UNIVERSITY OF KERALA

B. TECH. DEGREE COURSE

(2018 SCHEME)

SYLLABUS FOR

V SEMESTER

INFORMATION TECHNOLOGY

SCHEME -2018

V 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				
18.501	Engineering Mathematics IV (FR) (Complex Analysis and Linear Algebra)	4	3	1	-	50	3	100	150
18.502	Engineering Mathematics- V (FR) (Advanced Mathematics and Queueing Models)	4	3	1	-	50	3	100	150
18.503	Operating Systems (FR)	3	2	1	-	50	3	100	150
18.504	Systems Programming (FR)	3	2	1	-	50	3	100	150
18.505	Theory of Computation (F)	3	2	1	-	50	3	100	150
18.506	Object Oriented Design and Java Programming (FR)	3	2	1	-	50	3	100	150
18.507	Digital Circuit Lab (F)	2	-	-	4	50	3	100	150
18.508	Database Lab(F)	2	-	-	4	50	3	100	150
	Total	**24**	**14**	**6**	**8**	**400**		**800**	**1200**

18.501 ENGINEERING MATHEMATICS – IV (FR)

(COMPLEX ANALYSIS AND LINEAR ALGEBRA)

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

Course Objective:

To introduce the basic notion in complex analysis such as Analytic Functions, Harmonic functions and their applications in fluid mechanics and differentiations and integration of complex functions ,transformations and their applications in engineering fields.

Many fundamental ideas of Linear Algebra are introduced as a part of this course. Linear transformations provide a dynamic and graphical view of matrix-vector multiplication. Orthogonality plays an important role in computer calculations.

Module – I

Complex Differentiation: Limits, continuity and differentiation of complex functions. Analytic functions – Cauchy Riemann equations in Cartesian form (proof of necessary part only).Properties of analytic functions – harmonic functions. Milne Thomson method.

Conformal mapping: Conformality and properties of the transformations $w = \frac{1}{z}$, $w = z^2$, $w = z + \frac{1}{z}$, $w = \sin z$, $w = e^z$ - Bilinear transformations- Schwarz-Christoffel Formula

Module – II

Complex Integration: Line integral – Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – zeros and singularities – residues and residue theorem. Evaluation of real definite integrals – $\int_0^{2\pi} f(sinx, cosx)dx$, $\int_{-\infty}^{\infty} f(x)dx$ (with no poles on the real axis). (Proof of theorems not required)-Jordan's inequality-Jordan's Lemma (No proof).

Module – III

Vector spaces and subspaces- Null spaces, Column spaces and linear transformations-Kernal and range of a linear transformation -Linearly independent sets-Bases –Bases for nulA and ColA - Co-ordinate systems -Dimension of vector space -Rank -Change of basis.

Module – IV

Inner product spaces -Length and orthogonality -Orthogonal sets-Orthogonal and orthonormal bases -Orthogonal projection -Gram-Schmidt process -Least square problem - Quadratic forms-Constrained optimization of quadratic forms -Singular value decomposition (proof of the theorem are not included).

References:

1. *O'Neil P. V., Advanced Engineering Mathematics, Cengage Learning, 2011.*

2. *Kreyszig E., Advanced Engineering Mathematics, 9/e, Wiley India, 2013.*

3. *Grewal B. S., Higher Engineering Mathematics, 13/e, Khanna Publications, 2012.*

4. *Bronson R. and G. B. Costa, Linear Algebra-an introduction, Elsevier Academic Press, 2007.*

5. *Williams G., Linear Algebra with Applications, Jones and Bartlett Learning, 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, 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 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 master the basic concepts of complex analysis and linear algebra which they can use later in their career

Course outcome*:*

After successful completion of this course ,the students master the concepts of complex analysis and linear algebra which they can use later in their career.

18.502 ENGINEERING MATHEMATICS - V (FR)

(ADVANCED MATHEMATICS AND QUEUEING MODELS)

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

***Course Objective**:*

To introduce the important classes of special functions such as Gamma function, Beta function ,Legendre function and Bessel's Function which play an important role in the development of applied mathematics. The study of queuing models provides the methods to minimize the sum of cost of providing service and cost of obtaining service which are primarily associated with the value of time spent by the customer in a queue.

Module – I

Gamma and Beta functions: Gamma function ,Recurrence relation or Reduction formula, Gamma function for negative non-integer values ,Standard results, Various integral forms of Gamma function, Beta function, symmetry ,various integral forms of Beta function ,Relation of proportionality, Relation between Beta and Gamma functions, Duplication formula Dirichlet's Integral.

Module – II

Legendre Functions_: Legendre's differential equation, Solution of Legendre's Equation (No proof),Legendre's functions, Rodrigues Formula ,Derivation of Legendre's polynomials from Rodrigues formula ,Generating function for Legendre's polynomials, Recurrence relation for Legendre's polynomials, Christoffel's Summation Formula ,Orthogonal and Orthonormal functions, Orthogonal property of Legendre's polynomials ,Fourier Legendre expansion of functions, Fourier-Legendre expansion of polynomials

Module – III

Bessel Function: Bessel's differential equation ,Solution of Bessel's equation (No proof), Bessel's function of the first kind, Recurrence formula for $J_n(x)$,Generating functions for $J_n(x)$, Bessel's function of the second kind(n integer), Trigonometrical expansion involving Bessel's function, Equations reducible to Bessel's equation, Modified Bessel's function, Orthogonality of Bessel's function, Fourier Bessel expansion of f(x).

Module – IV

Queueing Theory-Introduction to queuing models ,Characteristics of a queuing system-Customer Behaviour, Kendall's notation, Basic queuing models –Model I –Single server Poisson Queue model - (M/M/I): (∞/FIFO), Little's Formula , Model II- Multi server

Poisson queue model -(M/M/S):(∞/FIFO),Model III –Finite capacity, Single server queue –(M/M/1) :(N/FIFO).

References :

1 .Michael D.Greenberg,Advanced Engineering Mathematics,2/e 2002,Pearson education, Inc.

2. N.P.Bali,Dr.Manish Goyal ,A textbook of Engineering Mathematics ,Laxmi publications(P) Ltd.,2013

3. Shahnaz Bathul ,Textbook of Engineering Mathematics ,Special functions and Complex variables PHI Learning pvt Ltd.,2008

4 .A.C.Srivastava,P.K.Srivastava,Engineering Mathematics ,Vol II, PHI Learning Pvt.,2011

5. Gubner J.A, Probability and random Processes For Electrical and Computer Engineers, Cambridge University Press,2006

6. Sundarapandian, Probability, Statistics and Queuing Theory 2/e ,Prentice Hall 2009

***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) – 10 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 subdivisions), out of the two from each module. Each question carries 20 marks.

***Course outcome**:*

Mastery of the field of special functions will enable the students to apply this knowledge to the fields of Algorithm analysis and Image Processing

18.503 OPERATING SYSTEMS (FR)

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

Course Objectives:

To provide an understanding of concepts those underlie operating systems.

Module – I

Introduction: Concept of Operating Systems, Computer-System Architecture-Single processor, Multiprocessor and Clustered systems, Kernel Data Structures - Operating Systems used in different computing environments.

OS structure and implementation: Operating-System Services - User and Operating-System Interface - System calls - Operating-System Structure- monolithic, layered, microkernel, modular, hybrid

Module – II

Process management: Concept, states, Process Control Block, Thread - Scheduling – Queues, Schedulers, Context Switch

Critical Section-Peterson's solution. **Synchronization** – Locks, Semaphores-usage and implementation, **Classical Problems of synchronization** – Producer Consumer, Dining Philosophers and Readers-Writers Problems

CPU scheduling – Basic concepts, Scheduling criteria, scheduling algorithms

Module – III

Interprocess communication- Shared Memory, Message Passing, Pipes.

Deadlock - System model, Conditions, Resource Allocation Graph – Prevention – Avoidance – Detection – Recovery

Device management: Overview of mass storage structure- disks and tapes. Disk attachment – Host-Attached Storage, Network-Attached Storage, Storage-Area Network - Disk scheduling - Selection of a Disk-Scheduling Algorithm

Module – IV

Memory Management: Main Memory – Swapping – Contiguous Memory allocation – Segmentation – Paging – Demand paging - page replacement

File System Interface: File Concepts – Attributes – operations – types – structure – access methods. File system mounting. Protection. File system implementation. Directory implementation – allocation methods

Text Book:

1. *Abraham Silberschatz, Peter B Galvin, Greg Gagne, Operating System Concepts, 9/e, Wiley India, 2015.*

References:

1. *Garry Nutt, Operating Systems: 3/e, Pearson Education, 2004*
2. *Bhatt P. C. P., An Introduction to Operating Systems: Concepts and Practice, 3/e, Prentice Hall of India, 2010.*
3. *William Stallings, Operating Systems: Internals and Design Principles, Pearson, Global Edition, 2015.*
4. *Andrew S Tanenbaum, Herbert Bos, Modern Operating Systems, Pearson, 4/e, 2015.*
5. *Madnick S. and J. Donovan, Operating Systems, McGraw Hill, 2001.*
6. *Hanson P. B., Operating System Principle, Prentice Hall of India, 2001.*

Internal Continuous Assessment*(Maximum Marks50)*

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) -– Ten 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 successful completion of this course, the student will be able to understand how operating system works in the background and makes the user interact with the machine.

18.504 SYSTEM PROGRAMMING (FR)

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

Course Objective:

- *To impart the basic concepts of system software design.*
- *To equip the student with the right kind of tools for computer systems design and development.*

Pre-requisites: *18.402 - Computer Organisation and Design*
18.306 - Data Structures and Algorithms.

Module – I

Systems Programming – Background, System software and Application Software.
System software-Basic Concepts of Assemblers,Loaders,Linkers,Macrprocessors,Texteditors.
SIC & SIC/XE Architecture and Programming.
Traditional (CISC) machines – VAX architecture, Pentium Pro architecture
RISC machine – Ultra SPARK, Power PC.

Module – II

Assemblers Vs Compilers Vs Interpreters.
Assemblers – Basic assembler directives, machine dependent assembler features, machine independent assembler features, Object code generation of SIC and SIC/XE. Assembler design options – one pass assembler, multi pass assembler.

Module – III

Loaders and Linkers - Basic loader functions, machine dependent loader features, machine independent loader features. Loader design options – linkage editors, dynamic linking, bootstrap loaders.

.

Module – IV

Macro processors – Basic macro processor functions, machine dependent and machine independent macro processor features, Design options.

Text Editors – overview of the editing process, user interface, editor structure.

Debuggers – Overview of Debugger features, Breakpoint mechanism, Hardware support for debugging, Context of Debugger Check pointing and Reverse Execution.

TextBook

1. *Beck L.L., System Software - An introduction to Systems Programming, 3/e, Pearson Education, 1997.*

References:

1. *Chattopadhyay S., System Software, Prentice Hall of India, 2007.*
2. *Donovan J. J., Systems Programming, 2/e, Tata McGraw Hill, 2010.*
3. *Damdhere D. M., Operating Systems and Systems Programming, 2/e, Tata McGraw Hill, 2006.*

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 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:

- *Design and develop various system softwares.*
- *Take more advanced software courses.*
- *Self learn advance features in system softwares.*

18.505 THEORY OF COMPUTATION (F)

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

Course Objectives:

This course introduces the students to various models of computation. The course deals with automata theory, computability theory and the basics of computational complexity theory.

Module – I

Introduction to the theory of computation.

Finite state automata – description of finite automata, designing finite automata, NFA, finite automata with epsilon moves, equivalence of NFA and DFA, regular expressions, regular sets, Moore and Mealy machines.

Regular grammars, pumping lemma for regular languages, closure properties of regular sets and regular grammars,

Applications of finite automata, decision algorithms for regular sets, minimization of FSA.

Module – II

Context Free Grammar – Derivation trees, ambiguity, simplification of CFLs, normal forms of CFGs.

PDA – formal definition, examples of PDA, Deterministic PDA.

Pumping lemma for CFGs, closure properties of CFLs, decision algorithms for CFGs.

Module – III

Turing machines - Chomsky classification of languages, formal definition of Turing Machine, language acceptability by TM, examples of TM.

Variants of TMs – multitape TM, Non-deterministic TM, offline TMs, equivalence of single tape and multitape TMs.

Module – IV

Recursive and recursively enumerable languages – properties recursive and r.e. languages.

Decidability - decidable and undecidable problems, Universal Turing Machine, halting problem, reducibility.

References:

1. *Hopcroft J. E., J. D. Ullman and R. Motwani, Introduction to Automata Theory, Languages and Computation, Pearson Education, 2008.*

2. *Linz P., Introduction to Automata Theory and Formal Languages, Narosa, 2006.*
3. *Sipser M., Introduction to the Theory of Computation, 3/e, Cengage Learning, 2013.*
4. *Moret B. M., The Theory of Computation, Pearson Education, 2008.*

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 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 students will have a good understanding of how efficiently problems can be solved on various models of computation. They will also have an idea as to whether a given problem is solvable on a particular model of computation.

18.506 OBJECT ORIENTED DESIGN AND JAVA PROGRAMMING (FR)

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

Course Objective:

- *To impart the basic concepts of Object Oriented Design Techniques.*
- *To develop a thorough understanding of Java language.*
- *To study the techniques of creating GUI based applications.*

Pre-requisites: ***18.403- Object Oriented Techniques***

Module – I

Review of Object Oriented Concepts – Object Oriented Systems Development Life cycle-Object Oriented Methodologies – Rumbaugh methodology – Booch methodology – Jacobson et. al methodology – Patterns – Frameworks – Unified Approach - Unified Modeling Language – Static and Dynamic Models – UML diagrams – UML Class Diagram – Use-Case Diagram.

Module – II

Java Overview – Java Virtual Machine – Introduction to Java Programming. Classes and objects – Constructors – Access Modifiers – Parameter Passing. Inheritance – Abstract classes and Interfaces. Polymorphism – Method overriding and overloading. Packages in Java – defining and importing packages. Wrapper classes. String Handling – String and StringBuffer class. Exception Handling – use of *try, catch, throw, throws* and *finally* – nested try statements – user defined exception.

Module – III

Generics – Generic class – Bounded types – Generic interfaces. Threads – Thread class and Runnable interface – Thread synchronization and priorities – Multithreading. Networking basics – communication using Stream sockets and Datagram sockets. Applets – Applet basics – lifecycle - Passing Parameters to Applets.

Module – IV

Event Handling – Delegation Event Model – Event Classes – Sources – Listener Interfaces. Introduction to AWT – Working with Frames, Graphics, Color, Font. AWT Controls – Label, Button, CheckBox, Choice, List, TextField, TextArea – Layout Managers. Image class,Swing overview – Creating simple GUI applications using Swing. Java database Connectivity – JDBC overview – Types of Statement – Creating and executing queries – Dynamic queries.

References:-

1. *Herbert Schildt, Java: The Complete Reference, 8th Edn –TMH.*
2. *Ali Bahrami, Object Oriented Systems Development using the Unified Modeling Language –McGraw Hill.*
3. *David Flanagan, Java in a Nutshwell, 5th Edn - O'Reilly.*
4. *K. Barclay, J. Savage, Object Oriented Design with UML and Java –Elsevier Publishers.*
5. *Kathy Sierra, Head First Java, 2nd Edn –O'Reilly.*
6. *E. Balagurusamy, Programming JAVA a Primer, 4th Edn –TMH.*

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 part

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 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 60% analytical/problem solving questions.*

Course Outcome:

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

Implement object oriented principles for reusability.

Assign priorities and resolve run-time errors with Multithreading and Exception Handling techniques.

Interpret Events handling techniques for interaction of the user with GUI.

Analyze JDBC drivers to connect Java applications with relational databases.

Develop client/server applications using socket programming.

18.507 DIGITAL CIRCUITS 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 implementing digital circuits.

List of Exercises:

1. Realization of digital gates
2. Realization of flipflops
3. Design and implementation of a counter

Design and implementation of a shift register

4. Multiplexer / Demultiplexer
5. Timer Circuits (using 555)
6. Experiments using the 8051 microcontroller

Internal Continuous Assessment *(Max Marks- 50)*

40% - Test

40% - Class work and Record (Up-to-date lab work, problem solving capability, keeping track of rough record and fair record, term projects, assignment, software/hardware exercises, etc.)

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

30% - Implementing / 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 digital circuits.

18.508 DATABASE 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 data base management concepts.

List of Exercises: Programming exercises based on the courses 13.405 Data Base Design.

1. Familiarization of creation of databases and SQL commands (DDL, DML and DCL). Suitable exercises to practice SQL commands may be given.
2. Write a SQL procedure for an application which uses exception handling.
3. Write a SQL procedure for an application with cursors.
4. Write a DBMS program to prepare reports for an application using functions.
5. Write a SQL block containing triggers and stored procedures.
6. Develop a menu driven, GUI-based database application in any one of the domains such as Banking, Billing, Library management, Payroll, Insurance, Inventory, Healthcare etc. integrating all the features specified in the above exercises.

Internal Continuous Assessment *(Maximum Marks-50)*

40% - Test

40% - Regular lab work and proper maintenance of labrecords

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% - Programming/Implementation

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 work on database management systems.