



# MCKV INSTITUTE OF ENGINEERING

NAAC Accredited "A" Grade Autonomous Institute under UGC Act 1956  
Approved by AICTE & affiliated to Maulana Abul Kalam Azad University of Technology, West Bengal

243 G.T. Road (N), Liluah, Howrah- 711204, West Bengal, India

Ph: +91 33 26549315/17 Fax +91 33 26549318 Web: [www.mckvie.edu.in/](http://www.mckvie.edu.in/)

## Curriculum for Undergraduate Degree (B.Tech.) in Information Technology (w.e.f. AY: 2020-21)

### Part III: Detailed Curriculum

#### Seventh Semester

<b>Course Name:</b>	<b>Internet Technology</b>		
<b>Course Code:</b>	PE-IT701A	<b>Category:</b>	Professional Elective Course
<b>Semester:</b>	Seventh	<b>Credit:</b>	3
<b>L-T-P:</b>	3-0-0	<b>Pre-Requisites:</b>	Basic knowledge of programming and Data Communications & Networking.
<b>Full Marks:</b>	100		
<b>Examination Scheme:</b>	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

#### Course Objectives:

1	To understand how to make your own web page and the basic tools and applications used in web publishing.
2	To understand how to host own the web site on internet.
3	To understand the concept of security needed in data communication through computers and networks along with various possible attacks.
4	To understand the network security concepts and study different Web security mechanisms.

#### Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	<b>Internet Technology Introduction:</b> Overview, Network of Networks, Intranet, Extranet and Internet. <b>Internet Routing Protocol:</b> Routing - Intra and Inter Domain Routing, Unicast and Multicast Routing, Broadcast. <b>World Wide Web:</b> Domain and Sub domain, Address Resolution, DNS. <b>Review of TCP/IP:</b> Features, Segment, IP Datagram, Difference between IPv4 and IPv6. IP Subnetting and addressing: Classful and Classless Addressing, Subnetting.	10L
2	<b>HTML:</b> Introduction, Editors, Elements, Attributes, Heading, and Paragraph. Formatting, Link, Head, Table, List, Block, Layout, CSS. Form, I frame, Colors, Color name, Color value. Image Maps: Map, area, attributes of image area.	6L



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3	<b>Extensible Markup Language (XML):</b> Introduction, Tree, Syntax, Elements, Attributes, Validation, and Viewing. <b>XHTML</b> in brief. <b>JavaScript:</b> Basics, Statements, comments, variable, comparison, condition, switch, loop, break.	6L
4	<b>Cookies:</b> Definition of cookies, Create and Store a cookie with example. <b>Threats:</b> Malicious code-viruses, Trojan horses, worms, eavesdropping, spoofing, modification, denial of service attacks.	4L
5	<b>Network Security Techniques - Firewalls:</b> Definitions, Types of firewall, Packet Filter, Application Gateway/Proxy Server, Circuit Gateway, Stateful, Screened Host firewall Single homed Bastion, Screened Host firewall Dual homed Bastion, Screened Subnet Firewall, Limitations of Firewall, <b>SSL (Secure Socket Layer):</b> Position of SSL in the TCP/IP, Handshake protocol, Record protocol, Alert protocol, Secure Hypertext Transfer Protocol (SHTTP). <b>VPN (Virtual Private Network):</b> IP Security.	8L
6	<b>Internet Telephony:</b> Introduction, VoIP, Multimedia Applications, Web Crawler.	4L
<b>Total</b>		<b>38L</b>

<b>Course Outcomes:</b>	
After completion of the course, students will be able to:	
1	Apply the knowledge of basic internet concepts in the web designing.
2	Apply the knowledge of World Wide Web in the internet domain.
3	Apply security knowledge to the internet domain

<b>Learning Resources:</b>	
1	Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013. (Chapters 1-5, 7, 8, 9).
2	Internetworking Technologies, An Engineering Perspective, Rahul Banerjee, PHI Learning, Delhi, 2011. (Chapters 5,6,12)
3	Data communications and networking (sie)   4th Edition, Behrouz A. Forouzan., McGraw Hill Education.

<b>Course Name:</b>	<b>Quantum Computing</b>		
<b>Course Code:</b>	PE-IT701B	<b>Category:</b>	Professional Elective
<b>Semester:</b>	Seventh	<b>Credit:</b>	3.0
<b>L-T-P:</b>	3-0-0	<b>Pre-Requisites:</b>	Basic understanding of Quantum Theory, Linear Algebra, Theory of Computation



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<b>Full Marks:</b>	100		
<b>Examination Scheme:</b>	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
1	Inculcate the idea of Quantum Computing and its inevitability in the near future.
2.	Develop a basic idea on Qubit, Quantum gates, Quantum Cryptography and appreciate the power of parallel computing with few quantum algorithms.
3.	Get hands-on experience in building quantum circuits using IBM's Qiskit.

Course Contents:		
Module No.	Description of Topic	Contact Hrs.
1.	<p><b>Vector and Operators:</b></p> <ul style="list-style-type: none"> <li>✓ The Motivation: Shannon's Information theory &amp; its connection to Entropy</li> <li>✓ Concept of Vector Spaces.</li> <li>✓ Basis &amp; dimensions</li> <li>✓ Linear Combination of Vectors: Representing a quantum state by a vector</li> <li>✓ Uniqueness of a spanning set, Inner Product (its relation to the vector dot product), Orthonormality, Gram-Schmidt orthogonalization, Bra-ket formalism and its usefulness, the Cauchy-Schwarz Inequality.</li> <li>✓ Outer Products, The Closure Relation</li> <li>✓ Concept of Operators in Quantum Mechanics and their representation using matrices, Hermitian &amp; Unitary operators</li> <li>✓ Concept of Eigen values &amp; Eigen Vectors and the span of vector space, Spectral Decomposition, Trace of an operator, important properties of Trace, Expectation Value of Operator, Projection Operator, Positive Operators</li> </ul>	10L
2.	<p><b>Tensor Products:</b></p> <ul style="list-style-type: none"> <li>✓ Representing Composite States in Quantum Mechanics, Tensor products of column vectors, operators and tensor products of matrices</li> <li>✓ Concept of Pure and Mixed State</li> <li>✓ Density Operator: Its usefulness</li> <li>✓ Density Operator of Pure &amp; Mixed state, Key Properties, Characterizing Mixed State</li> </ul>	7L



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3.	<b>The Building Block:</b> <ul style="list-style-type: none"> <li>✓ Concept of Qubit: its difference with a conventional Bit. Bloch vector &amp; Qubit.</li> <li>✓ Pauli spin matrices, Quantum Gates: Pauli matrices as Phase &amp; NOT gates.</li> <li>✓ Irreversibility of classical gates, Introduction to Hadamard, CNOT and Toffoli gates with their truth tables.</li> <li>✓ Entangled states: Its concept and mechanism of creation using quantum gates. Quantum teleportation using entanglement.</li> </ul>	8L
4.	<b>Parallel computing:</b> <ul style="list-style-type: none"> <li>✓ Deutsch Jozsa algorithm</li> <li>✓ Unstructured search using Grover's algorithm.</li> <li>✓ Quantum key distribution: The future of Cryptography</li> </ul>	6L
5.	<b>Hands-on:</b> <ul style="list-style-type: none"> <li>✓ Recent trends in Quantum Computing</li> <li>✓ Learning to use IBM's Qiskit to build quantum circuits</li> <li>✓ Utility of GPU's in Quantum Computing (eg. Google Colab, IBM Watson etc.)</li> </ul>	7L
<b>Total</b>		<b>38L</b>

## Course Outcomes:

After completion of the course, students will be able to:

1.	Relate vectors to physical states of system and matrices to operators.
2.	Examine the application of various quantum gates on qubit.
3.	Discover the power of parallel computing using quantum algorithms.
4.	Construct simple quantum circuits by IBM's Qiskit.

## Learning Resources:

1.	'Quantum Computing without Magic' by Zdzislaw Meglicki
2.	'Quantum Computing Explained' by David Mc Mahon
3.	'Quantum Computer Science' by Marco Lanzagorta and Jeffrey Uhlmann
4.	'An Introduction to Quantum Computing' by Phillip Kaye, Raymond Laflamme and Michele Mosca.
5.	<a href="https://qiskit.org/textbook/preface.html">https://qiskit.org/textbook/preface.html</a>



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<b>Course Name:</b>	<b>Cloud Computing</b>		
<b>Course Code:</b>	PE-IT701C	<b>Category:</b>	Professional Elective Course
<b>Semester:</b>	Seventh	<b>Credit:</b>	3
<b>L-T-P:</b>	3-0-0	<b>Pre-Requisites:</b>	PC-IT602(Computer Network)
<b>Full Marks:</b>	100		
<b>Examination Scheme:</b>	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

<b>Course Objectives:</b>	
1	To be familiar with service oriented computing
2	To have knowledge about cloud architecture and management
3	To understand the necessity of security in cloud computing
4	To be familiar with well-known cloud service providing organizations

<b>Course Contents:</b>		
<b>Module No.</b>	<b>Description of Topic</b>	<b>Contact Hrs.</b>
1	Overview of Computing Paradigm: <ul style="list-style-type: none"> <li>Recent trends in Computing : Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing</li> <li>Evolution of cloud computing</li> <li>Business driver for adopting cloud computing</li> </ul>	3L
2	Introduction to Cloud Computing: <ul style="list-style-type: none"> <li>Cloud Computing (NIST Model) : Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers</li> <li>Properties, Characteristics &amp; Disadvantages : Pros and Cons of Cloud Computing, Benefits of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing</li> <li>Role of Open Standards</li> </ul>	3L
3	Cloud Computing Architecture : <ul style="list-style-type: none"> <li>Cloud computing stack : Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services</li> <li>Service Models (XaaS) :               <ul style="list-style-type: none"> <li>➤ Infrastructure as a Service (IaaS)</li> <li>➤ Platform as a Service (PaaS)</li> <li>➤ Software as a Service (SaaS)</li> </ul> </li> </ul>	4L



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	<ul style="list-style-type: none"> <li>• Deployment Models           <ul style="list-style-type: none"> <li>➤ Public cloud</li> <li>➤ Private cloud</li> <li>➤ Hybrid cloud</li> <li>➤ Community cloud</li> </ul> </li> </ul>	
4	<p>Infrastructure as a Service (IaaS) :</p> <ul style="list-style-type: none"> <li>• Introduction to IaaS : IaaS definition, Introduction to virtualization, Different approaches to virtualization, Hypervisors, Machine Image, Virtual Machine (VM)</li> <li>• Resource Virtualization           <ul style="list-style-type: none"> <li>➤ Server</li> <li>➤ Storage</li> <li>➤ Network</li> </ul> </li> <li>• Virtual Machine (resource) provisioning and manageability, storage as a service, Data storage in cloud computing (storage as a service)</li> <li>• Examples           <ul style="list-style-type: none"> <li>➤ Amazon EC2 : Renting, EC2 Compute Unit, Platform and Storage, pricing, customers</li> <li>➤ Eucalyptus</li> </ul> </li> </ul>	4L
5	<p>Platform as a Service (PaaS) :</p> <ul style="list-style-type: none"> <li>• Introduction to PaaS : What is PaaS, Service Oriented Architecture (SOA)</li> <li>• Cloud Platform and Management           <ul style="list-style-type: none"> <li>➤ Computation</li> <li>➤ Storage</li> </ul> </li> <li>• Use of Platforms in Cloud Computing           <ul style="list-style-type: none"> <li>➤ Concepts of Abstraction and Virtualization, Virtualization technologies: Types of virtualization (access, application, CPU, storage)</li> <li>➤ Mobility patterns (P2V, V2V, V2P, P2P, D2C, C2C, C2D, D2D)</li> </ul> </li> <li>• Load Balancing and Virtualization: Basic Concepts, Network resources for load balancing, Advanced load balancing (including Application Delivery Controller and Application Delivery Network)</li> <li>• Examples           <ul style="list-style-type: none"> <li>➤ Google App Engine</li> <li>➤ Microsoft Azure</li> <li>➤ Salesforce.com's Force.com platform</li> </ul> </li> </ul>	3L



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6	<p>Software as a Service (SaaS) :</p> <ul style="list-style-type: none"> <li>• Introduction to SaaS</li> <li>• Web services</li> <li>• Web 3.0</li> <li>• Web OS</li> <li>• Case Study on SaaS</li> </ul>	4L
7	<p>Service Management in Cloud Computing :</p> <ul style="list-style-type: none"> <li>• Service Level Agreements(SLAs)</li> <li>• Billing &amp; Accounting</li> <li>• Comparing Scaling Hardware: Traditional vs. Cloud</li> <li>• Economics of scaling: Benefitting enormously</li> <li>• Managing Data <ul style="list-style-type: none"> <li>➤ Looking at Data, Scalability &amp; Cloud Services</li> <li>➤ Database &amp; Data Stores in Cloud</li> <li>➤ Large Scale Data Processing</li> </ul> </li> </ul>	5L
8	<p>Cloud Security :</p> <ul style="list-style-type: none"> <li>• Infrastructure Security : Network level security, Host level security, Application level security</li> <li>• Data security and Storage</li> <li>• Data privacy and security Issues, Jurisdictional issues raised by Data location</li> <li>• Identity &amp; Access Management</li> <li>• Access Control</li> <li>• Trust, Reputation, Risk</li> <li>• Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations</li> </ul>	5L
9	<p>Case Study on Open Source &amp; Commercial Clouds :</p> <ul style="list-style-type: none"> <li>• Eucalyptus</li> <li>• Microsoft Azure</li> <li>• Amazon EC2</li> </ul>	9L
<b>Total</b>		<b>40L</b>

## Course Outcomes:

After completion of the course, students will be able to:

1	Analyze the necessity of service oriented computing
2	Explain the cloud architecture and its management
3	Analyze the importance of securing the services
4	Know how the current organizations providing the cloud services



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Learning Resources:	
1	“Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
2	“Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011
3	“Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012
4	“Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010

<b>Course Name:</b>	<b>Multimedia Technology</b>		
<b>Course Code:</b>	PE-IT702A	<b>Category:</b>	Professional Elective Courses
<b>Semester:</b>	Seventh	<b>Credit:</b>	3
<b>L-T-P:</b>	3-0-0	<b>Pre-Requisites:</b>	Fundamental knowledge of Computation, Networking and DBMS
<b>Full Marks:</b>	100		
<b>Examination Scheme:</b>	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
1	To give each student a firm grounding in the fundamentals of the underpinning technologies in graphics and multimedia.
2	To teach students the principled design of effective media for entertainment, communication, training and education.
3	To provide each student with experience in the generation of animations, virtual environments and multimedia applications, allowing the expression of creativity.

Course Contents:		
Module No.	Description of Topic	Contact Hrs.
1	<b>Introduction:</b> Multimedia today, Impact of Multimedia, Multimedia Systems, Components and Its Applications	2L
2	<b>Text and, Image:</b> Text: Types of Text, Ways to Present Text, Aspects of Text Design, Character, Character Set, Codes, Unicode, Encryption. Image: Formats, Image Color Scheme, Image Enhancement.	5L
3	<b>Audio and Video:</b> <b>Audio:</b> Basic Sound Concepts, Types of Sound, Digitizing Sound, Computer Representation of Sound (Sampling Rate, Sampling Size, And Quantization), Audio Formats, Audio tools, MIDI.	6L





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	<b>Video:</b> Analogue and Digital Video, Recording Formats and Standards (JPEG, MPEG, H.261) Transmission of Video Signals, Video Capture, and Computer based Animation.	
4	<b>Synchronization, Storage models and Access Techniques:</b> Temporal relationships, synchronization accuracy specification factors, quality of service, Magnetic media, optical media, file systems (traditional, multimedia) Multimedia devices – Output devices, CD-ROM, DVD, Scanner, CCD.	7L
5	<b>Image and Video Database, Document Architecture and Content Management:</b> Image representation, segmentation, similarity based retrieval, image retrieval by color, shape and texture; indexing- kd trees, R-trees, quad trees; Case studies- QBIC, Virage. Video Content, querying, video segmentation, indexing, Content Design and Development, General Design Principles Hypertext: Concept, Open Document Architecture (ODA), Multimedia and Hypermedia Coding Expert Group (MHEG), Standard Generalized Markup Language (SGML), Document Type Definition (DTD), Hypertext Markup Language (HTML) in Web Publishing. Case study of Applications.	13 L
6	<b>Multimedia Applications:</b> Interactive television, Video-on-demand, Video Conferencing, Educational Applications, Industrial Applications, Multimedia archives and digital libraries, media editors	3L
<b>Total</b>		<b>36L</b>

## Course Outcomes:

After completion of the course, students will be able to:

1	Demonstrate knowledge and understanding of the concepts, principles and theories of Multimedia Applications and Virtual environments
2	Demonstrate knowledge and understanding of the current issues involved with development and deployment of multimedia system
3	Analyze and solve problems related to their expertise in Multimedia Applications and Virtual Environments.
4	Demonstrate their ability to extend their basic knowledge to encompass new principles and practice
5	Demonstrate their computing, technical and theoretical skills by developing a substantial Multimedia application.
6	Plan, conduct and report on the development of an Multimedia Application

## Learning Resources:

1	“Multimedia: Computing, Communications & Applications” by Ralf Steinmetz and Klara Nahrstedt, Pearson Ed.
2	“Multimedia and Animation” by V.K. Jain, Khanna Publishing House, 2019.



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3	“Multimedia Information System” by Nalin K. Sharda , PHI.
4	“Multimedia Communications” by Fred Halsall, Pearson Ed.
5	“Multimedia Systems” by Koegel Buford, Pearson Ed.
6	“Multimedia Literacy” by Fred Hoffstetter, McGraw Hill.
7	“Multimedia Fundamentals: Vol. 1- Media Coding and Content Processing” by Ralf Steinmetz and Klara Nahrstedt, PHI.
8	“Multimedia in Practice: Technology and Application” by J. Jeffcoate , PHI.

<b>Course Name:</b>	<b>Soft Computing</b>		
<b>Course Code:</b>	PE-IT702B	<b>Category:</b>	Professional Elective
<b>Semester:</b>	Seventh	<b>Credit:</b>	3
<b>L-T-P:</b>	3-0-0	<b>Pre-Requisites:</b>	Discrete Mathematics
<b>Full Marks:</b>	100		
<b>Examination Scheme:</b>	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

<b>Course Objectives:</b>	
1	To provide the students with the concepts of soft computing techniques such as neural networks, fuzzy systems, genetic algorithms.
2	To develop the ability to apply knowledge of Soft Computing for solution of Business problems.

<b>Course Contents:</b>		
<b>Module No.</b>	<b>Description of Topic</b>	<b>Contact Hrs.</b>
1	Introduction: Introduction to Evolutionary Computing; introduction to fuzzy sets and fuzzy logic systems; introduction to biological and artificial neural network; introduction to Genetic Algorithm	<b>5L</b>
2	Classical Sets and Fuzzy Sets: Fuzzy Operations, Membership functions, Different fuzzification methods, Fuzzy to Crisp conversions, Defuzzification methods, Fuzzy relations, Classical Logic and Fuzzy Logic, Fuzzy Implication , Fuzzy Rule based Systems, Fuzzy Inference System, Applications of Fuzzy Logic	<b>10L</b>
3	Introduction to Neural Networks: Advent of Modern Neuroscience, AI and Neural Networks, Biological Neurons and Artificial neural network, model of artificial neuron, Learning Methods, Neural Network models, single layer network, Competitive learning networks, Hebbian learning, Hopfield Networks. Neuro-Fuzzy modelling, Applications of Neural Networks, Pattern Recognition	<b>8L</b>



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	and classification	
4	Genetic Algorithms: crossover and mutation, Multi-objective Genetic Algorithm (MOGA), Applications of Genetic Algorithm: genetic algorithms in search and optimization, GA based clustering Algorithm, Image processing and pattern Recognition	8L
5	Other Soft Computing Technique: Simulated Annealing, Tabu search, Ant colony optimization(ACO), Particle Swarm Optimization (PSO).	5L
<b>Total</b>		<b>36L</b>

## Course Outcomes:

After completion of the course, students will be able to:

1	Know Artificial Intelligence, various types & characteristics of production systems.
2	Explain the concept of Neural Networks, architecture, functions and various algorithms involved.
3	Explain the concept of Fuzzy Logic, Various fuzzy systems and their functions.
4	Know Genetic algorithms, its applications and advances.
5	Explain the unified and exact mathematical basis to some extent as well as the general principles of various soft computing techniques.

## Learning Resources:

1	Fuzzy logic with engineering applications, Timothy J. Ross, John Wiley and Sons.
2	S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI
3	Principles of Soft Computing , S N Sivanandam, S. Sumathi, John Wiley & Sons
4	Genetic Algorithms in search, Optimization & Machine Learning by David E. Goldberg
5	Neuro-Fuzzy and Soft computing, Jang, Sun, Mizutani, PHI
6	Neural Networks: A Classroom Approach, 1/e by Kumar Satish, TMH,
7	Genetic Algorithms in search, Optimization & Machine Learning by David E. Goldberg, Pearson/PHI
8	A beginners approach to Soft Computing, Samir Roy & Udit Chakraborty, Pearson



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<b>Course Name:</b>	<b>Ad-Hoc and Sensor Networks</b>		
<b>Course Code:</b>	PE-IT 702C	<b>Category:</b>	Professional Elective Courses
<b>Semester:</b>	Seventh	<b>Credit:</b>	3
<b>L-T-P:</b>	3-0-0	<b>Pre-Requisites:</b>	Computer Networking
<b>Full Marks:</b>	100		
<b>Examination Scheme:</b>	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
1	To learn the basics of Sensor Networking
2	To learn the different Ad-hoc networks and architecture of sensor networks
3	To build an application of Sensor Network

Course Contents:		
Module No.	Description of Topic	Contact Hrs.
1	<b>Introduction and Overview:</b> Overview of wireless networks, types, infrastructure-based and infrastructure-less, introduction to MANETs (Mobile Ad-hoc Networks), characteristics, Introduction to sensor networks, commonalities and differences with MANETs, constraints and challenges, advantages, applications, enabling technologies for WSNs.	4L
2	<b>Architectures:</b> Ad-hoc network architecture, Single-node architecture - hardware components, design constraints, energy consumption of sensor nodes, operating systems and execution environments, multiple sources and sinks – mobility, optimization goals and figures of merit, gateway concepts, design principles for WSNs, Service interface for WSNs.	9L
3	<b>Communication Protocols:</b> Physical layer and transceiver design considerations, MAC protocols for wireless sensor networks, low duty cycle protocols and wakeup concepts - S-MAC , the mediation device protocol, wakeup radio concepts, address and name management, assignment of MAC addresses, routing protocols-classification, energy-efficient routing, unicast protocols, multi-path routing, data-centric routing, data aggregation, SPIN, LEACH, Directed-Diffusion, geographic routing.	9L
4	<b>Infrastructure Establishment:</b> Topology control, flat network topologies, hierarchical networks by clustering, properties, protocols based on sender-receiver and receiver-receiver synchronization, LTS, TPSN, RBS, HRTS, localization and positioning, properties and	9L



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	approaches, single-hop localization, positioning in multi-hop environment, range based localization algorithms – location services, sensor tasking and control.	
5	<b>Sensor Network Platforms and Tools:</b> Sensor node hardware, Berkeley motes, programming challenges, node-level software platforms, state-centric programming, Tiny OS, nesC components, NS2 simulator, TOSSIM.	9L
<b>Total</b>		<b>40L</b>

### Course Outcomes:

After completion of the course, students will be able to:

1	Apply the basic concepts of Ad-hoc and Sensor networks
2	Apply the knowledge of various architecture of Ad-hoc and Sensor networks
3	Apply the concepts of protection and security of Ad-hoc and Sensor networks

### Learning Resources:

1	Holger Karl & Andreas Willig, “Protocols and Architectures for Wireless Sensor Networks”, John Wiley, 2005.
2	Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach”, Elsevier, 2007.
3	Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks- Technology, Protocols, and Applications”, John Wiley, 2007.
4	Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003.
5	Thomas Haenselmann, "Sensor Networks"

<b>Course Name:</b>	<b>Information and Coding Theory</b>		
<b>Course Code:</b>	PE-IT702D	<b>Category:</b>	Professional Elective Course
<b>Semester:</b>	Seventh	<b>Credit:</b>	3
<b>L-T-P:</b>	3-0-0	<b>Pre-Requisites:</b>	ES-IT401 (Discrete Mathematics)
<b>Full Marks:</b>	100		
<b>Examination Scheme:</b>	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

### Course Objectives:

1	To be familiar with source coding and channel coding
2	To have knowledge about linear codes and its application for error correction
3	To understand the cyclic codes and its application



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4	To be familiar with BCH codes and its application
5	To know convolutional codes and their applications

Course Contents:		
Module No.	Description of Topic	Contact Hrs.
1	<b>Source Coding:</b> Uncertainty and information, average mutual information and entropy, information measures for continuous random variables, source coding theorem, Huffman codes.	6L
2	<b>Channel Capacity And Coding:</b> Channel models, channel capacity, channel coding, information capacity theorem, The Shannon limit.	6L
3	<b>Linear And Block Codes For Error Correction:</b> Matrix description of linear block codes, equivalent codes, parity check matrix, decoding of a linear block code, perfect codes, Hamming codes.	7L
4	<b>Cyclic Codes:</b> Polynomials, division algorithm for polynomials, a method for generating cyclic codes, matrix description of cyclic codes, Golay codes.	7L
5	<b>BCH Codes:</b> Primitive elements, minimal polynomials, generator polynomials in terms of minimal polynomials, examples of BCH codes.	6L
6	<b>Convolutional Codes :</b> Tree codes, trellis codes, polynomial description of convolutional codes, distance notions for convolutional codes, the generating function, matrix representation of convolutional codes, decoding of convolutional codes, distance and performance bounds for convolutional codes, examples of convolutional codes, Turbo codes, Turbo decoding	8L
<b>Total</b>		<b>40L</b>

Course Outcomes:	
After completion of the course, students will be able to:	
1	Apply their knowledge to source coding and channel coding
2	Apply their knowledge about linear codes for error correction
3	Apply their knowledge of cyclic codes and BCH codes to different application
4	Apply their idea about different convolutional codes for coding and decoding

Learning Resources:	
1	"Information theory, coding and cryptography" - Ranjan Bose, TMH.
2	"Information and Coding" - N Abramson, McGraw Hill.
3	"Introduction to Information Theory" - M Mansurpur, McGraw Hill
4	"Information Theory" - R B Ash, Prentice Hall



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5	“Error Control Coding” - Shu Lin and D J Costello Jr, Prentice Hall.
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<b>Course Name:</b>	<b>Human Computer Interaction</b>		
<b>Course Code:</b>	PE-IT702E	<b>Category:</b>	Professional Elective Courses
<b>Semester:</b>	Seventh	<b>Credit:</b>	3
<b>L-T-P:</b>	3-0-0	<b>Pre-Requisites:</b>	Prior knowledge of device to user Interface : UI / UX
<b>Full Marks:</b>	100		
<b>Examination Scheme:</b>	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
1	Learn the foundations of Human Computer Interaction.
2	Be familiar with the design technologies for individuals and persons with disabilities.
3	Be aware of mobile Human Computer interaction.
4	Learn the guidelines for user interface.

Course Contents:		
Module No.	Description of Topic	Contact Hrs.
1	Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.	8L
2	Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.	8L
3	Cognitive models – Socio-Organizational issues and stake holder requirements – Communication and collaboration models-Hypertext, Multimedia and WWW.	8L
4	Mobile Ecosystem: Platforms, Application frameworks – Different type of Mobile Applications, Mobile Design: Elements of Mobile Design, Tools.	6L
5	Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies. Evaluation models of UI: Donald Norman’s seven stage model of interaction.	8L



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6	Recent Trends: Speech Recognition and Translation, Multimodal System, Intelligent User Interfaces and help systems.	2L
<b>Total</b>		<b>40L</b>

### Course Outcomes:

After completion of the course, students will be able to:

1	Differentiate between various software vulnerabilities.
2	Develop software process vulnerabilities for an organization.
3	Monitor resources consumption in a software.
4	Interrelate security and software development process.

### Learning Resources:

1	Theodor Richardson, Charles N Thies, "Secure Software Design", Jones & Bartlett.
2	Kenneth R. Van Wyk, Mark G. Graff, Dan S. Peters, Diana L. Burley, "Enterprise Software Security", Addison Wesley

<b>Course Name:</b>	<b>Block Chain and its Applications</b>		
<b>Course Code:</b>	PE-IT702F	<b>Category:</b>	Professional Elective Course
<b>Semester:</b>	Seventh	<b>Credit:</b>	3
<b>L-T-P:</b>	3-0-0	<b>Pre-Requisites:</b>	Basic concepts of Computer Networks and Operating Systems
<b>Full Marks:</b>	100		
<b>Examination Scheme:</b>	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

### Course Objectives:

1	To understand the distributed decentralized database
2	To familiarize with fundamentals of Blockchain and its various applications
3	To identify distributed ledger technologies and their architecture.
4	To describe the Hashing in Blockchain mining
5	To get acquaintance with the Ethereum Virtual Machine (EVM), clients of EVM, and Ethereum Key pairs
6	To know about the cryptography and Bitcoin





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Course Contents:		
Module No.	Description of Topic	Contact Hrs.
1	<b>Overview of Blockchain:</b> Definition of Blockchain, Advantages of Blockchain, Evolution of Blockchain, Types of Blockchain, Architecture of Blockchain, Differences between public, private, and consortium Blockchains.	4L
2	<b>Hash Functions:</b> Introduction, Hashing, Message Authentication Code, Secure Hash algorithm, Distributed Hash Tables, Hashing and Data Structures, Hashing in Blockchain Mining.	6L
3	<b>Blockchain Components:</b> Introduction, Ethereum, History, Ethereum Virtual Machine, Working of Ethereum, Ethereum Clients, Ethereum Key Pairs, Ethereum Addresses, Ethereum Wallets, Ethereum Transactions, Ethereum Languages, Ethereum Development Tools.	8L
4	<b>Smart Contracts:</b> Introduction, Absolute and Immutable, Contractual Confidentiality, Characteristics, Use cases. Consensus Approach, Consensus Algorithms, Byzantine Agreement Methods.	6L
5	<b>Bitcoins:</b> Introduction, Working of Bitcoin, Creation of Bitcoins, Merkle Trees, Bitcoin Block Structure, Bitcoin Address, Bitcoin Transactions, Bitcoin Network, Bitcoin Wallets, Bitcoin Payments, Bitcoin Clients, Bitcoin Supply.	6L
6	<b>Decentralized Applications:</b> Introduction, Today's Web applications Requirement, Mining in Blockchain, Blockchain in healthcare, safety and security, Validation and Identification of Bitcoin based task, Mining Hardware and Software, Bitcoins Management.	6L
<b>Total</b>		<b>36L</b>

Course Outcomes:	
After completion of the course, students will be able to:	
1	Describe the basic concepts and working of Blockchain Technology.
2	Explain design principals of Bitcoin and Ethereum.
3	Explain the working of smart contracts.

Learning Resources:	
1	Mastering Blockchain: A deep dive into distributed ledgers, consensus protocols, smart contracts, DApps, cryptocurrencies, Ethereum, and more, 3rd Edition, Imran Bashir, Packt Publishing, 2020, ISBN: 9781839213199, book website: <a href="https://www.packtpub.com/product/mastering-blockchain-third-edition/9781839213199">https://www.packtpub.com/product/mastering-blockchain-third-edition/9781839213199</a>
2	Blockchain Technology-Concepts and Applications by Kumar Saurabh and Ashutosh



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	Saxsena, Wiley Publishers.
3	Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.
4	Hyperledger Tutorials - <a href="https://www.hyperledger.org/use/tutorials">https://www.hyperledger.org/use/tutorials</a>
5	Ethereum Development Resources - <a href="https://ethereum.org/en/developers">https://ethereum.org/en/developers</a>

<b>Course Name:</b>	<b>Human Resource Development and Organizational Behavior</b>		
<b>Course Code:</b>	OE-HU701B	<b>Category:</b>	Optional Elective Courses
<b>Semester:</b>	Seventh	<b>Credit:</b>	3
<b>L-T-P:</b>	3-0-0	<b>Pre-Requisites:</b>	Nil
<b>Full Marks:</b>	100		
<b>Examination Scheme:</b>	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
1	To learn the basic concepts of Organizational Behaviour and its applications in contemporary organizations.
2	To understand how individual, groups and structure have impacts on the organizational effectiveness and efficiency.
3	To appreciate the theories and models of organizations in the workplace.
4	To creatively and innovatively engage in solving organizational challenges.

Course Contents:		
Module No.	Description of Topic	Contact Hrs.
1	<b>Organizational Behaviour:</b> Definition, Importance, Historical Background, Fundamental Concepts of OB, Challenges and Opportunities for OB. <b>Personality and Attitudes:</b> Meaning of personality, Personality Determinants and Traits, Development of Personality, Types of Attitudes, Job Satisfaction.	8L
2	<b>Perception:</b> Definition, Nature and Importance, Factors influencing Perception, Perceptual Selectivity, Link between Perception and Decision Making. <b>Motivation:</b> Definition, Theories of Motivation - Maslow's Hierarchy of Needs Theory, McGregor's Theory X & Y, Herzberg's Motivation-Hygiene Theory, Alderfer's ERG Theory, McClelland's Theory of Needs, Vroom's Expectancy Theory.	8L



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3	<p><b>Group Behaviour:</b> Characteristics of Group, Types of Groups, Stages of Group Development, Group Decision Making.</p> <p><b>Communication:</b> Communication Process, Direction of Communication, Barriers to Effective Communication. <b>Leadership:</b> Definition, Importance, Theories of Leadership Styles.</p>	12L
4	<p><b>Organizational Politics:</b> Definition, Factors contributing to Political Behaviour. <b>Conflict Management:</b> Traditional vis-a-vis Modern View of Conflict, Functional and Dysfunctional Conflict, Conflict Process, Negotiation – Bargaining Strategies, Negotiation Process.</p> <p><b>Organizational Design:</b> Various Organizational Structures and their Effects on Human Behaviour, Concepts of Organizational Climate and Organizational Culture.</p>	10L
<b>Total</b>		<b>38L</b>

## Course Outcomes:

After completion of the course, students will be able to:

1	Define the conceptual framework of the discipline of HRD and OB and their practical applications in the organizational set up.
2	Deeply define the role of individual, groups and structure in achieving organizational goals effectively and efficiently.
3	Critically evaluate and analyze various theories and models that contribute in the overall understanding of the discipline.
4	Develop creative and innovative ideas that could positively shape the organizations.
5	Accept and embrace in working with different people from different cultural and diverse background in the workplace.

## Learning Resources:

1	Robbins, S. P. & Judge, T.A.: “Organizational Behavior”, Pearson Education, 15th Edn.
2	Luthans, Fred: “Organizational Behavior”, McGraw Hill, 12th Edn.
3	Shukla, Madhukar: “Understanding Organizations – Organizational Theory & Practice in India”, PHI
4	Fincham, R. & Rhodes, P.: “Principles of Organizational Behaviour”, OUP, 4th Edn.
5	Hersey, P., Blanchard, K.H., Johnson, D.E.- “Management of Organizational Behavior Leading Human Resources”, PHI, 10th Edn.



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<b>Course Name:</b>	<b>Introduction to Philosophical Thoughts</b>		
<b>Course Code:</b>	OE-HU701C	<b>Category:</b>	Open Elective Courses
<b>Semester:</b>	Seventh	<b>Credit:</b>	3
<b>L-T-P:</b>	3-0-0	<b>Pre-Requisites:</b>	Basic Knowledge of Inner Engineering
<b>Full Marks:</b>	100		
<b>Examination Scheme:</b>	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
1	To acquaint the knowledge and classification of Classical Indian Philosophical Schools
2	To be able to understand basic idea of the nature and scope of Psychology and methods employed.
3	To introduce philosophical discussion about religion

Course Contents:		
Module No.	Description of Topic	Contact Hrs.
1	<b>Nature of Indian Philosophy:</b> Definition of Philosophy, Plurality as well as common concerns. Basic concepts of the Vedic and Upanisadic views : Atman, Jagrata, Svapna, Susupti, Turiya, Brahman, Karma, Rta,Rna	8L
2	<b>Carvaka School:</b> Its epistemology, metaphysics and ethics. Mukti	8L
3	<b>Jainism:</b> Concepts of sat, dravya, guna, paryaya, jiva, ajiva, anekantavada, syadvada, and nayavada ; pramanas, ahimsa, bondage and liberation.	8L
4	<b>Buddhism:</b> theory of pramanas, theory of dependent origination, the four noble truths; doctrine of momentaryness; theory of no soul. The interpretation of these theories in schools of Buddhism : Vaibhasika, Sautrantrika, Yogacara, Madhyamika	8L
5	<b>Nyaya:</b> theory of Pramanas; the individual self and its liberation; the idea of God and proofs for His existence.	6L
<b>Total</b>		<b>38L</b>



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## Course Outcomes:

After completion of the course, students will be able to:

1	Explain the Vedic theism and Upanisadic conception of Atman& Brahman
2	Acquire thorough knowledge about Carvaka, Jainism and Buddhism
3	Apply the knowledge of Nyaya & Liberation

## Learning Resources:

1	“An Introduction to Indian Philosophy” Satish Chandra Chatterjee , Dhirendramohan Dutta, Motilal Banarsidass Publishers Pvt Ltd, Delhi.
2	Outlines of Indian Philosophy M. Hiriyanna
3	“Indian Philosophy Vol – I & II.”, S.Radhakrishnan
4	Studies in Philosophy Vol – 1., K.C.Bhattacharya

<b>Course Name:</b>	<b>Remote Sensing and GIS</b>		
<b>Course Code:</b>	OE-CS701H	<b>Category:</b>	Open Elective
<b>Semester:</b>	Seventh	<b>Credit:</b>	3
<b>L-T-P:</b>	3 - 0 - 0	<b>Pre-Requisites:</b>	Nil
<b>Full Marks:</b>	100		
<b>Examination Scheme:</b>	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

## Course Objectives:

1	To introduce the student about the major concepts involved in Geographic Information Systems.
2	To familiarize the students with GIS application areas.
3	To familiarize the students with Technology & Instruments involved in GIS & Remote Sensing.

## Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	Introduction and Overview of Geographic Information Systems Definition of a GIS, features and functions; why GIS is important; how GIS is applied; GIS as an Information System; GIS and cartography; contributing and allied disciplines; GIS data feeds; historical development of GIS.	3L



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2	GIS and Maps, Map Projections and Coordinate Systems Maps and their characteristics (selection, abstraction, scale, etc.); automated cartography versus GIS; map projections; coordinate systems; precision and error.	4L
3	Data Sources, Data Input, Data Quality and Database Concepts Major data feeds to GIS and their characteristics: maps, GPS, images, databases, commercial data; locating and evaluating data; data formats; data quality; metadata. Database concepts and components; flat files; relational database systems; data modeling; views of the database; normalization; databases and GIS	4L
4	Spatial Analysis Questions a GIS can answer; GIS analytical functions; vector analysis including topological overlay; raster analysis; statistics; integrated spatial analysis	3L
5	Making Maps Parts of a map; map functions in GIS; map design and map elements; choosing a map type; producing a map formats, plotters and media; online and CD-ROM distribution; interactive maps and the Web	6L
6	Implementing a GIS Planning a GIS; requirements; pilot projects; case studies; data management; personnel and skill sets; costs and benefits; selecting a GIS package; professional GIS packages; desktop GIS; embedded GIS; public domain and low cost packages.	4L
7	Technology & Instruments involved in GIS & Remote Sensing GIS applications; GIS application areas and user segments; creating custom GIS software applications; user interfaces; case studies. Future data; future hardware; future software; Object-oriented concepts and GIS; future issues – data ownership, privacy, education; GIS career options and how to pursue them.	8L
8	Remote Sensing Remote sensing of environment, E.M. Principle, Thermal infrared remote sensing, Remote sensing of Vegetation, Remote sensing of water, urban landscape	8L
<b>Total</b>		<b>40L</b>

## Course Outcomes:

After completion of the course, students will be able to:

1	Describe Geographic Information Systems
2	Explain different Technology & Instruments involved in GIS & Remote Sensing
3	Explain GIS application areas



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Learning Resources:	
1	“Principles of geographical information systems”, P. A. Burrough and R. A. Mcdonnel, Oxford.
2	“Remote sensing of the environment” , J. R. Jensen, Pearson
3	“Exploring Geographic Information Systems”, Nicholas Christmas, John Wiley & Sons.
4	“Getting Started with Geographic Information Systems”, Keith Clarke, PHI.
5	“An Introduction to Geographical Information Systems”, Ian Heywood, Sarah Cornelius, and Steve Carver. Addison-Wesley Longman.

Course Name: Project Management and Entrepreneurship			
Course Code:	HM-HU703	Category:	Humanities and Social Sciences including Management Courses
Semester:	Seventh	Credit:	3
L-T-P:	3-0-0	Pre-Requisites:	Basic concepts of Business and software projects
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
1	To explain concepts of Entrepreneurship and build an understanding about business situations in which entrepreneurs act.
2	To analyze the various aspects, scope and challenges under an entrepreneurial venture.
3	To explain classification and types of entrepreneurs and the process of entrepreneurial project development.
4	To discuss the steps in venture development and new trends in entrepreneurship.
5	Describe the process of Software Project Management.

Course Contents:		
Module No.	Description of Topic	Contact Hrs.
1	<b>ENTREPRENEURSHIP:</b> Introduction: Meaning and Concept of Entrepreneurship, Innovation and entrepreneurship, Contributions of entrepreneurs to the society, risk-opportunities perspective and mitigation of risks.	2L



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2	Entrepreneurship – An Innovation: Challenges of Innovation, Steps of Innovation Management, Idea Management System, Divergent v/s Convergent Thinking, Qualities of a prospective Entrepreneur	2L
3	Idea Incubation: Factors determining competitive advantage, Market segment, blue ocean strategy, Industry and Competitor Analysis (market structure, market size, growth potential), Demand-supply analysis	4L
4	Entrepreneurial Motivation: Design Thinking - Driven Innovation, TRIZ (Theory of Inventive Problem Solving), Achievement motivation theory of entrepreneurship – Theory of McClelland, Harvesting Strategies	2L
5	Information: Government incentives for entrepreneurship, Incubation, acceleration. Funding new ventures – bootstrapping, crowd sourcing, angel investors, Government of India’s efforts at promoting entrepreneurship and innovation – SISI, KVIC, DGFT, SIDBI, Defense and Railways	4L
6	Closing the Window: Sustaining Competitiveness, Maintaining Competitive Advantage, the Changing Role of the Entrepreneur.	2L
7	Applications and Project Reports Preparation	4L
8	<b>PROJECT MANAGEMENT:</b> Definitions of Project and Project Management, Issues and Problems in Project Management, Project Life Cycle - Initiation / Conceptualization Phase, Planning Phase, Implementation / Execution Phase, Closure / Termination Phase	4L
9	Project Feasibility Studies – Pre-Feasibility and Feasibility Studies, Preparation of Detailed Project Report, Technical Appraisal, Economic/Commercial/Financial Appraisal including Capital Budgeting Process, Social Cost Benefit Analysis	2L
10	Project Planning – Importance of Project Planning, Steps of Project Planning, Project Scope, Work Breakdown Structure (WBS) and Organization Breakdown Structure (OBS), Phased Project Planning	2L
11	Project Scheduling and Costing – Gantt chart, CPM and PERT Analysis, Identification of the Critical Path and its Significance, Calculation of Floats and Slacks, Crashing, Time Cost Trade-off Analysis, Project Cost Reduction Methods.	6L
12	Project Monitoring and Control – Role of Project Manager, MIS in Project Monitoring, Project Audit	2L
13	Case Studies with Hands-on Training on MS-Project	4L
<b>Total</b>		<b>40L</b>





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## Course Outcomes:

After completion of the course, students will be able to:

1	Identify the type of entrepreneur and the steps involved in an entrepreneurial venture.
2	Explain the role of project management including planning, scheduling, cost estimation, risk management, etc
3	Describe various steps involved in starting a venture and to explore marketing methods & new trends in entrepreneurship.
4	Demonstrate Entrepreneurial skills and management function of a company.

## Learning Resources:

1	Innovation and Entrepreneurship by Drucker, P.F.; Harper and Row
2	Business, Entrepreneurship and Management: Rao, V.S.P. ;Vikas
3	Entrepreneurship: Roy Rajeev; OUP.
4	Text Book of Project Management: Gopalkrishnan, P. and Ramamoorthy, V.E.; McMillan
5	Project Management for Engineering, Business and Technology: Nicholas, J.M., and Steyn, H.; PHI
6	Project Management: The Managerial Process: Gray, C.F., Larson, E.W. and Desai, G.V.; MGH

<b>Course Name:</b>	<b>Project-III</b>		
<b>Course Code:</b>	PW-IT781	<b>Category:</b>	Sessional Course
<b>Semester:</b>	Seventh	<b>Credit:</b>	6
<b>L-T-P:</b>	0-0-12	<b>Pre-Requisites:</b>	Knowledge of engineering, science and management subjects
<b>Full Marks:</b>	100		
<b>Examination Scheme:</b>	Semester Examination: 20		Continuous Assessment: 80

## Course Objectives:

1	In depth knowledge gain in the domain of the assigned topic.
2	To be able to finalize the approach to the problem of the assigned topic
3	To be able to prepare an Action Plan for conducting the investigation, including team work
4	To be able to do Detailed Analysis/Modelling/Simulation/Problem solving/Experiment as needed
5	To perform Development of product/process, testing, results, conclusions and future scope analysis



# MCKV INSTITUTE OF ENGINEERING

NAAC Accredited "A" Grade Autonomous Institute under UGC Act 1956  
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## Course Outcomes:

After completion of the course, students will be able to:

1	Prepare a report in the standard format.
2	Ready for Seminar Presentation before any standard body.
3	Prepare a paper for Conference presentation/Publication in Journals.