NOIDA INTERNATIONAL UNIVERSITY

SCHOOL OF ENGINEERING & TECHNOLOGY

EVALUATION SCHEME & SYLLABUS

FOR

BACHELOR OF TECHNOLOGY

Computer Science & Engineering/Information Technology

(2nd Year Syllabus)

(4 Year Course)

W.E.F Session 2021-2022 onwards

THIRD SEMESTER

COURSE		Contact Hours/Week			Credit	Evaluation Scheme				
Code	**Course Title**	**L**	**T**	**P**		**CA**	**TA**	**Int. Total**	**Ext.**	**Total**
BSC301	Discrete Mathematics	3	0	0	2	20	20	40	60	100
ESC301	Analog Electronic Circuits	3	0	0	3	20	20	40	60	100
ESC302	Digital Electronics	3	0	0	3	20	20	40	60	100
PCC-CS301	Data Structure & Algorithms	3	0	0	3	20	20	40	60	100
PCC-CS302	IT Workshop	1	0	0	1	20	20	40	60	100
HSMC301	Humanities –I (Human psychology)	3	0	0	3	20	20	40	60	100
PRACTICALS										
ESC301P	Analog Electronic Circuits Lab	0	0	4	2	20	20	40	60	100
ESC302P	Digital Electronics Lab	0	0	4	2	20	20	40	60	100
PCC-CS301P	Data Structure & Algorithms Lab	0	0	4	2	20	20	40	60	100
PCC-CS302 P	IT Workshop (MATLAB) Lab	0	0	4	2	20	20	40	60	100
Total		**16**	**0**	**16**	**23**					
FOURTH SEMESTER										
PCC-CS401	Computer Based Numerical & Statistical Techniques	3	0	0	3	20	20	40	60	100
PCC-CS402	Computer Organization & Architecture	3	0	0	3	20	20	40	60	100
PCC-CS403	Operating Systems	3	0	0	3	20	20	40	60	100
PCC-CS404	Design &Analysis of Algorithms	3	0	0	3	20	20	40	60	100
HSMC-401	Humanities –II (Human Values)	3	0	0	3	20	20	40	60	100
BSC-401	Biology	2	1	0	3	20	20	40	60	100
PRACTICALS										
PCC-CS402P	Computer Organization & Architecture Lab	0	0	4	2	20	20	40	60	100
PCC-CS403P	Operating Systems Lab	0	0	4	2	20	20	40	60	100
PCC-CS404P	Design &Analysis of Algorithms Lab	0	0	4	2	20	20	40	60	100
Total		**17**	**1**	**12**	**24**					

DETAILED 4-YEAR CURRICULUMCONTENTS

Undergraduate Degree in Engineering &Technology

BRANCH/COURSE: COMPUTER SCIENCE AND ENGINEERING

AND

INFORMATION TECHNOLOGY

Course Code: BSC301 **Course Name:** Discrete Mathematics

Course Credit Hour: 2hr **Total Contact Hour:** 40hrs

Course Objective:

Throughout the course, students will be expected to demonstrate their understanding of DiscreteMathematics by being able to use mathematically correct terminology and notation, construct correct direct and indirect proofs, use division into cases in a proof, use counter examples and apply logical reasoning to solve a variety of problems.

Course Description:

This course provides wide knowledge ofDiscrete Mathematics. Topics included: Basic of Sets, Relation and function, Principal of mathematical induction, counting technique, propositional logics, algebraic structure and graphs and tree with their applications.

Course Contents:

Unit 1: Sets, Relation and Function (8 hours)

Operations and Laws of Sets, Cartesian Products, BinaryRelation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum andProduct of Functions, Bijective functions, Inverse and Composite Function, Size of a Set,Finite and infinite Sets, Countable anduncountable Sets, Cantor's diagonal argument andThe Power Set theorem, Schroeder-Bernstein theorem.

Unit-2: Principles of Mathematical Induction& Basic Counting Technique (8 hours)

The Well-Ordering Principle, Recursivedefinition, The Division algorithm: Prime Numbers, The Greatest Common Divisor:Euclidean Algorithm, The Fundamental Theorem of Arithmetic.Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination.

Unit 3: Propositional Logic (8 hours)

Syntax, Semantics, Validity and Satisfiability, Basic Connectives andTruth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules ofInference, The use of uantifiers. **Proof Techniques:** Some Terminology, Proof Methodsand Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof ofNecessity and Sufficiency.

Unit 4: Algebraic Structures and Morphism (10 hours)

Algebraic Structures with one Binary Operation,Semi Groups, Monoids, Groups, CongruenceRelation and Quotient Structures,Free and Cyclic Monoids and Groups, Permutation Groups,Substructures, NormalSubgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domainand Fields. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra,Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form

Unit 5: Graphs and Trees (8 hours)

Graphs and their properties, Degree, Connectivity, Path, Cycle,Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Colouring, Colouring mapsand Planar Graphs,Colouring Vertices, Colouring Edges, List Colouring, Perfect Graph,definition properties and Example, rooted trees, trees and sorting, weighted trees and prefixcodes, Bi-connected component and Articulation Points, Shortest distances.

Course Learning Outcomes (CLOs):

CLO-1: For a given logic sentence express it in terms of predicates, quantifiers, and logical connectives.

CLO-2: For a given a problem, derive the solution using deductive logic and prove the solution based on logical inference.

CLO-3: For a given a mathematical problem, classify its algebraic structure.

CLO-4: Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.

CLO-5: Develop the given problem as graph networks and solve with techniques of graph theory.

Text books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw – Hill

2. Susanna S. Epp, Discrete Mathematics with Applications,Wadsworth Publishing Co. Inc.

3. C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, Tata McGraw – Hill.

Reference books:

1.Discrete Mathematics, Tata McGraw – Hill
2. J.P. Tremblay and R. Manohar, Discrete Mathematical Structure and It's Application to Computer Science", TMG Edition, TataMcgraw-Hill.
3. Norman L. Biggs, Discrete Mathematics, Oxford University Press.

Online links for study & reference materials:

https://nptel.ac.in/courses/106/106/106106094/

Assessment method: (Continuous Internal Assessment = 40%, Final Examination = 60%)

Assignment -1 - 04%

Assignment -2 - 04%

Assessment-3(Mid-Exam) - 20%

Assignment-3 - 04%

Assignment-4 - 04%

Assignment-5 - 04%

Total Internal Assessment - 40%

Course Code: ESC301 **Course Name:** Analog Electronic Circuits

Course Credit: 3 **Total Contact Hour:** 40hr

Course Objective:

- To understand Diodes and their application.
- To analyze BJT and understand the various application.
- To understand characteristics of op amp and MOSFET.
- To understand concepts of non linear application of OP amp.

Course Description:

This course emphasizes on the fundamental of Analog electronics. The course includes basic devices structure, application and working. This course gives an understanding of analog circuits.

Course Contents:

Unit 1: Diode circuits

P-N junction diode, I-V characteristics of a diode; review of half-wave and full-wave rectifiers, Zener diodes, clamping and clipping circuits.

Unit 2: BJT circuits

Structure and I-V characteristics of a BJT; BJT as a switch. BJT as an amplifier: small-signal model, biasing circuits, current mirror; common-emitter, common-base and common- collector amplifiers; Small signal equivalent circuits, high-frequency equivalent circuits

Unit 3: MOSFET circuits

MOSFET structure and I-V characteristics. MOSFET as a switch. MOSFET as an amplifier: small-signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; small signal equivalent circuits - gain, input and output impedances, trans-conductance, high frequency equivalent circuit.

Unit 4: Differential, multi-stage and operational amplifiers

Differential amplifier; power amplifier; direct coupled multi-stage amplifier; internal structure of an operational amplifier, ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product)

Unit 5: Linear applications of op-amp

Idealized analysis of op-amp circuits. Inverting and non-inverting amplifier, differential amplifier, instrumentation amplifier, integrator, active filter, P, PI and PID controllers and lead/lag compensator using an op-amp, voltage regulator, oscillators (Wein bridge and phase shift). Analog to Digital Conversion.

Unit 6: Nonlinear applications of op-amp

Hysteretic Comparator, Zero Crossing Detector, Square-wave and triangular-wave generators. Precision rectifier, peak detector. Monoshot.

Course Learning Outcomes(CLOs) :

At the end of this course students will demonstrate the ability to

- At the end of this course, students will demonstrate the ability to
- Understand the characteristics of transistors.
- Design and analyze various rectifier and amplifier circuits.
- Design sinusoidal and non-sinusoidal oscillators.
- Understand the functioning of OP-AMP and design OP-AMP based circuits.

Text books:

- S. Sedra and K. C. Smith, “Microelectronic Circuits”, New York, Oxford University Press, 1998.
- J. V. Wait, L. P. Huelsman and G. A. Korn, “Introduction to Operational Amplifiertheory and applications”, McGraw Hill U. S., 1992.
- J. Millman and A. Grabel, “Microelectronics”, McGraw Hill Education, 1988., “Digital Logic and Computer Design”, PHI Publications, 2002

Reference books

- P. Horowitz and W. Hill, “The Art of Electronics”, Cambridge University Press, 1989.
- P. R. Gray, R. G. Meyer and S. Lewis, “Analysis and Design of Analog Integrated Circuits”, John Wiley & Sons, 2001.

Online links for study & reference materials:

https://nptel.ac.in/courses/108/102/108102112/

Assessment method:(Continuous Internal Assessment = 40% , Final Examination = 60%)

Assessment -1 - 05%

Assessment-2 - 05%

Assessment-3(Midexam) - 20%

Assessment-3 - 05%

Assessment-4 - 05%

Total Internal Assessment - 40%

Course Code: ESC 302 **Course Name:** Digital Electronics

Course Credit: 3 **Total Contact Hour:** 40hr

Course Objective:

- To understand number representation and conversion between different representation in digital electronic circuits.
- To analyze logic processes and implement logical operations using combinational logic circuits.
- To understand characteristics of memory and their classification.
- To understand concepts of sequential circuits and to analyze sequential systems.

Course Description:

This course emphasizes on the fundamental of digital electronics. The student is first taught about the number system and logic gates before introducing them to digital IC technology. Then they are exposed to both combinational logic network and combinational MSI logic. In concurrence with this, the fundamental of sequential logic, flip-flop, counter and shift register will be taught. A/D & D/A convertors are summarized. Finally, the memory devices are introduced.

Course Contents:

Module 1:Fundamentals of Digital Systems and logicfamilies (8 Hours)

Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-ORoperations, Boolean algebra, examples ofICgates, number systems-binary, signed binary,octal hexadecimal number, binaryarithmetic,one's and two's complements arithmetic,codes, error detecting and correctingcodes,characteristics of digital lCs, digital logicfamilies, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-statelogic.

Module 2: Combinational DigitalCircuits (8 Hours)

Standard representation for logic functions, K-map representation, simplificationoflogicfunctions using K-map, minimization of logical functions. Don't care conditions,Multiplexer,De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry lookahead adder,serialadder, ALU, elementary ALU design, popular MSI chips, digitalcomparator,paritychecker/generator, code converters, priority encoders, decoders/driversfor display devices,Q-M method of functionrealization.

Module 3: Sequential circuits and systems (8 Hours)

A 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop, J- K-T andDtypesflipflops,applicationsofflipflops,shiftregisters,applicationsofshiftregisters,serialtoparallel converter, parallel to serial converter, ring counter, sequencegenerator,ripple(Asynchronous) counters, synchronous counters, counters design using flipflops,specialcounter IC's, asynchronous sequential counters, applications ofcounters.

Module 4: A/D and D/A Converters (8 Hours)

Digital to analog converters: weighted resistor/converter, R-2R LadderD/Aconverter,specifications for D/A converters, examples of D/A converter lCs, sampleand hold circuit,analog to digital converters: quantization and encoding, parallelcomparator A/Dconverter,successive approximation A/D converter, counting A/Dconverter, dual slope A/Dconverter,A/Dconverterusingvoltagetofrequencyandvoltagetotimeconversion,specificationsofA/Dconverters, example ofA/D converterICs

Module 5: Semiconductor memories and Programmable logic devices. (8 Hours)

Memory organization and operation, expanding memory size, classificationandcharacteristicsof memories, sequential memory, read only memory (ROM), read andwrite memory(RAM), content addressable memory (CAM), charge de coupled devicememory (CCD), commonly used memory chips, ROM as a PLD, Programmable logicarray, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).

Course Learning Outcomes(CLOs) :

At the end of this course students will demonstrate the ability to

- Understand working of logic families and logic gates.
- Design and implement Combinational and Sequential logiccircuits.
- Understand the process of Analog to Digital conversion and Digital to Analog conversion.

- Be able to use PLDs to implement the given logical problem.

Text books:

- Moris Mano, “Digital Logic and Computer Design”, PHI Publications, 2002
- R. P. Jain, “Modern Digital Electronics”, TMH, 3rd Edition, 2003.

Reference books:

- Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
- R.L. Tokheim, “Digital Electronics, Principles and Applications”, Tata McGraw Hill, 1999.
- W. Gothman, “Digital electronics”, PHI.
- S. Salivahanan& S. Arivyhgan. “Digital circuits and design”, Vikas Publication, 2001
- Malvino Leach, "Digital Principles and Application", TMH, 1999.
- V. Rajaraman : Computer Fundamentals (PHI)

Online links for study & reference materials:

https://nptel.ac.in/courses/117/106/117106086/

Assessment method:(Continuous Internal Assessment = 40% , Final Examination = 60%)

Assessment -1	- 05%
Assessment-2	- 05%
Assessment-3(Midexam)	- 20%
Assessment-3	- 05%
Assessment-4	- 05%
Total Internal Assessment	**- 40%**

Course Code: PCC-CS301 **Course Name:** Data Structure & Algorithms

Course Credit Hour: 3hr **Total Contact Hour:** 42hr

Course Objective:

- To impart the basic concepts of data structures and algorithms.
- To understand concepts about searching and sorting techniques
- To understand basic concepts about stacks, queues, lists, trees and graphs.
- To enable them to write algorithms for solving problems with the help of fundamental data structures.

Course Description:

- Study of advanced programming topics focused on logical structures of data as well as the design, implementation and analysis of algorithms operating on these structures.
- Topics include linked lists, stacks, trees, queues, graphs and analysis of efficiency. Also covers searching, sorting and hashing techniques.

Course Contents:

Module 1: Introduction: Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. Searching: Linear Search and Binary Search Techniques and their complexity analysis.

Module 2: 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 types of Queues: Algorithms and their analysis.

Module 3: Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.
Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL 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.

Module 4: 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.
Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

Course learning outcomes:

1. For a given algorithm student will able to analyze the algorithms to determine the time and computation complexity and justify the correctness.
2. For a given Search problem (Linear Search and Binary Search) student will able to implement it.
3. For a given problem of Stacks, Queues and linked list student will able to implement it and analyze the same to determine the time and computation complexity.
4. Student will able to write an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.
5. Student will able to implement Graph search and traversal algorithms and determine the time and computation complexity.

Suggested books:

1. "Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, SartajSahni, Computer Science Press.

Suggested reference books:

1. Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition byMarkAllen Weiss, Addison-Wesley Publishing Company
2. "How to Solve it by Computer" , 2nd Impression by R. G. Dromey, Pearson Education.

Online links for study & reference materials:

1. NPTEL

Assessment method :(Continuous Internal Assessment = 40% , Final Examination = 60%)

Assessment -1	- 05%
Assessment-2	- 05%
Assessment-3(Midexam)	- 20%
Assessment-3	- 05%
Assessment-4	- 05%
Total Internal Assessment	**- 40%**

Course Code: PCC-CS302 **Course Name:** IT Workshop (MATLAB)

Course Credit Hour: 1hr **Total Contact Hour:** 15hr

Course Objective

- To Impart the Knowledge to the students with MATLAB software.
- To provide a working introduction to the MATLAB technical computing environment.
- To introduce students the use of a high-level programming language using MATLAB.

Course Description:

- The course covers the basic concepts and techniques of MATLAB computing environment from both theoretical and practical perspective. The material includes Introduction to Matlab, Historical Background, Applications and scope of MATLAB, Commands, Data types, Operators, Data and Data Flow, Matlab Advanced Plotting and Mathematical Modeling.

Course Contents:

Unit-1

Introduction to Matlab, Historical Background, Applications, Scope of MATLAB, Importance of MATLAB for Engineers, Features, MATLAB Windows (Editor, Work Space, Command History, Command Window). Operations with Variables, Naming and Checking Existence, Clearing Operations, Commands, Data types, Operators.

Unit-II

Data And Data Flow In Matlab Vectors, Matrix Operations & Operators, Reshaping Matrices, Arrays, Colon Notations, Numbers, Strings, Functions, File Input-Output, Importing and Exporting of data.

Unit-III

Matlab Programming Conditional Statements, Loops, Writing Script Files, Error Correction, Saving Files, Worked out Examples.

Unit-IV

Matlab Advanced Plotting, Graphics, Creating Plot & Editing Plot, GUI (Graphical User Interface). Matlab- Algebra, Calculus, Differential, Integration, Polynomials, solving a system of linear equations.

Unit-V

Simulink Introduction, Importance, Model Based Design, Tools, Mathematical Modeling, Converting Mathematical Model into Simulink Model, Running Simulink Models, Importing Exporting Data, Solver Configuration, Masking Block/Model.

Course Learning Outcomes (CLOs):

On completion of the course students will be able to

- **CLO-1**: Understand the introduction of MATLAB environment.
- **CLO-2**: Understand and apply the operation of MATLAB in data flow operations.
- **CLO-3**: Write the various MATLAB programming scripts.
- **CLO-4**: Plot graphs of linear and polynomial equations using various MATLAB functions.
- **CLO-5:** Perform mathematical modeling, importing and exporting of data using Simulink.

Text books:

- Rudra Pratap , Getting Started With Matlab: A Quick Introduction For Scientists And Engineers , OXFORD University Press.
- Y. Kirani Singh, B.B. Chaudhuri , Matlab Programming ,PHI Publication

Reference Books:

- Y. Yang ,Wenwu Cao, Tae-Sang Chung, John Morris ,Applied Numerical Methods Using MATLAB , PHI Publication.

Online links for study & reference materials:

https://nptel.ac.in/courses/103/106/103106118/

Assessment method: (Continuous Internal Assessment = 40%, Final Examination = 60%)

Assignment -1	- 05%
Assignment -2	- 05%
Assessment-3(Mid-Exam)	- 20%
Assignment-3/Quiz-1	- 05%
Assignment-4	- 05%
Total Internal Assessment	**- 40%**

Course Code: HSMC 301 **Course Name:** Human Psychology

Course Credit Hour:3Hr **Total Contact Hour:**20hr

Course Objective:

- The student will acquire knowledge of human psychology including workplace environment, Motivation and perception.

Course Description:

- This course introduces the fundamental of human psychology includes important insights about motivation, leadership, perception and work environment.

Course Contents:

Unit 1:Introduction to Psychology(5 lectures)

Definitions & Scope. Types and branches of psychology Major influence on Psychology- Scientific Management and Human relations -Hawthorne Experiments. Taylor Principles, Implications of Psychology on Modern Industries and behavior

Unit 2: Individual at workplace (5lectures)

Attention and Perception, Individual at Workplace-Attitude, Motivation and Job satisfaction. Stress management. Leadership and Group dynamics.

Unit 3:Work Environment & Engineering Psychology-(5 lectures)

Engineering psychology: fatigue, Monotony, Boredom. Accidentsand Safety. Emotional and social development, Cognitive development. Consumer behavior analysis.

Unit 4:Job Analysis (5 lectures)

Job Analysis, Recruitment, Selection and Interview– Reliability & Validity of recruitment tests. Performance Management: Training & Development, Appraisals.

Course Learning Outcomes (CLOs):

CLO-1: Develop the basic concept of human psychology.

CLO-2: Inculcate leadership and motivational skills.

CLO-3: To understand consumer behavior and emotional development.

CLO-4:To understand about job recruitment process and interviews methods.

Text books:

(i) Aamodt, M.G. (2007) Human/Organizational Psychology: An Applied Approach (5th edition) Wadsworth/Thompson: Belmont, C.A.
(ii) Aswathappa K. (2008). Human Resource Management (fifth edition) New Delhi: Tata McGraw Hill.

Reference books:

(i) Miner J.B. (1992) Organizational Psychology. N Y: McGraw Hill.
(ii) Blum & Naylor (1982) Industrial Psychology. Its Theoretical & Social Foundations CBS Publication.

Assessment method:(Continuous Internal Assessment = 40%, Final Examination = 60%)

Assignment -1	- 05%
Assignment -2	- 05%

Assessment-3(Mid-Exam)	- 20%
Assignment-3/Quiz-1	- 05%
Assignment-4	- 05%
Total Internal Assessment	**- 40%**

ESC301P	Analog Electronic Circuits Lab	0L:0T:4P	2 credits

List of Experiments

1. To study the characteristics of P-N junction diode.
2. To study a half wave and full wave rectifier circuit.
3. To study the V-I characteristics of zener diode
4. To study the zener diode as constant voltage regulator.
5. Determine the input output characteristics of BJT in CB, and CE configuration.
6. Determine the input output characteristics of FET in CS & CD configuration.
7. To study of BJT as single stage amplifier and determination of Ai, Av, Ri, Ro.
8. To study the opamp as an inverting & non-inverting amplifier.
9. To use the opamp as an adder, subtractor, integrator & differentiator.
10. To design a ramp and a square wave generator.
11. To study of (i) Wein bridge oscillator (ii) Phase shift oscillator.
12. To design low pass, high pass and band pass filters using op-amp and plot their frequency response.

ESC302P	Digital Electronics Lab	0L:0T:4P	2 credits

LIST OF EXPERIMENTS

1. Verification of NAND, NOR, Ex-OR,AND& OR Gates.
2. Implementation of half Adder & Full Adder
3. Implementation of half Subtractor & Full Subtractor.
4. Implementation of Demultiplexer / Decoder operation using IC-74138.
5. Implementation of Seven segment display.
6. Implementation of Binary to gray converter.
7. Implementation of Arithmetic algorithms.
8. Implementation of various flip-flops.
9. Implementation of Counters.
10. Implementation of shift register.
11. Verification of Transfer characteristics of TTL inverters & TTL Schmitt Trigger inverter.

PCC-CS301P	Data Structure & Algorithms	0L:0T: 4P	2 credits

LIST OF EXPERIMENTS

Write programs in C for following:

1. Write a program to demonstrating Linear Search
2. Write a program to demonstrating Binary Search
3. Write a program to demonstrating Bubble Sort
4. Write a program to demonstrating Selection Sort
5. Write a program to demonstrating Insertion Sort
6. Write a program to demonstrating Merge Sort
7. Write a program to demonstrating Quick Sort
8. Write a program to demonstrating all operations on String without using standard library file
9. Write a program to demonstrating Single Linked List
10. Write a program to demonstrating Stack operations using array/Linked List
11. Write a program to demonstrating Queue operations using Linked list/Array
12. Program for demonstrating Binary Search Tree Using Linked List/Array

PCC-CS302P	IT Workshop Lab	0L:0T: 4P	2 credit

LIST OF EXPERIMENTS

1. Write a Program in M File to find the roots of a Quadratic Equation.
2. Consider the Matrix A=

$$\begin{bmatrix} 1 & 2 & 3 & 5 & 4 \\ 4 & 5 & 6 & 1 & 3 \\ 7 & 8 & 9 & 2 & 2 \end{bmatrix}$$

Write a MATLAB Code to obtain the following matrix

$$\begin{bmatrix} 7 & 8 & 2 & 2 \\ 4 & 5 & 1 & 3 \\ 1 & 2 & 5 & 4 \end{bmatrix}$$

3. W.A.P in MATLAB to solve the following linear equation:

$3x^4 + x^3 + 6x^2 + x + 4 = 0$

$x^4 + 3x^3 + 2x^2 + 41 = 0$

4. W.A.P to plot the following two functions for 30 Data Points from 0 to 2π by using Plot Command.
5. W.A.P to display the AND,OR & NOT Program
6. W.A.P. in MATLAB to convert Centigrade values to Fahrenheit values. The Values of the the temp in Centigrade will be taken as input from the user.
7. W.A.P to create a recursive function to find the factorial of a number.
8. W.A.P in MATLAB to show the use of the following operators
   (i) All operator (ii) any operator
9. Create a MATLAB Code to create the chessboard on a white background.
10. W.A.P in MATLAB to make a ribbon plot of the following function

    Z = 20 + Cos (0.5 * x) + 20 * Sin(0.5 * y)

Course Code: PCC-CS401 **Course Name:** Computer Based Numerical & Statistical Techniques

Course Credit Hour: 3hr **Total Contact Hour:**40hrs

Course Objective:

A good Engineer has to have an excellent background of Mathematics. Numerical and statistical techniques are one of the essential tools for learning Technology. This course is tofamiliarisethe students with statistical and numerical techniques needed in problem-solving and industrial applications.

Course Description:

This course provides an introduction to numbers and accuracy and wide knowledge of methods for solving transcendental equation, Interpolation, numerical integration and differentiation, solution of differential equation and statistical technique with their applications.

Course Contents:

Unit 1: **(8 hours)**

Introduction: Numbers and their accuracy, Computer Arithmetic, Mathematical preliminaries, Errors and their Computation, General error formula, Error in a series approximation.

Solution of Algebraic and Transcendental Equation: Bisection Method, Iteration method, Method of false position, Newton-Raphsonmethod, Methods of finding complex roots, Muller‟s method, Rate of convergence ofIterative methods, Polynomial Equations.

Unit 2: **(10 hours)**

Interpolation: Finite Differences , Difference tables Polynomial Interpolation:Newton's forward and backward formula Central Difference Formulae: Gauss forwardand backward formula, Stirling‟s, Bessel‟s, Everett‟s formula.Interpolation with unequal intervals: Langrange‟s Interpolation, Newton Divideddifference formula, Hermite‟s Interpolation

Unit 3: **(12 hours)**

Numerical Integration and Differentiation: Introduction, Numerical differentiationNumerical Integration: Trapezoidal rule, Simpson‟s 1/3 and 3/8 rule, Boole‟s rule,Waddle‟s rule.

Solution of differential Equations: Picard‟s Method, Euler‟s Method, Taylor‟sMethod, Runge-Kutta Methods, Predictor Corrector Methods, Automatic Error Monitoringand Stability of solution.

Unit 4: **(10 hours)**

Statistical Computation: Frequency chart, Curve fitting by method of least squares,fitting of straight lines, polynomials, exponential curves etc, Data fitting with Cubicsplines, Regression Analysis, Linear and Non-linear Regression, Multiple regression,Statistical Quality Control methods.

Course Learning Outcomes (CLOs):

CLO-1: Recognize the error in the number generated by the solution.

CO2. Compute solution of algebraic and transcendental equation by numerical methods.

CLO-3: Apply method of interpolation and extrapolation for prediction.

CLO-4:Evaluation of numerical differentiation and integration.

CLO-5: To find solution of differential equation.

CLO-6: Computation of statistical technique.

Text books:

1. Grewal B S, "Numerical methods in Engineering and Science", Khanna Publishers, Delhi.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,

Reference books:

(i) Numerical Method Principles, analysis and algorithms ,Srimamta Pal (Oxford Higher ed).
(ii) Rajaraman V, "Computer Oriented Numerical Methods", PHI, 3rd edition.

Online links for study & reference materials:

https://nptel.ac.in/courses/122/106/122106033/

Assessment method:(Continuous Internal Assessment = 40%, Final Examination = 60%)

Assignment -1	- 04%
Assignment -2	- 04%
Assessment-3(Mid-Exam)	- 20%
Assignment-3	- 04%
Assignment-4	- 04%
Assignment-5	- 04%
Total Internal Assessment	**- 40%**

Course Code: PCC-CS402 **Course Name:** Computer Organization & Architecture

Course Credit Hour: 3hr **Total Contact Hour:** 42hr

Course Objective:

- How Computer Systems work & the basicprinciples
- Instruction Level Architecture and InstructionExecution
- The current state of art in memory systemdesign
- How I/O devices are accessed and itsprinciples.
- To provide the knowledge on Instruction LevelParallelism
- To impart the knowledge on microprogramming
- Concepts of advanced pipeliningtechniques.

Course Description:

- This course provides students with a solid understanding of fundamental architectural techniques used to build today's high-performance processors and systems.
- Course topics include pipelining, superscalar, out of order execution, multithreading, caches, virtual memory, and multiprocessors.

Course Contents:

Module 1:Functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTLinterpretation ofinstructions, addressing modes, instruction set. Case study – instruction sets of some commonCPUs.
Data representation: signed number representation, fixed and floating point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-andadd, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating pointarithmetic.

Module 2:Introduction to x86 architecture.CPU control unit design: hardwired and microprogrammed design approaches, Case study – design of a simple hypotheticalCPU.Memory system design: semiconductor memory technologies, memory organization. Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers–program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process statetransitions, I/O device interfaces – SCII, USB

Module 3: Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards.Parallel Processors:Introduction to parallel processors, Concurrent access to memory and cachecoherency.

Module 4: Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, writepolicies.

Course learning outcomes:

1. "Computer Organization and Design: The Hardware/Software Interface" , 5th Edition by David A. Patterson and John L. Hennessy,Elsevier.
2. "Computer Organization and EmbeddedSystems" , 6th Editionby CarlHamacher, McGraw Hill HigherEducation.

Suggested reference books:

1. "Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill
2. "Computer Organization and Architecture: Designing for Performance" , 10th Edition by William Stallings, PearsonEducation.
3. "Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, PearsonEducation.

Online links for study & reference materials:

1. NPTEL

Assessment method :(Continuous Internal Assessment = 40% , Final Examination = 60%)

Assessment -1	- 05%
Assessment-2	- 05%
Assessment-3(Midexam)	- 20%
Assessment-3	- 05%
Assessment-4	- 05%
Total Internal Assessment	**- 40%**

Course Code: PCC-CS403 **Course Name:** Operating Systems

Course Credit Hour: 3hr **Total Contact Hour:** 42hr

Course Objective:

- To learn the mechanisms of OS to handle processes and threads and theircommunication
- To learn the mechanisms involved in memory management in contemporaryOS
- To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreementprotocols
- To know the components and management aspects of concurrencymanagement

Course Description:

- Covers the classical internal algorithms and structures of operating systems, including CPU scheduling, memory management, and device management.
- Considers the unifying concept of the operating system as a collection of cooperating sequential processes.
- Covers topics including file systems, virtual memory, disk request scheduling, concurrent processes, deadlocks, security, and integrity.

Course Contents:

Module 1: Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS - Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine. Case study on UNIX and WINDOWS OperatingSystem.

Module 2: Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching

Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads,

Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.

Module 3: Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer/Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problemetc.

Module 4: Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detectionandRecovery.

Module 5: Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation–Fixed and variable partition–Internal and External fragmentation and Compaction; Paging: Principle of operation – Pageallocation– Hardware support for paging, Protection and sharing, Disadvantages ofpaging.

Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault , Working Set , Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used(LRU).

Module 6:I/O Hardware: I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software, Secondary-Storage Structure: Disk structure, Disk scheduling algorithms

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency andperformance.

Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks

Course learning outcomes:

1. Create processes andthreads.
2. Develop algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, ResponseTime.
3. For a givenspecification of memory organizationdevelopthe techniques for optimally allocating memory to processes by increasing memory utilization and for improving the accesstime.Design and implement file managementsystem.
4. For a given I/O devices and OS (specify) develop the I/O management functions in OS as part of a uniform device abstraction by performing operations for synchronization between CPU and I/Ocontrollers.

Suggested books:

1. Operating System Concepts Essentials, 9th Edition by AviSilberschatz, Peter Galvin, Greg Gagne, Wiley Asia StudentEdition.
2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall ofIndia.

Suggested reference books:

1. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing
2. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt,Addison-Wesley
3. Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall ofIndia
4. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly andAssociates

Online links for study & reference materials:

1. NPTEL

Assessment method :(Continuous Internal Assessment = 40% , Final Examination = 60%)

Assessment -1	- 05%
Assessment-2	- 05%
Assessment-3(Midexam)	- 20%
Assessment-3	- 05%
Assessment-4	- 05%
Total Internal Assessment	**- 40%**

Course Code: PCC CS404 **Course Name :** Design & Analysis of Algorithm

Course Credit Hour: 3hr **Total Contact Hour :** 42hr

Course Objective:

- Analyze the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

Course Description :

Algorithms are the soul of computing. It can be roughly described as creating "recipes" (well defined sequences of computational steps) for getting "things" (computational problems specifying an input-output relation) "successfully" (correctly) "done" (in finite steps and time). This course introduces basic methods for the design and analysis of efficient algorithms emphasizing methods useful in practice. Different algorithms for a given computational task are presented and their relative merits evaluated based on performance measures. The following important computational problems will be discussed: sorting, searching, elements of dynamic programming and greedy algorithms, advanced data structures, graph algorithms (shortest path, spanning trees, tree traversals), string matching, elements of computational geometry, NP completeness.

Course Contents :

Module 1:
Introduction: Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem.

Module 2:
Fundamental Algorithmic Strategies: Brute-Force, Greedy, Dynamic Programming, Branch- and-Bound and Backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving , Bin Packing, Knap Sack TSP. Heuristics – characteristics and their application domains.

Module 3:
Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm.

Module 4:
Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques.

Module 5:
Advanced Topics: Approximation algorithms, Randomized algorithms, Class of problems beyond NP – PSPAC

Course Learning Outcomes (CLOs):

CLO-1: For a given algorithms analyze worst-case running times of algorithms based on asymptotic analysis and justify the correctness of algorithms.

CLO-2: Describe the greedy paradigm and explain when an algorithmic design situation calls for it. For a given problem develop the greedy algorithms.

CLO-3: Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Synthesize divide-and-conquer algorithms. Derive and solve recurrence relation.

CLO-4: Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it.

CLO-5: Develop the dynamic programming algorithms, and analyze it to determine its computational complexity.

CLO-6: For a given model engineering problem model it using graph and write the corresponding algorithm to solve the problems.

CLO-7: Explain the ways to analyze randomized algorithms (expected running time, probability of

error).

CLO-8: Explain what an approximation algorithm is. Compute the approximation factor of an approximation algorithm (PTAS and FPTAS).

Text books :

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, Introduction to Algorithms, 4TH Edition, MITPress/McGraw-Hill, 9780262032933, 0262032937
2. E. Horowitz etal. , Sartaj Sahni, Fundamentals of Algorithms , Computer Science Press 9783540120353, 3540120351

Reference books :

1. Jon Kleinberg and ÉvaTardos, Algorithm Design, 1ST Edition, Pearson, 9788131703106, 813170310X
2. Michael T Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Wiley, 9780471427568, 047142756X

Online links for study & reference materials:

https://lecturenotes.in/subject/12/design-and-analysis-of-algorithm-daa/note

Assessment method : (Continuous Internal Assessment = 40% , Final Examination = 60%)

Assessment -1	- 05%
Assessment-2	- 05%
Assessment-3(Mid exam)	- 20%
Assessment-3	- 05%
Assessment-4	- 05%
Total Internal Assessment	**- 40%**

Course Code: HSMC 401 **Course Name:** Human Values

Course Credit Hour:3Hr **Total Contact Hour:** 30hr

Course Objective:

- Development of a holistic perspective based on self- exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

Course Description:

- This course introduces the fundamental ofhuman values. It includes important insights about self-exploration, right conduct, ethics and harmony.

Course Contents:

Unit 1:Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I.

2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration.

3. Continuous Happiness and Prosperity- A look at basic Human Aspirations

4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority.

5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario

6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Unit 2: Understanding Harmony in the Human Being - Harmony in Myself!

1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'.

2. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility.

3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer).

4. Understanding the characteristics and activities of 'I' and harmony in 'I'.

5. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail.

6. Programs to ensure Sanyam and Health.

Unit 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

1.Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
2.Understanding the meaning of Trust; Difference between intention and competence
3.Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
4.Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
5. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

Unit 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

1. Understanding the harmony in the Nature

2. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature. 3.Understanding Existence as Co-existence of mutually interacting units in all-pervasive space.

4.Holistic perception of harmony at all levels of existence.

Unit 5 : Implications of the above Holistic Understanding of Harmony on Professional Ethics

1.Natural acceptance of human values

2. Definitiveness of Ethical Human Conduct

3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

4. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

5. Case studies of typical holistic technologies, management models and production systems

Course Learning Outcomes (CLOs):

CLO-1: Develop the basic concept of human values

CLO-2: To understand the importance of self-exploration process

CLO-3: To understand harmony at individual levels

CLO-4: To understand harmony at nature level

CLO-5: Develop professional ethics

Textbooks:

(i) Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010 Reference Books 1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
(ii) Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

Reference books:

1.Human Values and Professional Ethics: Values and Ethics of Profession, Jay Shree Suresh and B.S Bahgvan, S.Chand

Assessment method:(Continuous Internal Assessment = 40%, Final Examination = 60%)

Assignment -1	- 05%
Assignment -2	- 05%
Assessment-3(Mid-Exam)	- 20%
Assignment-3/Quiz-1	- 05%
Assignment-4	- 05%
Total Internal Assessment	**- 40%**

Course Code: BSC-401 **Course Name:** Biology
Course Credit: 3 **Total Contact Hour:** 33hr

Course Objective:

- ✓ To increase the understanding of living systems.
- ✓ To convey that Biology is as important a scientific discipline as Mathematics, Physics andChemistry.
- ✓ To understand the Hierarchy of life forms at phenomenological level.
- ✓ To convey that "Genetics is to biology what Newton's laws are to Physical Sciences"Mendel's laws, Concept of segregation and independent assortment.
- ✓ To learn the systems in relationship to the self and other organisms in the natural environment.
- ✓ To analyze biological processes at the reductionistic levelProteins- structure and function.
- ✓ To know and learn the fundamental principles of energy transactions.

Course Description:

This course explains the fundamental biological processes of metabolism, homeostasis, reproduction, development, and genetics, and the relationships between form and function of biological structures at the molecular, cellular, organismal and populationlevels of the biological hierarchy.

Course Content:

Module 1. (2 hours)- Introduction
Purpose: To convey that Biology is as important a scientific discipline as Mathematics, Physics andChemistryBring out the fundamental differences between science and engineering by drawing a comparisonbetween eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as anindependent scientific discipline. Why we need to study biology? Discuss how biological observationsof 18th Century that lead to major discoveries. Examples from Brownian motion and the origin ofthermodynamics by referring to the original observation of Robert Brown and Julius Mayor. Theseexamples will highlight the fundamental importance of observations in any scientific inquiry.

Module 2. (3 hours)- Classification
Purpose: To convey that classification per se is not what biology is all about. The underlyingcriterion, such as morphological, biochemical or ecological be highlighted. Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchyClassification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b)ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilization -Autotrophs,heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricoteliec, ureotelic (e) Habitataaquaticor terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism cancome under different category based on classification. Model organisms for the study of biologycome from different groups. E. coli, S.cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M.musculus.

Module 3. (4 hours)-Genetics
Purpose: To convey that "Genetics is to biology what Newton's laws are to Physical Sciences"Mendel's laws, Concept of segregation and independent assortment. Concept of allele. Genemapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasisto be give not to the mechanics of cell division nor the phases but how genetic material passes fromparent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype togenes. Discuss about the single gene disorders in humans. Discuss the concept of complementationusing human genetics.

Module 4. (4 hours)-Biomolecules
Purpose: To convey that all forms of life has the same building blocks and yet the manifestations areas diverse as one can imagineMolecules of life. In this context discuss monomeric units and polymeric structures. Discuss aboutsugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbonunits and lipids.

Module 5. (4 Hours). Enzymes
Purpose: To convey that without catalysis life would not have existed on earthEnzymology: How to monitor enzyme catalyzed reactions. How does an enzyme catalyzereactions?Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzymekinetics and kinetic parameters. Why should we know these parameters to understand biology? RNAcatalysis.

Module 6. (4 hours)- Information Transfer
Purpose: The molecular basis of coding and decoding genetic information is universalMolecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structurefromsingle stranded to double helix to nucleosomes. Concept of genetic code. Universality anddegeneracy of genetic code. Define gene in terms of complementation and recombination.

Module 7. (5 hours). Macromolecular analysis
Purpose: How to analyses biological processes at the reductionistic levelProteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary andquaternary structure. Proteins as enzymes, transporters, receptors and structural elements.

Module 8. (4 hours)- Metabolism
Purpose: The fundamental principles of energy transactions are the same in physical and biologicalworld.Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonicand exergonic reactions. Concept of Keq and its relation to standard free energy. Spontaneity. ATP asan energy currency. This should include the breakdown of glucose to CO2 + H2O (Glycolysis andKrebs cycle) and synthesis of glucose from CO2 and H2O (Photosynthesis). Energy yielding andenergy consuming reactions. Concept of Energy charge.

Module 9. (3 hours)- Microbiology
Concept of single celled organisms. Concept of species and strains. Identification and classificationof microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization andmedia compositions. Growth kinetics.

Course Learning Outcomes(CLOs):

At the end of this course students will learn:

- The major types of molecules that make up living organisms and how these molecules enable life functions.
- The structures found in cells and the functions of those sub-cellular structures.
- The processes by which cells replicate to produce genetically identical, or genetically variable, daughter cells.
- The roles carbohydrates play in biological systems
- The structure and function of proteins
- Nucleic acids and the role they play in DNA and RNA
- Thermodynamics as applied to biological systems
- Identification and classificationof microorganisms.

Text / References:

1. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, “Biology: A global approach”,Pearson Education Ltd, 2014.
2. E. E. Conn, P. K. Stumpf, G. Bruening and R. H. Doi, “Outlines of Biochemistry”, John Wiley andSons, 2009.
3. D. L. Nelson and M. M. Cox, “Principles of Biochemistry”, W.H. Freeman and Company, 2012.
4. G. S. Stent and R. Calendar, “Molecular Genetics”, Freeman and company, 1978.
5. L. M. Prescott, J. P. Harley and C. A. Klein, “Microbiology”, McGraw Hill Higher Education, 2005.

Assessment method: (Continuous Internal Assessment = 40%, Final Examination = 60%)

Assessment -1	- 05%
Assessment-2	- 05%
Assessment-3(Mid-exam)	- 20%
Assessment-3	- 05%
Assessment-4	- 05%
Total Internal Assessment	**- 40%**

PCC-CS402P	Computer Organization &Architecture Lab	0L:0T:4P	2 Credits

List of Experiments

1. To study Half Adder.
2. To study Full Adder (7483).
3. To study ALU (74181).
4. Write a program for hexadecimal addition and multiplication.
5. Write a program for binary multiplication.
6. Write a program for Booth's multiplication.
7. Write programs to simulate memory allocation policies
    a. First-fit algorithm
    b. Best-fit algorithm
8. Write programs to simulate the mapping techniques of Cache memory.
    a. Direct Mapped cache
    b. 2 Associative Mapped cache
    c. Set Associative Mapped cache
9. Write a program to implement stack and branch instructions.
10. Design of 4-bit Universal Shift Registers using D-FF.

PCC-CS403P	Operating Systems Lab	0L:0T:4P	2 Credits

List of Experiments

1. Write a program to implement CPU scheduling for first come first serve.
2. Write a program to implement CPU scheduling for shortest job first.
3. Write a program to perform priority scheduling.
4. Write a program to implement CPU scheduling for Round Robin.
5. Write a program for page replacement policy using a) LRU b) FIFO c) Optimal.
6. Write a program to implement first fit, best fit and worst fit algorithm for memory management.
7. Write a program to implement reader/writer problem using semaphore.
8. Write a program to implement Banker's algorithm for deadlock avoidance.

PCC-CS404P	Design and Analysis of Algorithms Lab	0L:0T:4P	2 Credits

List of Experiments

1. Write a Program to implement Insertion sort.
2. Write a Program to implement Binary Search using Divide and Conquer.
3. Write a Program to implement Quicksort.
4. Write a Program to implement shortest path algorithm.
5. Write a Program to implement Merge sort using Divide and Conquer.
6. Write a Program to implement Knapsack problem using Greedy method.
7. Write a Program to implement Prim's algorithm using Greedy method.
8. Write a Program to implement Kruskal's algorithm using Greedy method.
9. Write a Program to implement Graph Traversal: Breadth First Traversal.
10. Write a Program to implement Graph Traversal: Depth First Traversal.
11. Write a Program to implement 8-Queen's problem using Backtracking.
12. Write a Program to implement All Pairs Shortest Path Using Dynamic Programming.