Master of Technology in Computer Science Engineering with specialization in Mobile Technology

Background
Ranging from cellular phones to Smartphone’s, mobile technology has been on the forefront in providing end-to-end communication. Recent advancements in the field of wireless and mobile technologies have broken barriers regarding how we perceived of communication. Ubiquitous computing has now evolved from the nascent stage of desktop computing.

M.Tech. Program with specialization in Mobile Technology will cover theory and practical concepts required for mobile-based services. The program will focus on developing hands-on skills pertaining to the latest and most popular platforms, e.g. Symbian, Android, iOS, Windows Mobile, etc. Students will gain knowledge in wireless technologies, such as Bluetooth, WiFi, GPRS, EDGE, 3G, LTE, 4G, etc. They will be trained not only to use existing mobile platforms but also to build new ones. Projects will be an integral part of all the courses. This program offers a route into a rapidly-growing diverse industry which covers a range of applications from business to entertainment and advertising on handheld devices. This degree develops the necessary knowledge and skills for the mobile computing industry and covers all forms of mobile computing technology. It embraces games, PDAs, computers, laptops and notebooks, tablet computers, mobile phones, and digital broadcasting. So, there is a hugely expanding market for well-qualified people who are able to understand, manage and develop in this increasing mobile computing market. The course helps the students to propagate a creative and professional approach to learning applications and develop the potential for these products. Students will be prepared for an exciting career in a fast-growing and fundamental area of contemporary life. Advanced courses in other allied domains such as information security and biometrics will help prepare students for some of the future areas in mobile computing for e.g. possible security attacks and defence mechanism in the mobile domain.

Introduction
The mission of this course is pursuing excellence in research and innovation and strengthening student and staff capacity to serve both industry and the community in the field of Mobile Technology.

This Master’s program provides career options for our students in the emerging technology sector of Mobile Technology. The students will possess the competent knowledge and sector.

The course instills in the students practically applicable knowledge, helping them gain the acumen and technical expertise in the fields of network architecture, device architecture, application development and testing, web application, software system analysis and design, platform specific application development, user interface designing, location based services, value added services, enterprise applications, security in computing, and stand-alone application development.

To accomplish the mission, the objective of the course is as follows:

- To create engineers with right mix of principles, tradition and modern technology to benefit the society and the nation at large
- To promote technology, research and development in the institution
- To produce leaders and global citizens who will challenge the present and change the future

The course’s learning outcomes arm the students with technical expertise in mobile technologies and mobile application development experience. Industry leaders support the course by providing valuable industry inputs and invaluable insight into the process of developing cutting edge mobile applications.

Importance
Mobile technology is becoming the dominant means for interacting with people, places and most importantly, the internet. In fact, according to a recent study, it is estimated that the number of U.S. consumers who access
the Internet through traditional desktop and laptop personal computers will drop from 240 million in 2012 to 225 million by 2016. At the same time, the number of individuals who surf primarily through their mobile devices is expected to jump from 174 million to 265 million within that same time frame.

So why is this important to a small and medium size organization? If your customers or members are using the internet for social media, website surfing or locating items and places, you want to make sure that you can be located as well. This can be done through various methods but typically through a mobile app (iPad, iPhone, Android) or through a mobile website.

Here are the major reasons why mobile technologies are beneficial for learning:

- Ubiquity
- Connectivity
- Individuality
- Accessibility and Mobility
- Educate more and more people
- Equity of education
- Facilitate personalized learning
- Power anytime, anywhere learning
- Provide immediate feedback and assessment
- Ensure the productive use of time spent in classrooms
- Build new communities of student
- Support situated learning
- Enhance seamless learning
- Bridge formal and informal learning
- Improve communication and administration

Mobile technologies can support and enrich learning. Agencies like UNESCO aim to empower women and girls through education via innovative mobile technology-based learning and information programmes. They aim to provide access to information and knowledge on areas such as human rights, health and hygiene, nutrition, agriculture, or banking.

**Need for Education in Mobile Technology**

Mobile technology is gaining importance and popularity in organizations. Examples of applications of mobile technology in organizations include mobile access to company Intranet, mobile brokerage services, mobile payment and banking services, and electronic procurement application systems based on WAP using mobile phones and laptops.

We take it for granted that we can talk to other people at any time, from wherever we may be; we are beginning to see it as normal that we can access information, take photographs, record our thoughts with one device, and that we can share these with our friends, colleagues or the wider world. Newer developments in mobile phone technology are also beginning to offer the potential.

The strategic importance of mobile technology cannot be underestimated. The rapid pace of adoption and advancement of mobile technology creates opportunities for new and innovative services provided through mobile devices. The emergence of mobile technology is expected to drastically affect a number of industries and to impact their strategic management. Therefore, this new phenomenon needs to be better understood and warrants more research.

Internationally, mobile technologies are on the cutting edge of business applications. Widespread use of mobile phones, PDAs, MP3 players, handelds, tablet PCs, and laptops for learning, working, meeting, and conferencing is evident.

The academic environment has been introduced to mobile learning through the use of laptops, PDAs, and smartphones. Mobile Technology tools helps to create applications for the major mobile device players including Apple iPhone, Google Android, and Windows Phone 8. It is one of the hot new IT jobs identified in today’s world. If you are creative and consider the world of computers your future, an exciting and rewarding career may be waiting for you in this dynamic field.
Mobile technology is now one of the preferred modes of communication amongst the younger generation who highly priorities “portability”. The importance of course can be prescribed form two most important domains: Industry and Research.

Eligibility for Master of Technology in CSE:
The minimum eligibility criterion for this program is B.Tech./B.E. in Computer Engineering/ Information Technology/ Electronics and Communication or equivalent.
Admission to this programme shall be carried out through:
- Valid GATE Score
- PGET (Post Graduate Entrance Test) to be conducted at JIIT, Noida.

Overall Duration of course: 2 years consisting of four semesters
Total intake: 30
Proposed to be launched in July 2015.
### Proposed M. Tech. (Mobile Technology) Course Structure

#### FIRST SEMESTER

<table>
<thead>
<tr>
<th>Sr.No</th>
<th>Course No.</th>
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<tr>
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<td>3.</td>
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<td>Elective -I</td>
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<td>6.</td>
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**TOTAL** | 19 | 17 |

#### SECOND SEMESTER

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**TOTAL** | 19 | 17 |
### THIRD SEMESTER

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<td>Xxxxx Seminar &amp; Term Paper</td>
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### FOURTH SEMESTER

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### Electives

1. Mobile User Interface Design
2. Embedded Systems
3. Mobile Hardware for Software Engineers
4. Advanced Mobile and Cloud Computing
5. Wireless Sensor Networks
6. Advanced Digital Communication
7. Advanced Network Technologies
8. M-commerce
9. Advanced Optimization Techniques
10. Mobile Forensics
11. Big Data Analytics
12. Financial Data Analytics
13. Mobile and Cellular Network Security

**Total Credits: 70**

**Notes:-**

1. Dissertation in Fourth Semester may be allowed to be pursued in Industry.
2. Dissertation work at the end of Third Semester shall be evaluated by a panel consisting of a) Nominee of Dean A&R b) HoD or his nominee c) Supervisor(s).
3. Dissertation to be submitted by the students at the end of Fourth Semester shall be consolidated report of work done in Third and Fourth Semesters.
4. Dissertation at the end of Fourth Semester shall be evaluated by a panel consisting of a) HoD or his nominee b) An external expert c) Supervisor(s). The Grades may be awarded based on guidelines issued by Dean A&R from time to time.
Course Details

1. Advanced Mobile Computing


Protocols and Tools: Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management) Voice over IP and its Application. Emerging Technologies: Blue Tooth, WIMAX, IPV6, Mobile IP. Convergence of Mobile and Internet (Local & Adhoc Networks), Location Based Services, Context aware Computing.

2. Advanced Data Structures and Computational Thinking

Advanced data structures: String data structures, Red Black Tree, Tournament Tree, Splay Tree, Tries, Indexing trees for large scale databases, Priority search queues, Spatial and Multidimensional data structures (pyramid, kd tree, quad tree, octree, R tree, bsp tree, region adjacency graph, etc.), Kinetic data structures

Philosophy of CS – Fundamental questions of CS, traditions of CS (logico-mathematical view, design/engineering view, empirical/scientific view), emerging interdisciplinarity

Unifying and pervasive themes of CS. – abstraction, complexity, sequentiality, concurrency, synchronization, caching, consistency, completeness, state, system/quality metrics, performance, scalability, limits, load balancing, locality, non-determinism, prevention/detection/recovery of worst case scenarios through exception handling, error correction, redundancy, damage containment, tradeoffs and consequences, power consumption

3. Mobile Architecture and Programming

Introduction to Mobile Architecture: Mobile Architecture, Mobile Hardware Architecture, Mobile Software Architecture, Mobile Architecture Vs Computer Architecture, Memory organization, Input and output devices for handled devices and Booting of Mobile devices and a case study of any mobile device.

Hardware Architecture: Introduction to the processors used for Mobile and Handheld devices and SoC architecture like OMAP and Snap Dragon and its case study with reference to protocols, Input and output interfaces, GPU, DSP etc.
Software Architecture: Introduction to Operating Systems, Real Time Operating systems and Mobile Real Time Operating Systems. Tool chain (SDK’s) for Mobile Application Development and its functions with the case study with reference to layered architecture, communication protocols, hardware support etc.


4. Wireless Communications and Networks

Introduction to wireless communications: Examples of wireless communication system, Cellular concept and system design fundamentals, Frequency reuse, Co-channel Interference and Reduction Technique, Channel assignment strategies, Handoff strategies, Methods for improving coverage and capacity in cellular system. Mobile Radio propagation, Large scale path loss, Reflection, Diffraction, Scattering, Outdoor and Indoor propagation models, parameters of multi path channels, fading due to multipath, fading effect due to Doppler spread, equalization, Diversity.

Modulation Techniques: Digital modulation, Amplitude shift keying, Frequency shift keying, Phase shift keying, DPSK modulation, minimum shift keying, Quadrature amplitude modulation, Orthogonal frequency division multiplexing. Introduction to spread spectrum communication, multiple access techniques used in mobile wireless communication: FDMA, TDMA, Cellular CDMA, packet radio protocols, CSMA, reservation protocols, Digital Modulation. Evaluations of different generations of communications.


5. Mobile Database Management Systems

Introduction to Database Management Systems: Centralized Databases, Relational DBMS, Normalization in Relational DBMS, Spatial Databases, Distributed Databases: Data Fragmentation, Data Replication, Local versus Global Transactions, Distributed Transactions,
Distributed Query Processing, Concurrency Control & Commit Protocols in Distributed Databases.


Data management in Mobile Databases: Data categorization in Mobile Database, Query processing and Concurrency Control in Mobile Databases, Recovery in Mobile Databases, Introduction, Log Management in Mobile Database System, Mobile database recovery Scheme- Three Phase recovery scheme, low-cost check pointing and failure recovery, mobile agent based log management scheme. Forward strategy schemes. Applications of Mobile Databases. CASE STUDY: Microsoft SQL Server Compact, ORACLE Lite

6. Mobile Systems and Programming Lab

Experiments will be based on the J2ME application development, Android Platform, Android SDK, building a sample Android application, and developing mobile graphical user interface.

7. Advanced Algorithms

Amortized Analysis, NP Completeness; String Algorithms, Cryptography, Randomized and Approximation Algorithms; Optimization, Nature inspired algorithms; Large Graph Algorithms, Parallel Algorithms, Web Algorithms.

8. Mobile Operating System and Web Development Lab

Data Persistence, creating and using Databases, Common Android APIs. Web Based Applications, Database Applications, IOS, JQuery, Qt, and HTML5.

9. Mobile and Pervasive Computing

Software architecture and technologies for mobile and pervasive computing, mobile computing devices and system networks, Issues in mobile pervasive networking, Application development platforms for mobile pervasive services, Internet for Mobile Pervasive computing, Naming and Location management in pervasive mobile networks, context-aware computing, temporal consistency, sensor devices and sensor data management, real-time embedded and surveillance systems, sensor networks, data dissemination, Caching,

10. Advanced Mobile and Cloud Computing


11. Mobile Hardware for Software Engineers

The course covers the elements of embedded systems development, such as hardware fundamentals, real-time operating systems, interrupts and cross-development, as well mobile topics such as power management, machine-to-machine communication, radio/RF subsystems and wireless protocols. Topics typically include: USB, GPIO, blue-tooth, cellular networks, 802.11, Zigbee, RFID, NFC, cameras, audio, etc. Student teams will undertake small HW/SW interfacing projects to sharpen their experience. Unlike a conventional hardware course, the course instead focuses on the software implications, rather than the CPU and radio.

12. M-Commerce


13. Mobile and Cellular Network Security

Cellular phones and their supporting networks now represent the most widely available computing and communications technologies. The number of user of these networks outnumber the number of users of conventional desktops and laptops. The objective of this course is to understand how these systems function and the security challenges facing them. This course provides an in-depth investigation into security issues in areas including cellular air interfaces, core networking (SS7, IMS), cellular data networking, and mobile device architectures. The course will focus more on security aspect of technologies including GSM, CDMA and futuristic LTE.