POSTGRADUATE INSTITUTE OF SCIENCE
UNIVERSITY OF PERADENIYA

M.Sc. in Information Technology (IT)

1. INTRODUCTION

Most of the graduates require knowledge of Information and Communication Technology **(**ICT) in order to find a suitable job. On the other hand, those who have not offered Computer Science as a subject during the undergraduate programme are looking for a competitive job. Information and communication technology exert a great influence in all subjects and therefore it is essential to train graduates for the modern world. ICT is one of the most innovative disciplines that can interact with any other discipline in order to develop subjects, which have areas of interaction.

The knowledge of ICT is a must for undergraduate as well as postgraduate degree students. All the enterprises (institutes, organizations, and companies) should have at least one qualified ICT personal. In this decade, most institutes need to develop by introducing or/and improving ICT in their curricula to suit actual demands. A postgraduate degree programme facilitates to gain a comprehensive knowledge of recent issues in ICT.

2. OBJECTIVES OF THE PROGRAMME

The objective of this programme is to provide concepts of the information and communication systems, and technologies applicable. At the completion of this course, candidates will be able to effectively use ICT in the process of education, business, finance, web design and Graphic design.

3. PROGRAMME ELIGIBILITY

Candidates having a bachelor's degree with 30 credits including relevant modules of physical science or in a related area or equivalent accredited prior learning experience are eligible to follow the programme. *Those who do not possess the necessary background in the discipline(s) of computer science or ICT may have to follow additional courses (three Preliminary Courses) as described by the relevant Board of Study prior to the commencement of the postgraduate programme*.* Eligible applicants shall face a selection examination followed by an interview, conducted by the PGIS. Employed candidates eligible for admission should produce evidence of leave granted to follow the programme and a letter of release from the Head of the Department/Institution.

4. PROGRAMME FEE

Category	Programme Fee	
	M.Sc. by Course work	M.Sc. by Research
Local candidates	Rs. 160,000/-	Rs. 220,000/-
Foreign candidates	Rs. 320,000/-	Rs. 440,000/-

Students registered for the M.Sc. degree by course work shall pay the Programme fee in full or in two *(1/2 at the registration and the balance at the end of the first semester)* or three *(1/3rd at the registration, another 1/3rd after 4 months from the date of registration and the balance after 8 months from the date of registration)* instalments. An additional payment of Rs. 70,000/- should be made at the end of the first year to continue for the M.Sc. degree by research. Other payments including registration fee, medical fee, library subscription, examination fee and deposits (science and library) should be paid according to the procedure stipulated by the PGIS. (N.B. The Programme fees given above may be revised from time to time.)

5. THE PROGRAMME STRUCTURE AND DURATION

The programme is structured into three stages as follows.

I. Beginners who commence with little or no ICT knowledge must successfully complete the three **preliminary courses**.
II. All students must complete all the **compulsory core courses**.
III. Students undertake **elective courses** offered by the institute to fulfill the credit requirement.

This programme consists of three options for completion.

5.1 Masters Degree with Course Work

The M.Sc. degree (Course work) can be obtained by completing course work only (without conducting any research project).

Course work, comprising of theory courses, and laboratory and/or fieldwork, shall be conducted over a period of two semesters of 15 weeks each. The total duration of the degree, including examinations, shall be about 12 months. Satisfactory completion of a minimum of 30 credits of course work with a GPA of not less than 3.00 is required for the successful completion of the degree (The student who does not satisfy the above criteria but obtains a GPA in the range 2.75 to 2.99 for course work of 25 credits is eligible for the Diploma in Information Technology).

5.2 Masters Degree

In addition to Masters Degree with course work (5.1), the Masters Degree (Research) requires a research project. The duration of the entire programme will be 24 months inclusive of 5.1. Completion of all the requirements of 5.1 with a GPA of not less than 3.00 is a prerequisite for the Masters Degree (Research). The research project for this degree should be conducted on full-time basis, and completed during the second year. The research component is allocated 30 credits, totalling 60 credits for the entire programme. After successful completion of the research project, the student shall be eligible for the award of the M.Sc. Degree in Information Technology (The student who does not complete the research project shall be awarded the M.Sc. Degree in course work in Information Technology).

5.3 Extension of the programme for M.Phil. or Ph.D.

After completion of six months of research in the M.Sc. degree (research) programme, students who have demonstrated exceptional progress may apply for upgrading the degree status to M.Phil. The student should continue the research project and any additional research work/assignments recommended by the PGIS for a total of two years (60 credits of research) to qualify for the award of the M.Phil. degree.

During the second year of research, students who have demonstrated exceptional and continuous progress, may apply for upgrading the degree status from M.Phil. to Ph.D. The student should continue the research project and any additional research work/assignments recommended by the PGIS for another year on full-time basis (additional 30 credits) to qualify for the award of the Ph.D. degree.

Programme Summary

Preliminary Courses				
Course Code	***Course Title***	***Lecture hrs.***	***Practical hrs.***	***No. of Credits***
IT 401	Mathematics for IT	30	0	2
IT 402	Computer Application Fundamentals	20	20	2
IT403	Introduction to Computers and Computer Architecture	30	0	2

Compulsory Courses

Code	Title	Credits	Semester	Lect.	Pract.
IT 501	Programming techniques	2	I	30	
IT 503	Programming laboratory I	2	I		60
IT 504	Introduction to probability and Statistics	3	I	35	20
IT 505	Database Systems	2	II	30	
IT 506	IT Applications	2	I	30	
IT 507	Data Structures and Analysis of Algorithms	2	II	30	
IT 508	Document Markup languages	2	I	20	20
IT 509	Web Technologies	2	II	30	
IT 511	Programming laboratory II	2	II		60
IT 524	Mini Project	5	II		150
IT 520	Computer Graphics	2	II	30	
Total credits		**26**			

Optional Courses

Code	Title	Credits	Semester	Lect.	Pract.
IT 502	Object oriented program design	2	II	30	
IT 510	Information Security	2	II	30	
IT 514	Management Information Systems	2	II	30	
IT 515	E-Commerce	2	I	30	
IT 516	Systems Analysis and Design	2	I	30	
IT 517	Introduction to multimedia systems	2	I	30	
IT 518	Image processing	2	II	30	
IT 519	Programming laboratory III	2	II		60
IT 512	Operating Systems concepts	2	I	30	
IT 521	Human Computer Interaction Design	2	I	30	
IT 522	Programming laboratory IV	2	II		60
IT 523	Operations Research	2	I	30	60
IT 513	Communication networks	2	I	30	
IT 525	Data mining techniques	2	II	30	
IT 526	Software Engineering	2	I	30	
	Total credits	**30**			

6. PROGRAMME CONTENTS

Code	IT 401
Title	Mathematics for IT
Credits	2
Compulsory/ optional	Optional
Prerequisites	None
Aims	The aim of this course is to develop students' knowledge in basic mathematical methods such as vectors, differential equations and algebra.
Learning outcomes	At the completion of the course students will be able to: • describe the importnce of mathematics in ICT • use mathematical concepts for ICT
Time allocation	Lectures & Tutorial: 30 hrs
Content	Numerical Analysis: Spanned root finding, interpolation, approximation of functions, integration, differential equations, direct and iterative methods in linear algebra; Discrete Mathematics: Set Theory, Functions and Relations, Sums and Recurrence Relations, Mathematical Reasoning, Counting; Probability: Random variables, distributions, quantiles, mean variance, Conditional probability, Bayes' theorem, base rate fallacy Joint distributions, covariance, correlation, independence, Central limit theorem; Statistics : Bayesian inference with unknown priors, Frequentist significance tests and confidence intervals; Vector methods: Introduction to vectors, Linear combinations, Linear dependence and independence, Bases and dimension, Scalar product, Vector product, Differential equations: First order ordinary differential equations, Exact equations, Higher order linear ordinary differential equations with constant coefficients; Linear Algebra: Preliminaries, Determinants, Simultaneous linear equations, Eiganvalues and eiganvectors, Matrix calculations, Special matrices, Range and null space, Decomposition of matrices, Quadratic forms. Differentiation of scalar functions of matrices

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended Texts:

1. *Elementary Vector Analysis, C.E. Weatherburn, 1982*
2. *A First Course in Differencial Equations, D.G. Zill, 1998*
3. *Linear Algebra, K. Hoffman and R. Kunze, 1999*

Code	IT402
Title	Introduction to Application Software
Credits	2
Compulsory/optional	Optional
Prerequisites	None
Aims	The aim of this course is to develop students' skills and knowledge required to use applications software to carry out day to day activities
Learning outcomes	At the completion of the course students will be able to: • explain the history of computers • identify main component of s computer system • use computers to perform day to day task • identify and use office automation softwre for word processing, spreadsheet manipultion and electonic presentions
Time allocation	Lectures & Tutorial: 20 hrs Practical: 20 hrs
Content	**Word Processing**: Overview, Facilities available in word processing software, add remove tool bars, Managing files, Create, open and rename files, Editing and formatting, Cut, copy and paste, font formatting, paragraph formatting and bullets and numbering, Tables, Adding and formatting tables, Page setup and printing, Paper size, orientation and margins, Page numbering and print setup, Tools, Spell checker and mail merge, Help. **Spread Sheet**: Overview, Identifying cell, work sheet, name box, formula box and tool bars, Entering Data, Three kinds of data (Text, values and formulae and functions) Working with different formulae and functions, Custom lists, Formatting, Formatting cells, rows and columns, Custom formatting and conditional formatting, Protection, Protecting a work book, work sheet and a part of a work sheet, Charts, Adding and formatting charts, Macros, Creating and storing macros. **Presentation**: Views and design templates, Identifying various views (Normal, Slide sorter and slide show view). Using various design templates, Drawings and Diagrams, Inserting drawing objects (Auto shapes, curves and lines) and pictures, Charts, animations, slide transition and background formatting Formatting slides, Adding charts to the presentation, Setting animations and slide transition, Present Presenting the slide show, Publishing the show on the web.

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended texts:

1. Working In Microsoft Office, Ron Mansfield, Tata McGraw Hill, 2008
2. Gary Shelly, Misty Vermaat, Microsoft Office 2010: Introductory, CENGAGE Learning

Code	IT 403
Title	Introduction to Computing and Computer Architecture
Credits	2
Compulsory/ optional	Optional
Prerequisites	None
Aims	The aim of this course is to develop students' knowledge in digital computers and their characteristics
Learning outcomes	At the completion of the course students will be able to: • explian characteristics of hardware and software • describe the number systems used in computers • represent data with different number systems • perform binary arithmtics • identify input and output devices • describe the memory organization
Time allocation	Lectures & Tutorial: 30
Content	**Introduction to Computer Systems**: Basic concepts of computer system, History of computer, Types of computers, basic building blocks of personal computer and their functions. Introduction to Digital Computer, Hardware and Software Components, Number Systems, Boolean Logic and Circuit Fundamentals, Digital System Building Blocks, Fixed and Floating Point Binary Arithmetic, Computer Memory Systems. Architecture of a Digital Computer; Input-Output System; Memory and I/O Organization: Interfacing with CPU; Main Memory, Auxiliary Memory, Cache Memories, Associative Memory and Virtual Memory. I/O Interfacing with CPU; Addressing Data Transfer Techniques, Flynn's taxonomy.

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended text:

1. Computer Architecture And Organization: McGraw Hill, 2nd Edition, John Hyaes, 1988
2. Computer System Architecture: PHI, 3rd Edition, M. Morries Mano, 2010.
3. Computer Organization And Design: Prentice Hall Of India, Chaudhari P.P, 2004
4. Computer System Architecture: Prentice Hall, Tannenbaum A, 2005
5. Heuring Computer Systems Design And Architecture, 2/E, Pearson Education India, 2008

Code	IT 501
Title	Programming techniques
Credits	2
Compulsory/ optional	Compulsory
Prerequisites	None
Aims	The aim of this course is to develop students' understanding of basic programming concepts and good programming practices
Learning outcomes	At the completion of the course students will be able to: • describe the type of program translators and their role • explian the characteristics of high level programming languages • describe the use of data types and variables • analyse problems and design simple programs to solve them • use basic data structures in designing efficient programs • process files through programs
Time allocation	Lectures & Tutorial: 45 hrs
Content	Basic Concepts: The structure & definition of a HLL such as C, program translators: compilers and interpreters, and the role of translators, advantages and disadvantages of translators, the concept of Data types and operation on data types. Structured Program Development: Problem definition and specification, top-down design and development, Coding guidelines, and standards in developing commercial application systems. Writing a complete program: Sequential, alternation, and repetition control structure: formatted and unformatted basic input output, Modular structure program modules in C, functions. Pointers: Pointers concept, operations on pointers and usage of pointers. Array processing Character and string processing. Simple sorting and searching algorithms: Bubble sort, sequential and binary search. File processing: File Definition; processing logic for sequential and random files. Classification of Data types and Data Structure, scalar and structured data types, static and dynamic structures. Testing of programs: both black box testing, white box testing techniques, and system integration: bottom -up or top-down approach.

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended texts:

1. Structured programming concepts, K. Labudde, Mcgraw-Hill College,1986
2. Problem solving and Progamming, Barclay, ANSI C, Prentice Hall, 1990
3. Paul J. Deitel, Harvey M. Deitel, C: How to Program, Prentice Hall, 2010
4. Programming Techniques, Orizonturi Universitare, 2009

Code	IT 502
Title	Object oriented program design
Credits	2
Compulsory/ optional	Compulsory
Prerequisites	IT501
Aims	The aim of this course is to develop students' knowledge in object oriented paradigm and its usage in reusable program design
Learning outcomes	At the completion of the course students will be able to: • explain the properties of object oriented technology • identify classes/ objects and interactions involved in problem domain • design simple object oriented programs • use inheritance and dynamic binding in program design
Time allocation	Lectures & Tutorial: 45hrs
Content	Classes and objects: Introduction to basic object-oriented concepts of classes and objects. Basic class implementation and one-class programs; Inheritance and dynamic binding. Object-Oriented Programming in the small: Developing small programs using classes. Identifying and implementing class relationships. Good design and programming practice. File handling. Exception handling*:* Dealing effectively with runtime errors using the Java exception handling mechanism. Try, catch, throw, finally. How exceptions affect the design of an application. Debugging and Testing*:* More sophisticated use of debuggers. Testing a program: unit testing, functional testing

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended text:

1. How to Programme, 2nd Edition, Deitel and Deitel, Prentice Hall, 1994
2. Developing Java Software, 3rd Edition, by Russel Winder and Graham Roberts, published by John Wiley and Sons, 2006

Code	IT 503
Title	Programming laboratory I
Credits	2
Compulsory/ optional	Compulsory
Prerequisites	**IT501, IT502**
Aims	The aim of this course is to develop students' skills and knowledge required to apply procedural and object oriented paradigms in software development
Learning outcomes	At the completion of the course students will be able to: • identify language constructs required to develop programs • explain and use the language syntax • use control structures in manipulating the program execution • design and implement procedural programs in C and object oriented programs in Java • debug programs to identify errors
Time allocation	Practical: 60 hrs
Content	Language constructs: data declarations, loops, decision structures, input/output, files, subprograms / procedures. Implementation of programs with functions and procedures; implementation of programs with object oriented language constructs such as classes, objects, inheritance, composition and polymorphism numeric and non-numeric data. Design and construction of software: top-down and bottom-up design, decomposition, structuring, design for reuse, documentation, study of examples, writing software as a team, using software from others. Programming assignments: A variety of progressively more complex assignments

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended Text:

1. The C Programming Language, 2nd Edition, by Brian W. Kernighan and Dennis M. Ritchie, Prentice Hall, 1988.
2. Developing Java Software, 3rd Edition, by Russel Winder and Graham Roberts, published by John Wiley and Sons, 2006

Code	IT 504
Title	Introduction to probability and Statistics
Credits	3
Compulsory/optional	Compulsory
Prerequisites	None
Aims	The aim of this course is to develop students' understanding of the basic theories and concepts in Probability theory and Statistics
Learning outcomes	At the completion of the course students will be able to: • describe elements of probability • explain functions of a random variable • describe the use of different probbility distribution functions • use samples in data analysis and interpretation
Time allocation	Lectures & Tutorial: 35 hrs Practical: 20 hrs
Content	Elements of Probability: Experiments, Events, Sample space, Laws of Probability, Bayes' Theorem, Independence of events. Random variables: Discrete and continuous r.v.'s, Probability mass function, Probability density function, Cumulative distribution function, Functions of a random variable, generation and testing of random variables, Expectation, Moments, Mean and variance, Moment Generating function. Distributions: Discrete: Uniform, Bernoulli & Binomial, Poisson, Geometric, Negative Binomial, Hypergeometic, Multinomial, Continuous: Uniform, Normal, Gamma, Exponential, Properties and applications of distributions, Probability Generating functions. Basic ideas in Statistics: Representation of data, Histogram, Frequency polygon, Ogive. Measures of Location: Median, Mode, Quantiles, Deciles, Percentiles. Measures of Dispersion : Range, Interquartile range, Variance, Standard deviation, Chebyshev's rule for sample, Shepperd's correction for variance, Coefficient of variance, Moments of higher order, Skewness, Kurtosis. Representation of data using Stem-Leaf diagrams and Box plots. Students are support to answer self learning assignments on following topics: Approximation to Binomial using Poisson, Binomial using Normal, and Poisson using Normal. Probability inequalities: Chebyshev's and Markov's etc.
	Regression and Correlation: Scatter diagrams, Linear Regression, Method of least squares, Correlation, Coefficient of correlation, Rank correlation, Spearman's rank correlation coefficient. Index numbers: Introduction, Price Relatives, Quantity Relatives and Value Relatives. Link and Chain Relatives, Cost of living Index Numbers, Methods of construction of Index Numbers, Quantity Index Numbers, Tests for Index numbers. Introduction to statistical packages: Editing, summarizing, Transforming and Manipulating Data, Graphical methods for describing data, Numerical methods for describing data, Distributions and Random data. Applications

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended text:

1. Applied Probability and Statistical Methods, G.C.Canovos, 2009
2. A Course in Probability & Statistics , C.J. Stone, 1996
3. A Basic Course in Statistics, G. M. Clarke, and D. Cooke, 1998

Code	IT 505
Title	Database Systems
Credits	2
Compulsory/optional	Compulsory
Prerequisites	IT501
Aims	The aim of this course is to develop students' knowledge in database concepts, their usage and database models
Learning outcomes	At the completion of the course students will be able to: • describe the advantages of database approach • explain the 3 - level architecture of a database management system • design relational databases for given domains • handle functional dependencies to ensure consistency • explain the properties of a trasaction • identify problems in concurrent execution of transactions • describe concurrency control mechanisms
Time allocation	Lectures & Tutorial: 30 hrs
	Overview of Database Concepts: Database and Need for DBMS, Characteristics of DBMS, Database Users, 3-tier architecture, Data Models, Views of data-schemes and instances, Independence, Data modeling using the Entity-Relationship approach, Entities, Relationships, Representation of entities, attributes, relationship, and cardinality. Traditional database models, Relational Model, Structure of relational DB and different types of keys, relational algebra, Constraints, Relational database languages, SQL and embedded SQL, Relational Database design: Functional dependencies, and Normalization. Transaction Processing & Concurrency Control: Concept and definition of transaction, ACID properties, serializibility, states of transaction, Types of failure, desirable properties of transaction schedules and recoverability, serial usability of schedules, levels of transaction consistency, deadlocks, long duration transactions, transaction performance, transaction processing as implemented in contemporary database, management system. Concurrency Control, locking techniques, techniques based on time-stamp ordering, multiple granularity. Crash Recovery: failure classification, recovery concepts, database backup, and recovery concepts. Introduction to Distributed Database and Object Oriented Databases.

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended text:

1. Database systems: A practical guide to design, implementation and management, 3rd edition, Connolly Begg, Addion Wesley, 1998.
2. Fundamentals of Database Systems, 5th Edition by Ramez Elmasri and Shamkant B. Navathe, 2006
3. Date, C. J.; An Introduction to Database Systems; Addison-Wesley; 2000

Code	IT 506
Title	IT Applications
Credits	2
Compulsory/optional	Compulsory
Prerequisites	None
Aims	The aim of this course is to develop students' knowledge in IT applications and skills in using them
Learning outcomes	At the completion of the course students will be able to: • describe the advantages of IT applications • identify areas where IT is succesfuly used • describe propereties of E-Learning, E-marketing etc. • explain IT applications in research
Time allocation	Lectures & Tutorial: 30 hrs
	Overview of IT applications: Stake holders of IT applications, components of an IT application; IT Applications in Education: Learning Management Systems, E-learning and Distance learning; E-business applications: Online shopping, E-advertising etc.; IT applications in finance: E-Banking, Stock exchange, online payments etc.; IT applications in media: multimedia applications; IT applications in research and industries.

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended text:

1. Vadim Ermolayev, Heinrich C. Mayr, Mykola Nikitchenko, Aleksander Spivakovsky, Grygoriy Zholtkevych**,** ICT in Education, Research, and Industrial Applications, Springer, 2012

Code	IT507
Title	Data Structures and Algorithms
Credits	2
Compulsory/optional	Compulsory
Prerequisites	IT501, IT503
Aims	This course introduces learn data structures and their, algorithms, time complexity and the design of algorithms for problem solving
Learning outcomes	At the completion of the course students will be able to: • Explain what a data structure is and why it is important for programming • Explain the properties of different data structures • Explain the suitability of data structures for given task • Use data structures in program design • Write efficient programs in any programming language
Time allocation	Lectures & Tutorial: 30 hrs
Content	The aim of this course is to develop students' understanding of Data Structures and Analysis of algorithms, and their usage in designing efficient software.
	Data Structures: linear and non linear data structures. arrays, lists: linked list, ordered linked list and doubly linked list; push down stacks; queues: FIFO queue and deque. Tree structures – trees in general, binary search three (BST), root insertion to BST, splay tree, 2-3-4 trees, radix tree and red-black tree; Graphs; Implementation of depth first search, breadth first search; Analysis of algorithms: time complexity, big O notation. Sorting algorithms: bubble sort, selection sort, insertion sort, quick sort, heap sort, merge sort and external sorting methods. Hashing: hash functions and collision resolution: separate chaining, linear probing and double hashing. Classification of Algorithms by Implementation and Design Paradigm: Divide & Conquer Algorithms, Dynamic Programming, Greedy Algorithms, Recursive Algorithms, Backtracking, Alfa-Beta pruning, Branch & Bound Search;

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended Text:

1. R. Sedgwick, Algorithms in C, Addition Wesley, 1998.
2. Standish, T. A, Data Structures in Java, Addition Wesley, 1998.
3. Gregory L. Heilemen, Data structures, Algorithms & Object-Oriented programming, McGraw-Hill, 1996.
4. Sara Baase, Allen Van Gelder, Computer Algorithms - Introduction to Design & Analysis, Addison-Wesley, 2000
5. Thomas H. Cormen, Charles E. Leiserson & Ronald L. Rivest, Introduction to Algorithms, The MIT Press, 2009

Code	IT508
Title	Document Markup languages
Credits	2
Compulsory/optional	Compulsory
Prerequisites	IT501
Aims	The aim of this course is to develop students' understanding of syntax and semantics of document markup languages and develop skills to apply them in webpage designing
Learning outcomes	At the completion of the course students will be able to: • Use Hyper Text mark-up language (HTML) and scripting languages for design web pages • Connect an interface to a database for processing • Develop secure web applications
Time allocation	**Lectures & Tutorial: 15 hrs Practical: 30 hrs**
Content	Introduction to XML, Creation of XML Documents, DTDs, Namespaces and XML Schemas, Simple API for XML (SAX), Document Object Model (DOM), XLinks, Xpointers, Transformation of XML Documents – XSLT, Resource Description Framework – RDF, XML Applications. Introduction to Internet Programming., Client/Server model, Browsers-Graphical and Hypertext Access to the Internet, HTTP – Hyper Text Transfer Protocol, Creating Internet World Wide Web pages, HTML – Hyper Text Markup Language, headers, body, html tags, tables, Text, graphics, sounds, video clips, multi-media, Client side image mapping, web page counters, HTML resources - html converters and tools, HTML forms programming, Building a form, Text fields and value, size, maxlength, html buttons, radio, checkboxes, prechecked, Selection lists, Introduction to WAMP.

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended text:

1. (JXML) Optional: Java and XML, solutions to real-world problems, Brett Mc Laughlin O'Reilly, 2001.
2. Deitel and Deitel. "Java - How to Program", Addison-Wesley Press, Reading, Mass., 1998,
3. S. Gundavaram. "CGI Programming on the World Wide Web", O'Reilly and Associates Publishing, Sebastopol, CA, 1996.

Code	IT509
Title	Web technologies
Credits	2
Compulsory/optional	Compulsory
Prerequisites	IT508
Aims	The aim of this course is to develop students' knowledge in modern web technologies and their applications
Learning outcomes	At the completion of the course students will be able to: • Identify modern technologies available for web development • Use modern web technologies and tool to develop interactive web applications
Time allocation	**Lectures & Tutorial: 20 hrs** **Practical: 20 hrs**
Content	Explores the use of scripting languages, such as Java Script, PHP, ASP, VB.Net and Java Applets in web site development. Examines the use of relational databases to create dynamic web sites. Extensive exposure in lecture and lab to web based application development tools. Students will develop a full-featured web based interactive educational application

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended text:

1. A. Puntambekar, Web Technologies, Technical Publications Pune, 2009
2. Completer Reference HTML - Thomas A. Powell (TMH), Osborne/McGraw-Hill; 3rd edition, 2000
3. JavaScript Bible, Danny Goodman and Michael Morrison, Wiley; 5th edition, 2004
4. VBScript in Nutshell – Paul Lomax, O'relly, 2003

Code	IT510
Title	Information Security
Credits	2
Compulsory/optional	Compulsory
Prerequisites	IT513
Aims	The aim of this course is to develop students' understanding of secure data/information storage, as well as transmission via networks, in the presence of a diverse and large number of security threats
Learning outcomes	At the completion of the course students will be able to: • describe OSI security architecture • describe common security standards and protocols for network security applications • understand common information risks and requirements • explain the operation of conventional and public-key encryption techniques • describe the concepts and techniques for digital signatures, authentication and non-repudiation • understand privacy and ethics issues • appreciate the need for the digital certificates and public key infrastructure • appreciate the importance of system security against intruders and malicious software using firewalls
Time allocation	Lectures & Tutorial: 30 hrs
Content	Information Security Fundamentals, Attackers and Their Attacks, Security Basics, Security Baselines, OSI security architecture, security standards and protocols, information risks and requirements, Securing the Network Infrastructure, Web Security, Introducing Cryptography, Operational Security, Computer Forensics

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended text:

1. IT Security: Risking the Corporation by Linda McCarthy, Prentice Hall PTR, 2003.

Code	IT 511
Title	Programming laboratory II
Credits	2
Compulsory/optional	Compulsory
Prerequisites	IT505, IT509
Aims	The aim of this course is to develop students' skills and knowledge required for designing and implementing web applications
Learning outcomes	At the completion of the course students will be able to: • Physical design of consistence relational database • Develop applications using scripting languages and frameworks for database manipulation
Time allocation	Practical: 60 hrs
Content	Creating database tables and using data types: Create table, Modify table, and Drop table. Practical Based on Data Manipulation: Adding data with Insert, Modify data with Update, Deleting records with Delete. Practical Based on Implementing the Constraints: NULL and NOT NULL, Primary Key and Foreign Key Constraint, Unique, Check and Default Constraint. Practical for Retrieving Data Using Simple select clause, Accessing specific data with Where, Ordered By, Distinct and Group By. Practical Based on Aggregate Functions: AVG, COUNT, MAX, MIN, SUM, CUBE. Implement Nested Queries & JOIN operation. Make Database connectivity with front end tools like – PHP, VB, .Net. At least 3 assignments should be completed in web design & development.

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended Text:

1. Database systems: A practical guide to design, implementation and management, 5th edition, Thomas M. Connolly and Carolyn E. Begg, Addion Wesley, 2009
1. Fundamentals of Database Systems, 5th Edition by Ramez Elmasri and Shamkant B. Navathe, Addison Wesley; 5 edition, 2006
2. Date, C. J.; An Introduction to Database Systems; Addison-Wesley; 2000
3. VBScript by example – Jerry Honeycutt Paperback (Macmillan computer pub)
4. Teach yourself ASP programming in 21 days – Fleet, Warret, Hen Stojanovic Benoit Marchal, 1999/2001).
5. Internet & World Wide Web How to Programme, Second Edition, 2002

Code	IT512
Title	Operating Systems Concepts
Credits	2
Compulsory/optional	Optional
Prerequisites	IT507
Aims	This course allows students to learn operating systems concepts
Learning outcomes	At the completion of the course students will be able to: • Demonstrate High-level understand what is an operating system and the role it plays • Describe the structure of • Operating systems, applications, and the relationship between them. • Explain the services provided by operating systems. • Describe some details of major OS concepts.
Time allocation	Lectures & Tutorial: 30 hrs
Content	The aim of this course is to develop students' knowledge in functional behavior & responsibilities of an operating system as a resource manager and as an interface between hardware and user
	Memory Management: Memory Management Techniques; Single partition allocation, multiple partition allocation, Swapping, paging and segmentation, segmented-paged memory management techniques; logical and physical address space; address mapping. Demand paging, Virtual memory, protection and address mapping hardware, page fault, Page replacement and page removal algorithms. Device Management and I/O Programming: Classification of device according to speed, Disk structure, disk scheduling, FCFS scheduling SSTF scheduling, access method and storage capacity; sharable and non sharable devices and their management; spooling concept of virtual device, I/O Processor; CPU-IOP parallel operation, CPU-IOP Communication; Device drivers; I/O Programming. Information Management & File System: Information-an important system resource, stored and maintained in files. File organization and access methods, logical and physical file structure; physical file system realized with device management function; file allocation methods, linked and index allocation, logical file implemented on physical file system. File protection and security, Directory structure, single level, two level, tree structure, Free Space Management, Allocation Methods, Efficiency & Performance, Recovery, FAT32, & NTFS. Distributed & Network Operating Systems: Introduction to distributed systems, special functions supported by corresponding OS. Network OS; Remote login; remote file transfer. Distributed OS; Transparent migration of process & data; remote procedure call, Detection and recovery from failures. Distributed file system; mutual exclusion/synchronization using centralized and distributed approaches; concurrency control, majority protocols and time stamping; deadlock detection/prevention. Case Studies: Single User System – MS-DOS, Multi User System – LIUNX/Solaris 2.0, Network OS-Novell Netware.

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended text:

1. Andrew S Tanenbaum and Albert S Woodhull, Operating Systems Design and Implementation, Third Edition, Prentice Hall, 2006
2. Dietel H.M.: An Introduction To Operating Systems; Addison Wesley, 1984

Code	IT 513
Title	Communication Networks
Credits	2
Compulsory/optional	Compulsory
Prerequisites	IT403
Aims	The aim of this course is to develop students' knowledge in data communication and properties and functionality of computer networks
Learning outcomes	At the completion of the course students will be able to: • Explain Network fundamentals and terminology • Describe networks topologies and configuration depending on types of users accessing the network • Explain different type of network interfaces and their uses by identifying and using basic Network components, choosing appropriate network type and media. • Describe network industry standards such as: the OSI model, Routing Protocols, Address Resolution and Reverse Address Resolution Protocols, IP Addresses and Subnetting, MAC Addressing. • Define and explain the 5 conversion steps of data encapsulation. • Explain uses of broadband and baseband transmission.
Time allocation	Lectures & Tutorial: 30 hrs
Content	Data Communication Concepts: Introduction, Communication System, Communication mode, Data encoding: Analog and Digital data, digital and analog signal, Communication Channels, Synchronous and asynchronous transmission. Bandwidth concepts, channel capacity. Introduction to Networking: Computer network, Characteristic & advantages of networking, types of network, LAN, MAN, WAN. Transmission media & Network Topologies: Guided & Unguided media, Twisted pair, coaxial cable, Fiber optics, Radio. VHF and microwaves, Satellite link. Network topology, bus, star, ring, tree, mesh & hybrid topology. Advantages, disadvantages of each. Multiplexing Channels and Concept of multi channeling and modulation, pulse code modulation (PCM) Frequency Division multiplexing, Time Division multiplexing, CODECS. Switching: Switching concept, Circuit Switching, Packet Switching, Virtual circuits & data grams, Message switching, Network Standards: Introduction, Layered approach, OSI model, functions & responsibilities of each layer. Internet: Concepts, definition, applications, Internet connections, dial-up, broadband, ISDN, leased line etc. Internet services providers, Internet Vs. Intranet, web browser, URL, E-mail, messengers, cookies, search engines, uploading & downloading. Internetworking: Principles of internetworking, Connectivity Devices, Bridges, Routers, Routing with bridges, connectionless internetworking, router level protocol, connection oriented internetworking. Network Protocols: Data link protocols, Ethernet and token rings, X.25. Transport protocols, transport services, protocol mechanism, network services, TCP /IP protocol, architecture, operations and applications, Internet and e-mail protocols: SMTP, SLIP, POP, PPP, FTP, HTTP.

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended text:

1. Computer and Communication Networks, Nader F. Mir, Prentice Hall, Dec 1, 2014
2. Computer Network- Andrew S. Tanenbaum, Prentice Hall; 4th edition, 2002
3. Computer Networks and Internet, Douglas E. Comer, Prentice Hall, 3rd edition, 2001

Code	IT514
Title	Management Information Systems
Credits	2
Compulsory/optional	Optional
Prerequisites	IT510, IT505
Aims	The aim of this course is to develop students' understanding of the needs for and roles of management information systems (MIS) within business organizations, legal and ethical issues of information usage, and security and privacy of data resources, and to develop ICT skills and basic skills for interacting with single and multi-user information systems. Information systems and their usage in organizations
Learning outcomes	At the completion of the course students will be able to: • define what an MIS is • describe roles of a system analyst • explain the use of MIS and its advantages • identify different information systems that can be used for information management
Time allocation	Lectures & Tutorial: 30 hrs
Content	Organizational aspect of information systems, emerging strategic role, organizational impacts of information systems, the technical aspect of information systems, analysis, design and utilization of information systems in organizations: business processes reengineering using information systems, knowledge management, and other management challenges and opportunities created by current information systems

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended Text:

1. Management Information Systems, Eighth Edition, Kenneth C. Laudon (Author), Jane P. Laudon, Prentice Hall, 2003
2. Management Information Systems, Effy Oz, 6th Edition, Course Technology, 2008

Code	IT515
Title	E-Commerce
Credits	2
Compulsory/optional	Optional
Prerequisites	IT514
Aims	The aim of this course is to develop students' understanding of the theories and concepts underlying e-commerce.
Learning outcomes	At the completion of the course students will be able to: • Explain the role of information in business • Describe technologies used in E-commerce • Develop good web information systems for business • Describe issues in e-commerce
Time allocation	Lectures & Tutorial: 30 hrs
Content	Overview of Electronic Commerce, E-Marketplaces and Economic Impacts, Build to Order Production, Technologies: Infrastructure, Web Design, Web programming, Internet Consumers, Marketing Research, Data Collection, Mining, Analysis, Company-Centric B to B, EDI and Internet-Based EDI, E-Marketplaces and B to B Exchanges, Networks and Extranets for B to B, Order Fulfillment, E-Supply Chain, Intrabusiness, Portals, C-Commerce, Intranets, Auctions, E-Government, E-Learning, C2C, KM, Advertising, Mobile Commerce/Pervasive Computing,E-Commerce Security, Electronic Payment Systems Launching a Successful Internet Business, Building E-Commerce Applications and Infrastructure, Business Plans, EC Strategy and Implementation, Legal and Social Impacts Environment

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended text:

1. Principles of Internet Marketing by Ward Hanson, South-Western College Publication; 1 edition, 1999.
2. Turban, Efraim and Viehland, *Electronic Commerce: A Managerial Perspective, 3rd Edition*, Prentice Hall, *2004*

Code	IT516
Title	Systems Analysis and Design
Credits	2
Compulsory/optional	Optional
Prerequisites	IT507
Aims	The aim of this course is to develop students' knowledge in concepts of a system and what it means to develop and implement an information system in an organization
Learning outcomes	At the completion of the course students will be able to: • Explain principles and tools of systems analysis and design, the application of computing in different context, the professional and ethical responsibilities of practicing the computer and the need for quality • Solve a wide range of problems related to the analysis, design and construction of information systems • Analysis and Design of systems of small sizes • Be able to present projects • Plan and undertake a major individual project, prepare and deliver coherent and structured verbal and written technical reports
Time allocation	Lectures & Tutorial: 30 hrs
Content	Systems planning and the initial investigation. The process and stage of systems design. Define the purpose of each stage of Systems Development Life Cycle (SDLC). Use techniques and tools appropriate to each stage of systems analysis. File organization and data base design. Feasibility study. Cost/Benefit analysis. Describe the controls necessary to ensure the availability, integrity and privacy of computer systems. Implement a computer-based systems and software maintenance. Hardware/Software selection and the computer contract. Project scheduling and software. Security, Disaster/Recovery and Ethics in System Development

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended text:

1. System Analysis and Design, Elias M Awad, McGraw-Hill Professional, 1985
2. System Analysis and Design : A case study Approach – Robert J. Thierauf , Merrill Pub Co, 1986
3. Systems Analysis and Design, Gary B. Shelly, Thomas J. Cashman, Harry J. Rosenblatt, Course Technology; 7th edition, 2007

Code	IT 517
Title	Introduction to multimedia systems
Credits	3
Compulsory/optional	Optional
Prerequisites	IT505
Aims	The aim of this course is to develop students' understanding of multimedia information, how to process and render multimedia data to introduce multimedia quality of service (QoS) and to develop necessary skills to analyze the ways in which multimedia data is transmitted across networks
Learning outcomes	At the completion of the course students will be able to: • Describe different realizations of multimedia tools and the way in which they are used • Analyze the structure of the tools in the light of low-level constraints imposed by the adoption of various QoS schemes (i.e. bottom up approach) • Analyze the effects of scale and use on both presentation and lower level requirements (i.e. top down approach) • Plan experiments to test user perception of multimedia tools • State the properties of different media streams; compare and contrast different multicast protocols • Describe mechanisms for providing QoS guarantees in the network and • Propose experiments to analyze their performance.
Time allocation	Lectures & Tutorial: 30 hrs
Content	Multimedia in Use: Introduction to multimedia, Definition, Elements of multimedia, Need of multimedia, Applications, Goal & Objectives, Multimedia building blocks, Users of multimedia, Benefits of Multimedia, Training, Sales, Communication, Medicine. Multimedia & Internet. Multimedia Configuration: Converging technologies, Functions & subsystems (input, development & output). Multimedia PC workstation components. Multimedia platform, Multimedia H/w, System software, Multimedia OS File system (tiff, bmp, pcx, gif, jpeg etc.) Multimedia communication system. Development Tools: Developing applications, commercial tools, standards. Image and application image capture, Compression, text conversion, vaporization, image compression, Standards for encoding images, Standards for compression bitonal images, JPEG, Fractals for compression.

	Multimedia Graphics: 2D/3D animation fundamentals, color modules digital imaging, still and moving images, Video application, video capture, animation video, processing, video recovery techniques, Creating videos on the desktop, Television (Broadcast TV, HDTV), Compression standards, AVO, AVI file formats, NTSC, PAL, video/audio conferencing techniques and standards. Multimedia Audio: Basic sound concepts, audio, capture, music, speech sound processor, sound recovery technique, VOC and WAV file formats for sound. Compression standards (Audiovisual telephony & application) Multimedia Devices: Mass storage systems for multimedia requirements, Magnetic devices, Optical devices, CD-ROM, DVD, scanners, types & specifications. Multimedia in Real World: Multimedia on network, Multimedia databases (in Oracle), Windows support for sound, animation, movies, music. Training & education: need for training, multimedia in training and education. Multimedia for information and sales, Multimedia in office & home. Impact of Multimedia – Developing Applications: Introduction, Methodology, design. Multimedia objects, different kinds of object, object technology, Sharing multimedia, working in groups, workflow management, collaborative computing.

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended Text:

1. Introduction to Multimedia Systems, Urbashi Mitra, Academic Pres, 2004
2. Introduction to Multimedia Systems (Communications, Networking and Multimedia), Sugata Mitra and Gaurav Bhatnagar, Academic Press, 2001
3. Multimedia Computing, Communication & Applications – Ralf Steinmetz, Klara Nahrstedt , Prentice Hall, 1995
4. Principles of Interactive Multimedia – Mark Elsom-Cook, McGraw-Hill, 2001

Code	IT518
Title	Image processing
Credits	2
Compulsory/optional	Compulsory
Prerequisites	IT507
Aims	The aim of this course is to develop students' understanding of digital images, the main characteristics of monochrome digital images, representation of digital images and basic algorithms for image manipulation, characterization, segmentation and feature extraction in direct space
Learning outcomes	At the completion of the course students will be able to: • Describe, analyze and reason about how digital images are represented • Manipulate, encode and process images, with emphasis on algorithm design • Implement image processing applications and evaluate the
Time allocation	Lectures & Tutorial: 30 hrs
Content	Introduction to digital images: why digital images, the digital camera, data types and 2D, 3D and higher dimensional representations, fundamental steps in digital image processing, elements of visual perception, light and electro-magnetic spectrum, image sensing and acquisition , sampling and quantization, relationships between pixels, Image transformations: histogram processing, spatial filtering, fuzzy techniques, Filtering in the frequency domain: Fourier transform, DFT, filtering, Morphological image processing: erosion , dilation , opening, closing, hit-or-miss transform, gray scale morphology, Image segmentation: point, line and edge detection, thresholding, region based segmentation, watersheds, Representation and description: boundary descriptors, regional descriptors, Object recognition: patterns, pattern classes, classification, Color image processing: color models, image segmentation based on color. Performance evaluation and ROC analysis

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended text:

1. Recommended text: Gonzalez, R & Woods, R., Digital Image Processing, 3nd ed., Prentice Hall, 2008.
2. Digital Image Processing: An Algorithmic Approach, Madhuri A. Joshi, Prentice Hall India, 2006

Code	IT519
Title	Programming laboratory III
Credits	2
Compulsory/optional	Optional
Prerequisites	IT518, IT517
Aims	The aim of this course is to develop students' skills and knowledge required for designing and implementing multimedia applications
Learning outcomes	At the completion of the course students will be able to: • Identify application software supporting multimedia systems • Use such applications and tools for developing multimedia applications
Time allocation	Practical: 30 hrs
Content	Introduction to multimedia packages, sound editing, video editing, 2D and 3D animation design

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended Text:

1. Recommended text: Gonzalez, R & Woods, R., Digital Image Processing, 3nd ed., Prentice Hall, 2008.
2. Digital Image Processing: An Algorithmic Approach, Madhuri A. Joshi, Prentice Hall India, 2006

Code	IT520
Title	Computer Graphics
Credits	2
Compulsory/optional	Compulsory
Prerequisites	IT507
Aims	The aim of this course is to develop students' understanding of mathematical and other concepts used in Computer Graphics
Learning outcomes	At the completion of the course students will be able to: • Model mathematical representation and computer implementation of lines, curves, surfaces, and transformations • Describe what mathematics of projection, hidden surface removal and local and global illumination are • Design and develop graphical software
Time allocation	Lectures & Tutorial: 30 hrs
Content	Introduction; Overview of graphics systems, Components of graphics systems, Display devices, processors, software standards; introduction to GKS, PHIGS and OpenGL, Basic raster algorithms; Generation of output primitives, attributes (color, area filling, etc.), geometric transformations, Structure of graphics packages; 2-D viewing, structures /segments, hierarchical model, graphical user interfaces, interactive input methods, 3-D object representations and manipulations; Polygon mesh, spline surfaces, superquadrics, fractal geometry, octrees, visualization of 3-D, data sets, geometric transformations, 3-D viewing; Parallel and perspective projections, Visible surface identification methods, Illumination models and surface rendering; Constant intensity, Gouraud shading, Phong shading, ray tracing, radiosity, Color models; Basic concepts; RGB

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended Text:

1. Computer graphics: principles and practice, James D. Foley, Addison-Wesley Professional, 1996
2. Computer Graphics, A. P. Godse, Technical Publications, 2009

Code	IT521
Title	Human Computer Interaction Design
Credits	2
Compulsory/optional	Optional
Prerequisites	IT516
Aims	The aim of this course is to develop students' knowledge in the design of users' interactions with software-based systems, with an orientation towards developing practical interaction design skills and an appreciation of emerging interactive technologies
Learning outcomes	At the completion of the course students will be able to: • Explain the human components functions regarding interaction with computer • Explain Computer components functions regarding interaction with human • Demonstrate understanding of Interaction between the human and computer components. • Use HCI in the software process • Apply design rules • Produce implementation supports • Use evaluation techniques
Time allocation	Lectures & Tutorial: 30 hrs
Content	*Designing User-System Interactions:* User-centered and participatory design approaches, Prototyping, Creative Design Methods, Analytical Design Methods, Conceptual Design. *Evaluating User-System Interactions and Improving Designs:* Planning and conduct of lab- and field-based evaluation, Advanced Evaluations Techniques (eye tracking, physiological methods), Field trials, living labs. *Emerging technologies and their specific usability issues:* Mobile technologies, E-commerce systems, Multimedia, entertainment and games, Virtual and mixed-reality environments, IT Security and Security Systems

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended text:

1. Alan Dix, Janet E Finlay, Gregory D Abowd, Human-Computer Interaction, 3rd edition, Prentice Hall, 2003
2. Human-computer interaction: theory and practice, Julie A. Jacko, Constantine Stephanidis, Routledge, 2003

Code	IT522
Title	Laboratory work IV
Credits	2
Compulsory/optional	Optional
Prerequisites	IT518, IT520
Aims	The aim of this course is to develop students' skills and knowledge to use programming languages and tools for image processing, and graphics designing and implementation
Learning outcomes	At the completion of the course students will be able to: • Identify modern technologies and tools for software development • Apply ICT concepts in developing interactive
Time allocation	Practical: 60 hrs
Content	Introduction, digital image representations, reading, displaying and writing images, data classes, image types, histogram processing, filtering, morphological processing, image segmentation, classification, Final group assignment. Software, hardware, and mathematical tools for the representation, manipulation, and display of topological and two- and three-dimensional objects; applications of these tools to specific problems. Computer Programming on PCs and Workstations

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended Text:

1. Gonzalez, R & Woods, R.: Digital Image Processing, 3rd ed., Prentice Hall, 2008.
2. Gonzalez, R & Woods, R., Eddins S., Digital Image Processing using MATLAB, 1st ed., Prentice Hall, 2004.
3. *Neider J. et al ; Open GL Programming Guide Addison Wesley; 1993*

Code	IT 523
Title	Operations Research
Credits	2
Compulsory/optional	Compulsory
Prerequisites	None
Aims	The aim of this course is to develop students' knowledge in organizational principles and develop understanding of Operation Research approach to management problems
Learning outcomes	At the completion of the course students will be able to: • Formulate a real-world problem as a mathematical programming model • Implement and solve the model in EXCEL and LINDO • Describe the theoretical workings of the simplex method for linear programming and perform iterations of it by hand • Perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution as the data change • Solve specialized linear programming problems like the transportation and assignment problems • Solve network models like the shortest path, minimum spanning tree, and maximum flow problems • Model and solve problems using dynamic programming • Model a dynamic system as a queuing model and compute important performance measures
Time allocation	Lectures & Tutorial: 30 hrs
Content	Introduction: Introduction to O.R., Necessity of OR in Business and Industry, Scope of OR in modern management, O.R. and Decision Making. Linear programming: Various definitions, statements of basic theorems and properties, Advantages, Limitations and Application areas of Linear Programming, Linear Programming – The Graphical method – Graphical Solution methods of Linear Programming problem, Maximization Linear Programming problem, Maximization Problem. Formulation, Identification of decision variables, Constructing Objective Functions and Constraints, Assumptions. Methods of Solution: Graphical Method, Simplex method.- Phase I and Phase II of the Simplex Method, The Revised Simplex method, Primal and Dual Simplex Method, Simplex Algorithm for maximization case, Simplex Algorithm for minimization case – Two phase method and the Big –M method. Duality theory and Sensitivity Analysis: Duality theory: Existence of Dual of a LP problem, Primal Dual relationships in formulation and their solutions. Sensitivity analyses or Post Optimality Analysis: Dual Simplex Method, Changes affecting feasibility, Changes affecting optimality. Transportation and Assignment problems: The transportation algorithm: Formulation as a LP problem, Determination of Initial solutions, Stepwise Improvement to obtain optimal solution, Special cases Such as Multiple, Unbalanced, Degeneracy etc., The assignment model: Formulation as TP, The Hungarian method of solution. Network models: Critical Path Analysis (CAP): Network representation of simple projects, Critical path computation: Construction of time schedule, Crashing of project duration. PERT & CPM**:** Basic differences between PERT and CPM. Arrow Networks, time estimates, earliest expected time, latest – allowable occurrences time, Forward Pass Computation, Backward Pass Computation, Representation in Tabular Form Critical Path, Probability of meeting scheduled date of completion, Calculation on CPM network. Various floats for activities, Critical path updating projects. Operation time cost tradeoff Curve project, Time cost – tradeoff Curve- Selection of schedule based on Cost Analysis, Crashing the network.

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

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Recommended Text:

1. Introduction to Operations Research, Frederick S. Hiller, Gerald J. Lieberman, McGraw-Hill Companies, 2002
2. Operations Research - An introduction by Hamdy A. Taha, Prentice-Hall Quantitative Technoques, by L.C. Jhamb, Everest Publishing house, 2006
3. Optimization Methods in Operations Research and System Analysis by Mital K.V., 1976

Code	IT524
Title	Mini project
Credits	5
Compulsory/optional	Compulsory
Prerequisites	IT502, IT516
Aims	The aim of this course is to develop students' skills and knowledge required for designing and implementing information systems
Learning outcomes	At the completion of the course students will be able to: • analyse, design and implement ICT solutions for rel world problems • validate developed systems by testing
Time allocation	Practical: 90 hrs
Content	Students are expected to find a problem, to select a suitable solution, and to implement that solution. Students solve typical commercial or industrial problems. Work involves planning, design, and implementation Oral and written work is required

Assessment criteria

Continuous assessments	Mid-semester	Oral examination
		100%

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Code	IT525
Title	Data mining Techniques
Credits	2
Compulsory/optional	Compulsory
Prerequisites	IT505
Aims	The aim of this course is to develop students' understanding of concepts and techniques required for data mining
Learning outcomes	At the completion of the course students will be able to: • Describe current problems and research issues in Data Mining • Explain research in data mining and how this may contribute to the effective design and implementation of data mining applications. • Apply knowledge concerning current data mining research issues in an original manner and produce work which is at the forefront of current developments in the sub-discipline of data mining. • Evaluate critically current research and advanced scholarship in data mining.
Time allocation	Lectures & Tutorial: 30 hrs
Content	Introduction: Basic Data Mining Tasks, Database / OLTP Systems, Data Warehousing, OLAP Systems, Related Concepts (Statistics, Fuzzy Sets and Fuzzy Logic, Information Retrieval, Decision Support Systems, Dimensional Modeling, Machine Learning, Pattern Matching). Data Preprocessing, Exploratory Data Analysis, Statistical Approaches to Estimation and Prediction. Association Rule Mining. Classification and Prediction: Introduction, Decision Tree Induction Methods, Bayesian Classification, Rule Based Algorithms, Neural Network Based Algorithms. Cluster Analysis: Introduction, Similarity and Distance Measures, Partitioning Methods, Hierarchical Methods, Outlier Analysis. Web Mining: Web Content Mining, Web Structure Mining, Web Usage Mining. Applications and Trends in Data Mining. Some practical assignments will be given for this course

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended Texts:

1. *Data Mining Introductory and Advanced topics,* M.H. Dunham, 2003
2. *Predictive Data Mining,* Weiss SM & Indurkhya N, Morgan Kaufmann, 1997
3. *Principles of Data Mining,* Hand DJ et al, MIT Press, 2001

Code	IT526
Title	Software Engineering
Credits	2
Compulsory/optional	Optional
Prerequisites	IT507
Aims	The aim of this course is to develop students' understanding of software engineering concepts
Learning outcomes	At the completion of the course students will be able to: • Describe the need of engineering approach to software development • Explain the software development life cycle and its activities. • Apply software engineering techniques for system development.
Time allocation	Lectures & Tutorial: 30 hrs
Content	Overview of software engineering: software process; classic life cycle model, iterative models, incremental model. Project planning; Fundamentals of project and system planning, Requirements analysis, Software design fundamentals; Stepwise refinement, bottom-up approach, modularity, Design techniques; Use of UML and design patterns, Testing: Testing objectives, test case design, white box vs. black box testing, overview of testing strategies, Maintenance; Overview of maintenance issues and software configuration management

Assessment criteria

Continuous assessments	Mid-semester	End-semester examination
20%	30%	50%

Recommended Texts:

1. Ian Somerville, Software Engineering, Pearson, 2011.
2. Design Patterns, 1st edition, Addison Wesley, 1996.

7. PROGRAMME EVALUATION

Evaluation of Course work

Based on the scheme given below, the overall performance of a student in a given course shall be evaluated by the respective instructor(s) and a grade shall be assigned.

Evaluation Scheme

- For all courses a minimum of 80% attendance is expected.
- The evaluation of each course shall be based on within course and end of course examinations, and assignments. The weightage of marks given below can generally be used as a guideline in the computation of the final grade.
  End of course examination 50 - 60%
  Continuous assessments (mid-semester examination, assignments, etc.) 40 - 50%
- Courses with laboratory and/or fieldwork shall be evaluated, where applicable, on a continuous assessment basis.
- The minimum grade a student should achieve to pass a course is C.
- Students will be informed of the evaluation scheme by the instructor at the beginning of a given course.

Grade Points and Grade Point Average (GPA)

The Grade Point Average (GPA) will be computed using the grades earned for core courses and optional courses, taken for credit. Preliminary courses, industrial training, research project and seminar will be evaluated on a pass/fail basis.

On completion of the end of course examination, the instructor(s) is/are required to hand over the grades of a given course to the programme coordinator who will assign the Grade Points using the following table:

Grade	Grade Point
A+	4.0

A	4.0
A^-	3.7
B^+	3.3
B	3.0
B^-	2.7
C^+	2.3
C	2.0
F	0.0

The Grade Point Average (GPA) will be computed using the formula:

$$GPA = \frac{\Sigma\, c_i g_i}{\Sigma\, c_i},$$

where c_i = number of credit units for the i^{th} course, and
g_i = grade point for the i^{th} course

Make-up Examinations
'Make-up' examinations may be given only to students who fail to sit a particular examination due to medical or other valid reasons acceptable to the PGIS.

Repeat Courses
If a student fails a course or wishes to improve his/her previous grade in a course, he/she shall repeat the course and course examinations at the next available opportunity. However, he/she may be exempted from repeating the course, and repeat only the course examinations if recommended by the teacher-in-charge or M.Sc. Programme Coordinator. The student may repeat the same course or a substituted (new) optional course in place of the original course. A student is allowed to repeat five credits of coursework free-of-charge. The maximum number of credits a candidate is allowed to repeat is fifteen. The maximum grade, a candidate could obtain at a repeat attempt is a B and he/she is allowed to repeat a given course only on two subsequent occasions.

Evaluation of Research Project

Research project will be evaluated on the basis of a written report (M.Sc. project report) and oral presentation (see Section 6.0 of the PGIS Handbook for the format of the project report).

8. PANEL OF TEACHERS

Prof. S. R. Kodituwakku, Dept. of Statistics and Computer Science, Faculty of Science, Univ. of Peradeniya
B.Sc. (Perad.), M.Sc. (AIT, Thailand), Ph.D. (RMIT, Australia)
Field of specialization – Software Engineering

Prof. K. M. Liyanage, Dept. of Electrical and Electronic Engineering, Faculty of Engineering, Univ. of Peradeniya
B.Sc. Eng. (Perad.), M. Eng. (U-Tokyo), D. Eng. (U-Tokyo)
Field of specialization – Data Communication

Prof. A. A. I. Perera, Dept. of Mathematics, Faculty of Science, Univ. of Peradeniya
B.Sc. (Perad.), M. Sc. (Oslo), Ph.D. (RMIT, Australia)
Field of specialization – Algebra

Prof. W. B. Daundasekara, Dept. of Mathematics, Faculty of Science, Univ. of Peradeniya
B.Sc. (Perad.), M. Sc. (Alabama), Ph.D. (Alabama.)
Field of specialization – Operations Research

Dr. U. A. J. Pinidiyaarachchci, Dept. of Statistics and Computer Science, Faculty of Science, Univ. of Peradeniya
B.Sc. (Perad.), Ph.D.(Upsala, Sweden)
Field of specialization –Image Processing

Dr. Y. P. R. D. Yapa, Dept. of Statistics and Computer Science, Faculty of Science, Univ. of Peradeniya

B.Sc.(USJP), M.Sc. (Colombo), Ph.D.(Hiroshima, Japan)
Field of specialization –Information Engineering

Dr. Ruwan Nawarathna, Dept. of Statistics and Computer Science, Faculty of Science, Univ. of Peradeniya
B.Sc. (Perad.), Ph.D.(Texas Tech, USA)
Field of specialization –Image Processing

Dr. M. J. Kumara, Dept. of Statistics and Computer Science, Faculty of Science, Univ. of Peradeniya
B.Sc. (Perad.), Ph.D.(Texas Tech, USA)
Field of specialization – Web Technologies

Dr. Dammika Elkaduwa, Dept. of Computer Engineering, Faculty of Engineering, Univ. of Peradeniya
B.Sc. (Perad.), Ph.D. (New South Wales, Australia)
Field of specialization – Operating Systems

Dr. Manjula Sandirigama, Dept. of Computer Engineering, Faculty of Engineering, Univ. of Peradeniya
B.Sc. (Perad.), M.Sc. (University of Ehime), Ph.D. (University of Ehime)
Field of specialization – Operating Systems

Dr. Roshan Ragel, Dept. of Computer Engineering, Faculty of Engineering, Univ. of Peradeniya
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