

Vision & Mission

Vision

To be known globally for value-based education, research, creativity and innovation.

Mission

- Establish state-of-the-art facilities for world class education and research.
- Collaborate with industry and society to align the curriculum,
- Involve in societal outreach programs to identify concerns and provide sustainable ethical solutions.
- Encourage life-long learning and team-based problem solving through an enabling environment.




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School of Computing Science and Engineering
Department of Computer Science and Engineering

Vision:

To be recognized globally as a premier school of Computing Science and Engineering for imparting quality and value based education engaged in multi-disciplinary and collaborative research.

Mission:

M1: Developing a strong foundation in fundamentals of computer science and engineering with responsiveness towards emerging technologies.

M2: Establishing state-of-the-art facilities and adopt education 4.0 practices to analyse, develop, test and deploy sustainable ethical IT solutions by involving multiple stakeholders.

M3: Establishing Centres of Excellence for multidisciplinary collaborative research in association with industry and academia.

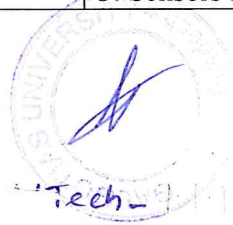
MTech: Curriculum Design and Development

The curriculum of the program-Mech is designed by following a systematic development process that considers each of the following component:

- i) what will be taught,
- ii) who will be taught, and
- iii) how it will be taught(pedagogy).

Curriculum design process not only take into consideration the inter-relationship between these components but also the *relevance to the local/ national / regional/global developmental needs* . The school has tie-ups with both local and global industries enabling association in designing curriculum both for theory as well as lab courses. Some of the industries and their respective association with curriculum design of various courses are listed below :

| Industry | Name of the course assisted for curriculum design |
|--|--|
| MicroChip Lab,Phase 1, Plot No. 149/B, Block A, EPIP, Industrial Area, Whitefield, Bengaluru, Karnataka 560048 | 1. Introduction to IoT 2. IoT Security 3. Sensors and Networks |



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|---|--|
| | 4. IoT Sensors |
| Intel CoE,UGF, Block E, International Trade Tower, Nehru Place, New Delhi, Delhi 110019 | 1. Data Sciences 2. Data Minig and Warehousing 3. Big Data Security 4. Predictive Analytics 5. Introduction to Big Data |
| Palo Alto Lab.Salarpuria Symbiosis, Arekere Village, Begur, Bannerghatta Main Rd, Venugopal Reddy Layout, UttarahalliHobli, Bengaluru, Karnataka 560076 | 1. Digital Forensics 2. Cyber Laws and Security policies 3. Cyber Security 4. E commerce |
| Unity Inc, Address: 2 b, unity building annexe, p kaligaraoad,, Kalinga Rao Rd, Bengaluru, Karnataka | 1. Computer Vision 2. Computer Graphics 3. Human Computer Interaction 4. Introduction to Grapics and Animation |
| AWS lab, Brigade Gateway, 8th floor, 26/1, Dr. Rajkumar Road, Malleshwaram(W), Bangalore-560055 | 1. Introduction to Cloud computing 2. Cloud Computing Security 3. Cloud Virtuliazation 4. Cloud Deploymnet models 5. Cloud Storage and Disaster recovery |
| VMware Lab, Brigade Gateway, 8th floor, 26/1, Dr. Rajkumar Road, Malleshwaram(W), Bangalore-560055 | Introduction to Virtulization, Cloud Storage Management |
| Google Cloud Lab, Unit No. 204, 2nd Floor, Signature Tower-II, Tower-A, Sector-15, Part-II, Village Silokhera Gurgaon Gurgaon HR 122001 IN | 1. Information Storage Management 2.Cloud Infrastructure service |
| Oracle Academy, Embassy Business Park C V Raman Nagar Bengaluru, Karnataka 560 093 | Database Management,Cloud Storage Management |
| Red Hat Academy, Aurangabad MIT, Red Hat Academy, Beed Bypass Road, Satara Village Road, Aurangabad, Maharashtra, 431010, India | Open source systems |
| Google Kotlin, Google India Pvt Ltd, 1st Floor,, 3 North Avenue, Maker Maxity, Bandra Kurla Complex, Bandra East, Mumbai, 400051, India | Mobile App development |
| Infosys, 3rd and 4th Floor Wing A, No. 39 (P), No. 41 (P) and No. 42 (P) Electronics City, Hosur Road Bengaluru 560 100 | Industry Oriented Java and Python |

For keeping relevance with the local/global developmental needs, **PEO-survey** from stakeholders are also taken into consideration during designing of curriculum.In keeping with the vision and mission of the SCSE , the school is able to develop and offer M.Tech (Computer Science) programs under the category of Computer Engineering domain which follow fully **Choice Based Credit System (CBCS) as per UGC guidelines since the introduction of the courses .**



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The development of an effective curriculum is a multi-step, ongoing and cyclical process. The process progresses from evaluating the existing program, to designing an improved program, to implementing a new program and back to evaluating the revised program. While

Curriculum is designed and developed to ensure excellence in the quality in a systematic manner which provides a learner centric education as per the following major steps:

Step-1: Program Assessment Committee (PAC) prepares the curriculum draft based on the following:

- Department Vision and Mission
- Program Educational Objectives
- Inputs obtained from stakeholders as per feedback obtained-Students, Parents, Faculty and Alumni
- **Inputs from external expert academicians**
- **Program Outcomes(POs) set by National Board of Accreditation(NBA)**
- Result of Gap Analysis as performed by Internal Quality Assurance Cell(IQAC)
- Benchmarking of curriculum against same/ similar program(s) run by leading educational institutions including IITs, NITs, **National/International Universities.**
- Guidelines of AICTE/ UGC

Step-2: Considering the **local/ national / regional/global developmental needs**, Board of Studies (BoS) committee is constituted comprising following members :

- Dean of School
- Program Chairs of all programs
- At least two professors of the school
- Two(02) Associate Professor
- Student Representatives
- **Two(02-03) members as Industry representative**
- VC as Nominee

BoS meeting is conducted and curricula and the accordingly respective syllabi are finalized,


Step-3: Curricula are finally approved by the Academic Council.

Salient features:-

- Wide choice of electives/Optional additional courses
- Interdisciplinary approach.
- Program Enhance skill/employability
- Make best use of the expertise of available faculty

The curricula are developed and reviewed by respective Boards of Studies of the SCSE under the direction of the **Program Assessment Committee (PAC)** , which comprises Head of the Department as the Chairperson, Program Chair (PC) as Coordinator for PAC, Professors, Associate Professors & Assistant Professors in the department associated with the program. The concerned Boards of studies recommend to the PAC, the introduction of new courses, prepare detailed scheme of the programs and review the syllabi from time to time and suggest modifications/ up-gradation. Feedbacks from faculty, students, alumni and




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the expert opinion is given due consideration. The new programs/curricula are formally approved by the Academic Council after detailed deliberations and the minutes of the meetings are duly prepared.

Academic Flexibility

Students can opt for any of the courses provided their prerequisites are met. They can also make an entry in second year if the lateral entry prerequisites are satisfied. There are provisions for integrated courses also. This enables the students to opt courses according to their interest and pace of learning. Other options available are: Interdisciplinary electives, Multidisciplinary open electives and Final year project work fully in industry.

Curriculum Enrichment

The Unique courses available are:-

- Campus to Corporate:-A personality development courses for employability.
- Foreign language courses for enabling students to become global professional
- Human values/NCC/NSS and environmental science courses for inculcating value education and environmental sensitivity necessary for holistic growth of the graduates
- Compulsory Industrial Internship for all students

The program and corresponding courses are well defined:

PEOs, POs and PSOs of the programs are formulated/reviewed through a consultative process involving the stakeholders including students, alumni, industry, employers, faculty and staff members.

Following are the program educational objective(PEOs),Program Outcome(POs) and program specific outcome(PSO) of the program.

Program:M.Tech (Computer Science)

| • M.Tech (Computer Science) (SCSE201) | | |
|---------------------------------------|---|---|
| 1 | Programme educational objectives(PEOs) | |
| | PEO1 | Be engaged with leading Global Software Services and Product development companies handling projects in cutting edge technologies |
| | PEO2 | Engaged in technical or managerial roles at Government firms, Corporates, Start-ups or contribute to the society as successful entrepreneurs. |
| | PEO3 | Undertake higher education, research or academia at institutions of transnational reputation. |
| 2 | Programme outcomes | |




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| 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 |
| 3 | Programme specifics outcome(PSO) |




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| | PSO1 | Ability to work with emerging technologies in computing requisite to Industry 4.0. |
| | PSO2 | Demonstrate Engineering Practice learned through industry internship to solve live problems in various domains. |

Similarly, Course Outcomes(Cos) of the courses are also formulated by the respective Boards of Studies under the direction of PAC during the introduction of the courses.

Snippets of Program-wise Cos are:

Program: M.Tech (Computer Science) (SCSE201)

| Advanced Design and Analysis of Algorithms(MCSE1110) | |
|---|--|
| CO1 | Analyze the complexity of the algorithms and use technique divide and conquer to solve the problems |
| CO2 | Identify feasible solutions for different problems through greedy method and minimize the solutions space and to solve the problems through dynamic programming. |
| CO3 | Solve the problems through graph algorithms. |
| CO4 | Justify that a certain problem is NP-Complete |
| CO5 | Understand and apply linear programming concepts to real time applications. |

| Advanced Computer Networks(MCSE1120) | |
|---|---|
| CO1 | Develop knowledge about physical structure of computer network |
| CO2 | Understand the fundamental concepts in routing and addressing |
| CO3 | Analysis the problem in different layer during the communication in network |
| CO4 | Understand the congestion control and transport protocols |
| CO5 | Became expert to use of Internet and public network |
| CO6 | Able to understand the connection management in network at transport layer |

| Advanced Operating Systems(MCSE1130) | |
|---|---|
| CO1 | Discuss the various synchronization, scheduling and memory management issues. |
| CO2 | Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system. |



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| CO3 | Discuss the various resource management techniques for distributed systems. |
| CO4 | Identify the different features of real time and mobile operating systems. |
| CO5 | Install and use available open source kernel. |
| CO6 | Modify existing open source kernels in terms of functionality or features used. |

| Advanced Software Engineering(MCSE1150) | |
|--|--|
| CO1 | Understand the advantages of various Software Development Lifecycle Models |
| CO2 | Gain knowledge on project management approaches as well as cost and schedule estimation strategies |
| CO3 | Use UML diagrams for analysis and design |
| CO4 | Architect and design using architectural styles and design patterns |
| CO5 | Understand software testing approaches |
| CO6 | Understand the advantages of DevOps practices |

| Artificial Intelligence & Machine Learning(MCSE1240) | |
|---|---|
| CO1 | Students should know about artificial intelligence and machine learning |
| CO2 | Students should learn machine learning tools. |
| CO3 | Students should know about neural networks. |
| CO4 | Students use prediction of AI techniques. |
| CO5 | Students can use classification of machine learning algorithm. |
| CO6 | Further take the R&D interest and try to contribute some new methods to the area. |

| Data Mining & Analytics using R(MCSE9100) | |
|--|--|
| CO1 | Compare various conceptions of data mining as evidenced in both research and application. |
| CO2 | Characterize the various kinds of patterns that can be discovered by association rule mining |
| CO3 | Evaluate mathematical methods underlying the effective application of data |



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| Research Methodology(MCSE1260) | |
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| CO1 | Understand the research problem and research process |
| CO2 | Understand research ethics |
| CO3 | Prepare a well-structured research paper and scientific presentations |
| CO4 | Explore on various IPR components and process of filing. |
| CO5 | Understand the adequate knowledge on patent and rights |

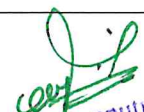
| Advanced Java Programming Lab(PBL) | |
|---|--|
| CO1 | Develop Swing-based GUI |
| CO2 | Develop client/server applications using socket programming |
| CO3 | Design, Update and retrieve the data from the databases using SQL |
| CO4 | Develop distributed applications using RMI and component-based Java software using JavaBeans |
| CO5 | Develop server-side programs in the form of Servlets and enterprise applications |

| Software Project Management(MCSE2320) | |
|--|--|
| CO1 | Understand overall software development life cycle and adopt suitable processes. |
| CO2 | Analyze, prioritize, and manage both functional and quality requirements. |
| CO3 | Estimate efforts required, plan, and track the plans |
| CO4 | Understand and apply configuration and quality management techniques. |
| CO5 | Create Software product using Various Process. |

| IoT Technology and Applications(MCSE9110) | |
|--|---|
| CO1 | Analyze various protocols for IoT Develop web services to access/control IoT devices. |
| CO2 | Design a portable IoT using Rasperry Pi |
| CO3 | Deploy an IoT application and connect to the cloud. |
| CO4 | Analyze applications of IoT in real time scenario |

| IoT on Cloud(MCSE9120) | |
|-------------------------------|---|
| CO1 | Identify and design the new models for market strategic interaction |
| CO2 | Design business intelligence and information security for WoB |
| CO3 | Analyze various protocols for IoT. |




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| CO4 | Design a middleware for IoT. |
| CO5 | Analyze and design different models for network dynamics. |

| Big Data Mining and Analytics(MCSE9130) | |
|--|---|
| CO1 | Design algorithms by employing Map Reduce technique for solving Big Data problems |
| CO2 | Design algorithms for Big Data by deciding on the apt Features set. |
| CO3 | Design algorithms for handling petabytes of datasets. |
| CO4 | Design algorithms and propose solutions for Big Data by optimizing main memory consumption. |
| CO5 | Design solutions for problems in Big Data by suggesting appropriate clustering techniques. |

| Foundations of Information Security(MCSE9260) | |
|--|---|
| CO1 | Evaluate vulnerability of an information system and establish a plan for risk management. |
| CO2 | Demonstrate basic principles of Web application security. |
| CO3 | Evaluate the authentication and encryption needs of an information system. |
| CO4 | Demonstrate how to secure a network |
| CO5 | Evaluate a company's security policies and procedures. |

| Formal Models of Software Systems(MCSE9310) | |
|--|---|
| CO1 | Understand the complexity of software systems, the need for formal specifications activities and qualities to control complexity. |
| CO2 | Gain knowledge on fundamentals of abstraction and formal systems. |
| CO3 | Learn the fundamentals of logic reasoning- Propositional Logic, temporal logic and apply to models systems. |
| CO4 | Develop formal specification models based on set theory, calculus and algebra and apply to a typical case study. |
| CO5 | Have working knowledge on Z, Object Z and B Specification languages with case studies. |

For complete course outcomes refer to respective course book.



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|------------------------------|-------------------------------------|---|---|---|---|
| Course Code: MCSE1130 | Advanced Operating Systems | L | T | P | C |
| Version No.1.0 | Date of Approval: 19/06/2018 | 3 | 0 | 0 | 3 |
| Prerequisite/Exposure | Operating System | | | | |
| Co-requisites | | | | | |

Course Objectives

1. To learn the fundamentals of Operating Systems.
2. To gain knowledge on Distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols.
3. To gain insight on to the distributed resource management components viz. the algorithms for implementation of distributed shared memory, recovery and commit protocols.
4. To know the components and management aspects of Real time, Mobile operating systems.

Course Outcomes

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

1. Discuss the various synchronization, scheduling and memory management issues.
2. Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system.
3. Discuss the various resource management techniques for distributed systems.
4. Identify the different features of real time and mobile operating systems.
5. Install and use available open source kernel.
6. Modify existing open source kernels in terms of functionality or features used.

Course Content

Unit I: Introduction

8 lecture hours

Operating system concept - processes and threads, process model, process creation, process termination, process hierarchies, and process states, Implementation of processes, Threads- Thread model, thread usage, Implementation of threads in user space and kernel, Hybrid implementations.

Unit II: Inter Process Communication

8 lecture hours

Race conditions, critical regions, Mutual Exclusion with busy waiting, sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing; Scheduling- scheduling in batch systems, Interactive systems, Real time systems, Thread scheduling.

Unit III: Deadlocks

8 lecture hours

Deadlocks-Introduction, Deadlock Detection and Recovery – Deadlock Detection with one resource of each type, with multiple resource of each type, recovery from deadlock; Deadlock Avoidance, Deadlock Prevention

Unit IV :Memory and Device Management

8 lecture hours

Introduction, Swapping, Paging, Virtual memory – Demand paging, page replacement Algorithms; File System Management- Organization of File System, File Permissions, MS DOS and UNIX file system case studies, NTFS; Device Management- I/O Channels, Interrupts and Interrupt Handling, Types of device allocation.

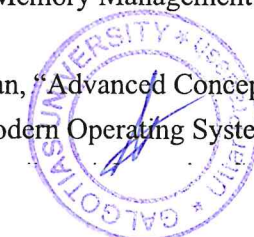
Unit V: Distributed Operating Systems

8 lecture hours

Distributed operating system concept – Architectures of Distributed Systems, Distributed Mutual Exclusion, Distributed Deadlock detection, Agreement protocols, Threads, processor Allocation, Allocation algorithms, Distributed File system design; Real Time Operating Systems: Introduction to Real Time Operating Systems, Concepts of scheduling , Real time Memory Management.

Text Books

1. Mukesh Singhal and Niranjana, "Advanced Concepts in Operating Systems", TMH, 1st Edition, 2001
2. Andrew S. Tanenbaum, "Modern Operating Systems", Pearson Education, 2nd Edition, 2006



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