PHD COURSE CODE

Ph.D. (IT) 1st Semester Code

Code	C.Hrs	Title of Subject
ITC-801	3(2+1)	Advance Topics Software Engineering (Th+Pr)
ITC-803	3(2+1)	Advance Telecommunication Systems (Th+Pr)
ITC-805	2(2+0)	Advances in Internet Protocols
ITC-807	2(2+0)	Professional Practice and Research Methodology

Ph.D. (IT) 2nd Semester Code

Code	C.Hrs	Title of Subject
ITC-802	3(2+1)	Advance Software Quality Assessment & Improvement Techniques (Th + Pr)
ITC-804	2(2+0)	Advance Topics in Wireless Communication
ITC-806	3(2+1)	Advance Virtual Reality & Interactive Communication (Th + Pr)
ITC-808	2(2+0)	Seminar

Course Contents of PhD(IT)

ITC-801: Advanced Topics in Software Engineering   **Cr. Hrs. 3(2+1)**
Prerequisite: Software Engineering

Theory:

System Development using Formal Techniques, Algebraic specification, Abstract model specification, Verification: Proof Systems, Proof Techniques, Proof obligations, Design: Data refinement, operation refinement, Design decomposition. Software Reliability and Metrics. Macro models: productivity, effort. Defect models: Software reliability, Failures and fault, Software reliability modeling. Simple model, Markov modeling, Parameter estimation, Comparison of models.

Practical:
Introduction to open-source development, eclipse, package explorer, perspectives, workspaces, eclipse dependencies, packages, modeling with eclipse, UML models, Eclipse modeling frame work (EMF), EMF Models, XMI EMF notations.

References
1. Bernd Oesterich. Developing Software with UML, Addison-Wesley, 2000.
2. James Rumbaugh, Ivar Jacobson and Grady Booch. Developing Object Oriented Software, Prentice Hall. Pearson Higher Education 2004. ISBN: 0321245628.

ITC-803: Advanced Telecommunication Systems　　　　**Cr. Hrs. 3(3+0)**

Prerequisite: Data Communications

<u>Theory:</u>

Review Algorithm and Applications: Ad Hoc and Sensor Network Applications, Medium Access Control, Routing and Data Aggregation, Mobile Computing, Data Transport, Design and Analysis Approach: Layerd Approach to Networking Design, Optimization, Information Theory, Control Theory Industry and Real Life Examples: USGS Earthquake Hazards Program, Zebranet, Motes and Non-motes, Architectural and Hardware Design Issues

<u>References</u>

1. <u>Wireless Ad Hoc And Sensor Networks : Theory And Applications</u> by Li, Xiang-Yang
2. Ad hoc Networks – Theory and Applications by C. DeMorais and D. P. Agrawal
3. Ad Hoc Wireless Networks - Architectures and Protocols by C.Siva Ram Murthy and B.S.Manoj

ITC-805: Advanced Topics in Internet Protocols   **Cr. Hrs.2(2+0)**

Prerequisite: Communication Systems

Theory:

Internetworking Concept And Architectural Model, Algorithm and Applications: Functional Architecture, ISO OSI architecture, Packet Switching Versus Circuit Switching, Internet Protocol version 4 (IPv4) addresses in terms of sub-netting, Internet Protocol (IPv4), IP Routing, Transmission Control Protocol (TCP), TCP Header, TCP ACK and 3-Way Handshake, Flow control, Congestion control, Overhead, User Datagram Protocol, Voice over Internet Protocol (VoIP), Internet Protocol (IPv6), Migration from IPv4 to IPv6, Internet Control Message Protocol (ICMP), Routing Information Protocol (RIP), Layer two bridging and switching, Virtual LAN Technologies, Open Shortest Path First (OSPF), Dynamic Host Configuration Protocol (DHCP), Domain Name System (DNS), Simple Mail Transfer Protocol (SMTP), File Transfer Protocol (FTP), Interior Gateway Routing Protocol (IGRP), Exterior Gateway Routing Protocol (EGRP)**.**

References

1. J. F. Kurose, K. W. Ross, Computer Networking: A Top-Down Approach, 5/Edition, MacGraw-Hill, 2010.
2. A.S. Tanembaum, Computer Networks, (5th Edition),2010.
3. W. Stallings, Data and Computer Communications (9thEdition), Prentice Hall, 2010.

ITC-807: Professional Practice & Research Methodology   Cr. Hrs 3(2+1)

Prerequisite:-

Theory:

Project Proposals, Identifying a research topic, Finding and reading related work, Report writing, citations and references, Using [digital] library services and search tools, Planning and managing a research project. Plagiarism, Business planning, financial and enterprise skills, Effective time and project management, Businesses and Enterprise: Types of commercial organization and their business and financial structures, Financing companies, business plans and cost headings, Budgeting, cash flow and investments appraisal, Net Present Value and Discounted Cash Flow calculations, Venture Navigator and business viability evaluation, Research Methodology, Principles of the scientific method, Scientific theories: predictive power, falsifiability, empirical validation, and economy of account, Scientific and controlled experiments: bias, placebos, double-blind methods, variables, Inductive vs. deductive inference, Common logical fallacies, Dissemination and peer review, Pseudoscience.

Practical:
Each student will have to work on case study and submit a complete case study by writing an article. The report will be reviewed by the teacher and student is required to refine his/her report.

References
1. DAWSON, C. W. Projects in Computing and Information Systems: A Student's Guide. Addison-Wesley, 2005BOTT, F. Professional Issues in Information Technology. British Computer Society, 2005

ITC-802: Advanced Software Quality Assessment & Improvement Techniques

Cr. Hrs.2(2+0)

Prerequisite:-

Theory:
Software Quality: Quality Assurance, Quality Engineering, Software Testing: Concepts, Issues, and Techniques, Test Activities, Management, and Automation, Coverage and Usage Testing Based on Checklists and Partitions, Input Domain Partitioning and Boundary Testing, Coverage and Usage Testing Based on Finite-State Machines and Markov Chains, Control Flow, Data Dependency, and Interaction Testing, Testing Techniques: Adaptation, Specialization, and Integration. Defect Prevention and Process Improvement, Software Inspection, Formal Verification, Fault Tolerance and Failure Containment, Comparing Quality Assurance Techniques and Activities. Feedback Loop and Activities for Quantifiable Quality Improvement, Quality Models and Measurements, Defect Classification and Analysis, Risk Identification for Quantifiable Quality Improvement, Software Reliability Engineering.

References:

1. Jeff Tian (2005), Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement," Wiley-IEEE Computer Society.
2. Boris Beizer, Software Testing Techniques, Prentice Hall. Pearson Higher Education

ITC-804: Advanced Topics in Wireless Communication   Cr. Hrs. 3(2+1)

Prerequisite: Wireless Communication

Theory:

General Overview, History of Mobile Communications Evolution of Cellular: from pre-1G to 4G Licensing Issues, Cellular Concept and Design, Hexagons, Channelization, Handoff, Interference vs. Capacity, Trunking, Grade of Service, Erlang Computations, Cell Splitting and Sectoring, Mobile Propagation, Basic Equations and Mechanisms, Free Space Loss, Flat Earth Loss, Diffraction and Scattering, Longley-Rice and OHLoss Models, Okamura- Hata, COST-231, Small Scale Fading and Multipath, Doppler Shift, Impulse Response and the Cellular Channel, Time Dispersion and Flat vs Frequency Selective Fading, Coherence Time and Fast vs Slow Fading, Rayleigh and Ricean Distributions, Fading Statistics, Practical Fading Model, Evolution to Modern Systems, Diversity and Downtilting, Code Division Multiple Access (CDMA) and Processing Gain, CDMA Capacity Calculations, Orthogonal Frequency Division Multiple Access (OFDMA) Concepts, Multiple Input Multiple Output (MIMO) systems.

Practical:

Introduction to Matlab, Signal Generation, Binary Phase Shift Keying (BPSK) Demonstration, Bit Error Rate for Gaussian and Rayleigh Fading Channel, Coverage Area vs Minimum Power Requirement, Narrowband vs Wideband Channel, Demonstration of Time and Space Diversity, MIMO with Maximum Liklihood Decoder, CDMA with Direct Sequence Spread Spectrum (DSSS).

References

1. Wireless Communications: Principles and Practice by Theodore S. Rappaport
2. Wireless Communications by Andrea Goldsmith
3. Fundamentals of Wireless Communication by David Tse and Pramod Viswanat

ITC-804:Advanced Virtual Reality & Interactive Communication Systems

Cr. Hrs. 3(2+1)

Prerequisite: Communication Systems

Theory:

Virtual Reality and Human senses, 3D Interfaces and Interaction; 3D audio, VR I/O devices, Visual, haptic, tectile, and auditory displays, 3D Graphics and Modeling, Virtual Reality Software and hardware, Tracking Systems for Virtual Reality, 3D and VR Displays, Tiled, stereo, auto stereo-scopic displays, HMDs, Collaborative Networked Virtual Reality, Web 3D, Augmented reality systems, Mobile VR, Novel User Interfaces, Applications of Virtual Reality.

Practical:

Understanding Virtual Environments, 3D and Virtual Reality Displays, Rendering Software's (Blender, Anim8tor), Introduction to use Blender a basic 3D modeling tool for visualization in 3D, Virtual lights/sunlight and cameras and rendering stills, 3D content creation, Depth map preparation, Creating a 3D model, Designing Interactive 3D models, Passive and active control of movement in virtual 3D environments, Rendering of 2D and 3D scenes, Rendering the image for 3D scene, Scientific visualization, Writing a report of description of implementation.

References

1. Virtual Reality Technology by G. Burdea and P. Coiffet Understanding Virtual Reality-Interface, Application, and Design by Sherman, W.R. and Craig, A.B. (2003, MIT Press).
2. Steeping Into Virtual Reality by Mario ArturoGutierrez Alonso, Mario. A. Gutierrez Frederic Vexo, Daniel Thalmann (Springer-Verlag, 2008)
3. Devloping Virtual Reality Applications: Foundations of Effective Design by Alan B. Craig, William R. Sherman, Effery D. Will (Elsevier, 2009)
4. Understanding Virtual Reality-Interface, Application, and Design by Sherman, W.R. and Craig, A.B. (2003, MITPress

ITC-808: Seminar   **Cr. Hrs.2(2+0)**

Theory:

The students are encouraged to write a report and deliver a lecture of any topic that interest to him/her. The topic will be arranged with the instructor and comprehensive report is required.