RAMAIAH
Institute of Technology

CURRICULUM

for the Academic year 2019 – 2020

INFORMATION SCIENCE AND ENGINEERING

III & IV Semester M. Tech (Software Engineering)

RAMAIAH INSTITUTE OF TECHNOLOGY
(Autonomous Institute, Affiliated to VTU)
Bangalore – 560054.

About the Institute

Ramaiah Institute of Technology (RIT)(formerly known as M.S. Ramaiah Institute of Technology) is a self-financing institution established in Bangalore in the year 1962 by the industrialist and philanthropist, Late Dr. M S Ramaiah. The institute is accredited with "A" grade by NAAC in 2014 and all engineering departments offering bachelor degree programs have been accredited by NBA. RIT is one of the few institutes with prescribed faculty student ratio and achieves excellent academic results. The institute was a participant of the Technical Education Quality Improvement Program (TEQIP), an initiative of the Government of India. All the departments have competent faculty, with 100% of them being postgraduates or doctorates. Some of the distinguished features of RIT are: State of the art laboratories, individual computing facility to all faculty members. All research departments are active with sponsored projects and more than 304 scholars are pursuing PhD. The Centre for Advanced Training and Continuing Education (CATCE), and Entrepreneurship Development Cell (EDC) have been set up on campus. RIT 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 over 1,35,427 books with subscription to more than 300 International and National Journals. The Digital Library subscribes to several online e-journals like IEEE, JET etc. RIT is a member of DELNET, and AICTE INDEST Consortium. RIT has a modern auditorium, several hi-tech conference halls and all are air-conditioned with video conferencing facilities. It has excellent hostel facilities for boys and girls. RIT Alumni have distinguished themselves by occupying high positions in India and abroad and are in touch with the institute through an active Alumni Association. RIT obtained Academic Autonomy for all its UG and PG programs in the year 2007. As per the National Institutional Ranking Framework, MHRD, Government of India, Ramaiah Institute of Technology has achieved 64th rank in 2019 among the top 100 engineering colleges across India.

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 and reaccredited in 2015 under Tier-1. 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, expert lectures, partial course deliveries by industry experts and student interns to keep an healthy academic atmosphere. Department is successfully conducting seminars, conferences and workshops for students and academicians in the emerging areas of Information Technology. Some of the laboratories have also been set up in collaboration with industries such as Intel, Microsoft, Apple, SECO, Honeywell, EMC^2, NVIDIA and IBM. Also, an echo system is built to initiate start-ups at the department level along with the mentorship. All the above potential activities have lead 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 M. S. 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.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Contribute in the area of Software Engineering development, maintenance and research in social-technical system

PEO2: Exhibit the Software Engineering skills for analysis, design and testing using modern tools and technologies within or outside discipline.

PEO3: Act according to professional ethics and communicate effectively with various stakeholders by demonstrating leadership qualities.

PROGRAMME OUTCOMES (POs)

PO1: An ability to independently carry out research/investigation and development work to solve practical problems.

PO2: An ability to write and present a substantial technical report/document.

PO3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

PO4: An ability to analyze, design, verify, validate, implement, apply and maintain software systems

PO5: A recognition of the need for, and an ability to apply, professional and ethical responsibilities

Curriculum Course Credits Distribution

Semester	Humanities & Social Sciences (HSS)	Basic Sciences / Lab (BS)	Engineering Sciences/ Lab (ES)	Professional Courses - Core (Hard core, soft core, Lab) (PC-C)	Professional Courses- Electives (PC-E)	Other Electives (OE)	Project Work/Internship (PW /IN)	Extra & Co-curricular activities (EAC)	Total credits in a semester
First				14	8				22
Second				14	8				22
Third				1	4		17		22
Fourth				2			20		22
Total									88

SCHEME OF TEACHING

III SEMESTER

Sl. No.	Course Code	Course Name	Category	Credits					Contact Hours
				L	T	P	S	Total	
1	MSWEEX	Elective – E	PC-E	4	0	0	0	04	04
2	MSWE31	Internship/Industrial Training	IN	0	0	4	0	04	08
3	MSWE32	Project Preliminaries	PW	0	3	10	0	13	26
4	MSWE33	Technical Seminar	PC-C	0	1	0	0	01	02
			Total	**4**	**4**	**14**	**0**	**22**	**40**

Elective- E

MSWEE1	Deep Learning
MSWEE2	Bioinformatics
MSWEE3	Digital Forensics

IV SEMESTER

Sl. No.	Course Code	Course Name	Category	Credits				Contact Hours
				L	T	P	Total	
1	MSWE41	IPR and cyber security laws	PC-C	0	2	0	02	04
2	MSWE42	Project-2	PW	0	0	20	20	560
			Total	**0**	**2**	**20**	**22**	**564**

DEEP LEARNING

Course Code: MSWEE1 **Credit: 4:0:0**
Prerequisite: NIL **Contact Hours: 56L**
Course Coordinator: Dr. Sumana M

Course Content:

Unit I

Introduction: Human brain, neuron models, neural nets as directed graphs, feedback, neural architectures, knowledge representation, Learning Process, Learning Tasks.

Unit II

Multilayer Perceptrons: Introduction , Some Preliminaries , Batch Learning and On-Line Learning ,The Back-Propagation Algorithm , XOR Problem ,Heuristics for Making the Back-Propagation Algorithm Perform Better , Back Propagation and Differentiation , The Hessian and Its Role in On-Line Learning, Cross-Validation , Virtues and Limitations of Back-Propagation Learning.

Unit III

Convolutional Neural Networks:- The Convolution Operation ,Motivation ,Pooling ,Convolution and Pooling as an Infinitely Strong Prior , Variants of the Basic Convolution Function , Structured Outputs , Data Types , Efficient Convolution Algorithms , Random or Unsupervised Features, The Neuroscientific Basis for Convolutional Networks.

Unit IV

Sequence Modeling: Recurrent and Recursive Nets , Unfolding Computational Graphs , Recurrent Neural Networks Bidirectional RNNs ,Encoder-Decoder Sequence-to-Sequence Architectures ,Deep Recurrent Networks , Recursive Neural Networks , The Challenge of Long-Term Dependencies, The Long Short-Term Memory and Other Gated RNNs.

Unit V

Autoencoders : Under complete Autoencoders , Regularized Autoencoders , Denoising Autoencoders , Learning Manifolds with Autoencoders , Contractive Autoencoders , Predictive Sparse Decomposition Applications of Autoencoders .

Applications : Large-Scale Deep Learning , Computer Vision ,Speech Recognition , Natural Language Processing , Other Applications , Deep Belief Networks, Learning Vectorial Representations of Words.

References:

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.
3. Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.
4. 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. Explain knowledge representation and learning in neural networks (PO-3, 4)
2. Design the back-propagation algorithm, its virtues and limitations, and understand its role as an optimum method for computing partial derivations. (PO-3,4)
3. Demonstrate construction of convolutional neural networks for images. (PO-1,3,4)
4. Design and develop recurrent neural networks for processing sequential data (PO-1, 3,4)
5. Illustrate autoencoder neural networks to perform unsupervised learning by applying backpropagation.(PO-1,3,4)

BIOINFORMATICS

Course Code: MSWEE2 **Credit: 4:0:0**
Prerequisite: NIL **Contact Hours: 56L**
Course Coordinator : 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

References:

1. Dan E. Krane, Michael L. Raymer, Fundamental Concepts of Bioinformatics, Pearson Education, 2008
2. T K Attwood, D J Parry Smith, Introduction to Bioinformatics, Pearson Education, 2004

3. 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 Recognize the role of Genetic Material in living organisms and the ways of acquiring DNA sequence using Molecular Biology Tools (PO-2)
2 Solve sequence alignment problems using dynamic programming methods (PO-1, 4)
3 Model the pattern of substitution within homologs (PO-1, 2, 4)
4 Solve phylogenetic problems using character based and distance based phylogeny (PO-1, 4)
5 Identify different parts of prokaryotic and Eukaryotic Genes **(**PO-1,2)

DIGITAL FORENSICS

Course Code: MSWEE3 **Credit: 4:0:0**
Prerequisite: NIL **Contact Hours: 56L**
Course Coordinator : Dr. Krishna Raj P M

Course content:

Unit I

Understanding Cyber Crime: Indian IT Act 2008 and amendments, Computer Forensic and Investigations as a Profession, Understanding Computer Forensics. Understanding Computer Investigations: Preparing a Computer Investigation, Taking a Systematic Approach, Procedures for Corporate High-Tech Investigations, Understanding Data Recovery Workstations and Software.

Unit II

Working with Windows and DOS Systems: Understanding File Systems, Exploring Microsoft File Structures, Examining NTFS Disks, Understanding Whole Disk Encryption, Understanding the Windows Registry, Understanding Microsoft Startup Tasks, Understanding MS-DOS Startup Tasks, and Understanding Virtual Machines.

Unit III

Data Acquisition: Understanding Storage Formats for Digital Evidence, Determining the best Acquisition Method, Contingency Planning for Image Acquisitions, Using Acquisition Tools, Validating Data Acquisitions, Using Remote Network Acquisition Tools. Computer Forensics Analysis and Validation: Determining What Data to Collect and Analyze, Validating Forensic Data, Addressing Data-Hiding Techniques, Performing Remote Acquisitions.

Unit IV

Current Computer Forensics Tools: Evaluating Computer Forensic Tool Needs, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating and Testing Forensics Software. Recovering Graphics Files: Recognizing a Graphics File, Understanding Data Compression, Locating and Recovering Graphics Files, Identifying Unknown File Formats, Understanding Copyright Issues with Graphics.

Unit V

Network Forensics: Network Forensic Overview, Performing Live Acquisitions, Developing Standard Procedures for Network Forensics, Using Network Tools. E-mail Investigations: Exploring the Role of E-mail in Investigations, Exploring the Roles of the Client and Server in E-mail, Investigating E-mail Crimes and Violations, Understanding E-mail Servers, Using Specialized E-mail Forensics Tools. Laboratory Lab exercises using forensic software and Case study data.

Text Book:

1. Nelson, Phillips, Frank, Enfinger and Steuart: Computer Forensics and Investigations, Cengage Learning, 2008. (Chapters: 1, 2, 4, 6, 7, 8, 9, 10, 11, 12) 30

Reference Books:

1. Marjie T. Britz: Computer Forensics and Cyber Crime - An Introduction, 2nd Edition, Pearson Education, 2012.
2. Harish Chander: Cyber Laws and IT Protection, PHI, 2012. 3. http://www.cyberforensics.in/default.aspx

Course Outcomes (COs):

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

1 Recognize the role of Cyber crime and investigate them. (PO-2)
2 Model appropriate file systems and use encryption systems to secure them. (PO-1, 4)
3 Understand data formats to store data and acquire them using various tools. (PO-1, 2, 4)
4 Evaluate computer forensic hardware and software tools. (PO-1, 4)
5 Understand network forensics and use tools to handle them. **(**PO-1,2)

INTERNSHIP / INDUSTRIAL TRAINING

Course Code: MSWE31 **Credit: 0:0:4**
Prerequisite: NIL **Contact Hours: 112P**
Course Coordinator : Dr. Sumana M

Internship Work-flow

1. Students submit the initial details including broad area of work and choice of guide in a prescribed format
2. The PG Co-ordinator along with Head of the department finalizes 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 Internship WorkBook to guide on the day of registration
5. Problem statement is submitted to PG Co-ordinator within one week of registration
6. Students update the workbook 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
10. Evaluation is based on following criteria
    - Project Management – 15 marks
    - Literature Survey – 10 marks
    - System Analysis – 15 marks
    - Software Design - 15
    - Implementation / simulation - 20
    - Testing / Validation - 15
    - Speaking and Writing Skills – 10 marks
    - Total – 100 marks

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- 1)
2. Formulate the requirements for the proposed system (PO- 3,4)
3. Design, implement and validate the system according to the plan (PO- 1,3,4)
4. Select effective communication strategies within and outside the team (PO-2)

PROJECT PRELIMINARIES

Course Code: MSWE32 **Credit: 0:3:10**
Prerequisite: NIL **Contact Hours: 84T+280L**
Course Coordinator : Dr. Sumana M

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 Co-ordinator along with Head of the department finalises 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 WorkBook 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.
10. Evaluation is based on following criteria
    - Project Management – 15 marks
    - Literature Survey – 10 marks
    - System Analysis – 15 marks
    - Speaking and Writing Skills – 10 marks
    - Total – 50 marks

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- 1)
2. Compare and contrast the available literature in the context of the project (PO- 3,4)
3. Formulate the requirements for the proposed system (PO-3,4)
4. Select effective communication strategies within and outside the team (PO-2)

TECHNICAL SEMINAR

Course Code: MSWE33 **Credit: 0:1:0**
Prerequisite: NIL **Contact Hours: 28T**
Course Coordinator : Dr. Sumana M

Seminar Workflow:

1. Each student is allotted a guide by Co-ordinator in consultation with Head of the Department.
2. The individual guides decide the topic for seminar during the first week of the semester.
3. The student undergoes a semester long independent study of the topic.
4. During the end of the semester, the student gives an oral presentation on the topic.
5. The student also presents a written report to the guide.
6. Evaluation is based on following criteria
    - Relevance of the topic – 20 marks
    - Background Research – 20 marks
    - Quality of Presentation – 20 marks
    - Speaking Skills – 20 marks
    - Writing Skills – 20 marks
    - Total – 100 marks

Course Outcomes (COs):

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

1. Study an emerging topic in software engineering and allied areas (PO - 1)
2. Demonstrate an ability to undertake a lifelong, independent study of a topic (PO – 3,4)
3. Communicate effectively among peers and general public in oral and written forms. (PO - 2)

IPR AND CYBER LAWS

Course Code: MSWE41 **Credit: 0:2:0**
Prerequisite: NIL **Contact Hours: 56T**
Course Coordinator : Mr Naresh E

Tutorial Topics:

1. Copyright law in software
2. Application of Patent laws to software
3. Trademarks and other IPR applicable to software
4. IPR related policies by government
5. International treaties governing IPR
6. IT ACT 2000 and its amendments
7. Software related case-laws
8. Cyber crimes
9. Laws applicable to cyberspace
10. Laws related to m-commerce

References:

1. Dr. B. L. Wadhera, Law Relating to Intellectual Property, Universal law Publishing Co. Ltd. 2009.
2. Joan Ruttenberg, Paige von Mehren, Julie Yen, "Intellectual Property And Cyberlaw", Harvard Law School, 2013.
3. CYBER CRIME LAW AND PRACTICE from THE INSTITUTE OF COMPANY SECRETARIES OF INDIA, 2016.
4. Case studies from internet sources.

Course Outcomes (COs):

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

1. Describe the evolution of IPR issues in software (PO-5)
2. Infer the socially relevant issues related to software like liberty and privacy (PO-5)
3. Sketch the process of protecting the IPR issues in software (PO-5)
4. Interpret the risks and liabilities of software in context of computer crimes (PO -5)
5. Critique the ethical issues arising from new areas of software usage (PO -3,5)

PROJECT WORK

Course Code: MSWE42 **Credit: 0:0:20**
Prerequisite: Project Preliminaries **Contact Hours: 560P**
Course Coordinator : Dr. Sumana M

Project Work-flow:

1. The work done in the previous semester (MSWE32) is continued
2. Students maintain a blog and update it on weekly basis about their work
3. Weekly meeting with guide is recorded in the workbook
4. 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
5. 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
6. Evaluation is based on following criteria
    - System Design – 15 marks
    - Coding – 15 marks
    - Testing – 10 marks
    - Speaking and Writing Skills – 10 marks
    - Total – 50 mark

Course Outcomes (COs):

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

1. Design the software by applying the relevant guidelines (PO- 3,4)
2. Develop the software by implementing the design (PO- 1,3,4)
3. Evaluate the quality of software by testing using appropriate techniques (PO- 4)
4. Demonstrate the project before general public and appraise its effectiveness (PO- 5)