UNIVERSITY OF KERALA

B. TECH. DEGREE COURSE

(2018 SCHEME)

SYLLABUS FOR V SEMESTER

COMPUTER SCIENCE & ENGINEERING

SCHEME -2018

V
SEMESTER
COMPUTER SCIENCE & ENGINEERING
(R)

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 Queuing 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	Microprocessors and Microcontrollers (R)	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	Object Oriented Programming Lab (R)	2	-	-	4	50	3	100	150
18.508	Database Lab(R)	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

CourseObjective:

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. Lay D. C., Linear Algebra with Applications, 3/e, Pearson Education, 2006.
5. Bronson R. and G. B. Costa, Linear Algebra-an introduction, Elsevier Academic Press, 2007.
6. 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 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 master the basic 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)

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

CourseObjectives:

- *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) - 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:

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

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 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 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 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

CourseObjective:

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,Text editorsSIC & 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 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:

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

18.505 MICROPROCESSORS AND MICROCONTROLLERS (R)

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

CourseObjectives:

To impart knowledge on the basics of Microprocessor Architecture

To acquire knowledge on the concepts of Peripheral Interfacing

To develop assembly language Programming skills

Pre-requisites: 18.402 - Computer Organization
18.305 - DigitalSystemDesign.

Module – I

Intel 8086 Microprocessor – Internal architecture, Signals and System connections, Memory System , Minimum and maximum mode operation,Minimum mode timing diagram.

Module – II

Programming 8086-- Addressing modes, Assembler Directives, Instruction set, Assembly Language Programming with subroutines and macros. Interrupts – Interrupt types, interrupt service routine, Handling interrupts in 8086, applications.

Module –III

Interfacing 8086- 8255 Programmable Peripheral Interface , 8279 key board/ display interfacing, 8259A Priority Interrupt controller, 8254 software programmable timer/counter (Programming not included).

Module – IV

Micro controllers – Types, Characteristics. 8051 Microcontroller – Architecture, Registers, Interrupts, Addressing modes, Instruction sets, Simple programs.

References:

1. Gaonkar R. S., *Microprocessor Architecture, Programming and Applications with the 8085*, 5/e, Prentice Hall, 2002. (Chapters 3, 5, 6, 7, 8, 4)

2. Hall D. V., *Microprocessors & Interfacing - Programming and Hardware*, 3/e, TataMcGraw-Hill, 2009. (Chapters 2, 3, 4, 5, 6, 8, 9)

3. Ray A. K. and K. M. Bhurchandi, *Advanced Microprocessors & Peripherals*, 3/e, TataMcGraw Hill, 2013.

4. Mathivanan N, *Microprocessors, PC Hardware and Interfacing* –PHI Learning, 2003.

5. Mukopadhyay A. K., *Microprocessor, Microcomputer and Applications*, 4/e, Narosa,2012.

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 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 successful completion of this course,

- *Attain a thorough understanding of 8 bit and 16 bit microprocessor architecture.*
- *Attain ability to design interfacing external devices with a microprocessor.*
- *Ability to develop programs in assembly language.*

18.506 OBJECT ORIENTED DESIGN AND JAVA PROGRAMMING (RF)

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

CourseObjective:

- *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. Swing overview – Creating simple GUI applications using Swing. Java database Connectivity – JDBC overview – Types of Statement – Creating and executing queries – Dynamicqueries.

References:-

1. Herbert Schildt., *Java: The Complete Reference*, 8/e, Tata McGraw Hill, 2011.
2. Bahrami A., *Object Oriented Systems Development using the Unified Modeling Language*, McGraw Hill, 1999.
3. Flanagan D., *Java in A Nutshell*, 5/e, O'Reilly, 2005.
4. Nageswararao R., *Core Java: An Integrated Approach*, Dreamtech Press, 2008.
5. Barclay K., J. Savage, *Object Oriented Design with UML and Java*, Elsevier, 2004.
6. Balagurusamy E., *Programming JAVA a Primer*, 5/e, McGraw Hill, 2014.

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 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 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 ExceptionHandling 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 OBJECT ORIENTED PROGRAMMING LAB (R)

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

Course Objective :

- *To acquaint students with Object Oriented concepts and terminology.*
- *To design and implement object oriented software to solve moderately complex problems.*

List of Exercises:

Programming exercises based on the course Object Oriented Techniques. The exercises may include the following:-

1. Functions
   a. Call by value, Call by reference, Call by name, return by reference
   b. Function overloading
   c. Default arguments

2. Classes and Objects
   a. Classes with primitive data members, arrays and pointers as data members b. Classes with static data members and static member functions
   c. Arrays of objects, objects as function arguments, returning objects
   d. Constructors and destructors - Parameterized constructor, copy constructor etc. e. Friend functions and classes

3. Compile time Polymorphism
   a. Operator Overloading including Unary and Binary operators.
   b. Overloading using Friend functions
   c. Function Overloading

4. Run time polymorphism
   a. Inheritance-Single, multiple, multilevel and hierarchical inheritance, Constructors in derived classes
   b. Virtual base classes, abstract classes
   c. Virtual functions

5. File handling
   a. Sequential access
   b. Random access

6. Templates

   a. Function templates

   b. Class Templates

7. Exception Handling

   a. Exception handling mechanism

   b. Specifying exception

Internal Continuous Assessment *(Maximum 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:

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

- *familiarize classes and attributes in real world applications.*
- *Perform programs using OOP concepts.*
- *Distinguish the types of inheritance in different problems.*
- *Perform applications by overloading operators and functions.*
- *Use virtual functions and ABC for problem solving.*

18.508 DATABASE LAB (R)

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

Course Objective :

To acquaint students with DDL , DML and DCL statements for database manipulation.

Programming exercises based on the courses 18.405 Data Base Design.

The exercises may include the following so that the students get trained in practicing database commands.

List of Exercises:

1. Familiarization of creation of databases, SQL commands (DDL, DML & DCL) and group functions to access data from the database.Suitable exercises to practice SQL commands in the above category may be given.
2. Creation of views, indexes, sequences.
3. Security management using SQL – granting and revoking privileges.
4. SQL procedures and Functions.
5. SQL cursors, triggers, and packages.
6. Exception handling in SQL.
7. Importing and exporting of databases using SQL.

Internal Continuous Assessment *(Maximum 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 TotalMarks:100*

A complete GUI based database application incorporating one/more features listed in the exercises above will be used to test the students' knowledge in the topic.

Marks should be awarded as follows:

45% - Implementing / Conducting the work assigned

25% - Output/Results and inference

30% - Viva voce

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

Course Outcome:

After successful completion of this course, students will be

- *Familiar with SQL queries using oracle database.*
- *Able to use PLSQL to handle queries in procedures.*