

**Level 01**

Module Code	IN 1100	Title	Programming Fundamentals			Compulsory (GPA)
Credits	4	Hours / Week	Lectures	3	Pre-requisites	None
			Lab / Tutorials	3		
<b><u>Learning Outcomes</u></b>						
On successful completion of this module, students will be able to: describe the basic methods and tools for identifying and analyzing of a problem; explain the use of algorithms for solving problems; apply design tools and programming skill to implement a system; and to distinguish between Structured programming and Event-driven programming.						
<b><u>Outline Syllabus</u></b>						
<ul style="list-style-type: none"><li>• Software Development Process</li><li>• Fundamental Constructs</li><li>• Algorithmic Problem Solving</li><li>• Data Structures</li><li>• Recursion</li><li>• Structured Programming</li><li>• Event-driven programming</li></ul>						

Module Code	IN 1310	Title	Digital Systems and Computer Hardware			Compulsory (GPA)
Credits	3	Hours / Week	Lectures	2	Pre-requisites	None
			Lab / Tutorials	3		

**Learning Outcomes**

On successful completion of this module, students will be able to: describe the theory behind the digital systems and computer hardware in relation to system components; analyze, design, implement and troubleshoot digital logic circuits and its real-time applications; and to demonstrate how interfacing is facilitated through I/O ports.

**Outline Syllabus**

- Analog and Digital concepts
- Introduction to computer systems
- Logic gates and Boolean algebra
- Logic expressions and minimization methods
- Combinational logic
- Flip-Flops and related devices
- Arithmetic circuits
- Computer systems components and their interconnections.
- Digital to Analog and Analog to Digital converters
- Introduction to I/O ports and interfacing

<b>Module Code</b>	IN 1320	<b>Title</b>	Computer Organization			<b>Compulsory (GPA)</b>
<b>Credits</b>	2.5	<b>Hours / Week</b>	<b>Lectures</b>	2	<b>Pre-requisites</b>	None
			<b>Lab / Tutorials</b>	3/2		
<b><u>Learning Outcomes</u></b>						
On successful completion of this module, students will be to demonstrate a theoretical understanding of basic concepts pertaining to the general organization of a computer.						
<b><u>Outline Syllabus</u></b>						
<ul style="list-style-type: none"><li>• Evolution of computers</li><li>• Machine level representation of data and codes</li><li>• Harvard architecture and von Neumann architecture</li><li>• Instruction set architecture</li><li>• Processor structure and organization</li><li>• Input-Output organization</li><li>• Memory systems organization</li><li>• Storage Devices &amp; Technologies</li><li>• Introduction to hierarchical bus interfaces and data flow</li><li>• Systems performance</li></ul>						

<b>Module Code</b>	IN 1400	<b>Title</b>	Fundamentals of Databases and Database Design			<b>Compulsory (GPA)</b>
<b>Credits</b>	2.5	<b>Hours / Week</b>	<b>Lectures</b>	2	<b>Pre-requisites</b>	None
			<b>Lab / Tutorials</b>	3/2		

**Learning Outcomes**

On successful completion of this module, student will be able to: describe the fundamental concepts in databases and database management systems; analyze real world scenarios and to design databases and manipulate them.

**Outline Syllabus**

- Database context
- Architectures
  - ANSI-SPARC Model, Components of DBMS, Schemas, Levels of abstractions and Mappings, Role of Data Dictionary, Client-Server Systems, PC based systems, Database Servers, Distributed Systems
- Database Analysis and Design
  - Database development life cycle.
  - The entity-relationship (E-R) model and EER Model
  - The relational model
  - Functional dependencies and Normalisation: first, second and third normal forms
- Mapping logical database designs to physical storage mechanisms.
- Database Processing
  - Formal Languages
    - Relational Calculus
    - Relational Algebra
  - Structured Query Languages

Module Code	IN 1500	Title	Data Communication			Compulsory (GPA)
Credits	2.5	Hours / Week	Lectures	2	Pre-requisites	None
			Lab / Tutorials	3/2		
<b><u>Learning Outcomes</u></b>						
On successful completion of this module students will be able to: differentiate between the features and requirements of different communication techniques; identify the different functions implemented at the data link layer; describe how different requirements of broadcast networks are implemented; and to list and explain network layer functions implemented to meet competing requirements.						
<b><u>Outline Syllabus</u></b>						
<ul style="list-style-type: none"><li>Physical Aspects of Data Transmission</li><li>Communication Techniques</li><li>Data Link Control</li><li>Broadcast Communication Networks</li><li>The Network Layer</li><li>The Transport Layer</li></ul>						

Module Code	IN 1610	Title	Multimedia Technologies			Compulsory (GPA)
Credits	2.5	Hours / Week	Lectures	2	Pre-requisites	None
			Lab / Tutorials	3/2		
<b><u>Learning Outcomes</u></b>						
On successful completion of this module, students will be able to use the basic knowledge of multimedia technologies and programming skills to develop interactive Multimedia.						
<b><u>Outline Syllabus</u></b>						
<ul style="list-style-type: none"><li>• Introduction to Multimedia components</li><li>• Using text in Multimedia</li><li>• Digital images</li><li>• Digital Audio Basics</li><li>• Audio video production basics</li><li>• Principles of animation</li></ul>						

Module Code	IN 1620	Title	Web Technologies			Compulsory (GPA)
Credits	2.5	Hours / Week	Lectures	2	Pre-requisites	None
			Lab / Tutorials	3/2		

**Learning Outcomes**

On successful completion of this module, students will be able to: acquire the knowledge about basics of multimedia and web designing technologies; and to design & develop web-based applications.

**Outline Syllabus**

- Introduction to Photography
- Future of multimedia: Virtual Reality
- Web based systems
- Client-server Architecture
- Web protocols
- Support tools for web site creation and web management
- Multi-tier web applications
- Developing Internet information servers
- Publishing information and applications
- eBusiness Models
- Online transactions
- Introduction to Grid Computing
- Web Services
- New Trends in WWW

Module Code	IN 1900	Title	ICT Project			Compulsory (GPA)
Credits	2	Hours / Week	Lectures	-	Pre-requisites	None
			Lab / Tutorials	-		
<u>Learning Outcomes</u>						
On successful completion of this module, students will be able to design and program hardware solutions for real world problems through a team work, and produce final project documentation.						
<u>Outline Syllabus</u>						
A project in developing a non-trivial application in ICT using appropriate design methodologies. Students will write a report and do a demonstration and presentation at a viva-voce.						

**Level 02**

Module Code	IN 2100	Title	Object Oriented Programming			Compulsory (GPA)
Credits	3	Hours / Week	Lectures	2	Pre-requisites	None
			Lab / Tutorials	3		
<u>Learning Outcomes</u>						
On successful completion of this module, students will be able to use the concept in object oriented approach to do programming.						
<u>Outline Syllabus</u>						
<ul style="list-style-type: none"><li>• Object-oriented design</li><li>• Object Oriented Concepts</li><li>• Input and output handling</li><li>• Event Handling</li><li>• Handling Exceptions</li><li>• Testing and Debugging</li><li>• GUI concepts</li></ul>						

<b>Module Code</b>	IN 2110	<b>Title</b>	Data Structures & Algorithms			Compulsory (GPA)
<b>Credits</b>	2.5	<b>Hours / Week</b>	<b>Lectures</b>	2	<b>Pre-requisites</b>	IN 1100
			<b>Lab / Tutorials</b>	3/2		
<b><u>Learning Outcomes</u></b>						
On successful completion of this module, students will be able to define and implement main data structures, search algorithms and sorting algorithms.						
<b><u>Outline Syllabus</u></b>						
<ul style="list-style-type: none"><li>• Why Data Structures and Algorithms?</li><li>• Revisited programming concepts</li><li>• Data structures</li><li>• Array, Stacks, Queues, Linked lists, Trees &amp; Graphs</li><li>• Searching Algorithms</li><li>• Sorting Algorithms</li><li>• Simple - Insertion, Bubble &amp; Selection sort</li><li>• Advanced, Quick &amp; Merge sort</li></ul>						

Module Code	IN 2200	Title	Software Engineering Methods			Compulsory (GPA)
Credits	3	Hours / Week	Lectures	2	Pre-requisites	None
			Lab / Tutorials	3		

**Learning Outcomes**

On successful completion of this module, students will be able to: compare and contrast different software engineering models; identify the activities of the software engineering life cycle; and to explain software engineering methodologies and practices.

**Outline Syllabus**

- Software Engineering as a discipline
- Software life cycle models
- Requirement Analysis and specification
- Software design
- Object Oriented software development
- User interface design
- Coding and testing

<b>Module Code</b>	IN 2210	<b>Title</b>	Object Oriented Analysis and Design			Compulsory (GPA)
<b>Credits</b>	2.5	<b>Hours / Week</b>	<b>Lectures</b>	2	<b>Pre-requisites</b>	None
			<b>Lab / Tutorials</b>	3/2		
<b><u>Learning Outcomes</u></b>						
On successful completion of this module, students will be able to: explain different stages of object oriented analysis; compare different models of analysis and design; and to carry out UML modeling.						
<b><u>Outline Syllabus</u></b>						
<ul style="list-style-type: none"><li>• Object Oriented Analysis</li><li>• Object Oriented Design</li><li>• Rational Unified Process</li><li>• Business Modelling</li><li>• UML</li><li>• Requirements Modelling</li></ul>						

<b>Module Code</b>	IN 2310	<b>Title</b>	Operating Systems			Compulsory (GPA)
<b>Credits</b>	2.5	<b>Hours / Week</b>	<b>Lectures</b>	2	<b>Pre-requisites</b>	None
			<b>Lab / Tutorials</b>	3/2		
<b><u>Learning Outcomes</u></b>						
On successful completion of this module, students will be able to identify the purpose and theory behind the operating systems and its real-time functionalities.						
<b><u>Outline Syllabus</u></b>						
<ul style="list-style-type: none"><li>• An overview of operating systems</li><li>• Hardware concepts related to OS</li><li>• Introduction to UNIX and Linux</li><li>• File systems and management</li><li>• Processes and threads</li><li>• Resource allocation and scheduling</li><li>• Memory management and organization</li><li>• Deadlocks and indefinite postponement</li><li>• I/O management</li><li>• Security concerns</li></ul>						

Module Code	IN 2320	Title	Computer Architecture			Compulsory (GPA)
Credits	2.5	Hours / Week	Lectures	2	Pre-requisites	IN 1320
			Lab / Tutorials	3/2		
<u>Learning Outcomes</u>						
On successful completion of this module, students will be able to demonstrate in-depth knowledge in computer architecture and designing of microprocessor based applications.						
<u>Outline Syllabus</u>						
<ul style="list-style-type: none"><li>• Overview of computer architecture</li><li>• Harvard architecture and von Neumann architecture</li><li>• CPU structure and Instruction set Architecture</li><li>• Instruction sets and addressing</li><li>• Programming Model</li><li>• Processor Architectures</li><li>• Storage systems and RAID</li><li>• System Bus, I/O, Interrupts</li><li>• Coprocessors and Multiprocessing</li><li>• Assembly Language</li></ul>						



Module Code	IN 2400	Title	Database Management Systems			Compulsory (GPA)
Credits	2.5	Hours / Week	Lectures	2	Pre-requisites	IN 1400
			Lab / Tutorials	3/2		
<b><u>Learning Outcomes</u></b> On successful completion of this module, students will be able to: construct databases and identify design & development issues; demonstrate knowledge in database administration; and to identify ethical issues.						
<b><u>Outline Syllabus</u></b> <ul style="list-style-type: none"><li>• Alternative database interfaces: embedded-SQL, graphical interfaces.</li><li>• Views, Stored Procedures, Triggers and Functions</li><li>• Query Processing and Optimization</li><li>• Introduction to Online Transaction Processing</li><li>• Object Oriented Databases and Object Relational databases</li><li>• Data administration.</li><li>• DCL in detail</li><li>• Introduction to non relational data models</li><li>• Ethical issues</li></ul>						

Module Code	IN 2510	Title	Computer Networks			Compulsory (GPA)
Credits	2.5	Hours / Week	Lectures	2	Pre-requisites	IN 1500
			Lab / Tutorials	3/2		

**Learning Outcomes**

On successful completion of this module students will be able to: compare and contrast Client-Server model with Peer-to-Peer model; explain the requirements of reliable network communication and how the TCP/IP model achieves it; describe how routing is carried out in the Internet; and to carry out network performance analysis using different delay models.

**Outline Syllabus**

- Overview of computer networks
- Application Layer
- Transport Layer
- Network Layer
- Local Area Networks
- Delay Models
- Multimedia Networking
- Delay Models

<b>Module Code</b>	IN 2600	<b>Title</b>	Computer Graphics and Animation			Compulsory (GPA)
<b>Credits</b>	2.5	<b>Hours / Week</b>	<b>Lectures</b>	2	<b>Pre-requisites</b>	IN 2100 CM 2110
			<b>Lab / Tutorials</b>	3/2		
<b><u>Learning Outcomes</u></b>						
On successful completion of this module, student will be able to identify the concepts of computer graphics representations and skills needed to design and develop computer graphics.						
<b><u>Outline Syllabus</u></b>						
<ul style="list-style-type: none"><li>• Fundamental of Computer Graphics and Human Vision</li><li>• Hardware components of Graphics</li><li>• Drawing 2D Computer Graphics</li><li>• 2D Computer Graphic Transformations</li><li>• 2D Graphic Authoring Tools</li><li>• Principles of animation</li><li>• Morphing, Story boarding, Character Modeling</li><li>• 2D Computer animations</li><li>• 3D Graphics fundamentals</li><li>• 3D transforms and matrices</li><li>• 3D Graphic Authoring Tools</li><li>• 3D Graphics Programming</li><li>• Basic rendering</li><li>• Textures and shading</li><li>• Virtual Reality and VRML</li></ul>						

Module Code	IN 2900	Title	Industry Based Project			Compulsory (GPA)
Credits	2.5	Hours / Week	Lectures	-	Pre-requisites	None
			Lab / Tutorials	-		
<b><u>Learning Outcomes</u></b>						
On successful completion of this module, through a group project, students will be able to develop a software solution for the industry and produce a final report by demonstrating the task carried out in major phases of a software development life-cycle.						
<b><u>Outline Syllabus</u></b>						
A project in developing a non-trivial application in ICT for the industry with the use of appropriate design methodologies. Students will write a report on the work done and do a presentation and demonstration at a viva-voce.						

**Level 03**

Module Code	IN 3000	Title	Industrial Training			Compulsory (NON GPA)
Credits	6	Hours / Week	Lectures		Pre- requisites	None
			Lab / Tutorials			
<u>Learning Outcomes</u> On successful completion of this module student will be able to analyze functioning of industry establishment, and prepare a report outlining the experiences gathered during training.						

<b>Module Code</b>	IN 3100	<b>Title</b>	Enterprise Applications Development			Elective (GPA)
<b>Credits</b>	3	<b>Hours / Week</b>	<b>Lectures</b>	2	<b>Pre-requisites</b>	IN 1100 IN 2100 IN 2210
			<b>Lab / Tutorials</b>	3		
<b><u>Learning Outcomes</u></b>						
On successful completion of this module, student will be able to design and build enterprise level applications using knowledge gained in Software Development Methodologies, Database Systems, Middleware, Web technologies and component technologies.						
<b><u>Outline Syllabus</u></b>						
<ul style="list-style-type: none"><li>• Basic concepts of Enterprise application development</li><li>• Component architectures</li><li>• Layered architecture for Enterprise Application Development: Presentation Layer, Database Layer, Business logic layer</li><li>• Integration of Enterprise Applications</li><li>• Web application Development Framework</li><li>• Design patterns and reusability</li><li>• Security of Enterprise Applications</li></ul>						

Module Code	IN 3400	Title	Advanced Database Management Systems			Elective (GPA)
Credits	2.5	Hours / Week	Lectures	2	Pre-requisites	IN 2400
			Lab / Tutorials	3/2		
<b><u>Learning Outcomes</u></b>  On successful completion of this module, students will be able to: describe and use databases in different perspectives including research; and to recommend the best database type to be used in a given application/context.						
<b><u>Outline Syllabus</u></b> <ul style="list-style-type: none"><li>• Introduction to Online Analytical processing</li><li>• Distributed databases</li><li>• Introduction to Data Mining and Data Warehousing</li><li>• Multi-media Databases</li><li>• Deductive Databases</li><li>• Spatial/GIS and Temporal Databases</li><li>• Semi-structured data and web</li></ul>						

Module Code	IN 3520	Title	Internetworking			Elective (GPA)
Credits	2.5	Hours / Week	Lectures	2	Pre-requisites	IN 2510
			Lab / Tutorials	3/2		

**Learning Outcomes**

On successful completion of this module, students will be able to: compare and contrast OSI model with TCP/IP model; identify different protocols implemented at different layers of TCP/IP model; differentiate between the features of TCP and UDP protocols at Transport Layer; and to describe the operation of certain network based applications.

**Outline Syllabus**

- Preliminaries
  - TCP/IP protocol suite, OSI Model,
  - Client-Server Model
  - Framework of a UNIX process
  - Inter-Process Communications (IPC)
- Networking Overview and Protocols
- Transport Protocols
- Transport Layer Interfaces
- Other Topics
  - Security
  - Network Management
- Design and Performance Issue

<b>Module Code</b>	IN 3600	<b>Title</b>	Digital Video Production			Elective (GPA)
<b>Credits</b>	2.5	<b>Hours / Week</b>	<b>Lectures</b>	2	<b>Pre-requisites</b>	IN 1610
			<b>Lab / Tutorials</b>	3/2		
<b><u>Learning Outcomes</u></b>						
On successful completion of this module, students will be able to explain and apply the knowledge and skills of digital video technology to do digital video production.						
<b><u>Outline Syllabus</u></b>						
<ul style="list-style-type: none"><li>• Overview of Digital Video Technology</li><li>• Digital Video Equipments &amp; Accessories</li><li>• Digital Standards, Video and Audio Compression Techniques, Storage Media</li><li>• Digital Video Production Techniques, Script Writing, Storyboarding, Camera Angles</li><li>• Basic Lighting techniques and Lamp Types</li><li>• Nonlinear Editing Theory and Techniques</li><li>• Special Effects</li><li>• Overview of Image Processing, Color Theory, Typography</li><li>• Introduction to multi-camera productions</li><li>• Introduction to Chroma key</li></ul>						

Module Code	IN 3900	Title	Independent Study			Compulsory (GPA)
Credits	2	Hours / Week	Lectures	-	Pre-requisites	None
			Lab / Tutorials	-		
<u>Learning Outcomes</u>  On successful completion of this module, students will be able to conduct a critical literature review on a hot topic in IT, and to produce a review paper meeting a publishable standard expected by a conference/journal.						
<u>Outline Syllabus</u>  This depends on the project proposal.						

**Level 04**

Module Code	IN 4100	Title	Theory of Programming Languages			Elective (GPA)
Credits	2.5	Hours / Week	Lectures	2	Pre-requisites	CM 3210
			Lab / Tutorials	3/2		

**Learning Outcomes**

On successful completion of this module students will be able to describe theoretical foundation of programming languages leading to design and development of programming languages.

**Outline Syllabus**

- Evolution of the major programming languages
- Describing syntax and semantics
- Names, Bindings, Type checking, and Scopes
- Data types
- Expression and the assignments statements
- Statement-level control structures
- Subprograms
- Support for Object Oriented Programming
- Concurrency
- Exception Handling



<b>Module Code</b>	IN 4110	<b>Title</b>	Network Programming			Elective (GPA)
<b>Credits</b>	2.5	<b>Hours / Week</b>	<b>Lectures</b>	2	<b>Pre-requisites</b>	IN 2510 IN 1100
			<b>Lab / Tutorials</b>	3/2		
<b><u>Learning Outcomes:</u></b>  On successful completion of this module, student will be able to: define the client-server architecture, explain connection establishment between client and the server using UDP; allocate server space for multiple clients; and to design and develop interactive IT applications.						
<b><u>Outline Syllabus</u></b> <ul style="list-style-type: none"><li>• Basic network and web concepts</li><li>• IP Addressing</li><li>• Input and Output</li><li>• Sockets for Clients</li><li>• Sockets for Servers</li><li>• Secure Communication</li><li>• UDP Datagrams and Sockets</li><li>• Multicast</li><li>• URL Connections</li><li>• Protocol and Content Handlers</li><li>• Remote Method Invocation</li></ul>						

Module Code	IN 4300	Title	Embedded Systems			Elective (GPA)
Credits	2.5	Hours / Week	Lectures	2	Pre-requisites	IN 2320
			Lab / Tutorials	3/2		
<b><u>Learning Outcomes</u></b>						
On successful completion of this module, students will be able to ascertain an in-depth knowledge of embedded and real-time systems and necessary skills to develop IT applications.						
<b><u>Outline Syllabus</u></b>						
<ul style="list-style-type: none"><li>• Distributed System’s Hardware, Software, and client-server model concepts</li><li>• Distributed Object-based systems</li><li>• Distributed file systems</li><li>• Distributed Document-based systems</li><li>• Distributed Coordination-based systems</li><li>• Microprocessor programming for embedded devices</li><li>• Models and methodologies of system design</li><li>• Hardware software partitioning and scheduling</li><li>• Co-simulation, synthesis and verification</li><li>• Architecture mapping, hardware-software Interfaces and Reconfigurable computing</li><li>• Low-Power Techniques in Real Time Embedded Systems</li><li>• Sensor Networks</li><li>• Software for Embedded Systems</li></ul>						

<b>Module Code</b>	IN 4310	<b>Title</b>	IT Based Applications with Microcontrollers			Elective (GPA)
<b>Credits</b>	2.5	<b>Hours / Week</b>	<b>Lectures</b>	2	<b>Pre-requisites</b>	IN 1310 IN 1320
			<b>Lab / Tutorials</b>	3/2		
<b><u>Learning Outcomes</u></b>						
On Successful completion of this module, students will be able to identify the principles of microcontrollers, their features, limitations, development system and applications.						
<b><u>Outline Syllabus</u></b>						
<ul style="list-style-type: none"><li>• Microcontroller based applications development environment.</li><li>• Architecture and features of microcontroller based systems.</li><li>• Simulators and emulators.</li><li>• Programming of microcontroller based systems.</li><li>• Interfacing with microcontroller based systems.</li><li>• IT based applications in microcontroller based systems.</li></ul>						

Module Code	IN 4400	Title	Data Mining and Data Warehousing			Elective (GPA)
Credits	2.5	Hours / Week	Lectures	2	Pre-requisites	IN 2400
			Lab / Tutorials	3/2		

**Learning Outcomes**

On successful completion of this module, the students will be able to: describe the data mining and data warehousing concepts and techniques; and to apply data mining techniques in practical applications.

**Outline Syllabus**

- Classification and Association
- Clustering: methods, algorithms and scaling
- Decision tree learning construction, performance, issues
- Tree pruning methods, missing values, continuous classes
- Learning: Instance-based, Bayesian, Meta, Semi-supervised and active, evaluating learning methods
- Automatic Information extraction
- Interesting item set mining
- Variants for sequential
- Data Warehousing: Structure of Data warehouse, Relational Database & Data warehousing
- Schema integration and data cleaning, Deduplication Data marts Multidimensional databases (OLAP)
- Advanced topics Integrating OLAP and mining Online aggregation

Module Code	IN 4500	Title	Mobile and Wireless Networks			Elective (GPA)
Credits	2.5	Hours / Week	Lectures	2	Pre-requisites	IN 2510
			Lab / Tutorials	3/2		
<b><u>Learning Outcomes</u></b>						
On successful completion of this module, students will be able to: list the features of different wireless access technologies, describe the operation of cellular wireless networks; identify features of wireless LAN and Local Loop technologies; and to compare and contrast different wireless data services.						
<ul style="list-style-type: none"><li>• Outline Syllabus</li><li>• Preliminaries</li><li>• Access Technologies</li><li>• Cellular Networks</li><li>• Wireless LANs and Local Loop</li><li>• Wireless Data Services</li><li>• Advanced Wireless Networks and Applications</li></ul>						

Module Code	IN 4510	Title	Computer and Network Security			Elective (GPA)
Credits	2.5	Hours / Week	Lectures	2	Pre-requisites	IN 2510
			Lab / Tutorials	3/2		
<u>Learning Outcomes</u> On successful completion of this module, students will be able to: compare and contrast different encryption techniques, identify the requirement of authentication and different techniques that can be used for authentication; and to describe the CIA triad in computer and network security						
<u>Outline Syllabus</u> <ul style="list-style-type: none"><li>• An Overview of Computer Security</li><li>• Access Control Matrix</li><li>• Security Policies</li><li>• Basic Cryptography and Key Management</li><li>• Cipher Techniques</li><li>• Authentication</li><li>• Design Principles</li><li>• Representing Identity</li><li>• Access Control Mechanisms</li><li>• Information Flow</li></ul>						

Module Code	IN 4520	Title	High Speed Communications Networks			Elective (GPA)
Credits	2.5	Hours / Week	Lectures	2	Pre-requisites	IN 2510
			Lab / Tutorials	3/2		
<b><u>Learning Outcomes</u></b>						
On successful completion of this module students will be able to: describe different technologies used for high speed communications; compare and contrast the features and performance of different technologies used in high speed communications under different conditions; and list the features applications that require high speed communications.						
<b><u>Outline Syllabus</u></b>						
<ul style="list-style-type: none"><li>• Models, and approaches to the design and management of networks.</li><li>• Optical transmission and switching technologies</li><li>• FDDI,</li><li>• DQDB,</li><li>• SMDS,</li><li>• Frame Relay,</li><li>• ATM,</li><li>• SONET.</li><li>• Applications demanding high-speed communication</li></ul>						

<b>Module Code</b>	IN 4530	<b>Title</b>	Multimedia Communications			Elective (GPA)
<b>Credits</b>	2.5	<b>Hours / Week</b>	<b>Lectures</b>	2	<b>Pre-requisites</b>	IN 1610
			<b>Lab / Tutorials</b>	3/2		IN 2510
<b><u>Learning Outcomes</u></b>						
On successful completion of this module, students will be able to demonstrate the understanding of how multimedia data are represented and deliver them over a variety of networks efficiently and securely.						
<b><u>Outline Syllabus</u></b>						
<ul style="list-style-type: none"><li>• Introduction to Multimedia Communications</li><li>• Multimedia Information representation</li><li>• Compression of Multimedia Data</li><li>• Multimedia Communication standards</li><li>• Multimedia networking</li><li>• Internet, WWW and Transport Protocols.</li><li>• Security of Multimedia Communications</li></ul>						

Module Code	IN 4540	Title	Performance Evaluation of Computer Networks			Elective (GPA)
Credits	2.5	Hours / Week	Lectures	2	Pre-requisites	IN 2510
			Lab / Tutorials	3/2		
<u>Learning Outcomes</u> On successful completion of this module, students will be able to: use different delay models to perform network analysis and Carry out network simulations and traffic analysis under different conditions and parameters.						
<u>Outline Syllabus</u> <ul style="list-style-type: none"><li>• Introduction to Queuing Theory</li><li>• Advanced Queuing System</li><li>• Queuing Networks</li><li>• Development of Simulation Software</li><li>• Applications to the Design of Computer Systems</li><li>• Application to the Design of Communication Systems</li></ul>						

Module Code	IN 4600	Title	Multimedia Systems			Elective (GPA)
Credits	2.5	Hours / Week	Lectures	2	Pre-requisites	IN 1610
			Lab / Tutorials	3/2		
<b><u>Learning Outcomes</u></b>  On successful completion of this module, students will be able to identify the essentials of multimedia systems and to design Multimedia systems.						
<b><u>Outline Syllabus</u></b>  <ul style="list-style-type: none"><li>• Introduction to Multimedia Systems</li><li>• Operating System Requirements</li><li>• Media Characteristics &amp; Compression Techniques</li><li>• Metadata Generation</li><li>• Indexing Structures</li><li>• Streaming Multimedia Data</li><li>• Watermarking Techniques &amp; Security</li><li>• Multimedia Server Architectures</li></ul>						

Module Code	IN 4610	Title	Multimedia Programming			Elective (GPA)
Credits	2.5	Hours / Week	Lectures	2	Pre-requisites	IN 1610 IN 2600
			Lab / Tutorials	3/2		
<b><u>Learning Outcomes</u></b>						
On successful completion of this module, students will be able to ascertain the advanced concepts of multimedia programming techniques and skills.						
<b><u>Outline Syllabus</u></b>						
<ul style="list-style-type: none"><li>• Introduction to Game Programming</li><li>• Mathematical fundamentals of 3D computer graphics</li><li>• Introduction to Textures and Skins</li><li>• 3D Programming Development &amp; Concepts</li><li>• Designing 3D Simulations</li><li>• Introduction to Modeling &amp; Making a Player Model</li><li>• Creating and Programming Sound</li><li>• Integrate art and models into a game world using Torque Script</li><li>• Lighting &amp; Shadows in games</li><li>• Multi-pass rendering &amp; Control of objects</li><li>• Collision detection &amp; Interactive control</li><li>• Multi-player game technology</li><li>• Gaming engine architecture</li></ul>						



Module Code	IN 4620	Title	Digital Image Processing			Elective (GPA)
Credits	2.5	Hours / Week	Lectures	2	Pre-requisites	IN 1610 CM 3110
			Lab / Tutorials	3/2		
<b><u>Learning Outcomes</u></b> On successful completion of this module, students should be able to use the knowledge, skills, theory and mathematical techniques of image processing, transformations and compression.						
<b><u>Outline Syllabus</u></b> <ul style="list-style-type: none"><li>• Digital Image Types and Representation</li><li>• Color Fundamentals</li><li>• Image Enhancement</li><li>• Image Analysis</li><li>• Image Transformations and operations</li><li>• Image Processing in Frequency domain</li><li>• Image restoration. Inverse filtering, Geometric correction</li><li>• Wavelets and Multi-resolution Processing</li><li>• Image Compression</li><li>• Morphological Image processing</li></ul>						

Module Code	IN 4700	Title	Cluster Computing			Elective (GPA)
Credits	2.5	Hours / Week	Lectures	2	Pre-requisites	IN 2510
			Lab / Tutorials	3/2		
<b><u>Learning Outcomes</u></b>						
On successful completion of this module, students will be able to investigate clusters of computers as a computing platform for distributed computing and impart the knowledge about specific hardware and software tradeoffs for cluster computing and performance in applications.						
<b><u>Outline Syllabus</u></b>						
<ul style="list-style-type: none"><li>• Concept of cluster based distributed computing.</li><li>• Hardware and High-speed networking aspects of Cluster Computing.</li><li>• Software for cluster computing</li><li>• Software and software architectures for cluster computing.</li><li>• Dynamic process creation, one-sided communication, parallel I/O.</li><li>• Variants based on new low level protocols</li><li>• Linux for clusters, cluster monitoring.</li><li>• Applications and Performance evaluation tools.</li></ul>						

Module Code	IN 4710	Title	Human Computer Interaction			Elective (GPA)
Credits	2.5	Hours / Week	Lectures	2	Pre-requisites	IN 2200
			Lab / Tutorials	3/2		
<u>Learning Outcomes</u>						
On successful completion of this module, student will be able to develop user friendly software packages and evaluate system usability.						
<u>Outline Syllabus</u>						
<ul style="list-style-type: none"><li>• Foundations of human-computer interaction</li><li>• Human-centered software development</li><li>• Human-centered software evaluation</li><li>• Graphical user-interface design</li><li>• HCI aspects of collaboration and communication</li></ul>						

<b>Module Code</b>	IN 4720	<b>Title</b>	Geographic Information Systems			Elective (GPA)
<b>Credits</b>	2.5	<b>Hours / Week</b>	<b>Lectures</b>	2	<b>Pre-requisites</b>	None
			<b>Lab / Tutorials</b>	3/2		
<b><u>Learning Outcomes</u></b>						
On successful completion of this module, students will be able to identify usage of spatial data in GIS system and the roles of various types of GIS and their applications.						
<b><u>Outline Syllabus</u></b>						
<ul style="list-style-type: none"><li>• Introduction to GIS</li><li>• Spatial data and modeling</li><li>• Attribute data management</li><li>• Data input, editing, and analysis</li><li>• Analytical modeling in GIS</li><li>• Output: new maps, enhanced decisions</li><li>• The development of computer methods for handling spatial data</li><li>• Data quality issues</li><li>• Human and organizational issues</li><li>• GIS project design and management</li></ul>						

Module Code	IN 4730	Title	High Performance Computing			Elective (GPA)
Credits	2.5	Hours / Week	Lectures	2	Pre-requisites	IN 2310 IN 2320
			Lab / Tutorials	3/2		
<b><u>Learning Outcomes</u></b>						
On successful completion of this module, student should be able to use the knowledge, tools and techniques to design and develop efficient programs						
<b><u>Outline Syllabus</u></b>						
<ul style="list-style-type: none"><li>• Introduction to Message Passing Interface (MPI)</li><li>• MPI Model</li><li>• Theory and Practice of Parallel Computing</li><li>• Designing Parallel Algorithms</li><li>• Parallel Virtual Machine (PVM)</li><li>• MPI Synchrony &amp; Types and MPI Process Groups</li><li>• Parallel Matrix Multiplications</li><li>• Parallel Sorting</li><li>• Topologies &amp; Complexity</li><li>• Shared Memory Multiprocessing (SMP) and Multithreading</li><li>• Code Optimization and Performance Optimization</li><li>• New trends in High Performance Computing</li></ul>						

Module Code	IN 4900	Title	Comprehensive Project			Compulsory ( GPA)
Credits	10	Hours / Week	Lectures	-	Pre-requisites	None
			Lab / Tutorials	-		
<b><u>Learning Outcomes</u></b>						
On successful completion of this module, students will be able to conduct an individual project to solve a challenging problem, preferably with a research value, by applying a set of cutting age technologies, and to produce documentations including project proposals, interim reports, final report and papers for conference/journals.						
<b><u>Outline Syllabus</u></b>						
Student will carry out an individual project and will produce a dissertation. The student will also make a presentation and do a demonstration of the project at a viva-voce.						