UNIVERSITY OF KERALA

B. TECH. DEGREE COURSE

(2018 SCHEME)

SYLLABUS FOR

III SEMESTER

INFORMATION TECHNOLOGY

SCHEME -2018

III 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				
18.301	Engineering Mathematics-II (ABCEFHMNPRSTU)	4	3	1	-	50	3	100	150
18.302	Humanities (BEFMRSU)	3	3	-	-	50	3	100	150
18.303	Discrete Structures (FR)	3	2	1	-	50	3	100	150
18.304	Electronic Devices and Circuits (FR)	3	2	1	-	50	3	100	150
18.305	Digital System Design (FR)	3	2	1	-	50	3	100	150
18.306	Data Structures and Algorithms (FR)	4	2	2	-	50	3	100	150
18.307	Electronic Circuits Lab (FR)	2	-	-	2	50	3	100	150
18.308	Programming Lab (FR)	2	-	-	2	50	3	100	150
	Total	**24**	**14**	**6**	**4**	**400**		**800**	**1200**

18.301 ENGINEERING MATHEMATICS - II (ABCEFHMNPRSTU)

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

Course Objective:

This course provides students a basic understanding of vector calculus, Fourier series and Fourier transforms which are very useful in many engineering fields. Partial differential equations and its applications are also introduced as a part of this course.

Module – I

Vector differentiation: Scalar and vector functions-differentiation of vector functions-velocity and acceleration - scalar and vector fields - vector differential operator-Gradient-Physical interpretation of gradient - directional derivative – divergence - curl - identities involving (no proof) - irrotational and solenoidal fields - scalar potential.

Vector integration: Line, surface and volume integrals. Green's theorem in plane. Stoke'stheorem and Gauss divergence theorem (no proof).

Module – II

Fourier Transforms: Fourier integral theorem (no proof)–Complex form of Fourier integrals-Fourier integral representation of a function- Fourier transforms – Fourier sine and cosine transforms, inverse Fourier transforms, properties.

Three-dimensional geometry:Sphere-Equation of a sphere-Cone-Equation of a cone-Right circular cone-Cylinder-Equation of a cylinder-Right circular cylinder-Ellipsoid-Hyperboloid-Elliptic Paraboloid-Hyperbolic paraboloid-Elliptic, Parabolic and Hyperbolic cylinders.

Module – III

Partial differential equations: Formation of PDE. Solution by direct integration. Solution of Langrage's Linear equation. Nonlinear equations - Charpit method. Homogeneous PDE with constant coefficients.

Module – IV

Applications of Partial differential equations: Solution by separation of variables. One dimensional Wave and Heat equations (Derivation and solutions by separation of variables). Steady state condition in one dimensional heat equation. Boundary Value problems in one dimensional Wave and Heat Equations.

References:

1. Kreyszig E., *Advanced Engineering Mathematics*, 9/e, Wiley India, 2013.
2. Grewal B. S., *Higher Engineering Mathematics*, 13/e, Khanna Publications, 2012.

3. Ramana B.V., *Higher Engineering Mathematics*, Tata McGraw Hill, 2007.
4. Greenberg M. D., *Advanced Engineering Mathematics*, 2/e, Pearson, 1998.
5. Bali N. P. and M. Goyal, *Engineering Mathematics*, 7/e, Laxmi Publications, India, 2012.
6. Koneru S. R., *Engineering Mathematics*, 2/e, Universities Press (India) Pvt. Ltd., 2012.
7. A.Gangadharan,*Engineering Mathematics,,Prentice Hall India Learning Pvt Ltd,2010*

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 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:

At the end of the course, the students will have the basic concepts of vector analysis, Fourier transforms and Partial differential equations which they can use later to solve problems related to engineering fields.

18. 302 HUMANITIES (BEFMRSU)

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

Course Objectives:

- *To explore the way in which economic forces operate in the Indian Economy.*
- *The subject will cover analysis of sectors, dimensions of growth, investment, inflation and the role of government will also be examined.*
- *The principle aim of this subject is to provide students with some basic techniques of economic analysis to understand the economic processes with particular reference to India.*
- *To give basic concepts of book keeping and accounting*

PART I ECONOMICS (2 periods per week)

Module – I

Definition of Economics –Central Economic Problems – Choice of techniques –Production possibility curve – Opportunity Cost-Micro & Macro Economics

Meaning of Demand – Utility-Marginal Utility and Law of Diminishing Marginal Utility-Law of demand - Determinants of Demand – Changes in Demand – Market Demand—Demand, forecasting-Meaning of supply-Law of Supply- Changes in Supply-- Market Price Determination – Implications of Government Price Fixation

Production function – Law of Variable proportion – Returns to scale – Iso-quants and Isocost line- Least cost combination of inputs – Cost concepts – Private cost and Social Cost -

Short run and Long run cost- cost curves – Revenue – Marginal, Average and Total Revenue-Break even Analysis

Module – II

National Income concepts - GNP – GDP – NNP– Per Capita Income – Measurement of National Income-Output method- Income method and Expenditure method -Sectoral Contribution to GDP– Money-Static and Dynamic Functions of Money-Inflation – causes of inflation – measures to control inflation – Demand Pull inflation – cost push inflation – Effects of Inflation – Deflation.

Global Economic Crisis India's Economic crisis in 1991 – New economic policy – Liberalization – Privatization and Globalization-Multinational Corporations and their impacts on the Indian Economy- Foreign Direct Investment (FDI) Performance of India-Issues and Concerns. Industrial sector in India – Role of Industrialization -Industrial Policy Resolutions-Industry wise analysis – Electronics – Chemical – Automobile – Information Technology.

Environment and Development – Basic Issues – Sustainable Development- Environmental Accounting – Growth versus Environment – The Global Environmental Issues- Poverty- Magnitude of Poverty in India- -Poverty and Environment

PART-II- ACCOUNTANCY (1 Period per week)

Module – III

Book-Keeping and Accountancy- Elements of Double Entry- Book –Keeping-rules for journalizing-Ledger accounts-Cash book- Banking transactions- Trial Balance- Method of Balancing accounts-the journal proper(simple problems).

Final accounts: Preparation of trading and profit and loss Account- Balance sheet (with simple problems) - Introduction to accounting packages (Description only).

References

1. Dewett K. K., *Modern Economic Theory,* S Chand and Co. Ltd., New Delhi, 2002.
2. Todaro M., *Economic Development*, Addison Wesley Longman Ltd., 1994.
3. Sharma M. K., *Business Environment in India,* Commonwealth Publishers, 2011.
4. Mithani D.M., *Money, Banking, International Trade and Public Finance*, Himalaya Publishing House, New Delhi, 2012.
5. Dutt R. and K. P. M. Sundaran*, Indian Economy,* S. Chand and Co. Ltd., New Delhi, 2002.
6. Varian H. R., *Intermediate Micro Economics,* W W Norton & Co. Inc., 2011.
7. Koutsoyiannis A., *Modern Micro-economics,* MacMillan, 2003.
8. Batliboi J. R., *Double Entry Book-Keeping,* Standard Accountancy Publ. Ltd., Bombay, 1989.
9. Chandrasekharan Nair K.G., *A Systematic approach to Accounting*, Chand Books, Trivandrum, 2010.

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 I and Part II to be answered in separate answer books.

Part I Economics *(70 marks)–Part I shall consist of 2 parts.*

Part A (20 Marks) - Two short answer questions of 10 marks each, covering entire syllabus. All questions are compulsory. (10x2=20marks)

Part B (50 marks) - Candidates have to answer one full question out of the two from Part I (Module I and Module II). Each question carries 25 marks.

Part II Accountancy *(30 marks)*

Candidates have to answer two full questions out of the three from Part II (Module III). Each question carries 15 marks.

Course outcome:

- *The students will be acquainted with its basic concepts, terminology, principles and assumptions of Economics.*
- *It will help students for optimum or best use of resources of the country*
- *It helps students to use the understanding of Economics of daily life*
- *The students will get acquainted with the basics of book keeping and accounting*

18.303 DISCRETE STRUCTURES (FR)

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

Course Objectives :

- *To impart fundamentals of discrete mathematical structures useful in studying, analysing and solving problems in Computer Science.*
- *To sharpen the mathematical skills by practicing problem solving, logical reasoning and writing precise proofs.*
- *To impart skills for applying ideas from discrete mathematics to real world problems.*

Module – I

Statement calculus: Statements, connectives, statement formulas, truth tables, conditional,biconditional, well formed formulas, tautology, contradiction, equivalence of formulas, duality law, tautological implications, formulas with distinct truth tables, functionally complete set of connectives, two state devices and statement logic, Theory of inference for statement calculus, validity using truth tables, rules of inference, consistency of premises and indirect method of proof.

Predicate calculus: predicates, statement functions, variables and quantifiers, predicate formulas, free and bound variables, universe of discourse, theory of inference for predicate calculus.

Module – II

Set Theory: basic concepts of set theory, Representation of discrete structures. *Relations and ordering* : relations–properties of binary relations in a set, relation matrix and graph of a relation, Partition and covering of a set, equivalence relations, compatibility relations, composition of binary relations, Partial ordering, Partially ordered set representation.

Functions: one to one, onto, bijection, composition of functions, inverse functions, binary and n-ary operations, natural numbers – Peano Axioms and Mathematical induction, Pigeon hole principle. Cardinality – countable and uncountable sets, Cantor's theorem of power sets.

Module – III

Algebraic structures: simple algebraic systems and general properties, morphism - congruence relation, sub algebra, product algebra and factor algebra, semigroups & monoids - morphism, cyclic semi groups and monoids, subsemigroups and submonoids, groups – abelian groups, permutation groups, cyclic groups, subgroups and homomorphism, cosets

and Lagrange's theorem, normal subgroups. Algebraic systems with two binary operations – ring, integral domain, field.

Module – IV

Lattices: as partially ordered sets, properties of lattices, lattices as algebraic systems, sublattices, direct product and homomorphism, Boolean algebra, subalgebra, direct product and homomorphism, Boolean functions. Graph theory – basic concepts, basic definitions of graphs, trees, paths, reachability and connectedness (No theorems and proofs for Graph theory topics).

References:

1. Tremblay J. P. and R. Manohar, *Discrete Mathematical Structures with Applicationsto Computer Science*, Tata McGraw-Hill, 1997.
2. Kolman B., *Discrete Mathematical Structures for Computer Science*, Prentice Hall, 1987.
3. Thomas Koshy, *Discrete Mathematics with Applications*, Elsevier, 2004.
4. Liu C. L., *Elements of Discrete Mathematics*, TMH, 2000.
5. Herstein I. N., *Modern Algebra*, John Wiley & Sons, 1999.
6. Gibbons A., Algorithmic Graph Theory, Cambridge University Press, 1985.
7. Rosen K. H., *Discrete Mathematics and Its Applications with Combinatorics andGraph Theory*, 6/e, Tata McGraw Hill, 2007.
8. Grimaldi R. P. and B.V. Ramana, *Discrete and Combinatorial Mathematics-An AppliedIntroduction*, 5/e, Pearson Education, 2008.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 3) 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 two questions 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-questions) out of the two from each module. Each question carries 20 marks.

Note : *The question paper should contain at least 60% analytical/problem solving questions*

Course Outcome:

After successful completion of this course students would be able to:

- *understand the basic discrete mathematical structures used in various applications in Computer Science.*
- *be conversant with the principles of valid reasoning and inference.*
- *apply the concepts of Discrete Mathematics to various applications in Computer Science.*

18.304 ELECTRONIC DEVICES AND CIRCUITS (FR)

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

Course Objectives:

Understand the operating principles of major electronic devices, circuit models and connection to the physical operation of devices.

Module – I

Introduction transistor biasing, fixed bias, self bias, voltage divider bias, effect of temperature on Q point, effect of bypass capacitor on biasing, RC coupled amplifier, factors affecting frequency response, CE-CE cascaded amplifier, effect of cascading on bandwidth.

Diode Circuits: Principle and working of RC differentiating circuit, RC integrating circuits, Clipping and clamping circuits based on diodes. Power amplifiers, classification, class B pushpull amplifiers, crossover distortions.

Module – II

Regulated power supplies: Review of simple zener voltage regulator using transistor, series and shunt regulator using transistor, current limiting techniques, IC regulator78XX, 79XX, LM317 regulator, Circuit/block diagram of SMPS, DC to DC conversion.

Working of 555 IC, monostable and astable multivibrators using 555.
Feedback in amplifiers types, advantages of negative feedback.

Module –III

Oscillators: RC phase shift oscillators, Wien bridge oscillators, Hartley and Colpitts oscillators (Working only).Astable, monostable and bistable multivibrator using transistor. (No Analysis required)

Operational amplifiers: Characteristics, applications- summing, Inverting and non-inverting amplifier, clipper, clamper, Integrator, Differentiator, precision rectifiers, astable and monostable multivibrators, active filters- first order and second order filters.

Module – IV

Concept of DAC (R-2R ladder) and ADC (Flash) using Op-amp.
Light dependent resistor ,phototransistor, photovoltaic cell, solar cell, seven segment display, intelligent display modules, LCD, principle of TFT, VDR, Laser diode, optocoupler.

Construction and working of enhancement type MOSFET, V-I characteristics, CMOS – working.

References :

1. Bogart T. F., *Electronic Devices Circuits*, 6/e, Pearson, 2012.
2. Singh B. P. and R. Singh, *Electronic Devices and Circuit*, 2/e, Pearson, 2013.
3. Maini A. K. and V. Agrawal, *Electronic Devices and Circuits*, Wiley India, 2011.
4. Raju G. S. N., *Electronic Devices and Circuits*, IK International, 2012.
5. Malvino A and D. Bates, *Electronic Principles*, 7/e, TMH, 2010.
6. Khan A. A. and K. K. Dey, *A First Course in Electronics*, 3/e, PHI, 2012.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 3) 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 two questions 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-questions) out of the two from each module. Each question carries (descriptive/analytical/problem solving)20 marks

18.305 DIGITAL SYSTEM DESIGN (FR)

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

Course Objectives:

- *To impart an understanding of the basic concepts of Boolean algebra and digital systems.*
- *Getting familiar with the design and implementation of different types of practically used sequential circuits.*
- *To provide an introduction to use Hardware Description Language.*

Pre-requisites: 18.109 Foundations of Computing and Programming in C (FR).

Module – I

Boolean algebra and logic gates : Introduction—Postulates of Boolean algebra–Canonical and Standard Forms — logic functions and gates – methods of minimization of logic functions — Karnaugh map method and tabulation method Product-of-Sums Simplification

— Don't-Care Conditions. **Combinational Logic** : Combinational Circuits and design Procedure — binary adder and subtractor — multilevel NAND and NOR circuits — Exclusive-OR and Equivalence Functions.

Module – II

MSI and LSI implementation of combination logic : parallel adder, carry look ahead adder,BCD adder, code converter, magnitude comparator, decoder, multiplexer, de-multiplexer, parity generator **Sequential logic circuits** : latches and flip-flops – edge-triggering and level-triggering — RS, JK, D and T flip-flops — race condition — master-slave flip-flop **Clockedsequential circuits** : state diagram—state reduction and assignment—design with state equations **Registers** : registers with parallel load - shift registers universal shift registers – application: serial adder.

Module – III

Counters : asynchronous counters—binary and BCD ripple counters—timing sequences

— synchronous counters — up-down counter, BCD counter, Johnson counter — timing sequences and state diagrams **Memory and Programmable Logic** : Random-Access Memory (RAM)—Memory Decoding—Error Detection and Correction — Read only Memory (ROM) — Programmable Logic Devices (PLD) — Programmable Array Logic (PAL), Programmable Logic Array (PLA). **HDL**: fundamentals, combinational logic, adder, multiplexer.

Module – IV

Arithmetic algorithms : algorithms for addition and subtraction of binary and BCD numbers — algorithms for multiplication and division of binary and BCD numbers — array multiplier —Booth's multiplication algorithm — restoring and non-restoring division — algorithms for floating point addition, subtraction, multiplication and division.

References:

1. Mano M. M., *Digital Logic & Computer Design*, 4/e, Pearson Education, 2013. [Chapters: 2, 3, 4.7, 4.8, 4.9, 5, 6, 7, 12.6].
2. Floyd T. L., *Digital Fundamentals*, 10/e, Pearson Education, 2009. [Chapters: 5, 6].
3. M. Morris Mano, *Computer System Architecture*, 3/e, Pearson Education, 2007. [Chapter 10].
4. Harris D. M. and, S. L. Harris, Digital *Design and Computer Architecture*, 2/e, Morgan Kaufmann Publishers, 2013 [Chapter 4.1, 4.2].
5. Tokheim R. L., *Digital Electronics Principles and Applications*, 7/e, Tata McGraw Hill, 2007.
6. Mano M. M. and M. D Ciletti, *Digital Design*, 4/e, Pearson Education, 2008.
7. Rajaraman V. and T. Radhakrishnan, *An Introduction to Digital Computer Design*, 5/e, Prentice Hall India Private Limited, 2012.
8. Tocci R. J., N. S. Widmer and G. L. Moss, *Digital Systems*, 10/e, Pearson Education, 2013.
9. Harris D. M. and S. L. Harris, *Digital Design and Computer Architecture*, 2/e, Morgan Kaufmann Publishers, 2013.

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 two questions 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-questions) 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

- *Study courses in higher semesters which includes organization of digital systems and hardware design*
- *Design and implement different types of practically used combinational and sequential circuits.*
- *Use Hardware Description language for defining simple logic circuits.*

18.306 DATA STRUCTURES AND ALGORITHMS (FR)

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

Course Objectives :

- *To learn basic concepts programming methodologies and analysis of algorithms.*
- *To learn concepts of various data structures such as stack, queue, priority queue, strings, trees and graphs.*
- *To acquire knowledge on various sorting techniques.*
- *To develop the skill to choose the most appropriate data structures for solving a given problem.*

Module – I

Introduction to programming methodologies – structured approach, stepwise refinement techniques, programming style, documentation – analysis of algorithms: frequency count, definition of Big O notation.

Study of basic data structures – vectors, arrays, linked lists:- singly linked list, doubly linked list, Circular linked list , operations on linked list , linked list with header nodes, applications of linked list.

Module – II

Implementation of Stacks and Queues using arrays and linked list, DEQUEUE (double ended queue). Multiple Stacks and Queues, Applications of stack.

String: - representation of string, concatenation, substring searching and deletion.

Trees: - m-ary tree, Binary tree – level and height of the tree, complete-binary tree representation using array, tree traversals, applications.

Binary search tree – creation, insertion and deletion operations, applications.

Graphs – representation of graphs, applications, BFS and DFS *(Algorithms for graph traversal **not** included)*

Module – III

Memory management: - reference count, garbage collection algorithm- Fragmentation and compaction-first fit, best fit, buddy system, boundary tag method.

Module – IV

Sorting techniques–Insertion sort, Merge sort, Partition- Exchange sort (Quick Sort), Heapsort.

Searching algorithms – Linear and Binary search. Hash Tables – Hashing functions – Midsquare, division, folding, digit analysis, Overflow handling.

References :

1. Horowitz E. and S. Sahni, *Fundamentals of Data Structures,* Galgotia, 1999.
2. Aho A. V., J. E. Hopcroft and J. D. Ullman, *Data Structures and Algorithms*, Pearson Publication,1983.
3. Samanta D., *Classic Data Structures*, Prentice Hall India, 2/e, 2009.
4. Tremblay J. P. and P. G. Sorenson, *Introduction to Data Structures with Applications,* Tata McGraw Hill, 1995**.**
5. Lipschuts S., *Theory and Problems of Data Structures*, Schaum's Series, 1986.
6. Horwitz E., S. Sahni and S. Anderson, Fundamentals of Data Structures in C, University Press (India), 2008.
7. Wirth N., *Algorithms + Data Structures = Programs,* Prentice Hall, 2004.
8. Hugges J. K. and J. I. Michtm, *A Structured Approach to Programming*, PHI, 1987**.**

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 two questions 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-questions) 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

- *Interpret and compute asymptotic notations of an algorithm to analyze the consumption of resources (time/space).*
- *Implement stack, queue, list and tree ADT to manage the memory using static and dynamic allocations.*
- *Develop and compare the searching and sorting algorithms.*
- *Identify appropriate data structure and algorithm for a given problem and implement in any programming language.*

18.307 ELECTRONICS CIRCUITS LAB (FR)

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

Course Objective:

To enable students to have the practical knowledge of different electronic devices and circuits and to study the specifications of devices and circuits.

List of Practicals:

1. Characteristics of diode, zener diode.
2. CE characteristics of BJT.
3. CE Characteristics of FET.
4. Rectifier circuits with and without filters.
5. RC low pass and high pass circuits.
6. Differentiating and integrating circuits.
7. Clipping and clamping circuits.
8. Simple zener diode regulator.
9. RC coupled amplifier using BJT.
10. RC phase shift oscillator using BJT.
11. Astable and Monostable multivibrators using 555 Timer IC.
12. Astable and Monostable multivibrators using 741 OPAMP.
13. Voltage regulator using 78XX and 317

Internal Continuous Assessment *(Maximum Marks-50)*

40% - Test/s (minimum 1)

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 entire syllabus given above.

Marks should be awarded as follows:

25% - Circuit Design

15% - Performance (Wiring, usage of equipment and trouble shooting)

35% - Result

25% - Viva voce

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

Course Outcome:

On successful completion of this course, student will understand the working of electronic devices with their characteristics and the typical specifications of semiconductor devices and circuits.

18.308 PROGRAMMING LAB (FR)

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

Course Objective:

- *To implement algorithms studied in the course Foundations of Computing and Programming in C language.*
- *To learn the implementation of control structures, Iterations and recursive functions.*
- *To implement operations on different types of files.*
- *To implement basic Data Structures.*

List of Exercises:

Introduction: Familiarization of operating systems like DOS and Windows.

Programming exercises in C based on the course *18.109 Foundations of Computing and Programming in C.* The exercises may include the following Programs using–

1. **Decision making, branching and looping**
   - if, if else statements
   - switch, goto statements
   - while, do, for statements
2. **Arrays and strings**
   - one-dimensional, two-dimensional, multidimensional arrays
   - reading/writing strings
   - operations on strings
   - string handling
3. **Functions**
   - user defined functions
   - function calls, arguments & return values
   - nesting of functions
   - recursive functions
   - passing arrays and strings to functions
4. **Structures and unions**
   - copying and comparing structure variables
   - arrays of structures
   - arrays within structures
   - structures within structures
   - structures and functions
   - unions

5. **Pointers**
   - pointers and arrays
   - pointers and character strings
   - array of pointers
   - pointers and functions
   - pointers and structures
6. **Files, memory allocation, bit-level programming**
   - files - defining, opening/closing, input-output operations
   - command line arguments
   - memory allocation functions
   - bit-wise operators
7. **Basic Data structures**
8. **Implementation of stack and Queue using array**

Internal Continuous Assessment *(Maximum Marks-50)*

40% - Test/s (minimum 1)

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 entire syllabus given above.

Marks should be awarded as follows:

20% - Algorithm/Design

30% - Performance (Implementing the work/Conducting the experiment)

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 capable of

- *Selecting appropriate control structures suitable for the given problem.*
- *Implementing algorithms for searching and sorting.*
- *Developing algorithm and implementing it using C programming language for a given problem.*
- *Creating and processing data stored in files.*