Coordinator: Dr. P M Krishna Raj

Course Content

PART - A

1. Write a program to implement decision trees using any data sets
2. Write a program to demonstrate association analysis
3. Implement any clustering technique.
4. Implement linear and logistic regression.
5. Implement a Map reduce program that processes a weather data set.
6. Data analytics: write a program that transposes the original data set, find all pairs products reviewed together; Writes on the output folder all the pairs of products that appear more than once and their frequencies. The pairs of products must be sorted by frequency.

PART –B

1. Implement a mini project using any data mining technique.

Course Outcomes (COs):

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

1. Design and deploy appropriate data mining techniques (PO 4,5) (PSO 2)
2. Apply data mining and analytics techniques for large data sets. (PO 4,5) (PSO 2)
3. Create applications for data analytics (PO 4,5,9,10) (PSO 2, 3)

PARALLEL PROGRAMMNG LABORATORY

Course Code: ISL77 **Credit: 0:1:1**
Prerequisite: Nil **Contact Hours: 14T + 14P**
Course Coordinator: Mr. Koushik S

Course Content

Tutorials:

- Seeking concurrency
- Programming parallel computers
- Parallel Architectures
- Interconnection Networks
- Processor Arrays
- Multiprocessors
- Flynn's Taxonomy
- Message passing model
- The Message passing interface
- Benchmarking
- Shared memory programming
- Parallel for loops
- Declaring private variables
- Critical sections
- Parallel pragma
- Function Parallelism

Lab:

Part-A

1. Write parallel program using OpenMP to sort n element using merge sort.
2. Write a program to Multiply a matrix by a vector and get the result of the operation.
3. Write an OpenMP program which demonstrates how to "multitask", implement two separate task, one to generate prime table and other to generate sine table for a given input using OpenMP for parallel execution. Justify the inference.
4. Write a program to show how first private clause works. (Factorial program)
5. Write an OpenMP parallel program for Points Classification. Prove the correctness of sequential program with that of parallel.
6. Write an OpenMP program to convert a color image to black and white image. Demonstrate the performance of different scheduling techniques for varying chunk values.

Part-B

7. Write a program for communication among two processes.
8. Write MPI program to compute dot product of two vectors using block-striped partitioning with uniform data distribution.
9. Write MPI program that computes the value of PI using Monto-Carlo Algorithm.
10. C program which creates new communicators involving a subset of initial set of MPI processes in the default communicator MPI_COMM_WORLD
11. Write MPI program to compute Matrix-Matrix Multiplication using self-scheduling algorithm.
12. C program which searches integers between A and B for a value J such that F(J) = C, using the MPI parallel programming environment

Text Book:

1. Calvin Lin, Lawrence Snyder, "Principles of Parallel Programming", 1st Edition, 2009, Pearson Education, Inc. New Delhi.

References:

1. OpenMP Spec 3.0 handbook available on the Web
2. Lecture Notes & Web Reference Books

Course Outcomes (COs):

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

1. Design and Develop distributed computing using parallel programming concepts. (PO-3,4) (PSO-1)
2. Demonstrate the concepts of Distributed and Parallel Computing Architecture. (PO-1,3,4) (PSO-2)
3. Generate an effective report on Distributed and Parallel Computing. (PO-10) (PSO-1)

SEMINAR

Course Code: ISSE **Credit: 0:0:1**
Prerequisite: Nil

Students have to study recent literature in Information Technology or learn a new technology prevalent in the IT field and demonstrate the knowledge in 2 seminars.
A mentor shall be assigned from the department to monitor the progress regularly.

Course Outcomes (COs):

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

1. Demonstrate the empirical knowledge of the literature/technology chosen. (PO – 1, 2, 4, 5, 6, 7) (PSO – 1, 2)
2. Demonstrate the ability to communicate effectively and potentiality of lifelong learning. (PO – 10, 12) (PSO – 3)

DEEP LEARNING

Course Code: ISE741 **Credit: 3:0:0**
Prerequisite: Nil **Contact Hours: 42L**
Course Coordinator: Ms. Rajeshwari S B

Course Content

UNIT-I

Introduction: Human brain, neuron models, neural nets as directed graphs, feedback, neural architectures, knowledge representation, connection to artificial intelligence

UNIT-II

Learning Process: Error-correction learning, memory based learning, Hebbian learning, competitive learning, Boltzmann learning, credit assignment, learning with and without a teacher, learning tasks, memory, and statistical learning theory.

UNIT-III

Modern practical deep neural networks: Deep feedforward networks, regularization for deep learning, optimization for training deep models, convolutional Networks.

UNIT-IV

Sequence Modelling: Recurrent and recursive nets, practical Methodology, applications

UNIT-V

Deep Learning Research: Linear factor models, auto encoders, variational auto encoders, restricted Boltzmann machine, generative adversarial networks.

Text Books:

1. Simon Haykin, Neural networks: A comprehensive foundation, Second Edition, Prentice Hall, New Delhi, 1999, ISBN-81-203-2373-4.
2. Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2016.

Reference:

1. Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.
2. Josh Patterson & Adam Gibson, Deep Learning – A Practitioners Approach, O'Reilly, 1st Edition 2017.

Course Outcomes (COs):

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

1. Describe what neural networks are, their properties, compositions and how they relate to artificial intelligence. (PO-1,2) (PSO-1,2)
2. Illustrate the many facets of the learning process and its statistical properties. (PO-1,2,5,9,10) (PSO-1,2)
3. Explain the core parametric function approximation technology that is behind all modern practical applications of deep learning. (PO-1,2,5,9,10) (PSO-1,2)
4. Demonstrate recurrent and recursive nets functionality and how practical problems can be mapped to them. (PO-1,2,5,9,10) (PSO-1,2)
5. Explicate the advanced approaches to deep learning, currently pursued by the research community (PO-1,2,5,9,10) (PSO-1,2)

VIRTUAL AND AUGMENTED REALITY

Course Code: ISE742 **Credit: 3:0:0**
Prerequisite: Computer Graphics **Contact Hours: 56L**
Course Coordinator: Mrs. Sunitha R S

Course Content

UNIT-I

Virtual Reality and Virtual Environments:
Human factors: Eye: accommodation, to Stereopsis, Visual field, Synthetic images versus reality. Ear: sound perception to Sound direction and stage, Head- related transfer functions, Measuring HRTFs, Ambisonics. The somatic senses: Tactile and Haptic technology. Virtual reality hardware& software: Sensor hardware, Head coupled displays, Acoustic Hardware, Integrated VR systems. Modeling Virtual worlds, Physical simulation, VR toolkits.

UNIT-II

Input Devices & Output Devices, Requirements for VR: Virtual databases, Real time image generation, database interaction, Physical simulation, Immersive and Non-Immersive VR systems, Hybrid VR systems, the cave, benefits of virtual reality. 3D Viewing Process- A Review, Examples of 3D viewing, A Simple Graphics Package, Segmented Display Files, Display File Compilation, Geometric Models, Picture Structure. Graphical Input techniques, Input Functions and Event Handling.

UNIT-III

The generic VR system: Virtual Environment, Computer environment, VR Technology, Modes of Interaction, VR Systems. Computing Architectures for VR: The Rendering Pipeline, PC Graphics Architecture, Workstation-Based Architectures, Distributed VR Architectures.

UNIT-IV

Modeling: Geometric Modeling, Kinematics Modeling, Behavior Modeling, Model Management. Conventional and Computer-Assisted Animation, Animation Languages, Methods of Controlling Animation, Basic Rules of Animation, Problems Peculiar to Animation. Animating the Virtual Environment, The dynamics of numbers: Linear interpolation, Non-linear interpolation, parametric interpolation.

UNIT-V

Animation: The animation of objects: Linear translation, Non-linear translation, Linear and Non-linear angular rotation. Shape, object parametric line/surface patch Inbetweening. Free-form deformation, Particle systems. Physics based modeling and simulation. Animating Objects in the Unity Editor.

Text Books:

1. Virtual Reality Technology,2nd edition, Grigore C. Burdea, Philippe Coffet, A John Wiley & Sons, Inc., Publication.
2. Virtual Reality Systems, John Vince, Published by Dorling Kindersley (India) pvt ltd., licensees of Pearson Education in south Asia.
3. Principles of Interactive computer graphics, second edition, William M Newman & Robert F. Sproull, McGraw-Hill International student edition.

References:

1. Computer Graphics, second Edition in C, James. D Foley, Andries Van Dam, Steven K Feiner, John F Hughes, Kindle edition.
2. Virtual Reality & Augmented Reality in Industry by Dengzhe Ma,Jürgen Gausemeier, Xiumin Fan, Michael Grafe By : Springer publications.
3. Computer Vision and Augmented Reality by Kerdvibulvech Chutisant, Publisher: LAP Lambert Academic Publishing, Edition: 2013
4. Principles and practice: Augmented Reality, By: Dieter Schmalstieg, Tobias Hollerer, Addison-Wesley Professional.

Course Outcomes (COs):

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

1. Apply the knowledge of Basic Science and Computer Graphics to discern the principles of hardware and other requirements for VR/AR and software tools. (PO-1,2,6,7,12) (PSO-1,2,3)
2. Design and develop a virtual/augmented Environment using / analyzing the conceptual pipeline of 3D viewing process, Input Techniques/functions/Event handling, to create a sustainable development of products. (PO-2,3.4,5,6,7,12) (PSO-2,3)
3. Illustrate the contextual knowledge of Generic VR system and Computing Architectures for VR/AR applications. (PO-3,4,5,6,12) (PSO-1,2,3)
4. Apply the knowledge of Modeling and VR Programming to develop projects in multidisciplinary areas. (PO-2,3,4,5,6,11) (PSO-1,2,3)
5. Usage of Animation techniques for the solutions of real world problem for effective communication. (PO- 10,11,12) (PSO- 2,3)

SOFT COMPUTING

Course Code: ISE743 **Credit: 3:0:0**
Prerequisite: Nil **Contact Hours: 42L**
Course Coordinator: Mr. Shashidhara H S

Course Contents

UNIT-I

Introduction: Neural networks, Fuzzy logic, Genetic algorithms, Hybrid systems, **Artificial Neural Networks:** Fundamental concept, Evolution, Basic model of ANN, Important terminologies of ANN, MP neuron, Hebb Network

UNIT-II

Supervised Learning Network: Perceptron Networks, Adaptive linear neuron, multiple adaptive linear neurons, Back propagation Network.

UNIT-III

Introduction to Fuzzy logic, classical sets and fuzzy sets: Classical sets, Fuzzy sets. **Classical relations and fuzzy relations:** Cartesian product of relation, Classical relation, Fuzzy relations, Tolerance and equivalence relations. **Membership functions**: Features, Fuzzification, methods of membership value assignments.

UNIT-IV

Defuzzification: Lambda-cuts for fuzzy sets, Lambda-cuts for fuzzy relations, Defuzzification methods. Fuzzy decision making: Individual, multiperson, multiobjective, multiattibute, and fuzzy Bayesian decision making

UNIT-V

Genetic algorithms: Introduction, Basic operations, Traditional algorithms, Simple GA, General genetic algorithms, the schema theorem, Genetic programming, applications.

Text Books:

1. Principles of Soft computing, S N Sivanandam, Deepa S. N, Wiley, India, (Chapters 1, 2, 3(Up to 3.5), 7, 8, 9, 10, 13, 15 (up to 15.6 & 15.9,15,10).
2. Neuro-fuzzy and soft computing, J.S.R. Jang, C.T. Sun, E. Mizutani, PHI (EEE edition) ISBN: 978-81-203-2243-1

Course Outcomes (COs):

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

1. Identify and describe soft computing techniques and their roles in building intelligent machines (PO1,3,4) (PSO-1,2)
2. Identify the components and building block hypothesis of Genetic algorithm. (PO1,3,4) (PSO-1,2)
3. Examine the features of neural network and its applications. (PO1,3,4) (PSO-1,2)
4. Design Genetic algorithm to solve optimization problem. (PO1,3,4) (PSO-1,2)
5. Describe Neuro Fuzzy system for clustering and classification. (PO1,3,4) (PSO-1,2)

INFORMATION SECURITY

Course Code: ISE751 **Credit: 3:0:0**
Prerequisite: Nil **Contact Hours: 42L**
Course Coordinator: Mrs. Deepthi K

Course Content

UNIT-I

Symmetric Ciphers: Symmetric cipher model, cryptography, cryptanalysis, Substitution techniques, Transposition Techniques. **Block Ciphers and the Data Encryption Standard**: Simplified DES, Block Cipher Principles, DES, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher modes of operation.

UNIT-II

Public Key Algorithms: Introduction, Modular Arithmetic, RSA, Diffie-Hellman, Digital Signature Standards, How Secure are RSA and Diffie-Hellman, Elliptic Curve Cryptography. **Hash and MAC Algorithms**: Secure Hash Algorithm, Whirlpool, HMAC and CMAC.

UNIT-III

Passive information Gathering: starting at the source, Mining Job ads and analyzing Financial Data, Using Google to Mine sensitive information, Exploring Domain Ownership. **Detecting Live Systems:** Detecting Active Systems, Port Scanning, OS fingerprinting, Scanning countermeasures. **Enumerating systems:** Enumerating systems, Advanced Enumeration.

UNIT-IV

Automated Attack and Penetration Tools: Why attack and penetration Tools are Important, Automated Exploit Tools, Determining Which Tools to use
Defeating Malware: Evolving threat, viruses, and Worms, Trojans.
Malicious Software: Viruses and Related Threats, Virus Countermeasures, DDoS Attacks
Firewalls: Firewall Design Principles, Trusted Systems

UNIT-V

Securing Wireless Systems: Wi-Fi Basics, Wi-Fi Security, Wireless LAN threats, Exploiting wireless networks, Securing wireless Networks
Intrusion Detection: Overview ID detection and Prevention, IDS Types and Components, an overview of Snort, Installing Snort on windows System, and Building snort rules and interface.

Text Books:

1. William Stallings, "Cryptography and Network Security principles and practices" 4th Edition PHI.
2. Charlie Kaufman et. al , Network Security, 2nd Edition PHI.
3. Michael Gregg, "Building your own Security LAB, A field Guide for Network Testing" Wiley India 2012.

Reference:

1. Forouzan, "Cryptography and Network Security" 3rd Edition, Tata McGraw Hill

Course Outcomes (COs):

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

1. Describe and Design Symmetric cipher model, cryptography algorithms and their techniques. (PO-3) (PSO-1)
2. Describe the most widely used encryption techniques. (PO-2, 3) (PSO-2)
3. Identify, Scan and Solve the problems in the live systems. (PO-2, 5) (PSO-1)
4. Explain the importance of automated tools for network security. (PO-4, 6) (PSO-2)
5. Discuss threats and security aspects of wireless networks and intrusion detection and prevention techniques. (PO-2,8) (PSO-1)

BIOINFORMATICS

Course Code: ISE752 **Credit: 3:0:0**
Prerequisite: Nil **Contact Hours:42L**
Course Coordinator: Mr. Shashidhara H S

Course Content

UNIT-I

The genetic material, gene structure and information content, protein structure and function, chemical bonds, molecular biology tools

UNIT-II

Dot plots, simple alignments, gaps, scoring matrices, the Needleman and Wunsch algorithm, semiglobal alignments, the Smith and Waterman algorithm, database searches – BLAST and FASTA

UNIT-III

Patterns of substitutions within genes, estimating substitution numbers, molecular clocks Molecular phylogenetics, phylogenetic trees, distance matrix methods, maximum likelihood approaches

UNIT-IV

Parsimony, Inferred Ancestral Sequences, strategies for fast searches – branch and bound and heuristic searches, consensus trees, tree confidence, molecular phylogenies Genomics – 1: Prokaryotic genomes, prokaryotic gene structure, GC content and prokaryotic genomes, prokaryotic gene density, eukaryotic genomes

UNIT-V

Genomics – 2: Eukaryotic gene structure Open reading frames, GC contents in eukaryotic genomes, gene expression, transposition, repetitive elements Amino acids, polypeptide composition, secondary structure, tertiary and quaternary structures, algorithms for modeling protein folding.

Text Books:

1. Dan E. Krane, Michael L. Raymer, Fundamental Concepts of Bioinformatics, Pearson Education, 2008

References:

1. T K Attwood, D J Parry Smith, Introduction to Bioinformatics, Pearson Education,2004
2. Gary B. Fogel, David W. Corne, Evolutionary Computation in Bioinformatics, Morgan Kaufmann Publishers

Course Outcomes (COs):

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

1. Explain all the available molecular biology tools. (PO 1, 5, 10) (PSO 3)
2. Solve sequence alignment problems with/without gap penalty. (PO 1, 2, 3, 4, 5) (PSO 1, 2)
3. Explain the pattern of substitution within genes. (PO 1, 5, 10) (PSO 3)
4. Distinguish between character based and distance based phylogeny. (PO 2, 4) (PSO 1, 2)
5. Identify different parts of prokaryotic and Eukaryotic Genes (PO 1, 2, 4, 5) (PSO 1, 2)

BIOINSPIRED COMPUTING

Course Code: ISE753 **Credit: 3:0:0**
Prerequisite: Nil **Contact Hours: 42L**
Course Coordinator: Dr. S R Mani sekhar

Course Content

Unit-I

Introduction: Evolutionary Systems, Pillars of Evolutionary Theory, Genotype, Gene Expression, Genetic Mutations, Nongenic DNA, Artificial Evolution, Discrete Representations, Real-Valued Representations

Unit-II

Representations: Tree-Based Representations, Fitness Functions, Genetic Operators, Crossover, Mutation, Cellular Systems- Basic Ingredients, Neural Systems- Computational neuroscience, Neural engineering, Biological Nervous Systems

Unit-III

Developmental Systems: Introduction, Developmental Representation Advantages, L-Systems, Turtle Graphics, Immune Systems- Innate Immune System, Limits of Innate Immunity

Unit-IV

Behavioral Systems**:** Cognitive Science Behavior, Artificial Intelligence Behavior, Collective Systems- Biological Self-Organization: Aggregation, Clustering, Nest Construction, Foraging, Division of Labor

Unit–V

Particle Swarm Optimization, Ant Colony Optimization, Swarm Robotics, Firefly algorithm, Bat algorithm

Text Books:

1. Dario Floreano and Claudio Mattiussi Bio-Inspired Artificial Intelligence-Theories, Methods, And Technologies, The MIT Press, 2008
2. Xin-She Yang. Nature-Inspired Optimization Algorithms, Elsevier, 2014

References:

1. Eiben,A.E.,Smith,James E, "Introduction to Evolutionary Computing", Springer 2015
2. Marco Dorigo and Thomas Stützle, Ant Colony Optimization MIT Press, 2004.

Course Outcomes (COs):

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

1. Illustrate the concepts of Evolutionary Systems. (PO 1, 2, 4, 10) (PSO 3)
2. Apply the different representations techniques on information. (PO 2, 3, 4, 5) (PSO 2)
3. Identify and utilize the concepts of Developmental System. (PO 1, 2, 4, 5) (PSO 1, 2)
4. Understand the Bio-Science Behavior. (PO 1, 7) (PSO 1)
5. Apply the Bio-inspired algorithm to solve real word problem. (PO 1, 2, 3, 4, 5) (PSO 1, 2, 3)

VIII SEMESTER

INTERNSHIP

Course Code: ISIN **Credit: 0:0:3**

Course Coordinator: Ms. Rajeshwari S B

Guidelines:

- The student can do the Internship during the summer semester between 4^{th}-5^{th} semesters or between 6^{th}-7^{th} semesters.
- The student should take prior permission from the department committee before carrying out the internship.
- The duration of the Internship is one month.
- The report of the Internship needs to be submitted to the department in the 8^{th} semester.
- The department will constitute a committee for the evaluation of Internship of student.

Course Outcomes (COs):

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

1. Schedule milestones of deliverables and formulate the requirements of the proposed work. (PO-2,9,11) (PSO-1,2)
2. Apply the engineering knowledge to develop software in an industry setting. (PO-1,2,3,5) (PSO-1,2)
3. Develop the inter-personal skills required to work in a professional team. (PO-9, 10, 11) (PSO-2, 3)
4. Engage in independent study of technology required for development of software. (PO-12) (PSO-2, 3)
5. Demonstrate the project and appraise its effectiveness. (PO-10) (PSO-3)

SENIOR PROJECT

Course Code: ISP **Credit: 0:0:14**

Course Coordinators: Mrs. Lincy Meera Mathews

Project Work-flow:

1. Students submit the initial details including broad area of work and choice of guide in a prescribed format.
2. The Project coordinators along with Head of the department finalize the guide allocation process.
3. Students are given an option to change the guide with mutual consent by applying through prescribed form.
4. Students submit the Project Work Book to guide on the day of registration.
5. Problem statement is submitted to Project Co-ordinator within one week of registration.
6. Students maintain a blog and update it on weekly basis about their work.
7. Weekly meeting with guide is recorded in the workbook.
8. Guide evaluates the student on a regular basis according to the rubrics defined in the workbook for total of 50 marks which constitutes the final CIE score.
9. At the end of the semester, an exam is conducted with one internal and one external examiner for 50 marks which constitutes the final SEE score.

Course Outcomes (COs):

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

1. Schedule milestones and deliverables using appropriate project management techniques. (PO-9,11) (PSO-1,2)
2. Compare and contrast the available literature in the context of the project. (PO-2,12) (PSO-3)
3. Formulate, Design and Develop the software by applying the relevant guidelines (PO-1,2,3,4,5,6) (PSO-1,2)
4. Evaluate the quality of software by testing it using appropriate techniques (PO-7,4) (PSO-1,2)
5. Demonstrate the project before general public and appraise its effectiveness (PO-5,8, 10) (PSO-3)