UNIVERSITY OF KERALA

B. TECH. DEGREE COURSE

(2018 SCHEME)

SYLLABUS FOR

VI SEMESTER

INFORMATION TECHNOLOGY

SCHEME -2018

VI SEMESTER
INFORMTION 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				
18.601	Compiler Design (FR)	4	3	1	-	50	3	100	150
18.602	Cryptogrphy(F)	3	2	1	-	50	3	100	150
18.603	Design and Analysis Of Algorithm(FR)	4	2	1	-	50	3	100	150
18.604	Computer Networks (FR)	3	2	1	-	50	3	100	150
18.605	Software Engineering and Project Management(F)	3	2	1	-	50	3	100	150
18.606	Computer Graphics(F)	3	2	1	-	50	3	100	150
18.607	Mini Project in Java(F)	2	-	-	4	50	3	100	150
18.608	Computer Graphics Lab (F)	2	-	-	4	50	3	100	150
	Total	**24**	**13**	**6**	**8**	**400**		**800**	**1200**

18.601 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: 18.306 *- Data Structures and Algorithms,*

18.504 *- System Programming*

Module – I

Introduction to compilers and interpreters – Overview of compilation, phases of compiler, Compiler writing tools, Bootstrapping.

Lexical Analysis:-Role of lexical analyzer, Specification tokens using regular expressions. Deterministic and non deterministic finite automata.

Module – II

Syntax Analysis:-Context free grammar-Derivation trees and parse trees, ambiguity. Type checking: Type systems, specification of a simple type checker.

Top-Down parsing:-recursive descent parser, predictive parser, simple LL(1) grammar.

Module – III

Bottom-up parsing: - Shift reduce parsing- operator precedence parsing.LR parsing-Constructing SLR, CLR, LALR parsers.
Syntax directed translation:- Syntax directed definitions, Bottom- up evaluation of S-attributed definitions, L- attributed definitions. Top-down translation,Bottom-up evaluation of inherited attributes.

Module – IV

Intermediate code generation:- Intermediate languages, graphical representations, Three address code, quadruples ,triples, assignment statements, Boolean expressions.

Code optimization:- Principal sources of optimization, Optimization of basic blocks.

Code Generation:- Issues in the design of a code generator. The target machine,
A simple code generator.

References:

1. *Aho A. V., M. S. Lam, R. Sethi and J. D. Ullman, Compilers: Principles, Techniques and Tools, 2nd Edn., Pearson Education.*
2. *Keith D Cooper and Linda Torczon, Engineering a Compiler, 2nd Edn, Elsevier.*
3. *Andrew W. Appel, Modern Compiler Implementation in C, Cambridge University Press.*
4. *Kenneth C. Louden, Compiler Construction: Principles and Practice, Cengage Learning.*
5. *Kakde O. G., Algorithms for Compiler Design, Cengage Charles River Media.*
6. *Raghavan V., Principles of Compiler Design, TMH.*

Internal Continuous Assessment *(MaximumMarks-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 MaxTotalMarks: 100

The question paper shall consist of 2 parts.

Part A (20 marks) - - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least one question from each module and not more than three 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.

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.*

18.602 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

Text book

1.William Stallings,Cryptography and Network Securitry,Principles and Practice.

Pearson-seventh edition

References

1. *Behrouz A. Forouzan, Cryptography and Network Security, Tata McGraw-HillEducation, 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) - - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least one question from each module and not more than three 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.

18.603 DESIGN AND ANALYSIS OF ALGORITHMS (FR)

Teaching Scheme: 2(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: *18.306 -* *Data Structures and Algorithms.*

Module – I

Introduction to algorithm analysis – Time and Space complexity,Elementary operations and computation of time complexity- best, average and worst case complexities, Solutions of Recurrence Equations – iteration method and master method- Asymptotic notation , Analysis of sorting algorithms – insertion sorting,Description of quick sort, randomised version of quick sort.

Module – II

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

Module – III

Graphs – DFS and BFS traversals, Complexity, 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, Strassen's matrix multiplication algorithm, analysis.

Module – IV

Dynamic programming: -Optimality principle- Matrix multiplication problem,Bellman-ford algorithm,analysis,Comparison of Divide and conquer and Dynamic programming stratergy.

Greedy algorithms –fractional Knapsack problem, **Back tracking** – N Queens problem,0/1 Knapsack problem, **Branch and Bound** – Travelling Salesman problem. Definitions and Basic concepts of NP-completeness and NP-Hardness. Study of NP Complete problems

Text Books:

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.*

References:

1. *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:

Exam duration: 3 hours *Max Total Marks:100*

The question paper shall consist of 2 parts.

Part A (20 marks) -- Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least one question from each module and not more than three questions from any module.

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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:

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.*

18.604 COMPUTER NETWORKS (FR)

Teaching Scheme: 3(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:*18.404* - *Data Communication*

Module – I

Introduction – Uses – Network Hardware – LAN –MAN – WAN, Internetworks – Network Software – Protocol hierarchies – Design issues for the layers. Reference models – OSI – TCP/IP. Data Link layer Design Issues – Framing –Error Detection and Correction – Elementary Data Link Protocols – Sliding Window Protocols.

Module – II

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

Module – III

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

Module – IV

Transport Layer – UDP – Header – TCP – Segment Header – Connection Establishment & Release. Application layer –DNS, Electronic mail, MIME, SNMP. Introduction to World Wide Web.

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

The question paper shall consist of 2 parts.

Maximum Total Marks 100

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least one question from each module and not more than three 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:

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.*

18.605 SOFTWARE ENGINEERING AND PROJECT MANAGEMENT (FR)

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

Course Objective:

- *To develop awareness regarding the theoretical and methodological issues related to software engineering and project management.*
- *To develop software projects based on current technologies.*

Module-I

Introduction to software engineering- scope of software engineering, historical aspects, economic aspects, maintenance aspects, specification and design aspects, team programming aspects. Software engineering a layered technology, processes, methods and tools. Software process models, prototyping models, incremental models, spiral model, waterfall model. Capability maturity model (CMM), ISO 9000. Phases in Software development, requirement analysis- requirements elicitation for software, analysis principles, software prototyping,specification.

Module - II

Planning phase, project planning objective, software scope, empirical estimation models-COCOMO, single variable model, staffing and personal planning. Design phase, design process, principles, concepts, effective modular design, top down, bottom up strategies, stepwise refinement. Coding, programming practice, verification, size measures, complexity analysis, coding standards.

Module - III

Testing, fundamentals, white box testing, control structure testing, black box testing, basis path testing, code walkthroughs and inspection, testing strategies-Issues, Unit testing, integration testing, Validation testing, System testing. Maintenance-Overview of maintenance process, types of maintenance. Risk management: software risks-risk identification-risk monitoring andmanagement.

Module - IV

Project Management concept: People, Product-Process-Project. Project scheduling and tracking: Basic concepts-relation between people and effort-defining task set for the software project-selecting software engineering task Software configuration management: Basics and standards User interface design- rules. Computer aided software engineering tools - CASEbuildingblocks,taxonomyofCASEtools,integratedCASEenvironment.

References:

1. Roger S. Pressman, *Software Engineering*, 8/e, McGraw Hill, 2014.
2. Walker Royce, *Software Project Management : A Unified Frame Work*, Pearson Education, 1998
3. Ian Sommervile, *Software Engineering*, 7/e, University of Lancastor, Pearson Education, 2004.
4. Aggarwal K. K. and Yogesh Singh, *Software Engineering*, 2/e, New age International Publishers, 2005.
5. Kelkar S. A., *Software Project Management: A Concise Study*, 3/e, PHI, 2012.

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). - *Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least one question from each module and not more than three 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:

- *Identify the theoretical and methodological issues involved in modern software engineering project management*
- *Develop the transferable skills in logical analysis, communication and project management necessary for working within a team.*
- *Translate a specification to a design, and identify the components to build the architecture for a given problem, using an appropriate software engineering methodology.*
- *Select and use project management frameworks that ensure successful outcomes.*
- *Develop software projects based on current technologies, by managing resources economically and keeping ethical values.*

18.606 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 1

Basic concepts in Computer Graphics – Types of Graphic Devices – Interactive Graphic inputs – Raster Scan and Random Scan Displays.

Line Drawing Algorithm- DDA, Bresenham's algorithm, Circle Generation Algorithms – Midpoint circle algorithm, Bresenham's algorithm, Scan Conversion-frame buffers – solid area scan conversion – polygon filling algorithms.

Module II

Two dimensional transformations. Homogeneous coordinate systems – matrix formulation and concatenation of transformations.

Windowing concepts –Window to Viewport Transformation- Two dimensional clipping-Line clipping – Cohen Sutherland, Midpoint Subdivision algorithm, Polygon clipping-Sutherland Hodgeman algorithm, WeilerAtherton algorithm, Three dimensional object representation, Polygon surfaces, Quadric surfaces – Basic 3D transformations.

Module III

Projections – Parallel and perspective projections – vanishing points. Visible surface detection methods– Back face removal- Z-Buffer algorithm, A-buffer algorithm, Depth-sorting method, Scan line algorithm. Computer animation.

Module IV

Image processing – Introduction - Fundamental steps in image processing – digital image representations – relationship between pixels – gray level histogram –spatial convolution and correlation – edge detection – Robert, Prewitt, Sobel, Canny, Scene segmentation and labeling, Region labeling algorithm.

Text Books

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) Ten questions of 2 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.

18.607 MINI PROJECT (F)

Teaching Scheme: 0(L) - 0(T) - 4(P) **Credits**: 2

Course Objectives:

To understand JAVA programming concepts
To plan, analyse, design and implement a software project
To demonstrate independent learning
The ability to locate and use technical information from multiple sources
To demonstrate an understanding of professional ethics
To participate in a project team
To demonstrate the ability to communicate effectively in speech and in writing

Course Outcomes:

On completion of the course, the student will be able to:

1. *Learn to work as a team and to do a working project on time with each student taking responsibility for their part of the project*
2. *Learn about software development cycle with emphasis on different processes – requirements, design and implementation phases*
3. *Gain confidence at having conceptualized, designed and implemented a working, medium sized project with their team*

The students are expected to develop a JAVA application using a standard DBMS package. They have to do a proper system study and prepare SRS and design documents. Each batch comprising of 3 to5 students shall design. Each student shall submit a project report at the end of the semester. The project report should contain the design and engineering documentation including the Bill of Materials and test results. Product has to be demonstrated for its full design specifications. Innovative design concepts, reliability considerations and aesthetics/ ergonomic aspects ergonomic aspects taken care of in the project shall be given due weight.

Guidelines for evaluation:

i)	Attendance and Regularity	5
ii)	Work knowledge and Involvement	15
iii)	End-Semester presentation & Oral examination	10
iv)	Level of completion & demonstration of functionality/specification	13
v)	Project Report	7
	Total marks :	50

Note: External projects and R&D projects need not be encouraged at this level. Points (i) & (ii) to be evaluated by the project guide & co-ordinator and the rest by the final evaluation team comprising of 3 teachers including the project guide.

18.608 COMPUTER GRAPHICS LAB (F)

Teaching Scheme: 0(L) - 0(T) - 4(P) **Credits**: 2

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.
5. Basics of OpenGL.

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

30% - Implementation /Conducting the work assigned

25% - Output/Results and inference

25% - 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.