UNIVERSITY OF KERALA

B. TECH. DEGREE COURSE

(2013 SCHEME)

SYLLABUS FOR

VI SEMESTER

INFORMATION TECHNOLOGY

SCHEME -2013

VI SEMESTER
INFORMATION TECHNOLOGY (F)

Course No	Name of subject	Credits	Weekly load, hours			C A Marks	Exam Duration Hrs	U E Max Marks	Total Marks
			L	T	D/ P				
13.601	Compiler Design (FR)	4	3	1	-	50	3	100	150
13.602	Cryptography (F)	3	2	1	-	50	3	100	150
13.603	Design and Analysis of Algorithms (FR)	4	3	1	-	50	3	100	150
13.604	Computer Networks (FR)	3	2	1	-	50	3	100	150
13.605	Internet Technology (F)	4	3	1	-	50	3	100	150
13.606	Computer Graphics (F)	3	2	1	-	50	3	100	150
13.607	Internet Technology Lab (F)	4	-	-	4	50	3	100	150
13.608	Computer Graphics Lab (F)	4	-	-	4	50	3	100	150
	Total	**29**	**15**	**6**	**8**	**400**		**800**	**1200**

13.601 COMPILER DESIGN (FR)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits**: 4

Course Objective:

- *To introduce the major concept areas of language translation and compiler design*
- *To develop an awareness of the function and complexity of modern compilers.*
- *To provide practical, hands on experience in compiler design.*

Pre-requisites: 13.306 - Data Structures and Algorithms.

Module – I

Introduction to compilers and interpreters – Overview of compilation, Issues in compilation – structure of a compiler – compiler writing tools – bootstrapping – notations and concepts for languages and grammars – regular expressions – context free grammar, derivations and parse trees, BNF notations.

Module – II

Context of a lexical analyzer – construction of lexical analyzer, deterministic and non deterministic finite automata. Compile time error handling, error detection, reporting, recovery and repair.

Module – III

Basic parsing techniques – Top down parsing – recursive descent parser, predictive parser simple LL(1) grammar. Bottom up parsers, operator precedence parser, LR grammar, LR(0), SLR(1), LALR(1) parsers.

Module – IV

Syntax directed translation schemes, intermediate codes, translation of assignments, translation of array reference, Boolean expressions, case statements, back patching. Code optimization, loop optimization and global optimization, sources of sample code generation.

References:

1. Keith D. Cooper and Linda Torczon*, Engineering a Compiler*, 2nd Edn, Elsevier.
2. Andrew W. Appel, *Modern Compiler Implementation in C,* Cambridge University Press.
3. Kenneth C. Louden, *Compiler Construction: Principles and Practice,* Cengage Learning.
4. Kakde O.G., *Algorithms for Compiler Design*, Cengage Charles River Media.

5. Raghavan V., *Principles of Compiler Design*, TMH.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Note: *The question paper shall contain at least 30% analytical/problem solving questions.*

Course Outcome:

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

- *Identify different language translators and explain the concepts and different phases of compilation with compile time error handling.*
- *Represent language tokens using regular expressions, context free grammar and finite automata and design lexical analyzer for a language.*
- *Compare top down with bottom up parsers, and develop appropriate parser to produce parse tree representation of the input.*
- *Explain syntax directed translation schemes for a given context free grammar and generate intermediate code.*
- *Apply optimization techniques to intermediate code and generate machine code for high level language program.*

13.602 CRYPTOGRAPHY (F)

Teaching Scheme: 2(L) - 1(T) - 0(P) **Credits**: 3

Course Objectives:

- *To understand cryptographic and cryptanalytic techniques.*
- *To understand the methods used for key management and distribution.*

Module – I

Introduction to cryptology: Cryptography and cryptanalysis, aspects of security. Cryptanalytic attacks. Classical cipher systems, transposition ciphers, substitution ciphers, Hagelin machine, statistics and cryptanalysis.

The information theoretical approach, information measure and absolute security, unicity distance, error probability and security.

Module – II

The DES algorithm: Characteristics, Alternative descriptions, Analysis of the DES, DES modes.

IDEA (International Data Encryption Algorithm).

Shift Registers: Stream and block enciphering, The theory of finite state machines, shift Registers, random properties of shift register sequences, generating function, cryptanalysis of LFSRs, nonlinear shift registers.

Module – III

Public Key Systems: Introduction, RSA system. Knapsack system, Cracking the knapsack system. Public key systems based on elliptic curves.

Key Management: General aspects of key management, key distribution for asymmetrical systems, key distribution for symmetrical algorithms, network security, fair cryptosystems.

Module – IV

Authentication and integrity : Protocols, message integrity.

Entity authentication with symmetrical algorithm, message authentication with a message authentication code (MAC), message authentication with digital signatures, zero knowledge techniques. Kerberos.

References

1. Behrouz A. Forouzan, *Cryptography and Network Security*, Tata McGraw-Hill Education, 2011.
2. Jan C. A. and Van Der Lubbe, *Basic Methods of Cryptography*, Cambridge University Press, 1998.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question (question may contain sub-divisions), out of the two from each module. Each question carries 20 marks.

Course outcome:

At the end of the course, the student will have a good understanding of cryptography and its applications.

13.603 DESIGN AND ANALYSIS OF ALGORITHMS (FR)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits**: 4

Course Objectives:

- *Analyze the asymptotic performance of algorithms.*
- *Write rigorous correctness proofs for algorithms.*
- *Demonstrate a familiarity with major algorithms and data structures.*
- *Apply important algorithmic design paradigms and methods of analysis.*
- *Synthesize efficient algorithms in common engineering design situations.*

Pre-requisites:13.306 - Data Structures and Algorithms.

Module – I

Concepts in algorithm analysis – the efficiency of algorithms, average and worst – case analysis, Asymptotic notation, time and space complexity, Recurrences – substitution method, iteration method and master method, Analysis of sorting algorithms – insertion sorting, heaps, maintaining the heap property, building heap, heap sort algorithm, priority queues. Description of quick sort, randomised version of quick sort.

Module – II

Height balanced trees – AVL TREES – Red-Black trees – Steps involved in insertion and deletion – rotations, Definition of B-trees – basic operations on B-trees, Algorithm for sets – Union and Find operations on disjoint sets.

Module – III

Graphs – DFS and BFS traversals, Spanning trees – Minimum Cost Spanning Trees, Kruskal's and Prim's algorithms, Shortest paths – single source shortest path algorithms, Topological sorting, strongly connected components. Algorithm Design and analysis Techniques – Divide and Conquer techniques – Merge Sort, Integer multiplication problem, Strassen's algorithm.

Module – IV

Dynamic programming – Matrix multiplication problem, Greedy algorithms – Knapsack problem, Back tracking – 8 Queens problem, Branch and Bound – Travelling Salesman problem. Definitions and Basic concepts of NP-completeness and NP-Hardness. Study of NP Complete problems.

References:

1. Thomas H. Cormen, Charles E. Leiserson and Ronald L. Rivest, *Introduction to Algorithms,* PHI.

2. Horowitz and Sahni, *Fundamentals of Computer Algorithms*, Galgotia Publication.
3. Kenneth A. Merman and Jerome L. Paul, *Fundamentals of Sequential and Parallel Algorithms,* Vikas Publishing Company.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question (question may contain sub-divisions), out of the two from each module. Each question carries 20 marks.

Note: *The question paper shall contain at least 30% analytical/problem solving questions.*

Course Outcome:

After successful completion of this course, the student will be able to:

- *Define asymptotic notations to analyze the performance of algorithms. Apply substitution method, iteration method and master method to analyze recursive algorithms.*
- *Analyze and compare performance of sorting algorithms in terms of time and space complexities.*
- *Discuss various operations of Height-balanced trees and analyze performance of the operations.*
- *Illustrate various applications of graphs such as minimum cost spanning tree, shortest path, topological sorting and strongly connected components, and determine their time and space complexities.*
- *Apply different algorithm design paradigms such as divide-and conquer, dynamic programming and the greedy methods to design efficient algorithms for real world problems.*
- *Use the concepts of NP-Completeness and NP-Hardness to identify whether a given problem is tractable or not.*

13.604 COMPUTER NETWORKS (FR)

Teaching Scheme: 2(L) - 1(T) - 0(P) **Credits**: 3

Course Objective:

- *Build an understanding of the fundamental concepts of computer networking.*
- *Familiarize the student with the basic taxonomy and terminology of the computer networking area.*
- *Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.*
- *Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.*

Pre-requisites*:* ***13.404*** *- Data Communication*

Module – I

Introduction – Uses – Network Hardware – LAN –MAN – WAN, Internetworks – Network Software – Protocol hierarchies – Design issues for the layers – Interface & Service – Service Primitives. Reference models – OSI – TCP/IP. Data Link layer Design Issues – Flow Control and ARQ techniques. Data link Protocols – HDLC. DLL in Internet.

Module – II

MAC Sub layer – IEEE 802 FOR LANs & MANs, IEEE 802.3, 802.4, 802.5. Bridges - Switches – High Speed LANs - Gigabit Ethernet. Wireless LANs - 802.11 a/b/g/n, 802.15. Network layer – Routing – Shortest path routing, Flooding, Distance Vector Routing, Link State Routing, RIP, OSPF, Routing for mobile hosts.

Module – III

Congestion control algorithms – QoS. Internetworking – Network layer in internet. IP Addressing – Classless and Classful Addressing. Subnetting, Internet Control Protocols – ICMP, ARP, RARP, BOOTP. Internet Multicasting – IGMP, Exterior Routing Protocols – BGP . IPv6 – Addressing – Issues.

Module – IV

Transport Layer – TCP & UDP. Application layer –DNS, Electronic mail, MIME, SNMP. Introduction to World Wide Web. VoIP - H.323, SIP standards, Gatekeeper.

References:

1. Andrew S. Tanenbaum, *Computer Networks*, 4/e, PHI.
2. Behrouz A. Forouzan, *Data Communications and Networking*, 4/e, Tata McGraw Hill.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question (question may contain sub-divisions), out of the two from each module. Each question carries 20 marks.

Note: *The question paper shall contain at least 30% analytical/problem solving questions.*

Course Outcome:

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

- *Describe the different aspects of networks, protocols and network design models.*
- *Explain the various Data Link layer design issues and Data Link protocols*
- *Analyze and compare different LAN protocols*
- *Compare and select appropriate routing algorithms for a network.*
- *Describe the important aspects and functions of network layer, transport layer and application layer in internetworking.*

13.605 INTERNET TECHNOLOGY (F)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits:** 4

Course Objectives:

This course introduces the students to web content preparation, markup languages, and tools and protocols used in the internet. A good understanding of network programming using Java is also provided.

Module – I

Introduction Web Browsers and Web Servers – URL, Web Content Preparation, HTML, Cascading Style Sheets, JavaScript (Introduction to Scripting, Control Statements, Functions, Arrays, Objects), DHTML (Object Model and Collections, Event Model), XML (Creating Markup with XML XML Namespaces, Document Type Definitions and Schema, Document Object Model, DOM Methods, Simple API for XML, Extensible Stylesheet Language, Web Services).

Module – II

Protocols - HTTP, FTP, TELNET, SMTP, POP3, IMAP, MIME.
Web Servers – IIS, Apache Web Server, Proxy Server. Search Engines. Content Display - Browsers, Plugins, Helper Applications.

Module – III

Java – Packages and Interfaces, Exception Handling, Multithreaded Programming, Strings, I/O, Applets, Event Handling, AWT components, Swing components.

Module – IV

Network Programming in JAVA – Looking Up Internet Addresses, Sockets for Clients, Sockets for Servers, Non-blocking I/O, UDP Datagrams and Sockets, RMI.
Persistence – Java Beans – CORBA, IDL.

References:

1. Paul J. Deitel, Harvey M. Deitel, Abbey Deitel, *Internet & World Wide Web – How To Program*, 5/e, Pearson Education, 2011.
2. Robert W. Sebesta, *Programming the World Wide Web*, 8/e, Pearson Education, 2014.
3. Herbert Schildt, *Java2 – The Complete Reference*, 5/e, Tata McGraw-Hill Education, 2002.
4. Elliotte Rusty Harold, *Java Network Programming*, 4/e, O'Reilly Media, 2013.
5. Clemens Szyperski, *Component Software: Beyond Object Oriented Programming*, Pearson Education, 2003.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as class room/home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question (question may contain sub-divisions), out of the two from each module. Each question carries 20 marks.

Course Outcome:

At the end of the course, the students will be able to prepare and display web documents in various formats. They should be able to appreciate the various protocols governing the internet and do network programming using Java.

13.606 COMPUTER GRAPHICS (F)

Teaching Scheme: 2(L) - 1(T) - 0(P) **Credits**: 3

Course Objective:

This course is intended to provide a thorough understanding of algorithms used in Computer Graphics. It also provides an introduction to image processing techniques.

Module – I

Basic concepts in Computer Graphics – Types of Graphics Devices – Interactive Graphic inputs – Basic Raster Scan Graphics – Line Drawing Algorithms – Circle Generation Algorithms.

Scan Conversion – frame buffers – solid area scan conversion – polygon filling.

Module – II

Two dimensional transformations – Homogeneous coordinate systems – matrix formulation and concatenation of transformations – Windowing concepts – two dimensional clipping.

Introduction to graphics in three dimension – specification of a 3D view, 3D transformations.

Module – III

Projections – Parallel and perspective projections – vanishing points.

Hidden surface elimination – Back face removal, ZBuffer algorithm, scan line algorithm.

Module – IV

Image processing – introduction – digital image representation – relationship between pixels – gray level histogram – equalization – edge detection – Robert, Sobel, Canny edge detectors. Scene segmentation and labeling – region labeling algorithm – perimeter measurement.

References:-

1. Donald Hearn and M. Pauline Baker, *Computer Graphics with OpenGL*, 3/e, Prentice Hall, 2004.
2. William M. Newman and Robert F. Sproull, *Principles of Interactive Computer Graphics*, Mc Graw-Hill, 1979.
3. David F. Rogers, *Procedural Elements for Computer Graphics*, McGraw-Hill, 1998.
4. Sonka M., V. Hlavac, and R. Boyle, *Image Processing, Analysis, and Machine Vision*, Thomson India Edition, 2007.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as class room/home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question (question may contain sub-divisions), out of the two from each module. Each question carries 20 marks.

Course Outcome:

At the end of the course, the students would have gained the ability to write programs for basic applications in computer graphics.

13.607 INTERNET TECHNOLOGY LAB (F)

Teaching Scheme: 0(L) - 0(T) - 4(P) **Credits**: 4

Course Objective :

This course intends to provide hands-on experience to students in web content generation and display, as well as socket programming using Java.

List of Exercises:

Programming exercises based on the course ***13.605 Internet Technology.*** The exercises should include the following.

1. Creation of HTML documents, use of external style sheets, ordered lists, tables, borders, padding, colors, embedded maps.
2. JavaScript – obtaining information on the browser and the operating system, timed JavaScript redirect, JavaScript features.
3. XML – conversion to HTML. Cascading Style Sheets, XSLT. XML document parsing using DOM.
4. Java applets – labels, lists, text fields and animation.
5. Java network programming – simple web client, email client, TCP/IP client and server, chat application with datagram sockets and datagram packets.
6. Java RMI.
7. CORBA.
8. Server configuration – web server, proxy server.

Internal Continuous Assessment *(Maximum Marks-50)*

40% - Test (minimum 2)

40% - Regular lab work and proper maintenance of lab records

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

Questions based on the list of exercises prescribed.

Marks should be awarded as follows:

20% - Algorithm/Design

20% - Programming/Implementation

30% - Output/Results and inference

30% - Viva voce

Candidate shall submit the certified fair record for endorsement by the external examiner.

Course Outcome:

At the end of the course, the students would have acquired the necessary hands-on skills on web content generation and display, configuration of web/proxy servers and Java-based socket programming.

13.608 COMPUTER GRAPHICS LAB (F)

Teaching Scheme: 0(L) - 0(T) - 4(P) **Credits**: 4

Course Objective :

This course intends to provide hands-on experience to students in graphics programming and image processing.

List of Exercises:

Programming exercises based on the course ***13.606 Computer Graphics.*** The exercises should include the following.

1. 2D Graphics: Drawing Elementary figures (line, Polygon), Polygon Filling (Boundary fill, Flood fill and Scan fill), Transformations (Scaling, Rotation, Reflection, Translation, Shear), Windowing and clipping (polygon clipping and line clipping). Interactive Graphics: Interactive input techniques (mouse programming).
2. 2D Animations using primitives (eg : man cycling along a road, a war aircraft bombing a ship, etc.).
3. 3D Graphics: Curves and Surfaces, Clipping, Hidden line and surface removal, Surface rendering, Rotation of a 3D object about arbitrary axis.
4. Basics of flash animation : Motion Tweening in flash player

Internal Continuous Assessment *(Maximum Marks-50)*

40% - Test

40% - Regular lab work and proper maintenance of lab records

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

Marks should be awarded as follows:

20% - Algorithm/ Design

20% - Programming/Implementation

30% - Output/Results and inference

30% - Viva voce

Candidate shall submit the certified fair record for endorsement by the external examiner.

Course Outcome:

At the end of the course, the students would have acquired the necessary hands-on skills to implement basic graphics algorithms and do image processing.