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M.Tech.

SOFTWARE SYSTEMS

with specialization in Data Analytics, Internet of Things, Embedded Systems, Security, Networks and Cloud

BITS Pilani
Pilani | Dubai | Goa | Hyderabad
Work Integrated Learning Programmes

HCL

WHO SHOULD APPLY?

M.Tech. in Software Systems is a four-semester Work Integrated Learning Programme designed for working professionals. They are the ones who are aspiring for rapid career progression in high-growth IT domains, and wish to stand out in highly competitive workplaces by acquiring prestigious Master's-level qualification from a premier institution.

- Highly driven and ambitious engineers working for software services or product companies and wish to advance their careers in hyper-growth areas of Software Engineering, Embedded systems, Data Analytics, Telecommunication or Networking.
- IT professionals in technical roles such as Software Developers, Test Engineers, Lead Engineers, Architects, or techno-managerial roles such as Product Managers and Project Managers.

WHAT ARE THE MAIN HIGHLIGHTS OF THE PROGRAMME?

- The programme is of four semesters, with online classes conducted mostly on weekends or after business hours.
- The programme offers a set of core courses and elective courses, allowing students to specialize in Data Analytics, Internet of Things, Embedded Systems, Security and Networks and Cloud.
- The programme makes use of Languages, Platforms, and Libraries. These include NS2, Net-SNMP, WireSha, R, Python, Prolog, Lisp, RStudio, Weka, Microsoft Power BI, TensorFlow, Anaconda Navigator, Python Ecosystem – NumPy, SciPi, Pandas, scikit-learn, MatplotLib; Searborn, Keras, NLTK, pgmpy etc., Keil, CCS Studio, Tossim, Cheddar, Jenkins, GitHub, SonarQube, Selenium, Tomcat, Maven, Java, Eclipse, Code::Blocks, Android Studio, Jupyter Notebooks, Spyder, Multisim, CPU-OS Simulator, SQLite, MATLAB, , Gantt Project, Open Project and XAMPP.
- The Dissertation (Project Work) in the final semester enables students to apply concepts and techniques learned during the programme.
- The programme uses a Continuous Evaluation System that assesses the learners over convenient and regular intervals. Such a system provides timely and frequent feedback and helps busy working professionals stay on course with the programme.
- The education delivery methodology is a blend of classroom and experiential learning. Experiential learning consists of lab exercises, assignments, case studies and work-integrated activities.
- Participants who successfully complete the programme will become members of an elite & global community of BITS Pilani Alumni.

WHAT ARE THE PROGRAMME OBJECTIVES?

Studies have shown that senior positions in technology industry require holistic understanding and capabilities that span multiple technologies, critical thinking & problem solving situations and cross-functional collaboration. The programme aims to:

- Build and nurture the knowledge, skills, and aptitude required to realise long-term career growth and enables participants to undertake higher responsibilities at the workplace.
- Provide a requisite conceptual foundation, and contextual understanding of real-world applications that enable a learner to enhance workplace performance and stand out among peers for growth opportunities.
- Enable learners to choose their specialization in some of the fastest-growing domains like Data Analytics, Internet of Things, Embedded Systems, Security, Networks and Cloud.

WHAT ARE THE STUDENT LEARNING OUTCOMES?

On completion of the program, a student will have the ability to:

- Provide a strong foundation in software development methods and best practices
- Provide an understanding of various software technologies used to develop software systems.
- Enable students to understand & analyse requirements of large software systems and to design, develop & manage them in an effective manner.

WHAT IS THE EDUCATION DELIVERY METHODOLOGY?

CLASSROOM SESSIONS

- Classroom sessions in this programme will be conducted through live online sessions which can be accessed by the learners from any location using a computer and a high-speed internet connection.
- Classes will be conducted by BITS Pilani faculty over weekends. A typical weekend classroom session per subject is of 1.5-2 hours duration. Since students typically pursue 4 courses in a semester, they will be expected to attend approximately 4 classroom sessions over a weekend. These classroom sessions will be typically scheduled over 16 weekends per semester.

The schedule of the classroom sessions, will be announced at the beginning of each semester.

EXPERIENTIAL LEARNING & LABS

The programme emphasises on Experiential Learning that allows learners to apply concepts learnt in classroom in simulated and real work situations. This is achieved through Simulations, Online Labs, Case Studies, Group Discussions, and Assignments, etc.

Some of the following tools be used during the programme:

Simulation Software like NS2, Tossim, Net-SNMP, MultiSim, CPU-OS Simulator, Cheddar, Keil, CCS Studio Design & Modelling Tools like StarUML Programming Environments like Eclipse, Code::Blocks, Amazon Cloud, Android Studio Other software/ tools like SQLite, WireShark, Weka, OpenProj

PROJECT WORK

During the final semester participants carryout a semester-long intensive project work applying the various concepts learnt throughout the program guided by the organisation mentor and supervisor. Participants are provided access to virtual labs where applicable, and faculty expertise to support the project work.

DIGITAL LEARNING

Learners can access engaging learning material at their own pace which lecture videos, student notes, curated content etc. for select courses, through a learning management platform that is engaging and mobile-friendly.

EXAMINATIONS & CONTINUOUS ASSESSMENT

The learners' performance is assessed continuously throughout the semester using various tools such as quiz, assignments, mid-semester and comprehensive exams. The assessment results are shared with the learners to improve their performance.

Each course will entail a minimum of 1 Assignment/ Quiz, a Mid-semester exam and a final Comprehensive exam. Your semester calendar will clearly indicate the dates of the Mid-semester and Comprehensive exam. Typically, a Mid-semester or Comprehensive examination for a course is for 2-3 hours duration. The examinations are typically conducted over a weekend, i.e. Saturday and Sunday. These exams will be conducted either at the learners' office premises, or at another suitable location. Details regarding the exam location will be communicated at the beginning of the semester.

WHAT IS THE ELIGIBILITY CRITERIA?

The minimum eligibility to apply: Employed professionals holding B. Tech., B.E, M.Sc., MCA or equivalent in relevant disciplines with at least 60% aggregate marks and minimum two years of relevant work experience within HCL are eligible to apply.

The programme is designed for enthusiastic and ambitious engineers working in the software industry and who wish to advance their careers in hyper-growth areas of Data Analytics, Internet of Things, Embedded Systems, Security, Networks and Cloud.

FEE STRUCTURE

The following fees schedule is applicable for candidates seeking new admission during the academic year 2021-22

Application Fees (one time)	:INR 1,500
Admission Fees (one time)	:INR 16,500
Semester Fees (per semester)	:INR 57,750

Programme Curriculum

The programme offers specializations in high-demand areas such as Data Analytics, Internet of Things, Embedded Systems, Security, Networks and Cloud.

Electives can be chosen either from the General pool of electives or from across other pools of electives for specializations. Specializations are optional. To earn a specialization, a participant must select and successfully complete at least 5 courses from that specialization pool.

First Semester

- Distributed Computing
- Data Structures & Algorithms Design
- Database Design & Applications
- Elective 1

Second Semester

- Software Architectures
- Elective 2
- Elective 3
- Elective 4

Third Semester

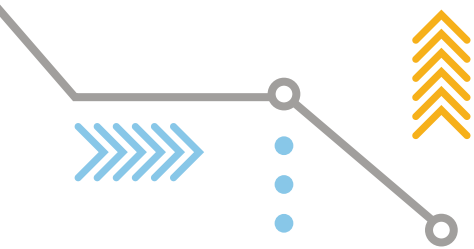
- Elective 5
- Elective 6
- Elective 7
- Elective 8

Fourth Semester

- Dissertation

General Pool of Electives

- Artificial Intelligence
- Computer Organization and Software Systems
- Distributed Data Systems
- Software Engineering and Management
- Usability Engineering
- Object-oriented Analysis & Design



Electives finally offered will be at the discretion of the BITS Pilani, and will be decided in consultation with HCL. Offered electives will be made available to enrolled students at the beginning of each semester.

1. Specialization in Data Analytics

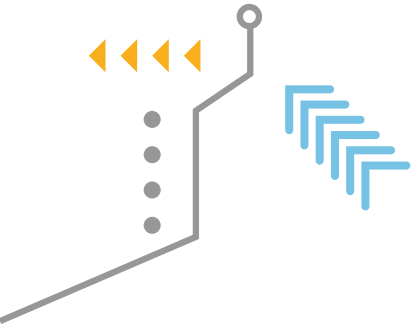
Participants that earn a specialization in Data Analytics will learn how to apply principles behind modern data analytics techniques; Apply statistical and machine learning methods to real data; Evaluate their performance and e ectively communicate the results; and build expertize in advanced Artificial Intelligence topics such as Deep Learning and Natural Language Processing.

Pool of Electives

- Advanced Statistical Techniques for Analytics
- Applied Machine Learning
- Metaheuristics for Optimization
- Data Mining
- Data Warehousing
- Deep Learning
- Information Retrieval
- Mathematical Foundations for Data Science (Mandatory Course for Specialization)
- Natural Language Processing

2. Specialization in Embedded Systems

Participants will gain expertise in key areas of Application (Domain) Specific System Design such as the scope of a Processor (Embedded processors, Desktop systems, Servers, and Supercomputers), the target application (general-purpose versus domain-specific), the characteristics of the design objectives (Speed, Power consumption, Cost, Reliability, Availability, and Re-configurability), and the measurement and analysis of resulting designs.



Pool of Electives

- Embedded Middleware Design
- Embedded System Design (Mandatory Course for Specialization)
- Fault-tolerant Embedded System
- Hardware-software Co-Design
- Networked Embedded Applications
- Parallel Embedded Architectures
- Real-Time Scheduling
- Real-Time Systems
- Software for Embedded Systems

3. Specialization in Networks and Cloud

Participants will build expertise in how to design, and manage software and hardware that control digital networks; conceptualize and solve engineering problems with reference to wireless and mobile networks effectively and arrive at the feasible optimal solution, individually and in teams; master formal techniques for network analysis, design and operate data centers; Network Security aspects Storage Area Networks, Virtualizations, and Cloud Computing Concepts which has great scope and opportunities in the industry; apply advanced software engineering techniques (e.g. software-defined networks,containerization, etc.) to compute, improve and master the development of distributed networks.

Pool of Electives

- Advanced Computer Networks
- Cloud Computing
- Computer Networks
- Data Storage Technologies and Networks

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- Design and Operation of Data Centers
- Edge Computing
- Mobile Networks
- Network Programming
- Network Security
- Software-defined Networks
- Wireless and Mobile Communication

4. Specialization in Security

Participants will build expertise in the implementation of core software engineering principles and the best cybersecurity practices in terms of policies, models and mechanisms; gain knowledge about securing computer networks and systems; learn to examine secure software design and development practices in cybersecurity; understand the prevalent network and distributed system attacks; incorporate approaches for incident response and security risk management; understand the key concepts in domain-specific security.

Pool of Electives

- Cyber Security
- Cryptography
- Network Security
- Ethical Hacking
- Identity and Access Management Technologies
- Cyber Crimes, Forensics and Incident Handling
- Cloud, IoT and Enterprise Security
- Secure Software Engineering
- Blockchain technologies & Systems
- AI and ML techniques in CyberSecurity

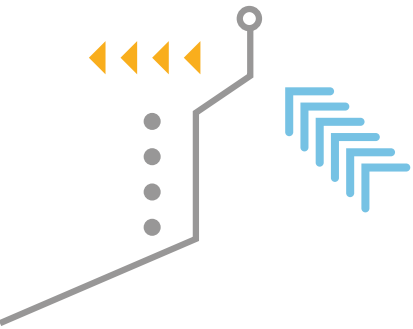
5. Specialization in the Internet of Things

Participants will build expertise in the building blocks of IoT technology and explore the vast spectrum of IoT applications; assess, select and customize technologies for IoT applications; connect the cyber world with the physical world of humans,

automobiles and factories; integrate geographically distributed devices with diverse capabilities; design and implement IoT applications that manage big data.

Pool of Electives

- Embedded Systems Design
- Cyber-physical Systems
- Networked Embedded Applications
- Cross-platform Application Development
- Cloud Computing
- Data Management for IoT
- Stream Processing and Analytics
- Embedded Network Security



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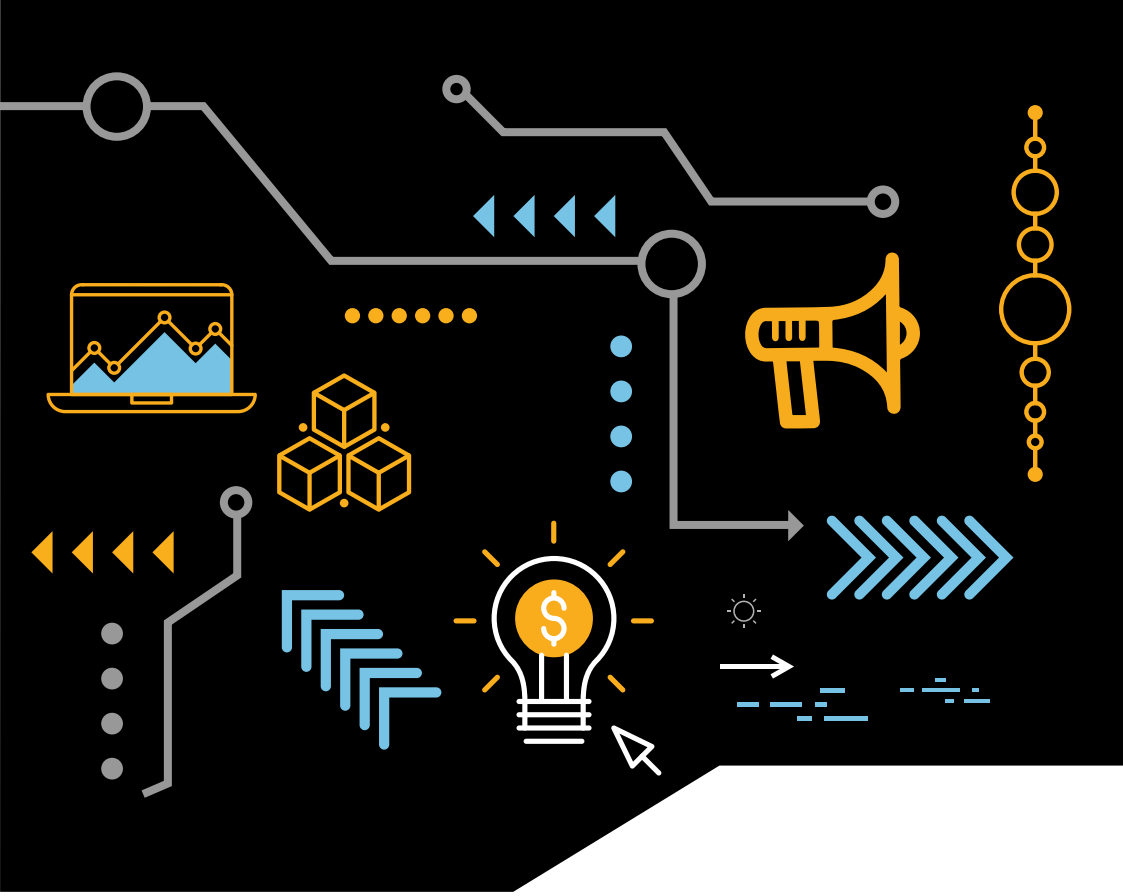
HOW TO APPLY

- Create your login at the Online Application Center by entering your official HCL Email ID only and create a password of your choice. Once your login has been created, you can anytime access the Online Application Center using your official email ID and password
- Begin by clicking on Step 1 - ‘Fill/ Edit and Submit Application Form’. This will enable you to select the programme of your choice. After you have chosen your programme, you will be asked to fill your details in an online form. You must fill all details and press ‘Submit’ button given at the bottom of the form
- Now, click on 'Pay Application Fee’ to pay INR 1,500/- using Netbanking/ Debit Card/ Credit Card
- Finally, click on 'Upload & Submit All Required Documents’. This will allow you to upload one-by-one all the mandatory supporting documents such academic certificates and transcripts, photograph, etc. and complete the application process. Acceptable file formats for uploading these documents are .DOC, .DOCX, .PDF, .ZIP and .JPEG
- Upon receipt of your Application Form and all other enclosures, the Admissions Cell will scrutinise them for completeness, accuracy and eligibility
- Admission Cell will intimate selected candidates by email within two weeks of submission of application with all supporting documents. The selection status can also be checked by logging in to the Online Application Centre



DISCLAIMER

Ever since it was declared as a Deemed to be University in 1964, BITS Pilani has been offering higher education programmes in science and technology, and has earned an enviable reputation for its innovations in this sphere. The Work Integrated Learning Programmes (WILP) of BITS Pilani constitutes a unique set of educational offerings for working professionals. These programmes, which BITS began to offer in 1979, have, over the years, evolved along the lines envisaged in the National Policy on Education, 1986.

The WILP are rigorous higher education programmes in technology areas, designed keeping the evolving needs of industry in view, and meant for working professionals in their respective domains. The very intent is to deliver the education at the workplace, in order that the greatest degree of work integration of the education is achieved, and thus the WILP are very distinct in philosophy and pedagogy from open, distance learning programmes. Though it is incorrect and improper, at times the WILP are compared to ODL programmes. Accordingly, it has been our constant endeavor to engage with the regulator, and provide all necessary information about these programmes.

The WILP have been well received, and accepted by industry, because of the high quality of the programmes in terms of the curriculum and the instruction, and also because of the high degree of work integration, which results not only in up gradation of knowledge, but also in up skilling, and productivity increase.

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