Curriculum for Undergraduate Degree (B.Tech.) in Information Technology (w.e.f. AY: 2020-21)

Part III: Detailed Curriculum

Third Semester

Course Name:	**Analog and Digital Electronics**		
Course Code:	ES-EC303	**Category:**	Engg. Science Courses
Semester:	Third	**Credit:**	3
L-T-P:	3-0-0	**Pre-Requisites:**	Basic Electronics Knowledge
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
1	To know simple Electronics Circuits and applications.
2	To know Boolean Algebra, K map, SOP & POS.
3	To know the uses of Combinational & Sequential Circuits.
4	To know the design of Counter.

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	**Revision of Basic Electronics:** (i) Introduction to Diodes and functionality of BJT & FET. VI Characteristics and Working Principles of Diode & BJT only. (ii) Types of Biasing, Load Line, Q Point and Applications of Transistors. Simple Numerical Problems on Transistor and Biasing.	**3L**
2	**Amplifiers and Oscillators:** (i) Different Classes of Power Amplifiers – (Class-A, B, AB and C – basic concepts, power, efficiency) (ii) Concept of Positive Feedback & Negative Feedback. Advantages of Negative Feedback. Simple Numerical Problems on Feedback. (iii) Basics of Oscillations- Criteria for Oscillation-Working of Crystal Oscillator, Wien Bridge Oscillator, Hartley Oscillator, Colpitt Oscillator.(Without Mathematical Derivations). (iv) Basics of IC 555 Timer only.	**10L**

3	**Introduction to Digital Electronics:** (i) Concept of Number System, , Basic Logic Gates, Universal Logic Gates, BCD, EBCDIC, ASCII, Gray Code, Boolean Algebra , De Morgan's Theorem, Representation of SOP, POS. (ii) Minimization of Logic Expression- By Boolean Algebra. K –map upto 4 Variables only.	**10L**
4	**Combinational Circuits:** (i) Adders- Half & Full, Code Converter, Decoder, Encoder, Multiplexer, De Multiplexer, Comparator.	**4L**
5	**Sequential Circuits:** (i) Difference between Combinational & Sequential Circuits. Concept of Latch. Concept of Clock Pulse & Triggering. (ii) Flip- Flop- JK, D, SR, T, Master Slave, Excitation Table. (iii) Registers- SISO, SIPO, PISO, PIPO. (iv) Concept of Counter- Asynchronous, Synchronous, Design of MOD N Counter, Ring Counter, Up Down Counter.	**8L**
6	(i) A/D and D/A Converter- Basics mainly R-2R Ladder, Successive Approximation Type Only. (ii) Logic Families- TTL, CMOS, RTL, ECL – Basic Concepts Only- Propagation Delay Time, Noise Margin, Fan-in, Fan Out, Power Dissipation.	**3L**
Total		**38L**

Course Outcomes:	
After completion of the course, students will be able to:	
1	Understand basic electronics simple Circuit.
2	Understand the Boolean arithmetic and its application in Digital design.
3	Understand, analyze and design various combinational and sequential.

Learning Resources:	
1	Microelectronics Circuits by A.S. Sedra & K.C. Smith, Oxford University Press.
2	Digital Fundamentals by Thomas L. Floyd , Pearson Prentice Hall
3	Electronic Principles by A.P. Malvino, Tata Mcgraw Hill Publications
4	Electronic Devices & Circuit Theory by Robert L. Boylestad & Louis Nashelsky,
5	Digital Integrated Electronics by David H. Taub& D, Shilling, Tata Mcgraw Hill Publications.
6	Solid State Electronic Devices by Ben G. Streetman, PHI Publication.
7	Fundamentals of Digital Electronics by Anad Kumar, PHI Publication.
8	The Art of Electronics by Paul Horowitz, Cambridge University Press.
9	Digital Logic: Applications and Design by John M. Yarbrough, West Publishing

	Company

Course Name:	**Data Structure and Algorithms**		
Course Code:	PC-IT301	**Category:**	Professional Core Courses
Semester:	Third	**Credit:**	4
L-T-P:	3-1-0	**Pre-Requisites:**	ES-CS201(Programming for Problem Solving)
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
1	To learn the basics of abstract data types.
2	To learn the principles of linear and nonlinear data structures.
3	To build an application using sorting and searching

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	Introduction: Basic Terminologies: Elementary Data Organizations, Array Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations; Basic Algorithms using array: Searching (linear and binary search) and their complexity analysis.	**8L**
2	Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into linked list, Deletion from linked list; Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.	**7L**
3	Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each Type of Queues: Algorithms and their analysis. Linked representation of Stack and Queue.	**8L**
4	Trees and Graph: Basic Tree Terminologies, Different types of Trees: Binary Tree, Binary Search Tree, AVL Tree, Threaded Binary Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis. Graph: Basic Terminologies and	**9L**

	Representations, Graph search and traversal algorithms and complexity analysis.	
5	Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing: Hash Functions, Separate Chaining, Open Addressing, Rehashing, Extendible Hashing, Hash Indices.	**8L**
Total		**40L**

Course Outcomes:	
After completion of the course, students will be able to:	
1	Understand and apply the concept of stack, queue and linked list operations
2	Discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing
3	Understand and apply the knowledge of tree and graphs concepts
4	Choose an appropriate data structure for a particular problem

Learning Resources:	
1	"Data Structures and Program Design In C", 2/e by Robert L. Kruse, Bruce P. Leung.
2	"Fundamentals of Data Structures of C" by Ellis Horowitz, Sartaj Sahni, Susan Anderson - freed.
3	"Data Structures in C" by Aaron M. Tenenbaum.
4	"Data Structures" by S. Lipschutz.
5	"Data Structures Using C" by Reema Thareja.
6	"Data Structures" by R.S. Salaria, Khanna Publishing House
7	"Data Structures through C" by Yashwant Kanitkar, BPB House
8	"Data Structure Using C", 2/e by A.K. Rath, A. K. Jagadev.
9	"Introduction to Algorithms" by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein

Course Name:	**Computer Organization and Architecture**		
Course Code:	PC-IT302	**Category:**	Professional Core Courses
Semester:	Third	**Credit:**	03
L-T-P:	3-0-0	**Pre-Requisites:**	Concept of Basic Electronics
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
This course will enable students to:	
1	Explain the basic sub systems of a computer, their organization, structure and operation.
2	Illustrate the concept of programs as sequences of machine instructions.
3	Describe arithmetic and logical operations
4	Describe memory hierarchy and concept of virtual memory.
5	Demonstrate different ways of communicating with I/O devices and standard I/O interfaces.
6	Illustrate pipelined processor and other computing systems.

Course Contents:

Module No.	**Description of Topic**	**Contact Hrs.**
1	Commonly used number systems. Fixed and floating point representation of numbers. Basic organization of the stored program computer and operation sequence for execution of a program. Role of operating systems and compiler/assembler. Fetch, decode and execute cycle, Concept of operator, operand, registers and storage, Instruction format. Instruction sets and addressing modes.	**10L**
2	Overflow and underflow, Design of adders - ripple carry and carry look ahead principles, Design of ALU, Fixed point multiplication -Booth's algorithm, Fixed point division - Restoring and non-restoring algorithms. Floating point - IEEE 754 standard.	**10L**
3	Memory unit : Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Speed, Size, and Cost, memory hierarchy, CPU-memory interfacing, Cache Memories – Mapping Functions, Replacement Algorithms, Performance Considerations.	**10L**
4	Design of control unit - hardwired and micro programmed control. Introduction to instruction pipelining. Introduction to RISC architectures. RISC vs. CISC architectures.	**10L**

	I/O operations - Concept of handshaking, Polled I/O, interrupt and DMA.	
Total		**40L**

Course Outcomes:	
After completion of the course, students will be able to:	
1	Explain the basic organization of a computer system.
2	Demonstrate functioning of different sub systems, such as processor, Input/output, and memory.
3	Illustrate hardwired control and micro programmed control, pipelining, embedded and other computing systems
4	Design and analyse simple arithmetic and logical units.

Learning Resources:	
1	C. Hamacher, Z. Vranesic and S. Zaky, "Computer Organization", McGraw-Hill
2	W. Stallings, "Computer Organization and Architecture - Designing for Performance", Prentice Hall of India
3	D. A. Patterson and J. L. Hennessy, "Computer Organization and Design -The Hardware/Software Interface", Morgan Kaufmann
4	J .P. Hayes, "Computer Architecture and Organization", McGraw-Hill
5	Mano, M.M., "Computer System Architecture", PHI.
6	Behrooz Parhami " Computer Architecture", Oxford University Press
7	Chaudhuri P. Pal, "Computer Organisation & Design", PHI,
8	Computer organization and Architecture – T.K Ghosh

Course Name:	**Mathematics-III**		
Course Code:	**BSM-301**	**Category:**	Basic Science Courses
Semester:	Third	**Credit:**	3
L-T-P:	3-0-0	**Pre-Requisites:**	High school mathematics and BSM-101
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
1	To understand probability theory and its applications.
2	To know about Bivariate distribution and Marginal distribution.
3	To learn Fourier series & transform.
4	To use the concept of generating function in solving recurrence relation.
5	To know about sampling distribution and hypothesis

Course Contents:		
Module No.	**Description of Topic**	**Contact Hrs.**
1	**Basic Probability:** • **Probability** (i) Definition of random experiment, sample space, events and probability. (ii) Basic theorems (Statement only) of probability and related problems. (iii) Conditional probability and independent events; Multiplication theorem; Baye's theorem (statement only) and related problems. • **Probability Distribution** (i) Definition of random variable; Discrete and continuous random variable; Probability mass function (p.m.f.) and probability density function (p.d.f.) of single random variable; Cumulative distribution function (c.d.f.); Applications. (ii) Expectation and variance of random variable; Properties and applications. (iii) **Some special types of distributions** ➢ **Discrete probability distribution:** Binomial and Poisson distributions; Mean and variance (no proof) and examples. ➢ **Continuous probability distribution:** Uniform, Exponential and Normal distributions; Mean and variance (no proof) and examples.	**9L**
2	**Bivariate Probability Distribution:** • **Discrete bivariate distribution** (i) Joint probability distribution of two discrete random variables, marginal distribution. (ii) Expectation, variance, covariance; Independent random variables. • **Continuous bivariate distribution** (i) Joint probability distribution of two continuous random variables, marginal distribution. (ii) Expectation, variance, covariance; Independent random variables.	**8L**

3	**Statistics:** • **Sampling distribution** (i) Population and sampling distribution; statistic, standard error and confidence interval. (ii) Point and interval estimation; unbiased and consistent estimator; maximum likelihood estimate. (iii) Chebyshev's inequality. • **Test of hypothesis** (i) Simple and composite hypothesis. Critical region. Level of significance. (ii) Type I and Type II errors. (iii) One sample and two sample tests for means and proportions. χ^2-test for goodness of it.	**8L**
4	**Fourier Series and Fourier Transforms:** • **Fourier Series** (i) Periodic function and periodic extension of a function; Odd and even functions. (ii) **Special wave forms:** square wave, half wave rectifier, full wave rectifier, saw-toothed wave, triangular wave (graphical illustration only). (iii) Euler's formulae for Fourier series; Fourier series of functions of period 2π; Fourier series of functions of period $2l$; Dirichlet's conditions and related problems. (iv) Half range Sine and Cosine series and related problems. (v) Parseval's identity (statement only) and related problems. • **Fourier Transforms** (i) Definition of Fourier transforms; Properties of Fourier transforms: Linearity, Shifting, Change of scale property; Fourier transforms of some elementary functions; Fourier transforms of derivatives. (ii) Fourier sine and cosine transforms and related problems. (iii) Inverse Fourier transforms and convolution theorem; related problems.	**10L**
5	**Recurrence Relation & Generating Function:** • **Generating Function** (i) Introduction to generating function (ii) Some standard generating functions (iii) Solution of recurrence relations by generating functions	**5L**
Total		**40L**

Course Outcomes:	
After completion of the course, students will be able to:	
1	Learn the ideas of probability and random variables, various discrete and continuous probability distributions with their properties and their applications in physical and engineering environment
2	Understand the basic ideas of statistics with different characterisation of a univariate and bivariate data set.
3	Apply statistical tools for analysing data samples.
4	Learn the tools of Fourier transform to analyze engineering problems and apply the concept of convergence of infinite series in many approximation techniques in engineering disciplines.
5	To solve engineering problems using z transform and probability theory.

Learning Resources:	
1	Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
2	Michael Greenberg, Advanced Engineering Mathematics, Pearson.
3	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
4	Kanti B. Dutta, Mathematical Methods of Science and Engineering, Cenage Learning
5	Reena Garg, Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishers.
6	N.G. Das, Statistical Methods (Combined Volume), Tata-McGraw Hill
7	S. Ross, A First Course in Probability, Pearson Education India
8	W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, Wiley

Course Name:	**Introduction to Industrial Management**		
Course Code:	HM-HU 301	**Category:**	Management Science & Humanities
Semester:	Third	**Credit:**	2
L-T-P:	2-0-0	**Pre-Requisites:**	Mathematics
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 5

Course Objectives:	
1	Understand the scope and role of Industrial Management. Organization Structure and System concepts of Operations Management.
2	Acquire knowledge of various types of manufacturing system and concept of Production and Productivity. Concept Value analysis and Value engineering.
3	Understand Critical Path Method (CPM) and Program Evaluation and Review

	Techniques (PERT). Determine Critical Path, Estimating various kinds of Floats and time crashing.
4	Understand the scopes and Material Management – Purchasing, Store –keeping functions and Inventory Control models, Techniques of selective inventory control. Material Requirement Planning (MRP) and Enterprise Resource Planning (ERP) – Concepts and Applications.
5	Understand various functions of Production Planning and Control – Routing, Loading , Scheduling, Dispatching etc., Objective of PPC, Relationship of PPC with other departments, Scheduling – Gantt Chart, Critical Ratio rules, Sequencing of Operations : "N" jobs and One machine, "N" jobs and Two machines (Johnson`s Procedure), " N" jobs and three machines.

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	**Introduction to Industrial Engineering, Production and Operations Management Functions** Definitions and Concepts of Industrial Engineering, Historical Development of Industrial Engineering, Objectives, Scope Functions of Industrial Engineering, of Industrial Engineering Department and its organization, Industrial Engineering and its organization. Techniques of Industrial Engineering, Role of Industrial Engineer. Production and Operations Management Function – System Concepts of Operations Management, Objectives of Production and Operations Management (Criteria of Performance), Decisions of Production and Operations Management.	**3L**
2	**Production and Productivity :** Concepts and Definition of Production, Products and Services, Production function, Types of Production, Concepts of Productivity (Financial Efficiency), Difference between Production and Productivity, Factors of Productivity Index, Concept of Cost effectiveness, Factors affecting Value Analysis and Value Engineering, Techniques _ FAST and DARSIRI Methods.	**6L**
3	**CPM and PERT :** CPM & PERT-meaning, features, difference, applications. Understand Different terms used in network diagram. Draw network diagram for a real life project containing 10-15 activities, computation of LPO and EPO.(Take minimum three examples). Determination of critical path on network. Floats, its types and determination offloats. Crashing of network, updating and its applications.	**6L**

4	**Materials Management:** Material management-definition, functions and importance; Purchase - objectives, Duties functions and responsibilities. Storekeeping-functions, Stores Systems and Procedures. Derivation for expression for Economic Order Quantity (EOQ) and numeric examples. ABC, HML, VED, XYZ and other modern methods of analysis. Various types of inventory models such as Wilson's inventory model, Replenishment model and two bin model. (Only sketch and understanding, no derivation.). Concepts of Material Requirement Planning (MRP) and Enterprise Resource Planning (ERP).	**7L**
5	**Production Planning and Control (PPC):** Introduction, Objective of PPC, Factors affecting PPC, Functions of PPC –Routing, Loading, Scheduling, Relationship of PPC with other departments, Scheduling- meaning and need for productivity and utilization. Gantt chart, Critical ratio scheduling-method and numeric examples., Sequencing of Operations: "N" jobs and One machine, "N" jobs and Two machines (Johnson`s Procedure), " N" jobs and three machines,"	**4L**
Total		**26L**

Course Outcomes:	
After completion of the course, students will be able to:	
1	Acquire fundamental knowledge of Industrial and Operations Management.
2	Understand and learn about production system and management techniques.
3	Prepare Production and Project Planning by CPM and PERT techniques.
4	Learn Material Management systems and Inventory Management Models.
5	Understand Production Planning and Control System and various Job sequencing techniques.

Learning Resources:	
1	O. P. KHANNA – "Industrial Engineering & Management" By Khanna Publishers.
2	A. P. Verma - "Industrial Engineering & Management"- KATARIA and SONS.
3	L.C.JHAMB – "Industrial Management - II – Everest Publishing House.
4	M. MAHAJAN – " Industrial Engineering and Production Management" Publisher :Dhanpat Rai, New Delhi..
5	L.S.Srinath – "CPM & PERT principles and Applications

Course Name:	**Analog and Digital Electronics Lab**		
Course Code:	ES-EC393	**Category:**	Engg. Science Courses
Semester:	Third	**Credit:**	1.5
L-T-P:	0-0-3	**Pre-Requisites:**	Basic Electronics Knowledge
Full Marks:	100		
Examination Scheme:	Semester Examination: 60	Continuous Assessment: 35	Attendance: 05

Course Objectives:	
1	Apply the concepts of electronics to carry out experiments on Analog & Digital Electronics to understand the aspects of cost effective design solutions.

Course Contents:		
Module No.	**Description of Topic**	**Contact Hrs.**
1	Realization of Basic gates gate using universal gates.	**3P/ Week**
2	Construction of Half Adder & Full Adder Circuit using Logic Gates. Verify its output.	
3	Constructions of simple Decoder & Multiplexer circuits using logic gates verify its output.	
4	Realization of RS / JK / D flip flops using logic gates.	
5	Realization of Synchronous Up/ Down Counter.	
6	Realization of MOD N Counter.	
7	Design a BCD to Seven Segment Decoder.	
8	Design a Binary to Gray Code Converter.	
9	Study of timer circuit using NE555 and configuration of Mono-stable and Astable Multi-vibrator.	
10	Construction of 2-stage R-C coupled transistor amplifiers & study of its gain and bandwidth.	
11	Study of Any Oscillator.	
12	Study of class A Power Amplifier.	
Total		**36P**

Course Outcomes:	
After completion of the course, students will be able to:	
1	Apply the practical knowledge of basic electronics simple Circuit.
2	Implement & design combinational and sequential circuit.

Learning Resources:	
1	Introduction to Analog & Digital Circuits Lab Manual by Brian Dean, Kendall Hunt Pub Co.
2	Analog And Digital Electronics,, by Charles H. Roth, Jr., Larry L. Kinney | Raghunandan G. H.
3	Hands on Electronics by Kalpan Daniel M Cambridge University Press

Course Name:	**Data Structure and Algorithms Lab**		
Course Code:	PC-IT391	**Category:**	Professional Core Courses
Semester:	Third	**Credit:**	2
L-T-P:	0-0-4	**Pre-Requisites:**	ES-CS201(Programming for Problem Solving)
Full Marks:	100		
Examination Scheme:	Semester Examination: 60	Continuous Assessment: 35	Attendance: 05

Course Objectives:	
1	To develop skills to design and analyze simple linear and nonlinear data structures
2	To strengthen the ability to identify and apply the suitable data structure for the given real world problem
3	To gain knowledge in practical applications of data structures

Course Contents:		
Module No.	**Description of Topic/ Experiment**	**Contact Hrs.**
The contents should include about 10 assignments with the focus given as outlined below:		
1	Lab 1: Implementation of array operations	**4P**
2	Lab 2: Stacks and Queues: adding & deleting elements Lab 3: Circular Queue: Adding & deleting elements	**8P**
3	Lab 4: Evaluation of expressions operations on Multiple Stacks & Queue	**4P**

4	Lab 5: Implementation of linked lists: inserting, deleting, and inverting a linked list Lab 6: Implementation of stacks & queues using linked lists	**8P**
5	Lab 7: Hash tables implementation: searching, inserting and deleting Lab 8: Searching techniques Lab 9: Sorting techniques	**12P**
6	Lab 10 : Recursive traversal of Trees Lab 11: Threaded binary tree traversal Lab 12: AVL tree implementation	**12P**
Total		**48P**

Course Outcomes:	
After completion of the course, students will be able to:	
1	Design and analyze the time and space efficiency of the data structure.
2	Identity and analyze the appropriate data structure for given problem.
3	Have practical knowledge on the application of data structures.

Learning Resources:	
1	"Data Structures and Program Design In C", 2/E by Robert L. Kruse, Bruce P. Leung.
2	"Fundamentals of Data Structures of C" by Ellis Horowitz, Sartaj Sahni, Susan Anderson - freed.
3	"Data Structures in C" by Aaron M. Tenenbaum.
4	"Data Structures Using C" by Reema Thareja.
5	"Data Structures through C" by Yashwant Kanitkar, BPB House
6	"Data Structure Using C", 2/e by A.K. Rath, A. K. Jagadev.

Course Name:	**Computer Organization and Architecture Lab**		
Course Code:	PC-IT392	**Category:**	Professional Core Courses
Semester:	Third	**Credit:**	02
L-T-P:	0-0-4	**Pre-Requisites:**	Concept of Basic Electronics
Full Marks:	100		
Examination Scheme:	Semester Examination: 60	Continuous Assessment: 35	Attendance: 05

Course Objectives: This course will enable students to:	
1	Design Adder/Subtractor composite unit.
2	Design a BCD adder.
3	Design a composite ALU .
4	Design of a 'Carry-Look-Ahead' Adder circuit
5	Cascade two RAM ICs

Course Contents:		
Module No.	**Description of Topic**	**Contact Hrs.**
1	Familiarity with IC-chips, e.g. a) Multiplexer , b) Decoder, c) Encoder b) Comparator Truth Table verification and clarification from Data-book.	8P
2	Design an Adder/Subtractor composite unit.	4P
3	Design a BCD adder.	4P
4	Design of a 'Carry-Look-Ahead' Adder circuit.	4P
5	Use a multiplexer unit to design a composite ALU.	4P
6	Use ALU chip for multibit arithmetic operation	4P
7	Implement read write operation using RAM IC.	4P
8	Cascade two RAM ICs for vertical expansion.	4P
9	Cascade two RAM ICs for horizontal expansion.	4P
Total		**40P**

Course Outcomes:	
The student will be able to :	
1	Design, implement, and debug digital hardware systems.
2	Understand digital logic specification methods and the compilation process that transforms these into logic networks.
3	Understand the design of the various functional units of digital computers

Learning Resources:	
1	Laboratory Manual

Course Name:	**IT Workshop (Sci. Lab/MATLAB/Python/R)**		
Course Code:	PC-IT393	**Category:**	Professional Core
Semester:	Third	**Credit:**	2
L-T-P:	0-0-4	**Pre-Requisites:**	Knowledge of Programming Logic and Programming Experience with any high level language(Preferable)
Full Marks:	100		
Examination Scheme:	Semester Examination: 60	Continuous Assessment: 35	Attendance: 05

Course Objectives:	
1	Understand about the details of Scripting languages.
2	Make students learn to use SciLab, MATLAB, R and Python and its libraries to provide the solutions for the real life problems.

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	Lab1: Familiarization with SciLab, MATLAB, R and Python environment with simple problems Lab 2: Simple computational problems using different operators, expressions.	8P
2	Lab 3: Problems involving using Conditional Statements (if-else, nested if-else) Lab 4: Iterative problems using while, do-while, for loops Lab 5: Problems to be solved using switch-case and nested loop.	12P
3	Lab 6 & 7: Concepts of Lists/Array/Vectors and problems using 1-D and 2-D array	8P
4	Lab 8: Concepts of Tuple and Dictionaries with suitable problems Lab 9: Problems on String manipulation Lab 10: Problems to be solved using functions and modules	12P
5	Lab 11: Concepts of Data Manipulation and related problems. Lab 12: Problems involving File handling operations and plotting of data.	8P
Total		**48P**

Course Outcomes:	
After completion of the course, students will be able to:	
1	Understand the details of Scripting languages
2	Design real life problems and think creatively about solutions
3	Develop Solutions for advanced applications using R/Matlab/Python

Learning Resources:	
1	Python Programming: Using Problem Solving Approach" by Reema Thareja
2	Data Structure and Algorithmic Thinking with Python" by Narasimha Karumanchi
3	Michael J. Crawley. Statistics: An Introduction using R. Wiley, 2nd edition, 2014. ISBN 978-1-118-94109-6.
4	Sarah Stowell. Using R for Statistics. Apress, 2014. ISBN 978-1484201404
5	http://www.mathworks.com/help/releases/R2014b/pdf_doc/matlab/getstart.pdf
6	https://www.scilab.org/sites/default/files/Scilab_beginners.pdf