UNIVERSITY OF KERALA

B. TECH. DEGREE COURSE

(2013 SCHEME)

SYLLABUS FOR

IV SEMESTER

INFORMATION TECHNOLOGY

SCHEME -2013

IV 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				
13.401	Probability, Random Processes and Numerical Techniques (FR)	4	3	1	-	50	3	100	150
13.402	Computer Organization and Design (FR)	3	2	1	-	50	3	100	150
13.403	Object Oriented Techniques (FR)	3	2	1	-	50	3	100	150
13.404	Data Communication (FR)	3	2	1	-	50	3	100	150
13.405	Data Base Design (FR)	4	2	2	-	50	3	100	150
13.406	Microprocessors & Microcontrollers (F)	4	3	1	-	50	3	100	150
13.407	Data Structures Lab(FR)	4	-	-	4	50	3	100	150
13.408	Object Oriented Programming Lab (F)	4	-	-	4	50	3	100	150
	Total	**29**	**14**	**7**	**8**	**400**		**800**	**1200**

13.401 PROBABILITY, RANDOM PROCESSES AND NUMERICAL TECHNIQUES (FR)

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

Course Objective:

- *To provide a basic understanding of random variables and probability distributions.*
- *To have a basic idea about Random process- its classification, types and properties and their applications in engineering fields.*
- *Numerical techniques for solving differential equations are also introduced as a part of this course.*

Module – I

Random Variables -Discrete and continuous random variables -Probability distributions.-Mathematical Expectation and properties.

Special probability distributions-Binomial distribution, Poisson distribution, Poisson approximation to Binomial, Uniform distribution, Exponential Distribution, Normal distribution- mean and variance of the above distributions (derivations except for normal distribution).

Module – II

Two dimensional random variables-Joint and marginal distributions-Expectations-Conditional probability distributions -independence - correlation and covariance of pairs of random variables.

Random processes-Types of random processes-Ensemble mean- Stationarity -Strict sense stationary process (SSS) and Wide sense stationary (WSS) process.-Autocorrelation, autocovariance and their properties(without proof).

Module – III

Special types of processes-Poisson process-mean and variance-simple problems

Ergodicity-Time averages of sample functions, ergodic processes, mean ergodic theorem (without proof). **Power spectral density (PSD) -**PSD of real processes and its properties. Relation between autocorrelation and power spectral density.

Module – IV

Numerical techniques-Solutions of algebraic and transcendental equations-Bisection method-Regula falsi method- Newton- Raphson method. Solution of system of equations-Gauss elimination, Gauss- Siedel iteration. Interpolation – Newton's Forward and backward formulae - Lagrange's interpolation formula .Numerical integration-Trapezoidal rule and Simpson's one third rule.

References:

1. Veerarajan T., *Probability, Statistics and Random Processes*, 3/e, Tata McGraw Hill, 2002.
2. Papoulis A. and S.U. Pillai, *Probability, Random Variables and Stochastic Processes*, 3/e, Tata McGraw Hill, 2002.
3. Koneru S. R., *Engineering Mathematics*, 2/e, Universities Press (India) Pvt. Ltd., 2012.
4. Sastry S. S., *Introductory Methods of Numerical Analysis*, 5/e, PHI Learning, 2012.
5. Babu Ram, *Numerical Methods*, 1/e, Pearson Education, 2010.

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.

Course Outcome:

After successful completion of this course, the students will be familiar with the various concepts of Random process which are essential in the communication field and they will be able to use the numerical methods to solve problems related to engineering fields.

13.402 COMPUTER ORGANIZATION AND DESIGN (FR)

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

Course Objectives:

- *To impart an understanding of the internal organisation and operations of a computer.*
- *To introduce the concepts of processor logic design and control logic design.*

Module – I

Basic Structure of computers – functional units – basic operational concepts – bus structures – software. Memory locations and addresses – memory operations – instructions and instruction sequencing –addressing modes –ARM Example (*programs not required*). Basic I/O operations – stacks subroutine calls.

Module – II

Basic processing unit – fundamental concepts – instruction cycle - execution of a complete instruction – multiple-bus organization – sequencing of control signals**.**

Processor Logic Design: Register transfer logic – inter register transfer – arithmetic, logic and shift micro operations – conditional control statements.

Processor organization:– design of arithmetic unit, logic unit, arithmetic logic unit and shifter – status register – processor unit – design of accumulator.

Module – III

Control Logic Design: Control organization – design of hardwired control – control of processor unit – PLA control –

Micro programmed control – microinstructions – horizontal and vertical micro instructions – micro program sequencer – micro programmed CPU organization.

Module – IV

I/O organization: – accessing of I/O devices – interrupts – direct memory access – buses – interface circuits – standard I/O interfaces (PCI, SCSI, USB).

Memory system: – basic concepts – semiconductor RAMs – memory system considerations – semiconductor ROMs – flash memory – cache memory and mapping functions.

References

1. Hamacher C., Z. Vranesic and S. Zaky, *Computer Organization*, 6/e, McGraw Hill, 2011. [Chapters: 2, 3, 4 (4.1 , 4.2, 4.4 – 4.7), 5 (5.2, 5.3, 5.5, 5.6)]

2. Mano M. M., *Digital Logic & Computer Design*, 4/e, Pearson Education, 2013. [Chapters: 8 - 10]
3. Patterson D.A. and J. L. Hennessey, *Computer Organization and Design*, 5/e, Morgan Kauffmann Publishers, 2013.
4. Chaudhuri P., *Computer Organization and Design*, 2/e, Prentice Hall, 2008.
5. Rajaraman V. and T. Radhakrishnan, *Computer Organization and Architecture*, Prentice Hall, 2011.
6. Messmer H. P., *The Indispensable PC Hardware Book*, 4/e, Addison-Wesley, 2001.

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.

***Note:** The question paper shall contain at least 50% design/analytical/problem solving questions.*

Course outcome:

- *Students would understand the basic structure and functioning of a digital computer.*
- *The concepts of addressing and instruction execution cycle would enable the students to develop efficient programs.*
- *Ability to design a basic processing unit using the concepts of ALU and control logic design.*

13.403 OBJECT ORIENTED TECHNIQUES (FR)

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

Course Objectives:

- *To impart the basic concepts of object oriented techniques.*
- *To develop programming skills in C++ programming language.*
- *To implement object oriented techniques using C++ language features.*

Module – I

Fundamentals of object oriented programming paradigm- Data Abstraction, Encapsulation, classes, objects, inheritance and class hierarchies, polymorphism, Dynamic binding, Applications of object oriented programming, object oriented languages.

Basics of C++- C++ enhancements to C, "const" qualifier, reference variables, reference as function parameters, references as return values, inline functions, default arguments, function overloading, scope resolution operator, new and delete operators.

Module – II

Introduction to classes and objects: specifying a class, creating objects, defining member functions, memory allocation for objects, static members, array of objects, objects as function argument, returning objects from functions, friendly functions and friend classes, passing references to objects and returning references.

Constructors and Destructors: Default and parameterised constructor, Constructor overloading, default argument constructor, copy constructors, dynamic constructors, destructors.

Module – III

Inheritance and access control- derived class and base class, base class access control, classification of inheritance, virtual base class, constructors in base and derived classes, pointers to objects, this pointer, pointers to derived classes, virtual functions, abstract classes, dynamic binding.

Polymorphism- Member function overloading, Operator overloading- overloading unary & binary operators – overloading of increment, decrement, comma, subscript, assignment, arithmetic, relational and logical operators, friend operator function, type conversions, overloading versus overriding.

Module – IV

Using stream for input and output, manipulators, File processing- formatted, unformatted and random files.

Generic programming- class template, function template. Exception handling- errors and exception, exception handling mechanisms, throwing and exception, specifying exception.

References:

1. Schildt H., *Teach Yourself C++*, Tata McGraw Hill, 2000.
2. Hubbard J. R., *Schaum's Outline of Programming with C++*, McGraw Hill, 2000.
3. Balagurusamy, *Object Oriented Programming with C++*, Tata McGraw Hill, 2008.
4. Lafore R., *Object Oriented Programming in C++*, Galgotia Publications, 2001.
5. Stephen D. R., C. Diggins, J. Turkanis and J. Cogswell, *C ++ Cook book,* O'Reilly Media, 2013.
6. Oualline S., *Practical C++ Programming*, 2/e, O'Reilly Media, 2002.
7. Meyers S., *Effective C++*, Addison Wesley, 2011.

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 50% design/analytical/problem solving questions.*

Course Outcome:

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

- *Attain conceptual understanding of object oriented techniques.*
- *Gain strong foundations in C++ language programming.*
- *Apply object oriented techniques using C++ language constructs in application program*

13.404 DATA COMMUNICATION (FR)

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

Course Objective:

- *Build an understanding of the fundamental concepts of data transmission.*
- *Familiarize the student with the basic taxonomy and terminology of the computer networking area.*
- *Preparing the student for understanding advanced courses in computer networking*

Module – I

Communication model Simplex, half duplex and full duplex transmission. Time Domain and Frequency Domain concepts - Analog & Digital data and signals - Transmission Impairments - Attenuation, Delay distortion, Noise - Different types of noise - Channel capacity -Shannon's Theorem - Transmission media- twisted pair, Coaxial cable, optical fiber, terrestrial microwave, satellite microwave.

Module – II

Synchronous and Asynchronous transmission. Sampling theorem - Encoding digital data into digital signal - NRZ, Biphase, Multilevel binary - Encoding digital data into analog signals - ASK, FSK, PSK - Encoding analog data into digital signals - PCM, PM, DM - Encoding analog data into analog signals - AM, FM, PM.

Module – III

Multiplexing - TDM, FDM, WDM & DWDM. Error Detecting and correcting codes. Error detection - parity check, CRC, VRC. Forward Error Correction -Hamming codes, Block codes, Convolution codes.

Module – IV

Basic principles of switching - circuit switching, packet switching, message switching. Spread spectrum-The concept of spread spectrum – frequency hopping spread spectrum – direct sequence spread spectrum – code division multiple access. Basics of wireless communi-cation, Introduction to WiFi, WiMax, GSM, GPRS.

References:

1. Stallings W., *Data and Computer Communications*, 8/e, Prentice Hall, 2007.
2. Forouzan B. A., *Data Communications and Networking*, 4/e, Tata McGraw Hill, 2007.

3. Tanenbaum A. S and D. Wetherall, *Computer Networks*, Pearson Education, 2013.
4. Schiller J., *Mobile Communications,* 2/e, Pearson Education, 2009.

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 40% design/analytical/problem solving questions.*

Course Outcome:

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

- *Explain Data Communications concepts and its components.*
- *Identify the different types of Transmission media and their functions within a network.*
- *Independently understand basic computer network technology.*

13.405 DATABASE DESIGN (FR)

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

Course Objectives:

- *To impart the basic understanding of the theory and applications of database management systems.*
- *To give basic level understanding of internals of database systems.*

Module – I

Introduction: Concept & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS.

Entity-Relationship Model: Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features.

Module – II

Relational Model: Structure of relational Databases, Integrity Constraints, relational algebra, tuple relational calculus, Extended Relational Algebra Operations.

Database Languages: Concept of DDL and DML, Basic SQL Structure, examples, Set operations, Aggregate Functions, nested sub-queries, assertions, triggers, views.

Module – III

Relational Database Design: Different anomalies in designing a database. Synthesizing ER diagram to relational schema, normalization, functional dependency, Armstrong's Axioms, closures, Equivalence of FDs, minimal Cover (proofs not required). Normalization using functional dependencies, INF, 2NF, 3NF and BCNF, lossless and dependency preserving decompositions.

Module – IV

Physical Data Organization: Secondary storage, buffering, file operations, un-ordered and ordered-files, hashing, index structures, primary, secondary and clustering indices, multi-level indexing and B-Trees (algorithms not needed).

Query Optimization: algorithms for relational algebra operations, heuristics-based query optimization.

Transaction Processing Concepts: over view of concurrency control and recovery acid properties, serial and concurrent schedules, conflict serializability. Two-phase locking, failure classification, storage structure, stable storage, log based recovery, immediate and deferred database modification, check-pointing, database security.

Recent topics (preliminary ideas only): RDF and Big Data.

References:

1. Elmasri R.and S. Navathe*, Database Systems: Models, Languages, Design and Application Programming*, Pearson Education, 2013. [Chapters 1, 2, 3, 4, 5.1-5.3, 6.1-6.6, 7.1-7.13, 8.1-8.2, 14.1-14.5, 15.1-15.2, 16.1-16.8, 17.1-17.3, 18.1-18.4, 18.6, 18.7, 20, 21.1, 22.1-22.3, 25.1, 25.2].
2. Sliberschatz A., H.F. Korth and S. Sudarshan, *Database System Concepts*, 5/e, McGraw Hill, 2006. [Chapters 16.1 (except 16.1.4-16.1.5), 17.1 – 17.7].
3. Powers S., *Practical RDF*, O'Reilly Media, 2003. [Chapter 1].
4. Plunkett T., B. Macdonald, *et. al.*, *Oracle Big Data Hand Book*, Oracle Press, 2013. [Chapters 1, 2]

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.

***Note:** The question paper shall contain at least 50% analytical/problem solving questions.*

Course Outcome:

At the end of the course, the student is expected to:

- *have a thorough understanding of the concepts of databases.*
- *be able to do design a relational database following the design principles.*
- *be able to develop queries for relation database.*
- *have basic level understanding of the internal architecture and working of a database.*
- *have a basic awareness of emerging areas of database technology.*

13.406 MICROPROCESSORS & MICROCONTROLLERS (F)

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

Course Objective:

This course introduces the students to microprocessors, their architecture and interfacing. The concepts learned are then used to provide detailed knowledge of microcontrollers and their programming.

Module – I

Intel 8086 microprocessor - Internal architecture - addressing modes - instruction set and programming – interrupts - 8259A priority interrupt controller –interfacing - 8254 programmable timer/counter - 8237 DMA controller - 8255 programmable peripheral interface.

Module – II

Introduction to microcontrollers – General architecture of microcontrollers – embedded processors.

Intel 8051 microcontroller – 8051 architecture – memory organization - registers and I/O ports – addressing modes - assembly language programming.

Module – III

8051 Programming - 8051 timer/counter in assembly language and C.

8051 Interrupts – Interrupt handling and programming.

Serial communication using 8051 – Interfacing with RS232, serial port programming.

Module – IV

8051 interfacing – Keyboard, LCD, ADC, DAC and stepper motor interface – interfacing to external memory.

PIC and ARM - Introduction to PIC microcontrollers and ARM processors.

References:-

1. Kant K., *Microprocessors & Microcontrollers*, Prentice Hall, 2014.
2. Pal A., *Microcontrollers: Principles & Applications*, Prentice Hall, 2011.
3. Mazidi M. A., J. G. Mazidi and R. D. McKinlay, *The 8051 Microcontroller and Embedded Systems,* 2/e, Pearson Education, 2006.

4. Ayala K. J., *The 8051 Microcontroller*, Thomson Delmar Learning, 2007.
5. Hall D. V., *Microprocessors & Interfacing*, McGraw Hill, 1990.
6. Sloss A. N., D. Symes and C. Wright, *ARM System Developer's Guide*, Elsevier, 2004.
7. Peatman J. B., *Design With PIC Microcontrollers*, Pearson Education 1998.

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 have a good understanding of microprocessors, microcontrollers and their programming. This will prepare them for later courses like Operating Systems and Embedded Systems.

13.407 DATA STRUCTURES LAB (FR)

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

Course Objective :

- *Implementation of basic data structures Stack, Queue and DEQUEUE.*
- *To familiarize the use of basic data structures for solving real world problems.*
- *To implement algorithms for various sorting techniques.*
- *To familiarize operations and applications using linked list and binary trees.*

List of Exercises:

1. Implementation of Stack and Multiple stacks using one dimensional array.
2. Application problems using stacks: Infix to post fix conversion, MAZE problem etc.
3. Implementation of Queue, DEQUEUE and Circular queue using arrays.
4. Implementation of various linked list operations.
5. Implementation of stack, queue and their applications using linked list.
6. Representation of polynomials using linked list, addition and multiplication of polynomials.
7. Implementation of binary tree operations- creations, insertion, deletion and traversal.
8. Implementation of sorting algorithms – bubble, insertion, selection, quick (recursive and non recursive), merge sort (recursive and non recursive), and heap sort.
9. Implementation of various string operations.
10. Sparse matrix representation transpose and addition.

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:

- *Choose appropriate data structure for a given problem*
- *Design algorithms to solve real world problems.*
- *Compare the performance of various searching and sorting algorithms.*

13.408 OBJECT ORIENTED PROGRAMMING 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 implementing object oriented programming concepts.

List of Exercises *(Based on 13.403 Object Oriented Techniques*) **:**

1. Programs Using Functions
    a. Functions with default arguments
    b. Implementation of Call by Value, Call by Address and Call by Reference
2. Simple Classes for understanding objects, member functions and Constructors
    a. Classes with primitive data members
    b. Classes with arrays as data members
    c. Classes with pointers as data members – String Class
    d. Classes with constant data members
    e. Classes with static member functions
3. Compile time Polymorphism
    a. Operator Overloading including Unary and Binary Operators.
    b. Function Overloading
4. Runtime Polymorphism
    a. Inheritance
    b. Virtual functions
    c. Virtual Base Classes
5. File Handling
    a. Sequential access
    b. Random access
6. Standard Template Library – Containers, Associative Arrays, Iterators

Internal Continuous Assessment *(Maximum Marks-50)*

40% - Test (Minimum 2)

40% - Class 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 distributed 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 skills to do object oriented programming.