ANNEXURE II – B

Department of Information Technology
Central University of Kashmir

B.Tech. CSE

Semester IV			
S. No.	**Course Code**	**Course Title**	**Credits**
1	BT 401	Mathematics IV (Probability and Statistics)	4
2	BTCS 408	Design and Analysis of Algorithms	4
3	BTCS 403	Discrete Structures	4
4	BTCS 404	Digital Electronics & Logic Design	4
5	BTCS 406 L	Digital Electronics & Logic Design Lab	2
6	BT 407	Economics for Engineers	2
		Total	**20**

Central University of Kashmir				
Course Title	Mathematics (Probability and Statistics)	**Course Code**	BT 401	
Degree	B.Tech.CSE	**Branch**	Computer Science &Engg.	
Course Type	Theory	**Department**	Information Technology	
Credits	04	**L**	**T**	**P**
Semester	4^{th}	4	0	0

Course Outline / Content

Unit	Topics	Week
1.	Probability and Statistics: Measures of Central Tendency: Mean, Median, Mode, Dispersion: Range, Standard Deviation; Probability: Definition, Motivation, Probability Models, Probability Rules, Sample Space having equally likely outcomes, Conditional Probability; Baye's Theorem; Independent Events.	4
2.	Random Variable; Discrete Random Variable, Distribution Function, Probability Mass Function, Poisson and Binomial Distributions, Continues Random Variables, Probability Density Function , Uniform and Normal Distributions.	4
3.	Correlation, coefficient of correlation, Linear Regression, regression coefficient, Method of Least Squares, Introduction to Sampling and Sampling Distribution, Standard Error, sampling distribution of the Mean (known) Sampling Distribution of the mean (unknown) – The sampling distribution of the variance.	4
4.	Hypothesis: Tests of Hypotheses, Null Hypotheses and Alternate Hypothesis, Critical Region, Type I and Type II Errors,, Significance tests ,Level of Significance, Z-test and , $\chi 2$—Test of Goodness of Fit .	4

References

1.	Miller and Fread, "Probability and statistics for engineers – Richard A Johnson" Pearson Education Asia / PHI.
2.	Ross, S.M, "Probabilty and Statics for Engineers and Scientists", 4th Edition, Elsevier.
3.	S.C.Gupta & V.K.Kapoor, "Fundamentals of Mathematical Statistics" Sultan & Sons, Eastern Economy Edition.
4.	Kishor S. Trivedi , "Probability And Statistics With Reliability, Queuing With Reliability, Queuing And Computer Science Application", PHI.

Central University of Kashmir				
Course Title	Design and Analysis of Algorithms	**Course Code**	BTCS 408	
Degree	B.Tech.CSE	**Branch**	Computer Science & Engg.	
Course Type	Theory	**Department**	Information Technology	
Credits	4	**L**	**T**	**P**
Semester	4th	4	0	0

Course Objectives

- 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.

Learning Outcomes

- For a given algorithms analyze worst-case running times of algorithms based on asymptotic analysis and justify the correctness of algorithms using Divide and Conquer.
- Describe the greedy paradigm and explain when an algorithmic design situation calls for it. For a given problem develop the greedy algorithms.
- 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.
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. For a given problems of dynamic-programming and develop the dynamic programming algorithms, and analyze it to determine its computational complexity.
- For a given model engineering problem model it using graph and write the corresponding algorithm to solve the problems.
- Explain the ways to analyze randomized algorithms (expected running time, probability of error).
- Explain what an approximation algorithm is. Compute the approximation factor of an approximation algorithm.

Course Synopsis

The course is divided into four units giving the insight of algorithm concepts which are

Introduction and Divide & Conquer techniques.
Greedy Methods and Dynamic Programming.
Graph Searching and Traversal and Back Tracking.
Branch & Bound and Computational complexity.

Course Outline / Content

Unit	Topics	Week
1.	Introduction: Algorithm Design paradigms- motivation, concept of algorithmic efficiency, run time analysis of algorithms, Asymptomatic Notations. Divide & Conquer: Structure of divide and conquer algorithms: examples, Binary search, Quick sort, analysis of divide and conquer run time recurrence relations.	6
2.	Greedy method: Overview of the greedy paradigm, examples of exact optimization solution (minimum cost spanning tree), approximate solution (Knapsack problem), single source shortest paths .Dynamic	4

	Programming: Overview, difference between dynamic programming and divide and conquer, applications: shortest path in graph, matrix multiplication, travelling salesman problem, longest common sequence.	
3.	Graph searching and traversal: Overview, traversal methods, depth first and breadth first search. Back Tracking: Overview, 8-queen problem and Knapsack problem.	4
4.	Branch & Bound: LC searching, bounding, FIFO branch and bound, Applications: 0/1 Knapsack problem, Travelling salesman problem. Computational complexity: Complexity measures, Polynomial vs Non-Polynomial time complexity; NP hard and NP complete classes, examples.	4
Text Books		
1.	Ellis Horowitz and Sartaz Sahani, "Computer Algorithms", Galgotia Publications.	
2.	Narasimha Karumanchi, "Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles" Careermonk Publications; 5th ed. Edition	
References		
1.	T. H. Cormen, C. E. Leiserson, R. L. Rivest, Clifford Stein, "Introduction to Algorithms", 2nd Ed., PHI.	
2.	V. Aho, J. E. Hopcroft, J. D. Ullman, "The Design and Analysis of Computer Algorithms", Addition Wesley.	
3.	D. E. Knuth, "The Art of Computer Programming", 2nd Ed., Addison Wesley.	
4.	Algorithm Design, 1ST Edition, Jon Kleinberg and ÉvaTardos, Pearson.	

Central University of Kashmir				
Course Title	Discrete Structures	**Course Code**	BTCS 403	
Degree	B.Tech.CSE	**Branch**	Computer Science & Engg.	
Course Type	Theory	**Department**	Information Technology	
Credits	4	**L**	**T**	**P**
Semester	4th	4	0	0

Course Objectives

1. Understand the applicability of basic discrete structures in various filed of computer science.
2. Understand the concepts of graph theory, Lattices, Group theory, Set theory and Boolean algebra for analysis of various computer science applications.

Learning Outcomes

1. Apply concept of Predicate Calculus in computer science like design of computing machines, artificial intelligence, definition of data structures for programming languages etc.

2. Apply the knowledge of Boolean algebra in computer science for its wide applicability in switching theory, building basic electronic circuits and design of digital computers.

3. Apply abstract concepts of graph theory and Group theory in modelling and solving non-trivial problems in different field of study.

Course Synopsis

1. Construct mathematical arguments using logical connectives and quantifiers.

2. Verify the correctness of an argument using laws of propositional and predicate logic and truth tables.
3. Standard forms of representation of Boolean function.
4. Minimization of Boolean expressions for construction of efficient circuits.

5. Use graphs and trees as tools to visualize and simplify situations.

6. Perform operations on discrete structures such as sets, functions, relations, and sequences.

7. Understand the application of various type of graphs in real life problem.

8. Understand the concepts of group theory, Lattices for analysis of various computer science applications.

Course Outline / Content		
Unit	**Topics**	**Week**
1.	Unit 1: Propositional Calculus Statements, Basic operations, Truth value of compound statements, Algebra of Propositions, Tautologies and contradiction, Conditional and Bi-conditional statements, logical implications, logical equivalence, predicates, Universal and existential quantifiers. Logic gates, Boolean Algebra, Postulates of Boolean Algebra; Theorems of Boolean Algebra, Sum of products and product of sums Simplification, NAND and NOR implementation	3
2.	Graph Theory Fundamental concepts (basic definitions, operations, properties); Trees (properties, distances and centroids, spanning trees, enumeration); Matchings (bipartite graphs, general graphs, weighted matching); Connectivity (vertex and edge connectivity, cuts, blocks, k-connected graphs, network flows); Traversibility (Eulerian tours, Hamiltonian cycles); Coloring (vertex and edge coloring, chromatic number); Planarity (duality, Euler's formula, characterization, 4-color theorem).	3
3.	Sets: Introduction, Set notations and description, sub-sets, Basis set operations, Venn diagrams, Combination of sets, Finite and infinite sets , Uncountable infinite sets, Mathematical induction, Principle of inclusion and exclusion. Relations: Definition, Properties of binary relations, Equivalence relations and partitions, Partial ordering relations. Hasse Diagrams.	3
4.	Group Theory Groups, semi group, infinite group, Finite group, order of a group, Abelian group, subgroup, Necessary and sufficient condition for a subset to be a subgroup of a group	3
Text Books		
1.	Kenneth H. Rosen : Discrete Mathematics and its applications,5th Ed. Tata McGraw Hill (2003	
2.	J L Mott, A Kandel, T P Baker, Discrete Mathematics for Computer Scientists & Mathematicians, Prentice-Hall of India.	
References		
1.	C. L. Liu, Elements of Discrete Mathematics, McGraw Hill International Editions. 5. K. D. Joshi, Foundations of Discrete Mathematics, Wiley Eastern Ltd.	
2.	K.R Parthasarty : basic Graph Theory, Tata Mc-Graw Hill	
3.	B. Kolman and R.C. Busby: Discrete mathematical structures for computer science Prantice Hall, New-Delhi	

Central University of Kashmir				
Course Title	Digital Electronics and Logic Design	**Course Code**	BTCS404	
Degree	B.Tech.CSE	**Branch**	Computer Science &Engg.	
Course Type	Theory	**Department**	Information Technology	
Credits	04	**L**	**T**	**P**
Semester	4th	04	0	0

Course Objectives

- Understanding the basics of Digital Electronics and different number systems and conversion between them.
- Design and construction of the basic and universal logic gates.
- Studying the Boolean algebra and simplification of Boolean expression using different methods.
- Study and construction of sequential logic circuits, understanding various design of flip flops.
- Studying the programmable logic devices, shift registers, counters and various memory devices.

Learning Outcomes

- Optimize logical equations using reduction techniques
- Design different types of code convertors
- Construct Combinational and Sequential circuits
- Validate the internal structure of combinational circuits
- Develop applications of sequential circuits
- Describe Programmable Logic Devices

Course Synopsis

The Course includes the Binary Systems, Boolean algebra & Logic Gates, Simplification of Boolean Functions,Combinational Logic, Sequential Logic, Registers, Counters, Data Converters .

Course Outline / Content

Unit	Topics	Week
1.	Review of number systems, BCD, Excess-3, Gray and Alphanumeric codes. Review of Booleanalgebra, De-Morgan's Theorems, Standard Forms of Boolean Expressions,Don't care conditions,Minimization-Techniques:K-MAPS, Q-M (Tabulation) method.	04
2.	Combinational Logic Circuits: Problem formulation and design of Basic Combinational LogicCircuits, Combinational Logic Using Universal Gates. Basic Adders, ALU, Parity-Checkers andGenerators, Comparators, Decoders, Encoders, Code Converters, Multiplexer (Data Selector), Demultiplexers	04
3.	Sequential Circuits: Latches, Flip-flops (SR, JK, T, D, Master/Slave FF,) Edge-Triggered Flip-Flops,Flip-Flop Operating Characteristics, Basic Flip-Flop Applications, Asynchronous Counter Operation,Synchronous Counter Operation, Up/Down Synchronous Counters.	04

4.	Shift registers & Memories, Shift Register Functions, Serial In - Serial Out Shift Registers, Serial In -Parallel Out Shift Registers, Parallel In - Serial Out Shift Registers, Parallel In - Parallel Out ShiftRegisters, Bidirectional Shift Registers.Basics of Semiconductor Memories, Random-Access Memories (RAM),Read Only Memories(ROMs).	04
Text Books		
1.	Morris Mano, Digital Logic Design, TMH	
2.	Kumar Anand, Digital Logic Design, PHI.	
References		
1.	Thomas L. F., Digital Fundamentals, Prentice Hall, Inc, 4th Edition 1997	
2.	Tocci R. J. &Widner, Digital Systems: Principles and Applications, PHI.	
3.	Gothman, Fundamentals of Digital Electronics, PHI.	

Central University of Kashmir				
Course Title	Digital Electronics &Logic Design Lab	**Course Code**	BTCS 406 L	
Degree	B.Tech.CSE	**Branch**	Computer Science &Engg.	
Course Type	Laboratory	**Department**	Information Technology	
Credits	2	**L**	**T**	**P**
Semester	4th	0	0	2

Course Objectives

1. To understand the basic of Digital Electronic concepts required in analysis and design of digital electronic circuits and systems.
2. To understand the implementation of Boolean expression via different components.
3. To understand Construction and operation of various digital circuits such as Adder, Subtractor, Multiplexer, Demultiplexer, Decoder, Encoder, Flip-flops, Counters, Registers and memory devices.
4. To evolve the capability in student so that he/she will be able to simplify, Analyse and design the Various Digital Electronic Circuits.

Learning Outcomes

1. Apply knowledge of Boolean algebra and other minimization techniques for digital circuit design.
2. Identify, formulate and solve a problem based on combinational and sequential circuits.
3. Select the appropriate hardware and software tools for combinational and sequential circuit design.
4. Design and analyze combinational and sequential circuits for various practical problems using basic gates and flip flops.

Course Synopsis

1.Verify the truth tables of various Digital Logic Gates.
2. Verify the application of NAND and NOR logic gates as universal gates.
3. Implementation of Boolean Logic Functions using logic gate ICs.
4. Measure digital logic gate specifications such as propagation delay, noise margin, fan in and fan out.
5. Implement various combinational logic circuits such as adder, subtractor, decoder, encoder, multiplexers, demultiplexer, etc.
6. Implementation of Boolean logic function and Logic of Gates by means of Mux.
7. Implement various sequential logic circuits such as flip-flops, counters and registers.

Course Outline / Content	
S.no	**Lab**
1.	Implementation of the logic of a. OR gate b. AND gate c. Not d. NAND gate e. NOR gate f. Ex-OR g .Ex-Nor
2	Realisation of NAND and NOR as universal Gates.
3	To simplify the given expression and to realize it using Basic gates and Universal gates.
4	To realize a. Half Adder and Full Adder b. Half Subtractor and Full Subtractor.
5	To design and set up a Multiplexer (MUX) , Demultiplexer (DE-MUX).
6	To realise the logic of gates and the given Boolean expression via Mux.
7.	Truth Table verification of 1) RS Flip Flop 2) T type Flip Flop. 3) D type Flip Flop. 4) JK Flip Flop.
8.	Implementation of Synchronous, asynchronous counters and Modulo-Counters.
Text Books	
1.	Morris Mano, Digital Logic Design, TMH.
2.	Kumar Anand, Digital Logic Design, PHI.
References	
1.	Thomas L. F., Digital Fundamentals, Prentice Hall, Inc, 4th Edition 1997. Gothman,
2.	Tocci R. J. &Widner, Digital Systems: Principles and Applications, PHI.
3.	Fundamentals of Digital Electronics, PHI.
	Simulation Tools
1	PSpices and NGSpice
2	Xcircuit

Central University of Kashmir				
Course Title	Economics for Engineers	**Course Code**	BT 407	
Degree	B.Tech.CSE	**Branch**	Computer Science &Engg.	
Course Type	Theory	**Department**	Information Technology	
Credits	02	**L**	**T**	**P**
Semester	4th	02	0	0

Course Outline / Content

Unit	Topics	Week
1.	Utility analysis –Concept of demand and law of demand; Cardinal Utility, Law of diminishing marginal utility; Ordinal utility— assumptions, Indifference curves and their properties, Marginal rate of substitution, Budget line, Consumer's equilibrium using Indifference curves; Elasticity of Demand—Price, income and cross elasticity.	
2.	National income-concept and related aggregates, measurement of national income- income, expenditure and value added method; Circular flow of income and expenditure-two, three and four sector model; Consumption function and its determinants.	
3.	Meaning and scope of public finance; Concept of budget and its types, measures of budget deficit- fiscal deficit, revenue deficit, and primary deficit. Taxation- types of taxes, Impact and incidence of taxation. Meaning and objectives of fiscal policy, Fiscal responsibility and budget management Act; Deficit Financing– meaning, objectives and causes, Effects of deficit financing.	

References

1.	A. Koutsoyiannis, Modern Microeconomics, Second Edition, Macmillan Press, London.
2.	D.N Dwivedi, Microeconomics – Theory and Applications, Pearson Publications.
3.	P.A Samuelson and W. Nordhaus, Economics, 19th Edition, Tata McGraw Hill Publication.
4.	Richard T Froyen, Macroeconomics, 10th Edition, Pearson Education. Delhi.
5.	N. Gregory Mankiw, Macroeconomics, 5th Edition, Macmillan.
6.	D.N Dwivedi, Macroeconomics – Theory and Policies, Pearson Publications.
7.	H. L Bhatia, Public Finance, 29th Edition, Vikas Publication.
8.	R.R Barthwal, Industrial Economics- An Introductory Textbook, New Age Publication.