

**Maulana Abul Kalam Azad University of Technology, West Bengal
(Formerly known as West Bengal University of Technology)
Syllabus for B. Tech in Computer Science and Engineering
(Cyber Security)
(Applicable from the academic session 2022-2023)**

Curriculum Structure

Semester III (Second year)								
Sl No		Type of Course	Code	Course Title	Hours per week			Credits
					L	T	P	
1	THEORY	Engineering Science Course	ESC301	Analog and Digital Electronics	3	0	0	3
2		Professional Core Course	PCC-CS301	Data Structure and Algorithms	3	0	0	3
3		Professional Core Course	PCC-CS302	Computer Organization	3	0	0	3
4		Basic Science Course	BSC-CS301	Discrete Mathematics	2	0	0	2
5		Humanities Social Science including Management Course	HSMC301	Economics for Engineers (Humanities II)	3	0	0	3
6	PRACTICAL	Professional Core Course	PCC-CS391	Data Structure and Algorithms	0	0	4	2
7		Engineering Science Course	ESC391	Analog and Digital Electronics	0	0	4	2
8		Professional Core Course	PCC-CS392	Computer Organization	0	0	4	2
9		Professional Core Course	PCC-CS393	IT Workshop (Python/Matlab/R)	0	0	4	2
TOTAL CREDITS								22

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Semester IV (Second year)								
Sl No		Type of Course	Code	Course Title	Hours per week			Credits
					L	T	P	
1	THEORY	Professional Core Course	PCC-CSY401	Probability and Statistics	3	0	0	3
2		Professional Core Course	PCC-ICB401	Data Communication and Networks	3	0	0	3
3		Professional Core Course	PCC-CS403	Formal Languageand Automata Theory	3	0	0	3
4		Professional Core Course	PCC-CS404	Design and Analysis of Algorithm	3	0	0	3
5		Basic Science Course	BSC401	Biology	2	1	0	3
6		Mandatory Course	MC401	Environmental Science	2	0	0	2
7	PRACTICAL	Professional Core Course	PCC-ICB491	Data Communication and Networks Lab	0	0	4	2
8		Professional Core Course	PCC-CS494	Design and Analysis of Algorithm Lab	0	0	4	2
TOTAL CREDITS								21

(Applicable from the academic session 2022-2023)

Semester V (Third year)								
Sl No		Type of Course	Code *	Course Title	Hours per week			Credits
					L	T	P	
1	THEORY	Professional Core Course	PCCCS501	Cyber Security	3	0	0	3
2		Professional Core Course	PCCCS502	Cyber Law & Cyber Crime	3	0	0	3
3		Professional Core Course	PCCCS503	Operating System	3	0	0	3
4		Professional Core Course	PCCICB502	Object Oriented Programming	3	0	0	3
5		Humanities and Social Sciences including Management	HSMC501	Industrial Management	2	0	0	2
6		Professional Elective	PECICB501 (A/B/C)	Mobile Computing/ Internet Technology/Smart Sensors and IoT	3	0	0	3
7		Mandatory Course	MC-501	Constitution of India / Essence of Indian Knowledge Tradition	2	0	0	0
8	PRACTICAL	Professional Core Course	PCCCS591	System Security Lab	0	0	4	2
9		Professional Core Course	PCCCS592	Operating System Lab	0	0	4	2
10		Professional Core Course	PCCICB593	Object Oriented Programming Lab	0	0	4	2
TOTAL CREDITS								23

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Semester VI (Third year)								
Sl No		Type of Course	Code*	Course Title	Hours per week			Credits
					L	T	P	
1	Theory	Professional Core Course	PCCCS601	Cryptography and Network Security	2	1	0	3
2		Professional Core Course	PCCCS602	Infrastructure Security	3	0	0	3
3		Professional Core Course	PCCCS603	Database Management System	3	0	0	3
4		Professional Elective	PECICB601 (A/B/C /D/E)	Cloud Computing/ Software Engineering/ Ethical Hacking	3	0	0	3
5		Open Elective	OECICB601 (A/B/C)	Human Resource Development and Organizational Behaviour/ Design Thinking/ Economic Policies India	3	0	0	3
6		Project	PROJ-CS601	Research Methodology	2	0	0	2
7	PRACTICAL	Professional CoreCourse	PCCCS691	Network Security Lab	0	0	4	2
8		Professional Elective Course	PCCCS692	Database Management System lab	0	0	4	2
TOTAL CREDITS								21

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Semester VII (Fourth year)								
SINo		Type of Course	Code*	Course Title	Hours per week			Credits
					L	T	P	
1	T H E	Professional Elective Course	PECICB701 (A/B/C)	Digital Forensics/ Information Theory and Coding/ Blockchain Technology	3	0	0	3
		Professional Elective Course	PECICB702 (A/B/C)	AI&ML/ Malware Analysis/ Mobile Application and Services	3	0	0	3
2		Open ElectiveCourse	OECICB701 (A/B/C)	Soft skill and Interpersonal Communication/Bio Informatics/ Business Analytics	3	0	0	3
3								
4		Humanities and Social Sciences including Management	HSMC701	Project Management andEntrepreneurship	2	0	0	2
5		Sessional	PROJICB7 81	Project I	0	0	12	6
TOTAL CREDITS								17

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Semester VIII (Fourth year)								
SlNo		Type of Course	Code*	Course Title	Hours per week			Credits
					L	T	P	
1	T H E C	Professional Elective Course	PECICB801 (A/B)	Information Security Management System (ISMS)/ Distributed System	3	0	0	3
2		Open Elective Course	OECICB801(A/ B /C)	Security Operations Management/ E-commerce and Digital Payment System/Operations Research	3	0	0	3
3		Open Elective Course	OECICB802 (A /B/C)	Management Information System(MIS)/ Multimedia Technology/ Introduction to Arts and Aesthetics	3	0	0	3
4		Sessional-1	PROJICB881	Project II	0	0	12	6
TOTAL CREDITS								15

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					L	T	P	
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2		Professional Core Course	PCC-CS301	Data Structure and Algorithms	3	0	0	3
3		Professional Core Course	PCC-CS302	Computer Organization	3	0	0	3
4		Basic Science Course	BSC-CS301	Discrete Mathematics	2	0	0	2
5		Humanities Social Science including Management Course	HSMC301	Economics for Engineers (Humanities II)	3	0	0	3
6	PRACTICAL	Professional Core Course	PCC-CS391	Data Structure and Algorithms	0	0	4	2
7		Engineering Science Course	ESC391	Analog and Digital Electronics	0	0	4	2
8		Professional Core Course	PCC-CS392	Computer Organization	0	0	4	2
9		Professional Core Course	PCC-CS393	IT Workshop (Python/Matlab/R)	0	0	4	2
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Semester IV (Second year)								
Sl No		Type of Course	Code	Course Title	Hours per week			Credits
					L	T	P	
1	THEORY	Professional Core Course	PCC-CSY401	Probability and Statistics	3	0	0	3
2		Professional Core Course	PCC-ICB401	Data Communication and Networks	3	0	0	3
3		Professional Core Course	PCC-CS403	Formal Languageand Automata Theory	3	0	0	3
4		Professional Core Course	PCC-CS404	Design and Analysis of Algorithm	3	0	0	3
5		Basic Science Course	BSC401	Biology	2	1	0	3
6		Mandatory Course	MC401	Environmental Science	2	0	0	2
7	PRACTICAL	Professional Core Course	PCC-ICB491	Data Communication and Networks Lab	0	0	4	2
8		Professional Core Course	PCC-CS494	Design and Analysis of Algorithm Lab	0	0	4	2
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Semester-III

Name of the Course:	Analog & Digital Electronics		
Course Code: ESC-301	Semester: III		
Duration: 6 months	Maximum Marks: 100		
Teaching Scheme		Examination Scheme	
Theory: 3 hrs./week		Mid Semester exam: 15	
Tutorial: NIL		Assignment and Quiz: 10 marks	
		Attendance: 5 marks	
Practical: hrs./week		End Semester Exam : 70 Marks	
Credit Points:	3		
Objective:			
1	To acquire the basic knowledge of different analog components and their applications		
2	To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.		
3	To prepare students to perform the analysis and design of various digital electronic circuits		
Pre-Requisite:			
1	Basic Electronics Parts I & II learned in the First year, semesters 1 & 2. Basic BJTs,.		
2	Basic concept of the working of P-N diodes, Schottky diodes,		
3	Basic FETs and OPAMP as a basic circuit component. Concept of Feedback		

Unit	Content	Hrs/Unit	Marks/Unit
1	Different Classes of Amplifiers - (Class-A, B, AB and C - basic concepts, power, efficiency; Recapitulation of basic concepts of Feedback and Oscillation, Phase Shift, Wein Bridge oscillators Astable & Monostable Multivibrators; Schmitt Trigger circuits, 555 Timer.	9	

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2	Binary Number System & Boolean Algebra (recapitulation); BCD, ASCII, EBCDIC, Gray codes and their conversions; Signed binary number representation with 1's and 2's complement methods, Binary arithmetic, Venn diagram, Boolean algebra (recapitulation); Representation in SOP and POS forms; Minimization of logic expressions by algebraic method.	11	
	Combinational circuits - Adder and Subtractor circuits (half & full adder & subtractor); Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and Parity Generator		
3	Sequential Circuits - Basic Flip-flop & Latch, Flip-flops -SR, JK, D, T and JK Master-slave Flip Flops, Registers (SISO, SIPO, PIPO, PISO) Ring counter, Johnson counter Basic concept of Synchronous and Asynchronous counters (detail design of circuits excluded), Design of Mod N Counter	10	
4.	A/D and D/A conversion techniques – Basic concepts (D/A :R-2-R only [2L] A/D: successive approximation [2L]) Logic families- TTL, ECL, MOS and CMOS - basic concepts. (2L)	6	

Text book and Reference books:

1. Microelectronics Engineering –Sedra & Smith-Oxford.
2. Analog Electronics, A.K. Maini, Khanna Publishing House (AICTE Recommended -2018)
3. Analog Electronics, L.K. Maheswari, Laxmi Publications (AICTE Recommended -2018)
4. Principles of Electronic Devices & circuits—B L Thereja & Sedha—S Chand
5. Digital Electronics – Kharate – Oxford
6. Digital Electronics – Logic & Systems by J.Bigmeil & R.Donovan; Cambridge Learning.
7. Digital Logic and State Machine Design (3rd Edition) – D.J.Comer, OUP
8. Electronic Devices & Circuit Theory – Boyelstad & Nashelsky - PHI
9. Bell-Linear IC & OP AMP—Oxford
10. P.Raja- Digital Electronics- Scitech Publications
11. Morris Mano- Digital Logic Design- PHI
12. R.P.Jain—Modern Digital Electronics, 2/e ,McGraw Hill
13. H.Taub & D.Shilling, Digital Integrated Electronics- McGraw Hill.
14. D.RayChaudhuri- Digital Circuits-Vol-I & II, 2/e- Platinum Publishers
15. Tocci, Widmer, Moss- Digital Systems,9/e- Pearson
16. J.Bignell & R.Donovan-Digital Electronics-5/e- Cenage Learning.
17. Leach & Malvino—Digital Principles & Application, 5/e, McGraw Hill
18. Floyd & Jain- Digital Fundamentals-Pearson.

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Course Outcomes:

On completion of the course students will be able to

ESC-301.1 Realize the basic operations of different analog components.ESC-

301.2 Realize basic gate operations and laws Boolean algebra.

ESC-301.3 Understand basic structure of digital computer, stored program concept and different arithmetic and control unit operations.

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Name of the Course:	Data Structure & Algorithms		
Course Code: PCC-CS 301	Semester: III		
Duration: 6 months	Maximum Marks:100		
Teaching Scheme		Examination Scheme	
Theory: 3 hrs./week		Mid Semester exam: 15	
Tutorial: NIL		Assignment and Quiz: 10 marks	
		Attendance : 5 marks	
Practical: hrs./week		End Semester Exam :70 Marks	
Credit Points:	3		
Objective:			
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		
Pre-Requisite:			
1	CS 201 (Basic Computation and Principles of C		
2	M101 & M201 (Mathematics), basics of set theory		

Unit	Content	Hrs/Unit	Marks/Unit
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 Technique sand their complexity analysis.	10	
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.	9	

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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	10	
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.	9	

Text book and Reference books:

1. "Data Structures and Program Design In C", 2/E by Robert L. Kruse, Bruce P. Leung.
2. "Data Structure & Algorithms Using C", 5th Ed., Khanna Publishing House (AICTE Recommended – 2018)
3. "Fundamentals of Data Structures of C" by Ellis Horowitz, Sartaj Sahni, Susan Anderson-freed.
4. "Data Structures in C" by Aaron M. Tenenbaum.
5. "Data Structures" by S. Lipschutz.
6. "Data Structures Using C" by Reema Thareja.
7. "Data Structure Using C", 2/e by A.K. Rath, A. K. Jagadev.
8. "Introduction to Algorithms" by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein
9. "Data Structures through C" by Yashwant Kanetkar, BPB Publications.
10. "Expert Data Structures with C++" by R.B Patel, Khanna Publishing House

Course Outcomes:

On completion of the course students will be able to

PCC-CS301.1 Differentiate how the choices of data structure & algorithm methods impact the performance of program.

PCC-CS301.2 Solve problems based upon different data structure & also write programs. PCC-

CS301.3 Identify appropriate data structure & algorithmic methods in solving problem.

PCC-CS301.4 Discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing

PCC-CS301.5 Compare and contrast the benefits of dynamic and static data structures implementations.

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Name of the Course:	Computer Organization		
Course Code: PCC- CS302	Semester: III		
Duration:6 months	Maximum Marks: 100		
Teaching Scheme		Examination Scheme	
Theory: 3 hrs./week		Mid Semester exam: 15	
Tutorial: NIL		Assignment and Quiz : 10 marks	
		Attendance: 5 marks	
Practical: hrs./week		End Semester Exam: 70 Marks	
Credit Points:	3		

Unit	Content	Hrs/Unit	Marks/Unit
1	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. [7L] Commonly used number systems. Fixed and floating point representation of numbers.[1L]	8	
2	Overflow and underflow. Design of adders - ripple carry and carry look ahead principles. [3L] Design of ALU. [1L] Fixed point multiplication -Booth's algorithm. [1L] Fixed point division - Restoring and non-restoring algorithms. [2L] Floating point - IEEE 754 standard. [1L]	8	
	Memory unit design with special emphasis on		
3	implementation of CPU-memory interfacing. [2L] Memory organization, static and dynamic memory, memory hierarchy, associative memory. [3L] Cache memory, Virtual memory. Data path design for read/write access. [5L]	10	
4.	Design of control unit - hardwired and microprogrammed control. [3L] Introduction to instruction pipelining. [2L] Introduction to RISC architectures. RISC vs CISC architectures. [2L] I/O operations - Concept of handshaking, Polled I/O, interrupt and DMA. [3L]	10	

Text book and Reference books:

1. Mano, M.M., "Computer System Architecture", PHI.
2. Behrooz Parhami "Computer Architecture", Oxford University Press
3. Hayes J. P., "Computer Architecture & Organisation", McGraw Hill,
4. Hamacher, "Computer Organisation", McGraw Hill,
5. N. senthil Kumar, M. Saravanan, S. Jeevananthan, "Microprocessors and

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Microcontrollers” OUP

6. Chaudhuri P. Pal, “Computer Organisation & Design”, PHI,
7. P N Basu- “Computer Organization & Architecture” ,Vikas Pub
8. Rajaraman – “Computer Organization & Architecture”, PHI
9. B.Ram – “Computer Organization & Architecture”, Newage Publications

Course Outcomes:

On completion of the course students will be able to

PCC-CS302.1 Understand basic structure of digital computer, stored program concept and different arithmetic and control unit operations.

PCC-CS302.2 Understand basic structure of different combinational circuits- multiplexer, decoder, encoder etc.

PCC-CS302.3 Perform different operations with sequential circuits.

PCC-CS302.4 Understand memory and I/O operations.

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Name of the Course:	Discrete Mathematics	
Course Code: BSC-CS301	Semester: III	
Duration:6 months	Maximum Marks:100	
Teaching Scheme		Examination Scheme
Theory:3 hrs./week		Mid Semester exam: 15
Tutorial:		Assignment and Quiz : 10 marks
		Attendance : 5 marks
Practical: NIL		End Semester Exam :70 Marks
Credit Points:	2	

Unit	Content	Hrs/Unit
1	Sets, Relation and Function: Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem. Principles of Mathematical Induction: The Well- Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic.	8
2	Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination	5
3	Propositional Logic: Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. Proof Techniques: Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency.	8
4.	Algebraic Structures and Morphism: Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form	7

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5	Graphs and Trees: Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Colouring, Colouring maps and Planar Graphs, Colouring Vertices, Colouring Edges, List Colouring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi- connected component and Articulation Points, Shortest distances.	8
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Text book and Reference books:

1. Russell Merris, Combinatorics, Wiley-Interscience series in Discrete Mathematics and Optimisation
2. N. Chandrasekaran and M. Umaparvathi, Discrete Mathematics, PHI
3. Gary Haggard, John Schlipf and Sue Whitesides, Discrete Mathematics for Computer Science, CENGAGE Learning
4. S.B. Singh, Discrete Structures – Khanna Publishing House (AICTE Recommended Textbook – 2018)
5. S.B. Singh, Combinatorics and Graph Theory, Khanna Publishing House (AICTE Recommended Textbook – 2018)
6. Gary Chartrand and Ping Zhang – Introduction to Graph Theory, TMH
7. J.K. Sharma, Discrete Mathematics, Macmillan
8. Winfried Karl Grassmann and Jean-Paul Tremblay, Logic and Discrete Mathematics, PEARSON. S. K. Chakraborty and B. K. Sarkar, Discrete Mathematics, OXFORD University Press.
9. Douglas B. West, Introduction to graph Theory, PHI
10. C. L. Liu, Elements of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 2000.
11. R. C. Penner, Discrete Mathematics: Proof Techniques and Mathematical Structures, World Scientific, 1999.
12. R. L. Graham, D. E. Knuth, and O. Patashnik, Concrete Mathematics, 2nd Ed., Addison-Wesley, 1994.
13. N. Deo, Graph Theory, Prentice Hall of India, 1974.
14. S. Lipschutz and M. L. Lipson, Schaum's Outline of Theory and Problems of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 1999.
15. J. P. Tremblay and R. P. Manohar, Discrete Mathematics with Applications to Computer Science, Tata McGraw-Hill, 1997.
16. Russell Merris, Combinatorics, Wiley-Interscience series in Discrete Mathematics and Optimisation
17. N. Chandrasekaran and M. Umaparvathi, Discrete Mathematics, PHI
18. Gary Haggard, John Schlipf and Sue Whitesides, Discrete Mathematics for Computer Science, CENGAGE Learning
19. Gary Chartrand and Ping Zhang – Introduction to Graph Theory, TMH

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Name of the Course:	Economics for Engineers (Humanities-II)
Course Code: HSMC-301	Semester: III
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory:3 hrs./week	Mid Semester exam: 15
Tutorial: NIL	Assignment and Quiz: 10 marks
	Attendance: 5 marks
Practical: NIL	End Semester Exam: 70 Marks
Credit Points:	3

Unit	Content	Hrs/Unit	Marks/Unit
1	1. Economic Decisions Making – Overview, Problems, Role, Decision making process. 2. Engineering Costs & Estimation – Fixed, Variable, Marginal & Average Costs, Sunk Costs, Opportunity Costs, Recurring And Nonrecurring Costs, Incremental Costs, Cash Costs vs Book Costs, Life-Cycle Costs; Types Of Estimate, Estimating Models - Per-Unit Model, Segmenting Model, Cost Indexes, Power-Sizing Model, Improvement & Learning Curve, Benefits.	9	
2	3. Cash Flow, Interest and Equivalence: Cash Flow – Diagrams, Categories & Computation, Time Value of Money, Debt repayment, Nominal& Effective Interest. 4. Cash Flow & Rate of Return Analysis – Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis Periods; Internal Rate of Return, Calculating Rate of Return, Incremental Analysis; Best Alternative Choosing an Analysis Method, Future Worth Analysis, Benefit-Cost Ratio Analysis, Sensitivity and Breakeven Analysis. Economic Analysis In The Public Sector -Quantifying And Valuing Benefits & drawbacks.	9	

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3	<p>5. Inflation and Price Change – Definition, Effects, Causes, Price Change with Indexes, Types of Index, Composite vs Commodity Indexes, Use of Price Indexes In Engineering Economic Analysis, Cash Flows that inflate at different Rates.</p> <p>6. Present Worth Analysis: End-Of-Year Convention, Viewpoint Of Economic Analysis Studies, Borrowed Money Viewpoint, Effect Of Inflation & Deflation, Taxes, Economic Criteria, Applying Present Worth Techniques, Multiple Alternatives.</p> <p>7. Uncertainty In Future Events - Estimates and Their Use in Economic Analysis, Range Of Estimates, Probability, Joint Probability Distributions, Expected Value, Economic Decision Trees, Risk, Risk vs Return, Simulation, Real Options.</p>	9	
4.	<p>8. Depreciation - Basic Aspects, Deterioration & Obsolescence, Depreciation And Expenses, Types Of Property, Depreciation Calculation Fundamentals, Depreciation And Capital Allowance Methods, Straight-Line Depreciation Declining Balance Depreciation, Common Elements Of Tax Regulations For Depreciation And Capital Allowances.</p> <p>9. Replacement Analysis - Replacement Analysis Decision Map, Minimum Cost Life of a New Asset, Marginal Cost, Minimum Cost Life Problems.</p> <p>10. Accounting – Function, Balance Sheet, Income Statement, Financial Ratios Capital Transactions, Cost Accounting, Direct and Indirect Costs, Indirect Cost Allocation.</p>	9	

Text book and Reference books:

1. James L.Riggs, David D. Bedworth, Sabah U. Randhawa : Economics for Engineers 4e , Tata McGraw-Hill
2. Donald Newnan, Ted Eschembach, Jerome Lavelle: Engineering Economics Analysis, OUP
3. John A. White, Kenneth E. Case, David B. Pratt : Principle of Engineering Economic Analysis, John Wiley
4. Sullivan and Wicks: Engineering Economy, Pearson
5. R.Paneer Seelvan: Engineering Economics, PHI
6. Michael R Lindeburg : Engineering Economics Analysis, Professional Pub
7. Premvir Kapoor, Sociology & Economics for Engineers, Khanna Publishing House (AICTE Recommended Textbook – 2018)

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Name of the Course:	Data Structure & Algorithms Lab
Course Code: PCC-CS391	Semester: III
Duration: 6 months	Maximum Marks: 100
Teaching Scheme:	
Theory: hrs./week	Continuous Internal Assessment
Tutorial: NIL	External Assessment: 60
Practical: 4 hrs./week	Distribution of marks: 40
Credit Points:	2

Laboratory Experiments:	
Linear Data Structure	
1	Implementation of array operations
2	Stacks and Queues: adding, deleting elements Circular Queue: Adding & deleting elements
3	Merging Problem: Evaluation of expressions operations on Multiple stacks & queues:
4	Implementation of linked lists: inserting, deleting, inverting a linked list. Implementation of stacks & queues using linked lists
5	Polynomial addition, Polynomial multiplication
Non Linear Data Structure	
6	Recursive and Non-recursive traversal of Trees
7	Threaded binary tree traversal. AVL tree implementation
8	Application of Trees. Application of sorting and searching algorithms
9	Hash tables implementation: searching, inserting and deleting, searching & sorting techniques.

Any experiment specially designed by the college
 (Detailed instructions for Laboratory Manual to be followed for further guidance)

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Name of the Course:	Analog & Digital Electronics Lab
Course Code: ESC-391	Semester: III
Duration: 6 months	Maximum Marks: 100
Teaching Scheme:	
Theory: hrs./week	Continuous Internal Assessment
Tutorial: NIL	External Assessment: 60
Practical: 4 hrs./week	Distribution of marks: 40
Credit Points:	2

Laboratory Experiments:	
Analog Electronics	
1	Design a Class A amplifier
2	Design a Phase-Shift Oscillator
3	Design of a Schmitt Trigger using 555 timer
Digital Electronics	
4	Design a Full Adder using basic gates and verify its output / Design a Full Subtractor circuit using basic gates and verify its output.
5	Construction of simple Decoder & Multiplexer circuits using logic gates.
6	Realization of RS / JK / D flip flops using logic gates
7	Design of Shift Register using J-K / D Flip Flop
8	Realization of Synchronous Up/Down counter
9	Design of MOD- N Counter
10	Study of DAC

Any experiment specially designed by the college
 (Detailed instructions for Laboratory Manual to be followed for further guidance)

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Name of the Course:	Computer Organization Lab
Course Code: PCC-CS392	Semester: III
Duration:6 months	Maximum Marks: 100
Teaching Scheme:	
Theory: hrs./week	Continuous Internal Assessment
Tutorial: NIL	External Assesement: 60
Practical: 4 hrs./week	Distribution of marks: 40
Credit Points:	2

Laboratory Experiments:	
1	Familiarity with IC-chips: a) Multiplexer, b) Decoder, c) Encoder b) Comparator Truth Table verification and clarification from Data-book.
2	Design an Adder/Subtractor composite unit.
3	Design a BCD adder.
4	Design of a 'Carry-Look-Ahead' Adder circuit.
5	Use a multiplexer unit to design a composite ALU
6	Use ALU chip for multibit arithmetic operation
7	Implement read write operation using RAM IC
8	8. (a) & (b) Cascade two RAM ICs for vertical and horizontal expansion.

Any experiment specially designed by the college
 (Detailed instructions for Laboratory Manual to be followed for further guidance)

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Name of the Course:	IT Workshop (Sci Lab/MATLAB/Python/R)
Course Code: PCC-CS393	Semester: III
Duration: 6 months	Maximum Marks: 100
Teaching Scheme:	
Theory: NIL	Continuous Internal Assessment
Tutorial: NIL	External Assessment: 60
Practical: 4 hrs./week	Distribution of marks: 40
Credit Points:	2

Practical Syllabus

Programming with Python

Introduction History, Features, Setting up path, Working with Python, Basic Syntax, Variable and Data Types, Operator Conditional Statements If, If- else, Nested if-else, Looping, For, While, Nested loops Control Statements Break, Continue, Pass String Manipulation Accessing Strings, Basic Operations, String slices, Function and Methods Lists Introduction, Accessing list, Operations, Working with lists, Function and Methods Tuple Introduction, Accessing tuples, Operations, Working, Functions and Methods Dictionaries Introduction, Accessing values in dictionaries, Working with dictionaries, Properties Functions Defining a function, Calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables Modules Importing module, Math module, Random module, Packages, Composition, InputOutput Printing on screen, Reading data from keyboard, Opening and closing file, Reading and writing files, Functions Exception Handling Exception, Exception Handling, Except clause, Try? finally clause, User Defined Exceptions.

Programming in R

1. Introduction to mechanism for statistics, data analysis, and machine learning; Introduction of R Programming, How to install and run R, Use of R help files, R Sessions, R Objects – Vectors, Attributes, Matrices, Array, Class, List, Data Frames etc. Operators in R.
2. R Programming Structures, Control Statements, Loops, Repeat and Break, R-Function, RVector Function, Recursive Function in R.
3. R Packages (Install and Use), Input/Output Features in R, Reading or Writing in File. Data Manipulation in R. Rearranging data, Random Number and Simulation, Statistical methods like min, max, median, mean, length, Linear Regression, Normal Distribution, Decision tree
4. Graphics, Creating Graphs, The Workhorse of R Base Graphics, Graphical Functions – Customizing Graphs, Saving Graphs to Files, Pie chart, Bar Chart, Histogram.

Programming in Matlab

Introduction

Why MATLAB?, History, Its strengths, Competitors, Starting MATLAB, Using MATLAB as a calculator, Quitting MATLAB

Basics

Familiar with MATLAB windows, Basic Operations, MATLAB-Data types, Rules about

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variable names, Predefined variables

Programming-I

Vector, Matrix, Array Addressing, Built-in functions, Mathematical Operations, Dealing with strings (Array of characters), Array of array (cell) concept

Programming-II

Script file, Input commands, Output commands, Structure of function file, Inline functions, Feval command, Comparison between script file and function file

Conditional statements and Loop

Relational and Logical Operators, If-else statements, Switch-case statements, For loop, While loop, Special commands (Break and continue), Import data from large database, Export data to own file or database

2D Plotting

In-built functions for plotting, Multiple plotting with special graphics, Curve fitting, Interpolation, Basic fitting interface

3D Plotting

Use of meshgrid function, Mesh plot, Surface plot, Plots with special graphics Programming with Python

Introduction

History, Features, Setting up path, Working with Python, Basic Syntax, Variable and Data Types, Operator

Conditional Statements

If, If- else, Nested if-else, Looping, For, While, Nested loops

Control Statements

Break, Continue,

Pass String

Manipulation

Accessing Strings, Basic Operations, String slices, Function and Methods Lists

Introduction, Accessing list, Operations, Working with lists, Function and Methods Tuple

Introduction, Accessing tuples, Operations, Working, Functions and Methods Dictionaries

Introduction, Accessing values in dictionaries, Working with dictionaries, Properties Functions

Defining a function, Calling a function, Types of functions, Function

Arguments, Anonymous functions, Global and local variables Modules

Importing module, Math module, Random module, Packages, Composition, Input-Output Printing on screen, Reading data from keyboard, Opening and closing file, Reading and writing files, Functions

Exception Handling

Exception, Exception Handling, Except clause, Try? finally clause, User Defined Exceptions.

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Semester-IV

Subject: Probability & Statistics	
Course Code: PCC-CSY401	Semester: IV
Teaching Scheme	Maximum Marks: 100
Theory: 3 hrs./week	Examination Scheme
Tutorial:	End Semester Exam: 70
Practical:0	Attendance: 5
Credit:3	Continuous Assessment: 25
Aim:	
Sl. No.	
1.	The aim of this course is to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline.
2.	The objective of this course is to familiarize the students with statistical techniques.
Objective: Throughout the course, students will be expected to demonstrate their understanding of probability & statistics by being able to learn each of the following	
Sl. No.	
1.	The ideas of probability and random variables and various discrete and continuous probability distributions and their properties.
2.	The basic ideas of statistics including measures of central tendency, correlation and regression.
3.	The statistical methods of studying data samples.
Pre-Requisite:	
Sl. No.	
1.	Knowledge of basic algebra, calculus.
2.	Ability to learn and solve mathematical model.

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Contents		Hrs./week	Contents
Chapter	Name of the Topic	Hours	Marks
01	Definition of Partial Differential Equations, First order partial differential equations, solutions of first order linear PDEs; Solution to homogenous and nonhomogeneous linear partial differential equations of second order by complimentary function and particular integral method. Second-order linear equations and their classification, Initial and boundary conditions, D'Alembert's solution of the wave equation; Duhamel's principle for one dimensional wave equation. Heat diffusion and vibration problems, Separation of variables method to simple problems in Cartesian coordinates. The Laplacian in plane, cylindrical and spherical polar coordinates, solutions with Bessel functions and Legendre functions. One dimensional diffusion equation and its solution by separation of variables.	16	20
02	Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality. Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities. Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.	16	25
03	Basic Statistics, Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation. Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, Tests for single mean, difference of means, and difference of standard deviations. Test for ratio of variances - Chi- square test for goodness of fit and independence of attributes.	16	25
	Sub Total:	48	70
	Internal Assessment Examination & Preparation of Semester Examination	4	30
	Total:	52	100

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Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Erwin Kreyszig	Advanced Engineering Mathematics	9 th Edition	John Wiley & Sons
N. G. Das	Statistical Methods	0070083274, 9780070083271	Tata Mc.Graw Hill
Reena Garg	Advanced Engineering Mathematics	First Edition	Khanna Publishing

Reference Books:

P. G. Hoel, S. C. Port and C. J. Stone	Introduction to Probability Theory		Universal Book Stall
W. Feller	An Introduction to Probability Theory and its Applications	3rd Ed.	Wiley
Manish Sharma, Amit Gupta	The Practice of Business Statistics	First Edition	Khanna PublishingHouse

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❖ DATA COMMUNICATION AND NETWORKS [3 0 0 3]- PCCICB40 1

Basic concepts of computer networks, Layered architecture and comparison between ISO/OSI, TCP/IP layered models. Significance of Datalink layer and protocols. Network layer functionalities, classful, classless IP addressing, address allocation and role of forwarding module in forwarding the packet using routing table. Roles played by IP, ARP, RARP, ICMP& IGMP protocols in network layer. Inter-domain and intra-domain routing algorithms for routing tables. Importance of transport layer in achieving process-to-process communication. Insight of connection oriented protocol TCP and connectionless protocol UDP. Features of TCP in achieving flow control, error control and congestion control. Requirement of different timers in TCP. Drawbacks of IPv4 addressing and new IP addressing scheme IPv6. Migrating from IPv4 to IPv6. Introduction to application layer, a client/server application program and a case study. Client-server application program-Dynamic Host Configuration Protocol (DHCP).

References:

1. Behrouz A. Forouzan, *TCP/IP Protocol Suite*, 4th Edition, Tata McGraw Hill, 2010.
2. Tannenbaum, A.S, *Computer Networks*, 5th Edition, Prentice Hall of India EE Edition, 2011.
3. Behrouz A. Forouzan, *Data Communications and Networking*, 5th Edition, Tata McGraw Hill, 2013.
4. Leon Garcia and Widjaja, *Communication Networks*, 5th Edition, Tata McGraw Hill, 2017.
5. Bhawneet Sidhu, *An Integrated Approach to Computer Networks*, Khanna Publishing House, 2019.

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❖ Formal Language & Automata Theory [3 0 0 3]- PCC-CS403

Unit	Content	Hrs/Unit	Marks/Unit
1	Introduction:Alphabet, languages and grammars, productions and derivation, Chomsky hierarchy of languages.	6	
2	Regular languages and finite automata: Regular expressions and languages, deterministic finite automata (DFA) and equivalence with regular expressions, nondeterministic finite automata (NFA) and equivalence with DFA, regular grammars and equivalence with finite automata, properties of regular languages, pumping lemma for regular languages, minimization of finite automata)	7	
3	Context-free languages and pushdown automata: Context-free grammars (CFG) and languages (CFL), Chomsky and Greibach normal forms, nondeterministic pushdown automata (PDA) and equivalence with CFG, parse trees, ambiguity in CFG, pumping lemma for context-free languages, deterministic pushdown automata, closure properties of CFLs.	6	
4.	Context-sensitive languages: Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG.	6	
5	Turing machines: The basic model for Turing machines (TM), Turing recognizable (recursively enumerable) and Turing-decidable (recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs, unrestricted grammars and equivalence with Turing machines, TMs as enumerators	6	
6	Undecidability: Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice's theorem, undecidable problems about languages	6	

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Design and Analysis of Algorithms

Code: PCC-CS404

Contacts: 3L

Name of the Course:	Design and Analysis of Algorithms
Course Code: PCC-CS404	Semester: IV
Duration: 6 months	Maximum Marks:100
Teaching Scheme	Examination Scheme
Theory: 3 hrs./week	Mid Semester exam: 15
Tutorial: NIL	Assignment and Quiz: 10 marks
	Attendance: 5 marks
Practical: hrs./week	End Semester Exam: 70 Marks
Credit Points:	3

Unit	Content	Hrs/Unit
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	8
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.	8
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.Tractable and Intractable Problems: Computability	6
4.	of Algorithms, Computability classes – P,NP, NP- complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques.	10
5	Advanced Topics: Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE	4

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Text books/ reference books:

1. Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, Ronald LRivest and Clifford Stein, MIT Press/McGraw-Hill.
2. Fundamentals of Algorithms – E. Horowitz et al.
4. Algorithm Design, 1ST Edition, Jon Kleinberg and ÉvaTardos, Pearson.
5. Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Michael TGoodrich and Roberto Tamassia, Wiley.
6. Algorithms -- A Creative Approach, 3RD Edition, UdiManber, Addison-Wesley, Reading,MA
7. Design & Analysis of Algorithms, Gajendra Sharma, Khanna Publishing House (AICTERecommended Textbook – 2018)
8. Algorithms Design and Analysis, Udit Agarwal, Dhanpat Rai

world will be ruled by ideas, concept, and creativity.

1. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
2. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

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❖ **Biology [2 1 0 3]- BSC401**

Unit	Content	Hrs/Unit
1	<p>To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry. Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology?</p> <p>Discuss how biological observations of 18th Century that lead to major discoveries.</p> <p>Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in a scientific inquiry.</p>	2
2	<p>The underlying criterion, such as morphological, biochemical or ecological be highlighted. Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy. Classification. Discuss classification based on (a) cellularity - Unicellular or multicellular (b) ultrastructure - prokaryotes or eucaryotes. (c) energy and Carbon utilisation - Autotrophs, heterotrophs, lithotrophs (d) Ammonia excretion – aminotelic, uricotelic, ureotelic (e) Habitat - aquatic or terrestrial (f) Molecular taxonomy - three major kingdoms of life.</p> <p>Agiven organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E. coli, S. cerevisiae, D. Melanogaster, C. elegans, A. Thaliana, M. musculus</p>	3
3	<p>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. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics.</p> <p>Emphasis to be given to the mechanics of cell division and the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans.</p> <p>Discuss the concept of complementation using human genetics.</p>	4

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4.	Biomolecules: To convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine. Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.	4
5	Enzymes: To convey that without catalysis life would not have existed on earth Enzymology: How to monitor enzyme catalysed reactions. How does an enzyme catalyse reactions? Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.	4
6	Information Transfer: The molecular basis of coding and decoding genetic information is universal Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure - from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.	4
7	Macromolecular analysis: How to analyse biological processes at the reductionist level Proteins - structure and function. Hierarchy in protein structure. Primary, secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.	5
8	Metabolism: The fundamental principles of energy transactions are the same in physical and biological world. Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergonic reactions. Concept of K_{eq} and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to $CO_2 + H_2O$ (Glycolysis and Krebs cycle) and synthesis of glucose from CO_2 and H_2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge	4
9	Microbiology: Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.	3

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Textbooks/referencebooks:

1. Uma Devi, General Biology, Khanna Publishing House.
 2. Biology:A globalapproach:Campbell, N.A.; Reece,J.B.; Urry,Lisa; Cain,M, L.; Wasserman,S. A.;Minorsky,P.V.; Jackson, R.B.PearsonEducationLtd
 3. OutlinesofBiochemistry,Conn,E.E;Stumpf,P.K;Bruening,G;Doi,R.H.JohnWileyandSons
 4. PrinciplesofBiochemistry(VEdition),ByNelson,D.L.;andCox,M.M.W.H.FreemanandCompany
 5. MolecularGenetics(Secondedition),Stent,G.S.;andCalender,R.W.H.Freemanandcompany,Distributedby Satish Kumar Jainfor CBSPublisher
- Microbiology,Prescott,L.MJ.P.HarleyandC.A.Klein1995.2ndeditionWm,C.BrownPublishers

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❖ Environmental Science [2 0 0 2]- MC401

Unit	Content	Hrs/Unit
1	<p>Basic ideas of environment, basic concepts, man, society & environment, their interrelationship (1L)</p> <p>Mathematics of population growth and associated problems, Importance of population study in environmental engineering, definition of resource, types of resource, renewable, non-renewable, potentially renewable, effect of excessive use vis-à-vis population growth, Sustainable Development. (2L)</p> <p>Material balance: Steady state conservation system, steady state system with non-conservative pollutants, step function. (1L)</p> <p>Environmental degradation: Natural environmental Hazards like Flood, earthquake, Landslide-causes, effects and control/management; Anthropogenic degradation like Acid rain-cause, effects and control. Nature and scope of Environmental Science and Engineering. (2L)</p>	6
2	<p>Elements of ecology: System, open system, closed system, definition of ecology, species, population, community, definition of ecosystem-component types and function. (1L)</p> <p>Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Mangrove ecosystem (special reference to Sundarban); Food chain [definition and one example of each food chain], Food web. (2L)</p> <p>Biogeochemical Cycle- definition, significance, flowchart of different cycles with only elementary reaction [Oxygen, carbon, Nitrogen, Phosphate, Sulphur]. (1L)</p> <p>Biodiversity- types, importance, Endemic species, Biodiversity Hot-spot, Threats to biodiversity, Conservation of biodiversity. (2L)</p>	6

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3	<p>Atmospheric Composition: Troposphere, Stratosphere, Mesosphere, Thermosphere, Tropopause and Mesopause. (1L)</p> <p>Energy balance: Conductive and Convective heat transfer, radiation heat transfer, simple global temperature model [Earth as a black body, earth albedo], Problems. (1L)</p> <p>Greenhouse effects: Definition, impact of greenhouse gases on the global climate and consequent rise in sea water level, agriculture and marine food. Global warming and its consequence, Control of Global warming. Earth's heat budget. (1L)</p> <p>Lapse rate: Ambient lapse rate, Adiabatic lapse rate, atmospheric stability, temperature inversion (radiation inversion). (2L)</p> <p>Atmospheric dispersion: Maximum mixing depth, ventilation coefficient, effective stack height, smokestack plumes and Gaussian plume model. (2L)</p> <p>Definition of pollutants and contaminants, Primary and secondary pollutants: emission standard, criteria pollutant. Sources and effect of different air pollutants- Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN. (2L) Smog, Photochemical smog and London smog. Depletion of ozone layer: CFC, destruction of ozone layer by CFC, impact of other greenhouse gases, effect of ozone modification. (1L)</p> <p>Standards and control measures: Industrial, commercial and residential air quality standard, control measure (ESP, cyclone separator, baghouse, catalytic converter, scrubber (ventury), Statement with brief reference). (1L)</p>	11
4.	<p>Hydrosphere, Hydrological cycle and Natural water. Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, thermal application, heavy metals, pesticides, volatile organic compounds. (2L)</p> <p>River/Lake/groundwater pollution: River: DO, 5-day BOD test, Seeded BOD test, BOD reaction rate constants, Effect of oxygen demanding wastes on river [deoxygenation, reaeration], COD, Oil, Greases, pH. (2L)</p> <p>Lake: Eutrophication [Definition, source and effect]. (1L)</p> <p>Groundwater: Aquifers, hydraulic gradient, groundwater flow (Definition only) (1L)</p> <p>Standard and control: Wastewater standard [BOD, COD, Oil, Grease],</p> <p>Water Treatment system [coagulation and flocculation, sedimentation and filtration, disinfection, hardness and alkalinity, softening] Wastewater treatment system, primary and secondary treatments [Trickling filters, rotating biological contractor, Activated sludge, sludge treatment, oxidation ponds] tertiary treatment definition. (2L)</p> <p>Water pollution due to toxic elements and their biochemical effects: Lead, Mercury, Cadmium, and Arsenic (1L)</p>	9

(Applicable from the academic session 2022-2023)

5	Lithosphere;Internalstructureofearth,rockandsoil(1L) SolidWaste:Municipal,industrial,commercial,agricultural,domestic,pathologicalandhazard oussolidwastes; Recoveryanddisposalmethod- Opendumping,Landfilling,incineration,composting,recycling. Solidwastemanagementandcontrol(hazardousandbiomedicalwaste).(2L)	3
6	Definitionofnoise,effectofnoisepollution,noiseclassification[Transportnoise,occupationaln oise,neighbourhoodnoise] (1L) Definitionofnoisefrequency,noisepressure,noisecintensity,noisethresholdlimitvalue,equival entnoiselevel, <i>L10</i> (18hrIndex) , <i>nLd</i> .Noise pollution control.(1L)	3
7	Environmentalimpactassessment,EnvironmentalAudit,Environmentalallawsandprotectionac tofIndia,Differentinternationalenvironmentaltreaty/agreement/ protocol.(2L)	2

Textbooks/referencebooks:

1. M.P.Poonia & S.C.Sharma, Environmental Studies, Khanna Publishing House (AICTE Recommended Textbook-2018)
2. Masters, G.M., "Introduction to Environmental Engineering and Science", Prentice-Hall of India Pvt. Ltd., 1991.
3. De, A.K., "Environmental Chemistry", New Age International

Maulana Abul Kalam Azad University of Technology, West Bengal
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Syllabus for B. Tech in Computer Science and Engineering(Cyber Security)
(Applicable from the academic session 2022-2023)

❖ Data Communication and Networking Lab -PCCICB491

Objectives :

- Student should be able to configure peer-to-peer network. This will help to understand different issues involved in peer-to-peer network.
- Apply computer engineering discipline specific knowledge to solve core computer engineering related problems.
- Function effectively as a leader and team member in diverse/multi disciplinary teams.
- Ability to install and configure TCP/IP protocol. Ability to configure peer to peer network.

List of Experiments

- 1) Configure Peer-to-Peer Network at least three Host.
- 2) Create desired standard network cable including cross cable and test it by using cable tester
- 3) Connect computer using given topology with wired media.
- 4) Connect Computers Using Wireless Media
- 5) Write a C Program for CRC Error Detection
- 6) Create a Network Using Bluetooth. Setting up wireless network
- 7) Configure File Server. Configure client to file server and use file services
- 8) Configure static and dynamic IP addresses. Configure DHCP server
- 9) Run basic utilities and network commands: ipconfig, ping, tracert, netstat, path ping, route.
- 10) Create two subnets and implement it with calculated subnet masking
- 11) Set access rights and security permissions for user.
- 12) Create IPv6 environment in a small network using simulator
- 13) Linux network configuration, measurement and analysis tool: Wireshark
- 14) Socket Programming: TCP and UDP, peer to peer applications
- 15) Client Server using RPC using threads or processes
- 16) Simulation of LAN and Wi-Fi

Reference Books :

- 1) "Data and Computer Communication" by William Stallings
- 2) "Data Communication and Networking" by Behrouz A Forouzan
- 3) "Internetworking with TCP/IP, Volume 1" by Douglas Comer
- 4) "Computer Networks 5th Edition" by Tanenbaum
- 5) "An Integrated Approach to Computer Networks" by Bhawneet Sidhu

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(Applicable from the academic session 2022-2023)

❖ DESIGN & ANALYSIS OF ALGORITHMS LAB [0 0 4 2]- PCCCS494

Exercises to implement doubly linked list & Binary Search Tree, GCD Techniques. Sorting algorithms. String Matching, DFS, BFS, Topological sorting, AVL tree, 2-3 tree, Horspool algorithm, Open hash table, Floyd's algorithm, Warshall's algorithm, Greedy Techniques, Dijkstra's algorithm, Backtracking.

References:

2. Anany Levitin, *Introduction to the Design and Analysis of Algorithms*, (3e), Pearson Education, India, 2011.
3. Ellis Horowitz and Sartaj Sahni, *Computer Algorithms/C++*, (2e), University Press, 2007
4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, *Introduction to Algorithms*, (2e), PHI, 2006.

Maulana Abul Kalam Azad University of Technology
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Syllabus and Curricular Mapping for B. Tech in Computer Science & Engineering
(Cyber Security)
Effective from Academic Session 2022-2023
Semester-V

Course Title: Cyber Security	Code: PCCCCS501
Type of Course: Theory	Course Designation: Professional Course
Semester: 5th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
PCCCCS501.CO1	Describe conceptual understanding of cyber security issues, challenges and mechanisms common cyber security vulnerabilities and attacks and basic concept of cryptography.	Describe	K1
PCCCCS501.CO2	Illustrate the different type of hackers and their workings. Malware and other threats analysis	Illustrate	K3
PCCCCS501.CO3	Apply the ethical hacking techniques vis-à-vis social engineering methodology.	Apply	K5
PCCCCS501.CO4	Analyse the approaches of cyber security tools for forensic and audit applications.	Analyse	K4
PCCCCS501.CO5	Explain the concept of cyber ethics and law.	Explain	K2

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	-	-	-	-	-	-	-	1	3	3
CO2	3	3	3	-	2	-	-	-	-	-	-	-	3	2
CO3	2	2	1	2	3	1	-	1	1	3	-	-	3	2
CO4	3	3	2	2	3	1	2	1	0	2	-	-	3	2
CO5	3	2	3	2	1	-	-	-	-	1	-	-	2	2
AVG	2.8	2.8	2.2	1.2	2.2	0.4	0.4	0.4	0.2	1	-	0.2	2.8	2.2

University Syllabus:

Unit	Content	Hrs/Unit
1	Introduction: Introduction to Cyber Security, Importance and challenges in Cyber Security, Cyberspace, Cyber threats, Cyber-warfare, CIA Triad, Cyber Terrorism, Cyber Security of Critical Infrastructure, Cyber security - Organizational Implications.	6
2	Hackers and Cyber Crimes: Types of Hackers, Hackers and Crackers, Cyber-Attacks and Vulnerabilities, Malware threats, Sniffing, Gaining Access, Escalating Privileges, Executing Applications, Hiding Files, Covering Tracks, Worms, Trojans, Viruses, Backdoors.	7
3	Ethical Hacking and Social Engineering: Ethical Hacking Concepts and Scopes, Threats and Attack Vectors, Information Assurance, Threat Modeling, Enterprise Information Security Architecture, Vulnerability Assessment and Penetration Testing, Types of Social Engineering, Insider Attack, Preventing Insider Threats, Social Engineering	8

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	Targets and Defence Strategies.	
4.	Cyber Forensics and Auditing: Introduction to Cyber Forensics, Computer Equipment and associated storage media, Role of forensics Investigator, Forensics Investigation Process, Collecting Network based Evidence, Writing Computer Forensics Reports, Auditing, Plan an audit against a set of audit criteria, Information Security Management System Management. Introduction to ISO 27001:2013	10
5	Cyber Ethics and Laws: Introduction to Cyber Laws, E-Commerce and E-Governance, Certifying Authority and Controller, Offences under IT Act, Computer Offences and its penalty under IT Act 2000, Intellectual Property Rights in Cyberspace. at Network Layer-IP Sec.	5

References:

1. Cyber security by Nina Gobole & Sunit Belapune; Pub: Wiley India.
2. Information Security & Cyber laws, Gupta & Gupta, Khanna Publishing House

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THEORY

Course Title: Cyber Law & Crime	Code: PCCCS502
Type of Course: Theory	Course Designation: Professional Core
Semester: 5th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
PCCCS502.CO1	Describe conceptual understanding of cyber law dealing with cyber-crime, it challenges and mechanisms to mitigate/content criminal intention by use of cyber law.	Describe	K1
PCCCS502.CO2	Evaluate various mode of cyber-crime using mobile and wireless device.	Evaluate	K4
PCCCS502.CO3	Illustrate the legal procedure under it act for dealing with cyber criminals.	Illustrate	K2
PCCCS502.CO4	Apply the knowledge of cyber law for management of digital signature and associate algorithm.	Apply	K3

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	1	3	3
CO2	3	3	3	-	2	-	-	-	-	-	-	-	3	2
CO3	2	2	1	2	3	1	-	1	1	3	-	-	3	2
CO4	3	3	2	2	3	1	2	1	0	2	-	-	3	2
AVG	2.75	2.75	1.5	1	2	0.5	0.5	0.5	0.25	1.25	-	0.25	3	2.25

University Syllabus:

Unit	Content	Hrs/Unit
1	Introduction of Cybercrime: What is cyber-crime & its classification, Forgery, Hacking, Software Piracy, Computer Network intrusion. Category of Cybercrime: how criminals plan attacks, passive attack, Active attacks, cyberstalking.	8
2	Cybercrime Mobile & Wireless devices: Security challenges posted by mobile devices, cryptographic security for mobile devices, Attacks on mobile/cellphones, Theft, Virus, Hacking. Bluetooth; Different viruses on laptop	9
3	Tools and Methods used in Cyber-crime: Proxy servers, password checking, Random checking, TrojanHorses and Backdoors; DOS & DDOS attacks; SQL injection: buffer over flow. Phishing & Identity Theft: Phishing methods, ID Theft; Online identity method.	10
4.	Cyber Law : Legal perspective of cybercrime, IT Act 2000 and its amendments, Cyber-crime and offences, Organisations dealing with Cyber-crime and Cyber security in India, Case studies	9

References:

1. Cyber security by Nina Gobole & Sunit Belapune; Pub: Wiley India.
2. Information Security & Cyber laws, Gupta & Gupta, Khanna Publishing House
3. Textbook on Cyber Law, Pavan Duggal ISBN : 9789351438083, Universal Law Publishing

THEORY

Maulana Abul Kalam Azad University of Technology
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(Cyber Security)

Effective from Academic Session 2022-2023

Course Title: Operating System	Code: PCCCS503
Type of Course: Theory	Course Designation: Professional Core
Semester: 5th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to:

Course Outcomes	Details	Action Verb	Knowledge Level
PCCCS503.CO1	Demonstrate the concepts of Operating System Services, System calls, structure and types.	Demonstrate	K2
PCCCS503.CO2	Discuss processes and threads for multiprogramming and multi-threading.	Discuss	K6
PCCCS503.CO3	Develop algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, Response	Develop	K3
PCCCS503.CO4	Explain algorithmic solutions to process synchronization problems for Inter-Process communication	Explain	K5
PCCCS503.CO5	Analyze the necessary conditions for Deadlock avoidance and prevention to solve them.	Analyze	K6
PCCCS503.CO6	Explain Memory management, Virtual Memory, I/O Hardware, File and Disk Management system.	Explain	K2

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	1	-	2	2	3	2	3	-	2	3	3
CO2	3	2	1	1	2	-	-	3	3	1	1	3	3	2
CO3	3	2	3	1	1	-	-	2	3	2	2	2	3	2
CO4	3	3	3	2	-	-	-	3	3	2	2	2	3	2
CO5	3	2	1	1	3	-	-	2	3	1	2	2	3	2
CO6	3	2	2	1	-	-	-	2	2	-	2	1	3	2
AVG.	3	2	1.83	1.17	2	2	2	2.5	2.67	1.8	1.8	2	3.00	2.17

University Syllabus:

Unit	Content	Hrs/Unit
1	Introduction: Generations Concept of Operating systems, Types of 3 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 Operating System.	3
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.	10
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, Dining Philosopher Problematic.	5

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4	Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.	5
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 –Page allocation Hardware support for paging, Protection and sharing, Disadvantages of paging. 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).	8
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 and performance. Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks.	5

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THEORY

Course Title: Object Oriented Programming	Code: PCCICB502
Type of Course: Theory	Course Designation: Professional Core
Semester: 5th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
PCCICB502.CO1	Describe classes, objects, members of a class and relationships among them needed for a specific problem.	Describe	K1
PCCICB502.CO2	Explain the features of object-oriented principles Such as encapsulation, polymorphism and composition of systems based on object identity.	Explain	K2
PCCICB502.CO3	Analyze the concepts of inheritance and its application in OO design with different design patterns.	Analyze	K4
PCCICB502.CO4	Discuss simple abstract data types and design implementations using abstraction functions to document them.	Discuss	K2
PCCICB502.CO5	Apply some common object-oriented design patterns and give examples of their use.	Apply	K3
PCCICB502.CO6	Design applications with an event-driven graphical user interface.	Design	K6

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	2	-	-	-	2	-	-	2	2	2	1
CO2	3	3	1	3	-	-	-	1	-	-	2	2	2	3
CO3	3	3	2	3	-	-	-	3	-	-	2	2	3	2
CO4	3	3	2	3	-	-	-	3	-	-	2	2	3	2
CO5	3	3	-	1	-	-	-	2	2	2	2	2	2	1
CO6	3	3	-	3	-	-	-	3	2	2	2	2	3	2
AVG.	3	3	1.5	2.5	0	0	0	2.33	2	2	2	2	2.5	1.83

University Syllabus:

Unit	Content	Hrs/Unit
1	Abstract data types and their specification. How to implement an ADT. Concrete state space, concrete invariant, abstraction function. Implementing operations, illustrated by the Text example.	8
2	Features of object-oriented programming. Encapsulation, object identity, polymorphism – but not inheritance	8
3	Inheritance in OO design. Design patterns. Introduction and classification. The iterator pattern.	6
4	Model-view-controller pattern. Commands as methods and as objects. Implementing OO language features. Memory management.	8
5	Generic types and collections GUIs. Graphical programming with Scale and Swing. The software development process	6

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THEORY

Course Title: Industrial Management	Code: HSMC501
Type of Course: Theory	Course Designation: Compulsory
Semester: 5th	Contact Hours: 2L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
HSMC501.CO1	Recall the concepts of Accounting and Recognize different systems used in industrial applications.	Remember	K1
HSMC501.CO2	Discuss on the design of appropriate accounting tool required for real life problems.	Discuss	K1
HSMC501.CO3	Apply and demonstrate the use of Economical concepts.	Apply	K3
HSMC501.CO4	Analyze and Simulate a sequential accounting tool for a system or process appropriate for required accuracy.	Analyze	K4
HSMC501.CO5	Design a sequential economic policy that can work according to the required specifications.	Design	K6
HSMC501.CO6	Justify a specific accounting technique for a specific purpose.	Evaluate	K5

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	1	-	-	-	-	-	-	-
CO3	-	-	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	3	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	1	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG.	3	3	3	0	3	0	1	0	1	0	0	0	0	0

University Syllabus:

Unit	Content	Hrs/Unit
1	Introduction System- concept, definition, types, parameters, variables and behavior. Management – definition and functions. Organization structure: i. Definition. ii. Goals. iii. Factors considered in formulating structure. iv. Types. v. Advantages and disadvantages. vi. Applications. Concept, meaning and importance of division of labor, scalar & functional processes, span of control, delegation of authority, centralization and decentralization in industrial management. Organizational culture and climate – meaning, differences and factors affecting them. Moral-factors affecting moral. Relationship between moral and productivity. Job satisfaction- factors influencing job satisfaction. Important provisions of factory act and labor laws.	6
2	Critical Path Method (CPM) and Programme Evaluation Review Technique(PERT): 2.1 CPM & PERT-meaning, features, difference, applications. 2.2 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 of floats. Crashing of network, updating and its applications.	4

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3	Materials Management: Material management-definition, functions, importance, relationship with other departments. Purchase - objectives, purchasing systems, purchase procedure, terms and forms used in purchase department. Storekeeping- functions, classification of stores as centralized and decentralized with their advantages, disadvantages and application in actual practice. Functions of store, types of records maintained by store, various types and applications of storage equipment, need and general methods for codification of stores. Inventory control: i. Definition. ii. Objectives. iii. Derivation for expression for Economic Order Quantity (EOQ) and numeric examples. iv. ABC analysis and other modern methods of analysis. v. Various types of inventory models such as Wilson's inventory model, replenishment model and two bin model. (Only sketch and understanding, no derivation.). 3.6 Material Requirement Planning (MRP)- concept, applications and brief details about software packages available in market.	6
4	Production planning and Control (PPC): Types and examples of production. PPC : i. Need and importance. ii. Functions. iii. Forms used and their importance. iv. General approach for each type of production. Scheduling- meaning and need for productivity and utilisation. Gantt chart- Format and method to prepare. Critical ratio scheduling- method and numeric examples. Scheduling using Gantt Chart (for at least 5-7 components having 5-6 machining operations, with processes, setting and operation time for each component and process, resources available, quantity and other necessary data), At least two examples. 4.7 Bottlenecking- meaning, effect and ways to reduce.	4
5	Value Analysis (VA) and Cost Control: 5.1 VA-definition, terms used, process and importance. 5.2 VA flow diagram. DARSIRI method of VA. Case study of VA-at least two. Waste-types, sources and ways to reduce them. Cost control-methods and important guide lines.	4
6	Recent Trends in IM: ERP (Enterprise resource planning) - concept, features and applications. Important features of MS Project. Logistics- concept need and benefits. Just in Time (JIT)- concept and benefits. Supply chain management-concept and benefits.	4

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Course Title: Mobile Computing	Code: PECICB501A
Type of Course: Theory	Course Designation: Professional Elective
Semester: 5th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
PECICB501A.CO1	Analyze the Personal Communication service and GSM architecture	Analyze	K4
PECICB501A.CO2	Develop the concept of GPRS architecture and WLAN standard	Develop	K3
PECICB501A.CO3	Illustrate the WLL structure and the concept of WAP protocol.	Illustrate	K2
PECICB501A.CO4	Discuss the 3G mobile services	Discuss	K1
PECICB501A.CO5	Understand the concept of Global Mobile Satellite Systems and its case studies	Understand	K2
PECICB501A.CO6	Explain the Server-side programming in Java and Pervasive web application architecture	Explain	K2

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	-	-	-	-	-	-	3	3	2
CO2	3	3	2	2	2	-	-	-	-	-	-	3	3	2
CO3	3	1	2	2	2	-	-	-	-	-	-	3	2	2
CO4	3	2	2	2	3	-	-	-	-	-	1	3	2	3
CO5	3	3	2	2	3	-	-	-	-	-	2	3	2	2
CO6	3	3	2	2	3	-	-	-	-	-	2	3	2	2
AVG.	3	2.5	2.17	2	2.5	0	0	0	0	0	1.67	3	2.33	2.17

University Syllabus:

Unit	Content	Hrs/Unit
1	Introduction to Personal Communications Services (PCS): PCS Architecture, Mobility management, Networks signaling. Global System for Mobile Communication (GSM) system overview: GSM Architecture, Mobility management, Network signaling.	5
2	General Packet Radio Services (GPRS): GPRS Architecture, GPRS Network Nodes. Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 standard, Mobile IP.	5
3	Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, wireless markup Languages (WML). Wireless Local Loop (WLL): Introduction to WLL Architecture, wireless Local Loop Technologies.	6
4	Third Generation (3G) Mobile Services: Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G	6
5	Global Mobile Satellite Systems; case studies of the IRIDIUM and GLOBALSTAR systems. Wireless Enterprise Networks: Introduction to Virtual Networks, Blue tooth technology, Blue tooth Protocols.	6
6	Server-side programming in Java, Pervasive web application architecture, Device independent example application	8

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THEORY

Course Title: Internet Technology	Code: PECICB501B
Type of Course: Theory	Course Designation: Professional Elective
Semester: 5th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
PECICB501B.CO1	Demonstrate the concept of computer networks and various protocols related to this.	Understand	K1
PECICB501B.CO2	Creating a web page and identify its elements and attributes.	Create	K6
PECICB501B.CO3	Develop the concepts of Internet Telephony, Multimedia Applications and Search Engines.	Develop	K3
PECICB501B.CO4	Explain the protocols related to networking such as TCP/IP , FTP, HTTP etc.	Evaluate	K5
PECICB501B.CO5	Apply the concepts of Client-Server programming for a given problem and develop a solution using the technologies taught like PERL and Java.	Analyze	K6
PECICB501B.CO6	Understand the security issues while using different technologies for web programming.	Understand	K2

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	3	2	1	3	3	3	-	2	2	2	1
CO2	2	3	1	2	2	1	-	1	2	1	1	3	2	2	1
CO3	2	2	3	1	1	-	1	2	3	2	2	1	2	3	1
CO4	2	2	3	2	1	3	3	3	3	2	2	2	3	2	1
CO5	2	3	1	3	3	1	2	1	3	1	2	2	3	2	1
CO6	3	1	2	1	1	-	1	2	2	1	2	2	3	2	1
AVG.	2.17	2.00	1.83	1.67	1.83	1.75	1.60	2.00	2.67	1.67	1.80	2.00	2.50	2.17	1.00

University Syllabus:

Unit	Content	Hrs/Unit
1	Introduction : Overview, Network of Networks, Intranet, Extranet and Internet. World Wide Web : Domain and Sub domain, Address Resolution, DNS, Telnet, FTP, HTTP. Review of TCP/IP : Features, Segment, Three-Way Handshaking, Flow Control, Error Control, Congestion control, IP Datagram, IPv4 and IPv6. IP Subnetting and addressing: Classful and Classless Addressing, Subnetting. NAT, IP masquerading, IP tables. Internet Routing Protocol: Routing -Intra and Inter Domain Routing, Unicast and Multicast Routing, Broadcast. Electronic Mail : POP3, SMTP.	6
2	HTML : Introduction, Editors, Elements, Attributes, Heading, Paragraph. Formatting, Link, Head, Table, List, Block, Layout, CSS. Form, I frame, Colors, Color name, Color value. Image Maps : map, area, attributes of image area. Extensible Markup Language (XML) :Introduction, Tree, Syntax, Elements, Attributes, Validation, Viewing, XHTML in brief. CGI Scripts :Introduction, Environment Variable, GET and POST Methods.	10

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3	<p>PERL : Introduction, Variable, Condition, Loop, Array, Implementing data structure, Hash, String, Regular Expression, File handling, I/O handling.</p> <p>JavaScript : Basics, Statements, comments, variable, comparison, condition, switch, loop, break. Object – string, array, Boolean, reg-ex. Function, Errors, Validation.</p> <p>Cookies : Definition of cookies, Create and Store a cookie with example.</p> <p>Java Applets : Container Class, Components, Applet Life Cycle, Update method; Parameter passing applet, Applications.</p>	10
4	<p>Client-Server programming In Java :Java Socket, Java RMI.</p> <p>Threats: Malicious code-viruses, Trojan horses, worms; eavesdropping, spoofing, modification, denial of service attacks.</p> <p>Network security techniques : Password and Authentication; VPN, IP Security, security in electronic transaction, Secure Socket Layer (SSL), Secure Shell (SSH).</p> <p>Firewall : Introduction, Packet filtering, Stateful, Application layer, Proxy.</p>	5
5	<p>Internet Telephony: Introduction, VoIP.</p> <p>Multimedia Applications: Multimedia overIP:RSVP, RTP, RTCP and RTSP. Streaming media, Codecand Plugins, IPTV.</p> <p>Search Engineand WebCrawler : Definition, Metadata, WebCrawler, Indexing, Page rank, overview of SEO..</p>	5

References:

1. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013. (Chapters 1-5,7,8,9).
2. Internetworking Technologies, An Engineering Perspective, Rahul Banerjee, PHI Learning, Delhi, 2011. (Chapters 5,6,12)

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THEORY

Course Title: Smart Sensors and IoT	Code: PECICB501C
Type of Course: Theory	Course Designation: Professional Elective
Semester: 5th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
PECICB501C.CO1	Understand the vision of IoT from a global context.	Understand	K2
PECICB501C.CO2	Determine the Market perspective of IoT.	Determine	K5
PECICB501C.CO3	Use of Devices, Gateways and Data Management in IoT.	Apply	K3
PECICB501C.CO4	Analyzed the use of IoT in Industrial and Commercial Building Automation and Real World Design Constraints.	Analyze	K4
PECICB501C.CO5	Understand the architecture of smart sensor.	Understand	K2
PECICB501C.CO6	Build the interfacing among IoT components.	Create	K6

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	1	1	1	1	1	2	2	3	3
CO2	3	3	3	3	-	1	1	1	1	1	2	2	3	3
CO3	3	3	3	3	-	-	-	-	1	1	-	2	2	2
CO4	3	3	3	3	-	-	-	-	1	1	-	2	2	2
CO5	3	3	3	3	-	-	-	-	1	1	-	2	2	2
CO6	3	3	3	3	-	-	-	-	1	1	-	2	2	2
AVG.	3	3	3	3	2	1	1	1	1	1	2	2	2.33	2.33

University Syllabus :

Unit	Content	Hrs/Unit
1	Environmental Parameters Measurement and Monitoring: Why measurement and monitoring are important, effects of adverse parameters for the living being for IOT	7
2	Sensors: Working Principles: Different types; Selection of Sensors for Practical Applications, Introduction of Different Types of Sensors such as Capacitive, Resistive, Surface Acoustic Wave for Temperature, Pressure, Humidity, Toxic Gas etc.	8
3	Important Characteristics of Sensors: Determination of the Characteristics Fractional order element: Constant Phase Impedance for sensing applications such as humidity, water quality, milk quality Impedance Spectroscopy: Equivalent circuit of Sensors and Modeling of Sensors Importance and Adoption of Smart Sensors	11
4	Architecture of Smart Sensors: Important components, their features Fabrication of Sensor and Smart Sensor: Electrode fabrication: Screen printing,	10

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Course Title: Constitution of India	Code: MC501A
Type of Course: Theory	Course Designation: Mandatory Course
Semester: 5th	Contact Hours: 2L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
MC501A.CO1	Understand Basic Structure of the Constitution of India	Understand	K2
MC501A.CO2	Apply the understanding in Engineering Profession	Apply	K3
MC501A.CO3	Apply Constitutional Values in Engineering Education	Apply	K3
MC501A.CO4	Apply Constitutional Provisions in Policy matters of CSE	Apply	K3
MC501A.CO5	Apply Team Spirit and Constitutional Legislative Provisions for Industrial Design	Apply	K3
MC501A.CO6	Analyze Constitutional Values of Legislation, Executive & Judiciary in the light of the Professional requirements of Computer Science Engineering	Analyze	K4

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	1	-	1	1	2	-	2	3	1	-	2	1	1
CO2	2	2	2	2	2	3	3	3	2	2	1	3	1	1
CO3	1	3	2	2	1	2	3	2	3	1	1	2	1	1
CO4	1	2	1	2	1	2	2	2	3	1	1	2	1	1
CO5	2	1	1	1	2	2	2	2	3	1	1	2	1	1
CO6	2	1	1	1	1	2	2	2	3	1	1	2	1	1
AVG.	1.33	1.67	1.17	1.5	1.33	2.17	2	2.17	2.83	1.17	0.83	2.17	1	1

University Syllabus:

Unit	Content	Hrs/Unit
1	Introduction: Constitution' meaning of the term,, Indian Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy	2
2	Union Government and its Administration : Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha	6
3	State Government and its Administration Governor: Role and Position, CM and Council of ministers, State Secretariat: Organisation, Structure and Functions	6
4	Local Administration District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Panchayati raj: Introduction, PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Position and role, Block level: Organizational Hierarchy (Different 4 departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy	8
5	Election Commission Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women	6

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Course Title: Essence of Indian Knowledge Tradition	Code: MC501B
Type of Course: Theory	Course Designation: Mandatory Course
Semester: 5 th	Contact Hours: 2L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
MC501B.CO1	Understand the concept of Traditional knowledge and its importance.	Understand	K2
MC501B.CO2	Know the need and importance of protecting traditional knowledge	Analyse	K4
MC501B.CO3	Know the various enactments related to the protection of traditional knowledge	Analyse	K4
MC501B.CO4	Understand the concepts of Intellectual property to protect the traditional knowledge.	Understand	K2
MC501B.CO5	Understand the traditional knowledge in different sectors.	Understand	K2

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	1	1	2	2	3	-	-	3	1	1	1
CO2	1	1	1	1	1	2	1	2	3	2	2	3	1	1	1
CO3	-	-	-	2	2	2	2	1	1	2	-	-	-	1	2
CO4	-	2	2	2	2	1	1	2	-	-	2	3	-	1	2
CO5	-	2	1	1	2	1	2	3	1	2	-	3	-	1	1
AVG.	0.4	1.2	1	1.2	1.6	1.4	1.6	2	1.6	1.2	0.8	2.4	0.4	1	1.4

University Syllabus:

Unit	Content	Hrs./ Unit
1	Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge	6
2	Protection of traditional knowledge (TK): the need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.	4

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3	Legal frame work and TK: A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indicators act 2003.	6
4	Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.	6
5	Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.	6

References:

1. A. Jha, Traditional Knowledge System in India, 2009.
2. B.K. Mohanta and V.K. Singh, Traditional Knowledge System and Technology in India, Pratibha Prakashan, 2012.
3. K. Kapoor and M. Danino, Knowledge Traditions and Practices of India, Central Board of Secondary Education, 2012.
4. E-Resources: <http://nptel.ac.in/courses/121106003/>

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PRACTICAL

Course Title: System Security Lab	Code: PCCCS591
Type of Course: Practical	Course Designation: Professional Core
Semester: 5th	Contact Hours: 4P/week
Continuous Assessment: 40 Marks	Final Exam: 60 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
PCCCS591.CO1	Demonstrate basic concepts in information system and the benefits with these systems in modern society.	Demonstrate	K1
PCCCS591.CO2	Understand the difference between data, information and knowledge.	Understand	K2
PCCCS591.CO3	Develop projects goals at implementing system security.	Develop	K4
PCCCS591.CO4	Understand and systems definition, systems requirements, and information needed for decision making.	Understand	K2
PCCCS591.CO5	Develop basic understanding of security, cryptography, system attacks and defenses against them	Develop	K3
PCCCS591.CO6	Establishing and maintaining an information security governance framework and supporting processes to ensure that information security strategies are aligned with business objectives and risks are managed effectively	Analyze	K4

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	1	1	1	2	2	1	2	2	2	1
CO2	3	2	1	3	2	2	1	1	1	1	-	2	3	1
CO3	2	3	3	2	1	2	1	2	1	1	-	3	2	1
CO4	1	1	2	1	1	1	1	1	2	1	3	2	3	2
CO5	2	2	2	2	2	1	1	1	1	1	2	2	1	-
CO6	3	2	2	2	2	2	1	1	2	1	2	3	-	-
AVG.	2.17	2	2	2	1.5	1.5	1	1.33	1.5	1	2.25	2.33	2.2	1.25

University Syllabus:

Laboratory Experiments:	
1	Design and Implementation of a product cipher using Substitution and Transposition ciphers
2	Implementation and analysis of RSA cryptosystem and Digital signature scheme using RSA/El Gamal.
3	Implementation of Diffie Hellman Key exchange algorithm.
4	For varying message sizes, test integrity of message using MD-5, SHA-1, and analyse the performance of the two protocols. Use crypt APIs
5	Study the use of network reconnaissance tools like WHOIS, dig, traceroute, nslookup to gather information about networks and domain registrars.
6	Study of packet sniffer tools: wireshark,
7	Download and install wireshark and capture icmp, tcp, and http packets in promiscuous mode.
8	Explore how the packets can be traced based on different filters.
9	Download and install nmap. Use it with different options to scan open ports, perform OS fingerprinting, do a ping scan, tcp port scan, udp port scan, xmas scan etc.
10	Detect ARP spoofing using nmap and/or open-source tool ARPWATCH and wireshark. Use arping tool to generate gratuitous arps and monitor using wireshark.
11	Simulate DOS attack using Hping, hping3 and other tools.

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12	Simulate buffer overflow attack using Ollydbg, Splint, Cppcheck etc.
13	1. Set up IPSEC under LINUX. 2. Set up Snort and study the logs.
14	Setting up personal Firewall using iptables
15	Explore the GPG tool of Linux to implement email security
16	SQL injection attack, Cross-Cite Scripting attack simulation

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PRACTICAL

Course Title: Operating System Lab	Code: PCCCS592
Type of Course: Practical	Course Designation: Professional Core
Semester: 5th	Contact Hours: 4P/week
Continuous Assessment: 40 Marks	Final Exam: 60 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
PCCCS592.CO1	Understanding of different Unix/Linux commands and shell programming	Understand	K2
PCCCS592.CO2	Demonstrate the creation of processes and POSIX threads.	Apply	K3
PCCCS592.CO3	Develop the problems of process scheduling and process synchronization (Signal and Semaphore)	Create	K6
PCCCS592.CO4	Determine the deadlock avoidance and detection algorithms.	Evaluate	K5
PCCCS592.CO5	Analyse different Memory allocation and File accessing techniques	Analyze	K4
PCCCS592.CO6	Illustrate Inter-Process Communication through system calls.	Apply	K3

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1	1	-	1	-	-	1	-	1	3	3
CO2	3	3	3	2	3	-	1	2	-	1	-	2	3	1
CO3	3	3	3	2	3	-	1	2	1	1	-	2	3	2
CO4	3	3	3	2	3	-	1	2	-	1	1	2	3	3
CO5	3	3	3	2	3	-	1	1	1	1	1	2	3	3
CO6	3	3	2	1	1	-	1	-	1	1	-	1	3	3
AVG.	3.00	3.00	2.83	1.67	2.33	0	1	1.75	1.00	1	1.00	1.67	3.00	2.50

University Syllabus:

Unit	Content
1	Managing Unix/Linux Operating System [8P]: Creating a bash shell script, making a script executable, shell syntax (variables, conditions, control structures, functions, and commands). Partitions, Swap space, Device files, Raw and Block files, Formatting disks, Making file systems, Superblock, I- nodes, File system checker, Mounting file systems, Logical Volumes, Network File systems, Backup schedules and methods Kernel loading, init and the inittab file, Run-levels, Run level scripts. Password file management, Password security, Shadow file, Groups and the group file, Shells, restricted shells, user-management commands, homes and permissions, default files, profiles, locking accounts, setting passwords, Switching user, Switching group, Removing users & user groups.
2	Process : starting new process, replacing a process image, duplicating a process image, waiting for a process, zombie process.
3	Signal: signal handling, sending signals, signal interface, signal sets.
4	Semaphore: programming with semaphores (use functions semctl, semget, semop, set_semvalue, del_semvalue, semaphore_p, semaphore_v).
5	POSIX Threads: programming with pthread functions (viz. pthread_create, pthread_join, pthread_exit, pthread_attr_init, pthread_cancel)
6	Inter-process communication: pipes (use functions pipe, popen, pclose), named pipes (FIFOs, accessing FIFO), message passing & shared memory (IPC version V).

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PRACTICAL

Course Title: Object Oriented Programming Lab	Code: PCCICB593
Type of Course: Practical	Course Designation: Professional Core
Semester: 5th	Contact Hours: 4P/week
Continuous Assessment: 40 Marks	Final Exam: 60 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
PCCICB593.CO1	Define an object oriented programming language, and associated class libraries and learn how to develop object oriented programs.	Define	K1
PCCICB593.CO2	Understand the concepts of class, constructor, data encapsulation, inheritance, overriding and polymorphism to describe large scale software.	Understand	K2
PCCICB593.CO3	Develop and debug programs using object oriented principles with wrapper class, arrays.	Develop	K3
PCCICB593.CO4	Apply the concept of interfaces- multiple inheritance, extending interfaces.	Apply	K3
PCCICB593.CO5	Analyze and use an integrated environment development by creating and accessing packages and multithreaded programming	Analyze	K4
PCCICB593.CO6	Develop programs with Graphical User Interfaces capabilities and solve related problems.	Develop	K6

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1	2	-	-	-	2	-	-	2	2	1
CO2	3	3	3	1	3	-	-	-	1	-	-	2	2	3
CO3	3	3	3	2	3	-	-	-	3	-	-	2	3	2
CO4	3	3	3	2	3	-	-	-	3	-	-	2	3	2
CO5	3	3	3	-	1	-	-	-	2	2	2	2	2	1
CO6	3	3	3	-	3	-	-	-	3	2	2	2	3	2
AVG.	3	3	3	1.5	2.5	0	0	0	2.3	2	2	2	2.5	1.8

University Syllabus:

Unit	Content
1	Assignments on class, constructor, overloading, inheritance, overriding
2	Assignments on wrapper class, arrays
3	Assignments on developing interfaces- multiple inheritance, extending interfaces
4	Assignments on creating and accessing packages
5	Assignments on multithreaded programming
6	Assignments on applet programming

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Semester-VI

Course Title: Cryptography and Network Security	Code: PCCCS601
Type of Course: Theory	Course Designation: Professional Core
Semester: 6th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
PCCCS601.CO1	Describe conceptual understanding of network security issues, challenges and mechanisms common network vulnerabilities and attacks and basic concept of cryptography.	Describe	K1
PCCCS601.CO2	Evaluate various techniques of cryptography.	Evaluate	K5
PCCCS601.CO3	Illustrate the algorithms of different key symmetric cryptography.	Illustrate	K2
PCCCS601.CO4	Apply the public key algorithms, digital signature message and digest.	Apply	K3
PCCCS601.CO5	Analyze the approaches of security protocol and authentication.	Analyze	K4
PCCCS601..CO6	Explain the concept of electronic mail security and types of firewall and its configurations.	Explain	K2

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	-	-	-	-	-	-	-	1	3	3
CO2	3	3	3	-	2	-	-	-	-	-	-	-	3	2
CO3	2	2	1	2	3	1	-	1	1	3	-	-	3	2
CO4	3	3	2	2	3	1	2	1	0	2	-	-	3	2
CO5	3	2	3	2	1	-	-	-	-	1	-	-	2	2
CO6	3	2	3	2	2	2	-	-	-	-	-	-	2	2
AVG.	2.83	2.5	2.33	2	2.2	1.33	2	1	0.5	2	0	1	2.67	2.17

University Syllabus :

Unit	Content	Hrs/Unit
1	Attacks on Computers & Computer Security - Introduction, Need for Security, Security approaches, Principles of Security, Types of attack	5
2	Cryptography: Concepts & Techniques Introduction, Plaintext & Cipher text, Substitution Techniques, Transposition Techniques, Encryption & Decryption, Symmetric & Asymmetric key Cryptography, Key Range & Key Size	6
3	Symmetric Key Algorithm - Introduction, Algorithm types & Modes, Overview of Symmetric Key Cryptography, DES(Data Encryption Standard) algorithm, IDEA(International Data Encryption Algorithm) algorithm, RC5 (Rivest Cipher 5) algorithm.	7
4	Asymmetric Key Algorithm, Digital Signature and RSA - Introduction, Overview of Asymmetric key Cryptography, RSA algorithm, Symmetric & Asymmetric key Cryptography together, Digital Signature, Basic concepts of Message Digest and Hash Function (Algorithms on Message Digest and Hash function not required).	5
5	Internet Security Protocols, User Authentication - Basic Concepts, SSL protocol, Authentication Basics, Password, Authentication Token, Certificate based Authentication, Biometric Authentication	6
6	Electronic Mail Security - Basics of mail security, Pretty Good Privacy, S/MIME.	4
7	Firewall - Introduction, Types of firewall, Firewall Configurations, DMZ Network	3

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Course Title: Infrastructure Security	Code: PCCCS602
Type of Course: Theory	Course Designation: Professional Core
Semester: 6th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
PCCCS602.CO1	To understand underlying principles of infrastructure security.	Describe	K1
PCCCS602.CO2	To explore software vulnerabilities, attacks and protection mechanisms to learn security aspects of wireless network infrastructure and protocols.	Illustrate	K3
PCCCS602.CO3	To investigate web server vulnerabilities and their countermeasures.	Apply	K5
PCCCS602.CO4	To investigate cloud infrastructure vulnerabilities and their countermeasures.	Apply	K4
PCCCS602.CO5	To Predict the secondary and tertiary structures of protein sequences.	Apply	K2

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	-	-	-	-	-	-	-	1	3	2
CO2	3	2	3	-	2	-	-	-	-	-	-	-	3	2
CO3	2	3	2	1	3	1	-	1	1	2	-	-	3	3
CO4	3	3	2	3	3	1	2	1	0	2	-	-	3	2
CO5	3	2	3	2	1	-	-	-	-	1	-	-	2	2
AVG	2.8	2.8	2.2	1.2	2.2	0.4	0.4	0.4	0.2	1	-	0.2	2.8	2.2

University Syllabus:

Unit	Content	Hrs/unit
1	Introduction: Cyber-attacks, Vulnerabilities, Defense Strategies and Techniques, Authentication Methods- Password, Token and Biometric, Access Control Policies and Models (DAC,MAC, RBAC, ABAC, BIBA, Bell La Padula).	4
2	Software Security: Software Vulnerabilities: Buffer overflow, Format String, Cross-Site Scripting, SQL Injection, Malware: Viruses, Worms, Trojans, Logic Bomb, Bots, Rootkits Operating System Security: Memory and Address Protection, File Protection Mechanism, User Authentication. Database Security: Database Security Requirements, Reliability and Integrity, Sensitive Data, Inference Attacks, Multilevel Database Security	8
3	Wireless Security: Mobile Device Security- Security Threats, Device Security, IEEE 802.11xWireless LAN Security, VPN Security, Wireless Intrusion Detection System (WIDS)	6
4	Cloud Security: Cloud Security Risks and Countermeasures, Data Protection in Cloud, Cloud Application Security, Cloud Identity and Access Management, Cloud Security as a Service.	6
5	Web Security: Web Security Considerations, User Authentication and Session Management, Cookies, SSL, HTTPS, SSH, Privacy on Web, Web Browser Attacks, Account Harvesting, Web Bugs, Clickjacking, Cross- Site Request Forgery, Session Hijacking and Management, Phishing and Pharming Techniques, DNS Attacks, Web Service Security, Secure Electronic Transaction, Email Attacks, Web Server Security as per OWASP, Firewalls.	8

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6	Information security and Risk Management: Security Policies, Business Continuity Plan, Risk Analysis, Incident Management, Legal System and Cybercrime, Ethical Issues in Security Management.	4
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References:

1. Web Application Hackers Handbook by Wiley.
2. Computer Security, Dieter Gollman, Third Edition, Wiley
3. CCNA Security Study Guide, Tim Boyle, Wiley
4. Introduction to Computer Security, Matt Bishop, Pearson.
5. Cloud Security and Privacy, Tim Mather, Subra Kumaraswamy, Shahed Latif , O’Riely
6. Nina Godbole, Sunit Belapure, Cyber Security, Wiley India, New Delhi

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Course Title: Database Management System	Code: PCCCS603
Type of Course: Theory	Course Designation: Professional Core
Semester: 6th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
PCCCS603.CO1	Describe the basic concept of database and different databasemodels along with database languages like DDL, DML etc, Data Abstraction, and Data Independence.	Describe	K1
PCCCS603.CO2	Identify different approaches for solving queries such as Relational algebra, Tuple and domain relational calculus, considering the query optimization strategies, and different normal forms for relational database normalization.	Identify	K3
PCCCS603.CO3	Evaluate the applications of different storage strategies suchas Indices, B-trees, hashing	Evaluate	K5
PCCCS603.CO4	Understand the transaction processing and concurrency control strategies including ACID property, serializability of scheduling, locking and timestamp based schedulers, Database recovery.	Understand	K2
PCCCS603.CO5	Analyze the database security approaches including authentication, authorization and access control, DAC, MAC and RBAC models, intrusion detection, SQL injection etc.	Analyze	K4
PCCCS603.CO6	Explain the advanced concepts related to DBMS such as object oriented and object relational databases, logical databases, web databases, distributed databases, data warehousing and data mining.	Explain	K2

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	1	-	-	-	-	-	-	1	2	-
CO2	2	-	2	2	-	-	1	-	-	-	-	-	2	-
CO3	-	2	2	2	2	-	-	2	-	-	1	-	3	1
CO4	1	3	3	1	2	-	-	-	-	-	-	-	3	2
CO5	1	2	-	2	1	-	-	-	-	-	2	-	2	-
CO6	2	2	2	2	2	3	-	-	-	-	-	-	2	1
AVG.	1.6	2.2	2.2	1.6	1.6	3	1	2	0	0	1.5	1.00	2.33	1.33

University Syllabus :

Unit	Content	Hrs/Unit
1	Database system architecture: Data Abstraction, Data Independence, Data Definition Language(DDL),Data Manipulation Language(DML). Data models: Entity-relationship model, network model, relational and object oriented data models,integrity constraints, data manipulation operations.	9
2	Relational query languages: Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQLserver. Relational database design: Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Losslessdesign. Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.	13
3	Storage strategies: Indices, B-trees, hashing.	3

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4	Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multiversion and optimistic Concurrency Control schemes, Database recovery.	5
5	Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.	3
6	Advanced topics: Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.	3

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THEORY

Course Title: Cloud Computing	Code: PECICB601A
Type of Course: Theory	Course Designation: Professional Elective
Semester: 6th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	CO Statement	Action Verb	Knowledge Level
PECICB601A.CO1	Explain the main concepts, key technologies, strengths and limitations of cloud computing	Explain	K2
PECICB601A.CO2	Discuss the architecture, infrastructure and delivery models of cloud computing	Understand	K2
PECICB601A.CO3	Apply suitable virtualization concept	Apply	K3
PECICB601A.CO4	Analyze the components of Google web, AWS and Microsoft cloud services	Analyze	K4
PECICB601A.CO5	Discover the core issues of cloud computing such as security, privacy and interoperability	Understand	K2
PECICB601A.CO6	Ability to choose the appropriate services and technologies for the related issues.	Analyze	K4

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	2	-	-	1	1	-	1	1	2	1
CO2	3	2	2	1	2	1	-	2	2	1	1	1	1	1	1
CO3	3	2	2	2	2	2	1	1	2	1	1	2	-	1	2
CO4	3	2	1	2	2	2	1	1	2	1	1	2	-	1	2
CO5	3	2	2	-	1	1	2	1	1	2	1	2	1	2	1
CO6	3	2	2	3	2	2	2	1	1	1	2	2	2	-	3
AVG.	3.00	2.00	1.67	1.80	1.67	1.67	1.50	1.20	1.50	1.17	1.20	1.67	1.25	1.40	1.67

University Syllabus:

Unit	Content	Hrs/Unit
1	Definition of Cloud Computing and its Basics Definition of Cloud Computing: Defining a Cloud, Cloud Types – NIST model, Cloud Cube model, Deployment models (Public, Private, Hybrid and Community Clouds), Service models: Infrastructure as a Service, Platform as a Service, Software as a Service with examples of services/ service providers, Cloud Reference model Characteristics of Cloud Computing: a shift in paradigm Benefits and advantage of Cloud Computing Cloud Architecture: A brief introduction on Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Connecting to the Cloud by Clients Services and Applications by Type IaaS – Basic concept, Workload, partitioning of virtual private server instances, Pods, aggregations, silos PaaS–Basic concept, tools and development environment with examples SaaS - Basic concept and characteristics, Open SaaS and SOA, examples of SaaS platform Identity as a Service(IDaaS) Compliance as a Service(CaaS)	6
2	Definition of Cloud Computing and its Basics Definition of Cloud Computing: Defining a Cloud, Cloud Types – NIST model, Cloud Cube model, Deployment models (Public, Private, Hybrid and Community Clouds), Service models – Infrastructure as a Service, Platform as a Service, Software as a Service	10

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	<p>with examples of services/ service providers,</p> <p>Cloud Reference model Characteristics of Cloud Computing : a shift in paradigm Benefits and advantage of Cloud Computing</p> <p>Cloud Architecture: A brief introduction on Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Connecting to the Cloud by Clients Services and Applications by Type</p> <p>IaaS – Basic concept, Workload, partitioning of virtual private server instances, Pods, aggregations, silos</p> <p>PaaS–Basic concept, tools and development environment with examples</p> <p>SaaS - Basic concept and characteristics, Open SaaS and SOA, examples of SaaS platform Identity as a Service(IDaaS) Compliance as a Service(CaaS)</p>	
3	<p>Use of Platforms in Cloud Computing</p> <p>Concepts of Abstraction and Virtualization</p> <p>Virtualization technologies : Types of virtualization (access, application, CPU, storage), Mobility patterns (P2V,V2V,V2P,P2P,D2C,C2C,C2D,D2D) Load Balancing and Virtualization: Basic Concepts, Network resources for load balancing, Advanced loadbalancing(includingApplicationDeliveryControllerandApplicationDeliveryNetwork), Mention of the Google Cloud as an example of use of load balancing</p> <p>Hypervisors: Virtual machine technology and types, VMware</p> <p>vSphere Machine Imaging(including mention of Open Virtualization Format–OVF)</p> <p>PortingofapplicationsintheCloud:TheSimpleCloudAPIandAppZeroVirtualApplicationappliance</p> <p>Concepts of Platform as a Service (PaaS)</p> <p>Definition of services, Distinction between SaaS and PaaS (knowledge of Salesforce.com and Force.com), Application development Use of PaaS Application frame works</p> <p>Use of Google Web Services</p> <p>Discussion of Google Applications Portfolio – Indexed search, Dark Web, Aggregation and disintermediation, Productivity applications and service, Adwords, Google Analytics, Google Translate, a brief discussion on Google Toolkit (including introduction of Google APIs in brief), major features of Google App Engine service.</p> <p>Use of AWS: Amazon Web Service components and services: Amazon Elastic Cloud, Amazon Simple Storage system, Amazon Elastic Block Store, Amazon Simple DB and Relational Database Service</p> <p>Use of Microsoft Cloud Services: Windows Azure platform: Microsoft’s approach, architecture, and main elements, overview of Windows Azure App Fabric, Content Delivery Network, SQL Azure, and Windows Live services</p>	8
4	<p>Cloud Infrastructure: Types of services required in implementation–Consulting, Configuration, Customization and Support</p> <p>Cloud Management: An overview of the features of network management systems and a brief introduction of related products from large cloud vendors, Monitoring of an entire cloud computing deployment stack: an over view with mention of some products, Life cycle management of cloud services (six stages offline cycle) Concepts of Cloud Security Cloud security concerns, Security boundary, Security service boundary Overview of security mapping</p> <p>Security of data: Brokered cloud storage access, Storage location and tenancy, encryption, and auditing and compliance Identity management (awareness of Identity protocol standards)</p>	6
5	<p>Concepts of Services and Applications</p> <p>Service Oriented Architecture: Basic concepts of message-based transactions, Protocol stack for an SOA architecture, Event-driven SOA, Enterprise Service Bus, Service catalogs</p> <p>Applications in the Cloud: Concepts of cloud transactions, functionality mapping, Application attributes, Cloud service attributes, System abstraction and Cloud Bursting, Applications and Cloud APIs</p>	6

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	Cloud-based Storage: Cloud storage definition–Manned and Unmanned Webmail Services: Cloud mail services including Google Gmail, Mail2Web, Windows Live Hotmail, Yahoo mail, concepts of Syndication services	
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THEORY

Course Title: Software Engineering	Code: PECICB601B
Type of Course: Theory	Course Designation: Professional Elective
Semester: 6th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
PECICB601B.CO1	Identify and define the various phases of lifecycle for a given project and the appropriate process model depending on the user requirements in order to develop a cost-effective software product.	Understand	K2
PECICB601B.CO2	Distinguish between a structure chart and a flow chart and identify the activities carried out during transform.	Analyze	K4
PECICB601B.CO3	Choose between the coding style (structured or OO) and Perform Code review, Code analysis, build process	Apply	K3
PECICB601B.CO4	Judge appropriate software testing techniques to the quality of a software product at modules, integration, and system granularity levels.	Evaluate	K5
PECICB601B.CO5	Apply the principles, processes and main knowledge areas for Software Project Management	Apply	K3
PECICB601B.CO6	Design different types of UML diagram with knowledge when and why use a particular type of diagram based on the software product requirements	Create	K6

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	1	1	1	1	1	2	3	3	2
CO2	3	3	2	2	2	-	1	1	1	1	-	3	3	2
CO3	3	1	3	2	2	1	1	1	1	1	-	3	2	2
CO4	3	2	2	2	3	2	1	1	1	1	1	3	3	3
CO5	3	3	2	2	3	-	1	1	1	1	2	3	3	3
CO6	3	3	2	2	3	-	1	1	1	1	2	3	2	2
AVG.	3	2.5	2.33	2	2.5	1.33	1	1	1	1	1.75	3.00	2.66	2.33

University Syllabus:

Unit	Content	Hrs/Unit
1	Overview of System Analysis & Design, Business System Concept, System Development Life Cycle, Waterfall Model, Spiral Model, Feasibility Analysis, Technical Feasibility, Cost-Benefit Analysis, COCOMO model.	8
2	System Design: Context diagram and DFD, Problem Partitioning, Top-Down And Bottom-Up design; Decision tree, decision table and structured English; Functional vs. Object-Oriented approach.	5
3	Coding & Documentation: Structured Programming, OO Programming, Information Hiding, Reuse, System Documentation. Testing – Levels of Testing, Integration Testing, Test case Specification, Reliability Assessment, Validation & Verification 12 Metrics, Monitoring & Control.	10
4	Software Project Management: Project Scheduling, Staffing, Software Configuration Management, Quality Assurance, Project Monitoring.	6
5	Static and dynamic models, why modeling, UML diagrams: Class diagram, interaction diagram: collaboration diagram, sequence diagram, state chart diagram, activity diagram, implementation diagram.	7

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Course Title: Ethical Hacking	Code: PECICB601C
Type of Course: Theory	Course Designation: Professional Elective
Semester: 6th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
PECICB601C .CO1	Understand the basics of ethical hacking and Indian IT-ACT-2000.	Remember	K1
PECICB601C .CO2	Learn the toolset for foot printing and Reconnaissance.	Apply	K3
PECICB601C .CO3	Learn the tools for Scanning networks, Enumeration and sniffing	Apply	K3
PECICB601C .CO4	Analyse different types of attacks.	Analyse	K4
PECICB601C .CO5	Learning the technology for different types of web based attacks,	Analyse	K4
PECICB601C .CO6	Defence against various cyber-attacks.	Evaluate	K5

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	-	-	1	1	-	-	1	2	3	3
CO2	3	3	3	-	2	-	1	1	1	-	1	2	3	2
CO3	2	2	1	2	3	1	1	1	1	3	1	2	3	2
CO4	3	3	2	2	3	1	2	1	1	2	1	2	3	2
CO5	3	2	3	2	1	-	1	1	-	1	1	2	2	2
CO6	3	3	3	2	2	2	1	1	-	-	1	2	2	2
AVG	2.83	2.67	2.33	1.34	1.84	0.67	1.17	1	0.5	1	1	2	2.67	2.5

University Syllabus:

Unit	Content	Hrs/ Unit
1	Ethical hacking: Definition, types of hacking, advantages, disadvantages and purpose of hacking, Types of hackers, Code of ethics, Types of attacks and attack vector types, Prevention from hackers, Phases of hacking The Indian IT Act 2000 and Amendments to the Indian IT Act (2008)	5
2	Footprinting: Definition, active and passive footprinting, purpose of footprinting, objectives of footprinting, footprinting threats, Types of footprinting, footprinting countermeasures. Self-Learning Topics: footprinting tools	3

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3	<p>Scanning networks: Network scanning and its types, objectives of network scanning, scanning live systems, scanning techniques-TCP Connect/ Full Open Scan, Types of Stealth scans, port scanning countermeasures, IDS evasion techniques, Banner grabbing and its tools, vulnerability scanning, proxy servers, anonymizers, IP spoofing and its countermeasures.</p> <p>Enumeration and Sniffing: Enumeration: Definition, Enumeration techniques, Enumeration types, Enumeration countermeasures, Sniffing: Definition, Wiretrapping and its types, packet sniffing, sniffing threats, working sniffers, sniffing methods-ARP spoofing and MAC flooding, active and passive sniffing, types of sniffing attacks, sniffing countermeasures, Wireless Sniffing, sniffing detection techniques</p>	8
4	<p>Worms, viruses, Trojans, Types of worms, viruses and worms, Preventing malware attacks, types of attacks: (DoS / DDoS), Waterhole attack, brute force, phishing and fake WAP, Eavesdropping, Man-in-the-middle, buffer overflow, DNS poisoning, ARP poisoning, Identity Theft, IoT Attacks, BOTs and BOTNETs, Steganography: text, image and audio and video, types of Social Engineering: Physical social engineering, Remote social engineering and hybrid social engineering. Self Learning Topics: Case studies, malware tools and steganographic tools.</p>	7
5	<p>Hijacking: Definition, successful hijacking, hijacking techniques, process, Types, countermeasures, protecting and preventing, Hacking web servers and web applications: Causes of web servers being compromised, web server attacks, stages of web server attacks, defending against web server attacks, web application components, its working, architecture, web server attack vectors, web application threats and counter measures SQL injection: Definition, SQL injection threats, SQL injection attacks, SQL injection detection, Types of SQL injection, SQL injection methodology, SQL injection prevention and counter measures.</p>	6
6	<p>Types of wireless Architecture, wireless encryption techniques: WEP and WPA, breaking WEP/WPA and defending WPA encryption Characteristics, types of cloud computing services, models and benefits, threats and attacks, Cryptography and its attacks, what is Pen Testing, need for pen testing, types and techniques of pen testing, phases of pen testing. Self-Learning Topics: Tools of WEP/WPA, cloud computing, cryptography, Pen testing.</p>	5

References :

1. Manthan Desai Basics of ethical hacking for beginners.
2. Penetration testing A Hands-On Introduction to Hacking by Georgia Weidman

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THEORY

Course Title: Human Resource Development	Code: OECICB601A
Type of Course: Theory	Course Designation: Open Elective
Semester: 6th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
OECICB601A.CO1	Understand about the functions of HRM	Understand	K2
OECICB601A.CO2	Distinguish between Recruitment and Selection	Evaluate	K5
OECICB601A.CO3	Relate the various stages in Training cycle and Performance appraisal	Apply	K3
OECICB601A.CO4	Understand the basics of compensation management.	Understand	K2
OECICB601A.CO5	Analyse about managing employee relations.	Analyse	K4

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	1	1	1	3	1	2	1	1	2	2	1	1	1
CO2	1	2	3	1	1	1	1	3	1	2	1	1	1	1	1
CO3	2	2	2	1	1	1	1	2	2	2	1	1	1	1	1
CO4	2	2	2	1	1	1	1	3	2	2	2	1	1	1	1
CO5	1	3	1	1	1	3	1	2	3	1	2	2	1	1	1
AVG.	1.4	2.4	1.8	1	1	1.8	1	2.4	1.8	1.6	1.6	1.4	1	1	1

University Syllabus:

UNIT	Content	Hrs/Unit
1	Human Resource Development: Meaning, Scope, objectives, and functions of HRM, HR as a Factor of Competitive Advantage, Structure of HR Department, , Line and staff responsibility of HR Managers, Environmental factors influencing HRM Human Resource Planning: definition, objective, process of HRP. Supply and Demand Forecasting techniques, Manpower Inventory, Career Planning & Development, Succession Planning, Rightsizing, Restructuring. Human Resource Information System (HRIS)	6
2	Recruitment and Selection: Process, Sources, Methods of selection, Interviewing Methods, Skills and Errors. Human Resource Development: Definition, objective, process of HRD, Assessment of HRD Needs, HRD Methods: Training and Non-Training, Training Process; Designing, Implementation and Evaluation of Training Programmes, Induction Training. Developing Managerial Skills for: team management, collaboration, interaction across business functions, presentation , Negotiation, and Networking	10
3	Performance Appraisal Systems : Purpose, Methods, Appraisal instruments, 360 degree Appraisal, HR Score Card, Errors in appraisal, Potential Appraisal, Appraisal Interview. Compensation Management : Concepts, Components; System of Wage Payment, job evaluation, wage/ salary fixation, incentives, bonus, ESOPs, Fringe Benefits, Retirement Benefits. Compensation Plans	7
4	Industrial Relations in India: Parties; Management and Trade Unions, Industrial Disputes: Trends, Collective Bargaining, Settlement Mechanisms, Role of Government, Labour Policy in India. Workers' Participation in Management: Concept, Practices and Prospects in India, Quality Circles and other Small Group Activities	7
5	Discipline Management : Misconduct, Disciplinary action, Domestic Enquiry, Grievance Handling Strategic HRM: Meaning, Strategic HRM vs Traditional HRM, SHRM Process, barriers to SHRM. Nature of e-HRM, eRecruitment & Selection, e-Performance Management, e-Learning	6

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Syllabus and Curricular Mapping for B. Tech in Computer Science & Engineering
(Cyber Security)
Effective from Academic Session 2022-2023

THEORY

Course Title: Organizational Behaviour	Code: OECICB601B
Type of Course: Theory	Course Designation: Open Elective
Semester: 6th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
OECICB601B.CO1	Understanding the general concept of Organization Behaviour, its challenges and opportunities in the global environment	Understand	K2
OECICB601B.CO2	Explaining the concept of personality, attitude and perception for better	Evaluate	K5
OECICB601B.CO3	Demonstrating to role of Motivation, Communication and Leadership for boosting up employees' moral.	Understand	K2
OECICB601B.CO4	Contrasting Group Decision Making and Individual Decision Making; formation and development of Groups in the changing business environment.	Apply	K3
OECICB601B.CO5	Analysing the needs of Organisational Design and Organisational Policies for better control	Analyse	K4
OECICB601B.CO6	Developing techniques to avoid conflicts and building a strong organisational base.	Create	K6

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	2	1	-	2	2	2	-	-	2	2	1	1	1
CO2	-	-	-	-	-	1	-	1	1	2	-	-	1	1	1
CO3	-	-	-	-	2	-	-	-	3	3	2	-	1	1	1
CO4	-	2	-	-	-	-	1	-	3	2	2	-	-	1	1
CO5	1	-	2	2	3	3	1	2	-	-	-	2	-	1	1
CO6	-	-	2	-	2	2	-	2	-	2	-	2	-	-	-
AVG.	0.34	0.34	1	0.5	1.17	1.34	1.6	2	1.6	1.2	0.8	2.4	0.5	0.83	0.83

University Syllabus:

Unit	Content	Hrs/Unit
1	OB–Overview–Meaning of OB, Importance of OB, Field of OB, Contributing Disciplines, Applications in Industry.	4
2	Personality–Meaning of Personality, Determinants of Personality, Theories of Personality, Measurement of Personality, Development of Personality.	6
3	Perception–Process and Principles, Nature and Importance, Factors Influencing Perception, Perceptual Selectivity, Social Perception, Fundamentals of Decision making	4
4	Work Motivation– Approaches to Work Motivation, Theories of Motivation–Maslow's Hierarchy of Need Theory, Alderfer's ERG Theory, Herzberg's Motivation- Hygiene Theory, McClelland's Achievement–Motivation Theory, McGregor's Theory X & Y, Vroom's Expectancy Theory, Porter Lawler Expectancy Model	6
5	Attitudes and Job Satisfaction – Sources of Attitudes, Types of Attitudes, Attitudes and Consistency, Cognitive Dissonance Theory, Attitude Surveys.	2

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6	Organization - Mission, Goals, Characteristics, Types, Organizational Theory- Classical Theories, Scientific Management, Administrative Principles, Bureaucracy, Human Relation Approach, Modern Theories: System Approach, Contingency Approach, Quantitative Approach, Behavioral Approach, Managing Organizational Culture, Various Organizational Structures	6
7	Group Behavior-Characteristics of Group, Types of Groups, Stages of Group Development, Group Decision-making, difference work group and work team, Why work Teams, Work team in organization, Team Building, Organizational Politics.	4
8	Leadership – Qualities of a Successful Leader, Leadership Theories, Leadership Styles ,Skills and influence process, Blake & Mouton's Managerial Grid, Leadership and power, Manager vs Leader , Examples of Effective Organizational Leadership in India, Cases on Leadership, Success stories of today's Global and Indian leaders.	4

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Course Title: Design Thinking	Code: OECICB601C
Type of Course: Theory	Course Designation: Open Elective
Semester: 6th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
OECICB601C .CO1	Describe the phases of Design thinking	Describe	K1
OECICB601C .CO2	Understanding unexpressed needs, Design insight	Understand	K2
OECICB601C .CO3	Analyse the concept of conflict of interest	Analyse	K4
OECICB601C .CO4	Design an algorithm of inventive problem	Create	K6
OECICB601C .CO5	Conceptualise the parameters for testing ideas	Evaluate	K5
OECICB601C.CO6	Compose and test the ideas, refinement	Create	K6

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	1	-	3	2	2	3	2	3	1	1	2
CO2	2	2	1	1	-	2	1	1	-	1	1	3	2	1
CO3	-	3	-	1	-	-	1	3	1	1	-	2	2	2
CO4	3	3	2	2	3	-	1	2	2	3	1	1	3	3
CO5	1	2	2	2	3	1	-	2	1	2	1	2	1	2
CO6	2	2	2	2	2	2	1	2	3	3	-	3	3	3
AVG.	1.67	2.17	1.17	1.5	1.33	1.33	1	2	1.67	2	1	2	2	2.17

University Syllabus:

Unit	Content	Hrs/Unit
1	Introduction and history to Design Thinking, human centered design, evoking the 'right problem', case study.	5
2	Empathize Phase, Customer Journey Mapping, understanding unexpressed needs, design insight and strategy.	6
3	Analyze Phase, 5-Whys, conflict of interest.	6
4	Solve Phase, Ideation, algorithm of inventive problem (ARIZ), TRIZ and theory of inventive problem solving (TIPS), inventive principle (preliminary action, beforehand cushioning, the other way round).	7
5	Conceptual phase, Test Phase, parameter needed to test ideas, Field work, Storyboarding and Rapid Prototyping Customer reactions to prototype and validation, proposal submission.	7
6	Test Phase, parameter needed to test ideas, Field work, Usability Testing, Refine and Enhance Design.	5

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THEORY

Course Title: Economic Policies of India	Code: OECICB601D
Type of Course: Theory	Course Designation: Open Elective
Semester: 6th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
OECICB601D.CO1	To know the concepts and macroeconomic frameworks of Indian economic policies and scope of development.	Understand	K2
OECICB601D.CO2	Understanding the economic environment of an economy and also to present their usefulness for business decision making	Understand	K2
OECICB601D.CO3	Analyzing the different sectors and their economic structures	Analyze	K4
OECICB601D.CO4	Evaluate the different fiscal developments in India in terms of global perspective	Evaluate	K5

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	3	1	3	3	3	3	2	2	3	1	1	1
CO2	1	1	1	2	1	2	2	2	2	2	3	2	1	-	1
CO3	1	3	2	2	2	1	3	3	3	2	2	3	1	1	1
CO4	1	3	2	3	3	2	2	3	2	2	3	2	-	1	-
AVG.	1	2.25	1.5	2.5	1.75	2	2.5	2.75	2.5	2	2.5	2.5	0.75	0.75	0.75

University Syllabus:

Unit	Content	Hrs/Unit
1	Growth and Structural Change Indian economy at Independence, the policy framework: statist policy, transition to market-oriented policy, role of erstwhile Planning Commission And NITI Ayog, two phases of growth (1950-1980 and 1980 onwards), factors underlying turnaround, structural change in Indian economy	6
2	Agricultural and Industrial Sectors Agricultural Sector Performance of agricultural sector, factors determining agricultural growth, factors underlying food inflation, agricultural price policy and food security, industrial Growth - Industrial growth before and after reforms - Dualism in Indian manufacturing, issues in performance of public sector enterprises and privatisation	7
3	Fiscal Developments, Finance and External Sector Expenditure trends, GST: rationale and impact, evolution of the financial sector in post-liberalisation period, external sector performance: emergence of India as major exporter in services, performance of manufacturing sector	8
4	Poverty and Inequality Measuring poverty in India: Selection of poverty lines, poverty in pre and post liberalization periods, impact of growth on poverty, PDS vs cash transfers, feasibility of universal basic income in India, inequality in India in pre and post liberalization periods	7
5	Social Issues Gender gap in India and trends in female labour force participation rates, factors determining female labour force participation,	8

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	employment : changing nature of employment in India, meaning of jobless growth, labour in informal sector, India's demographic transition	
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References:

1. Indian Economy Since Independence Edited by Uma Kapila (New Delhi: AcademicFoundation),the latest edition
2. Economic Survey 2018 and subsequent editions (Government of India: Ministry of Finance)
3. Indian Economy by Ramesh Singh
4. The Indian Economy by Sanjiv Verma

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THEORY

Course Title: Research Methodology	Code: PROJCS601
Type of Course: Theory	Course Designation: Project
Semester: 6th	Contact Hours: 2L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
PROJCS601.CO1	Define and understand the motivation and objectives of research work	Define	K1
PROJCS601.CO2	Explain how to define and formulate a research problem	Explain	K2
PROJCS601.CO3	Identify the importance of literature review in a research work	Identify	K3
PROJCS601.CO4	Examine the appropriate statistical methods required for a particular research design and develop the appropriate research hypothesis for a research project	Examine	K4
PROJCS601.CO5	Explain the ethical issues involved while undertaking research	Explain	K2
PROJCS601.CO6	Develop the skill set to correctly present a research work by following the protocols of writing a standard research report.	Develop	K6

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	-	-	-	1	-	2	3	3	2
CO2	3	3	2	2	2	-	-	-	1	-	2	3	3	2
CO3	3	1	2	2	2	-	-	-	1	-	2	3	3	2
CO4	3	2	2	2	3	-	-	-	1	-	2	3	3	2
CO5	-	-	-	-	-	-	-	3	1	-	-	3	2	3
CO6	3	3	2	2	3	-	-	-	1	-	2	3	2	3
AVG.	3	2.4	2.2	2	2.4	0	0	3	1	0	2	3.00	2.66	2.33

University Syllabus:

Unit	Content	Hrs/Unit
1	RESEARCH FORMULATION AND DESIGN Motivation and objectives – Research methods vs. Methodology. Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical, concept of applied and basic research process, criteria of good research. Defining and formulating the research problem, selecting the problem, necessity of defining the problem, importance of literature review in defining a problem, literature review-primary and secondary sources, reviews, monograph, patents, research databases, web as a source, searching the web, critical literature review, identifying gap areas from literature and research database, development of working hypothesis.	7
2	DATA COLLECTION AND ANALYSIS Accepts of method validation, observation and collection of data, methods of data collection, sampling methods, data processing and analysis strategies and tools, data analysis with statically package (Sigma STAT, SPSS for student t-test, ANOVA, etc.), hypothesis testing	7
3	RESEARCH ETHICS, IPR AND SCHOLARY PUBLISHING Ethics-ethical issues, ethical committees (human & animal); IPR- intellectual property rights and patent law, commercialization, copy right, royalty, trade related aspects of intellectual property rights (TRIPS); scholarly publishing- IMRAD concept and design of research paper, citation and acknowledgement, plagiarism, reproducibility and accountability	7

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4	INTERPRETATION AND REPORT WRITING Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Project Report, Layout of the Project/Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Project/Research Report, Precautions for Writing Research Reports, Conclusions.	7
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PRACTICAL

Course Title: Network Security Lab	Code: PCCCS691
Type of Course: Practical	Course Designation: Professional Core
Semester: 6th	Contact Hours: 4P/week
Continuous Assessment: 40 Marks	Final Exam: 60 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
PCCCS691.CO1	Demonstrate security architectures, protocols and services in both wired and wireless networks	Apply	K3
PCCCS691.CO2	Understand the role of security protocols in securing networks	Understand	K2
PCCCS691.CO3	Discover, analyze and identify security issues in the network.	Analyze	K4
PCCCS691.CO4	Evaluate the use of an IDS and IPS in a working environment	Evaluate	K2
PCCCS691.CO5	Understand computer security principles and discuss ethical issues for theft of information. Identify threat models and common computer network security goals	Understand	K3
PCCCS691.CO6	Configure Numbered ACL for a given topology.	Apply	K3

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	1	1	1	2	2	1	-	3	2	1
CO2	3	2	1	3	2	1	1	1	2	1	-	2	3	1
CO3	2	3	3	2	2	1	1	2	2	1	-	3	2	1
CO4	2	1	2	1	2	1	1	1	2	1	1	2	3	2
CO5	2	2	2	2	2	1	1	1	2	1	2	2	1	-
CO6	3	2	2	2	2	1	1	1	2	1	2	3	-	-
AVG.	2.5	2	2	2	1.84	1	1	1.34	2	1	1.67	2.5	2.2	1.25

University Syllabus:

Laboratory Experiments:	
1	Make a Detailed Report on Network Security Threats covering Structured, Unstructured, Internal and External Threats
2	Perform the following Scan using Wireshark and analyze your results (a) Analyze TCP session (b) Perform and analyze these scans (i) Start a Wireshark capture. Open a Windows-> command window and perform a Host Scan (using ICMP packets) on a neighbours machine using nmap -sP [neighbors ip address]. Stop the capture and filter the traffic for ARP and ICMP packets. (ii) Start a new Wireshark capture, and then perform a host scan (ICMP scan) on a system out with the subnet, such as nmap -sP scanme.nmap.org. (Stop the capture and filter the traffic for ARP and ICMP packets and Compare with previous results. (iii) Start a new Wireshark capture, and then perform a complete Port Scan (in this case a TCP SYN scan) and an Operating System Fingerprint on a neighbours machine using nmap -O

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	[neighbours ip address] . The -O option should provide the OS running on the scanned machine. Stop the capture and filter for source address == your machines address if necessary.
3	Perform to Analysis Network using Wireshark for (a)Traffic Monitoring (TCP slow down and HTTP slow down) (b) Packet Sniffing
4	Perform to Explore, execute and analysis traffic using TCP Dump and Net discover tools
5	Perform to explore Shodan for (a) locating Boats and Ship Locations (b) Searching and capturing Live Cameras. (b) To Write a small NSE Script
6	Perform to spoof IP address of your own system using Kali Linux
7	Perform to sniff traffic using ARP Spoofing
8	Perform to perform man in middle attack using DNS spoofing
9	Perform to perform UDP session hijacking using Scapy
10	Perform to perform TCP session hijacking
11	Perform HTTP Session Hijacking through Cookie stealing
12	Configuring IPSec VPN Tunnel Mode using Packet Tracer
13	Decryption SSL/TLS Traffic using Wireshark
14	Configure AAA (TACACS+) on Packet Tracer for User Authentication
15	User account Using TACACS AND RADIUS ON PACKET TRACER
16	Configure Numbered ACL for a given topology.
17	Perform Wireless Hacking using airo dumping
18	Defining Snort Rules

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PRACTICAL

Course Title: Database Management System Lab	Code: PCCCS692
Type of Course: Practical	Course Designation: Professional Elective
Semester: 6th	Contact Hours: 4P/week
Continuous Assessment: 40 Marks	Final Exam: 60 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
PCCCS692.CO1	Analyze and transform an Entity Relationship Model into arelational database schema and to use a data definition language to implement the schema using a DBMS	Analyze	K4
PCCCS692.CO2	Declare and enforce integrity constraints on a database using a DBMS	Understand	K1
PCCCS692.CO3	Populated and query a database using SQL DML/DDDL commands	Apply	K3
PCCCS692.CO4	Retrieve of data from a database.	Apply	K3
PCCCS692.CO5	Describe and implement relational algebra expression using aggregate functions, joins and sub-queries.	Remember	K1
PCCCS692.CO6	Compile programs in PL/SQL including stored procedures, stored functions, cursors, packages.	Create	K6

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1	3	1	1	1	2	1	1	2	2	1
CO2	3	2	3	2	3	1	1	-	2	1	1	2	2	1
CO3	3	2	3	2	3	1	1	2	2	1	1	2	2	1
CO4	3	2	3	2	3	1	1	2	2	1	1	2	2	1
CO5	3	2	3	3	3	1	1	2	2	1	1	2	2	1
CO6	3	2	3	2	3	1	1	2	2	1	1	2	2	1
AVG.	3	2	3	3	3	1	1	1.8	2	1	1	2	2	1

University Syllabus:

Unit	Content
1	Structured Query Language: Creating Database Creating a Database, Creating a Table, Specifying Relational Data Types, Specifying Constraints, Creating Indexes
2	Table and Record Handling, INSERT statement, Using SELECT and INSERT together, DELETE, UPDATE, TRUNCATE statements, DROP, ALTER statements
3	Retrieving Data from a Database: The SELECT statement, Using the WHERE clause, Using Logical Operators in the WHERE clause, Using IN, BETWEEN, LIKE, ORDER BY, GROUP BY and HAVING Clause, Using Aggregate Functions, Combining Tables Using JOINS, Subqueries
4	Database Management: Creating Views, Creating Column Aliases, Creating Database Users, Using GRANT and REVOKE
5	Cursors in Oracle PL / SQL, Writing Oracle PL / SQL Stored Procedures

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Semester-VII

Course Title: Digital Forensics	Code: PECICB701A
Type of Course: Theory	Course Designation: Professional Elective
Semester: 7th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
PECICB701A.CO1	Conduct digital investigations that conform to accepted professional standards and are based on the investigative process: identification, preservation, examination, analysis, and reporting	Remember	K1
PECICB701A.CO2	Cite and adhere to the highest professional and ethical standards of conduct, including impartiality and the protection of personal privacy	Understand	K2
PECICB701A.CO3	Identify and document potential security breaches of computer data that suggest violations of legal, ethical, moral, policy, and/or societal standards	Analyze	K4
PECICB701A.CO4	Apply a solid foundational grounding in computer networks, operating systems, file systems, hardware, and mobile devices to digital investigations and to the protection of computer network resources from unauthorized activity	Understand	K2
PECICB701A.CO5	Work collaboratively with clients, management, and/or law enforcement to advance digital investigations or protect the security of digital resources	Apply	K3
PECICB701A.CO6	Access and critically evaluate relevant technical and legal information and emerging industry trends	Analyze	K4

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	2	1	3	1	1	2	2	2	3
CO2	2	2	2	3	1	1	1	-	1	1	-	2	3	3
CO3	2	3	3	2	2	1	1	2	1	1	-	3	2	3
CO4	2	3	3	2	1	1	1	-	1	1	3	2	3	2
CO5	2	2	2	2	1	1	1	-	1	1	2	2	2	-
CO6	3	2	3	2	1	1	1	-	1	1	2	3	-	2
AVG.	2.33	2.5	2.67	2.33	1.34	1.17	1	0.84	1	1	1.5	2.34	2	2.17

University Syllabus:

Unit	Content	Hrs/Unit
1	Introduction: Introduction to Digital Forensics, electronic evidence and handling, electronic media, collection, searching and storage of electronic media, hacking and cracking, credit card and ATM and Online frauds, emerging digital crimes.	6
2	Computer Forensics: Definition and Cardinal Rules, Data Acquisition and Authentication Process, computer Artifacts, Internet Artifacts, OS Artifacts and their forensic applications. Types of Business Computer Forensic Technology. Types of Military Computer Forensic Technology, Types of Law Enforcement- Computer Forensic	8

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	Technology, Types of Business Computer Forensic Technology.	
3	Forensic Tools: Introduction to Forensic Tools, Usage of Slack space, tools for Disk Imaging, Data Recovery, Vulnerability Assessment Tools, Encase and FTK tools, Anti Forensics and probable counters, retrieving information, process of computer forensics and digital investigations.	6
4	Processing of Digital Evidence: Processing of digital evidence, digital images, damaged SIM and data recovery, multimedia evidence, retrieving deleted data: desktops, laptops and mobiles, retrieving data from slack space, renamed file, ghosting, compressed files. Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics.	8
5	Evidence Collection and Data Seizure: Process of evidence collection. Collection Options, Obstacles-Types of Evidence-The Rules of Evidence-Volatile Evidence-General Procedure-Collection and Archiving-Methods of Collections-Art facts-Collection Steps - Controlling Contamination: The chain of custody. Duplication and Preservation of <i>Digital</i> Evidence: Preserving the Digital Crime Scene-Computer Evidence processing steps-legal aspects of collecting and preserving computer forensic Evidence.	8

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Course Title: Information Theory and Coding	Code: PECICB701B
Type of Course: Theory	Course Designation: Professional Elective
Semester: 7th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
PECICB701B.CO1	Describe the concept of information and entropy	Remember	K1
PECICB701B.CO2	Explain Shannon's theorem for coding	Understand	K2
PECICB701B.CO3	Examine the amount of information using channel capacity	Apply	K3
PECICB701B.CO4	Illustrate information representation using Huffman encoding algorithms	Analyze	K4
PECICB701B.CO5	Differentiate between cyclic codes and linear block codes	Understand	K2

Mapping of COs with POs and PSOs. (Course articulation matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	2	1	1	1	1	1	2	-	2	2	1
CO2	3	3	3	1	1	1	1	1	1	2	-	2	2	2
CO3	3	3	2	3	1	1	1	1	1	1	-	2	2	1
CO4	3	3	3	3	1	1	1	1	1	1	-	2	3	2
CO5	2	2	2	3	1	1	1	1	1	2	-	2	2	1
AVG.	2.6	2.8	2.4	2.4	1	1	1	1	1	1.6	-	2.0	2.2	1.4

University Syllabus:

Unit	Content	Hrs/Unit
1	Coding: Uncertainty and information, average mutual information and entropy, information measures for continuous random variables, source coding theorem, Huffman codes.	4
2	Channel Capacity And Coding: Channel models, channel capacity, channel coding, information capacity theorem, The Shannon limit.	4
3	Linear And Block Codes For Error Correction: Matrix description of linear block codes, equivalent codes, parity check matrix, decoding of a linear block code, perfect codes, Hamming codes	8
4	Cyclic Codes: Polynomials, division algorithm for polynomials, a method for generating cyclic codes, matrix description of cyclic codes, Golay codes.	6
5	BCH Codes: Primitive elements, minimal polynomials, generator polynomials in terms of minimal polynomials, examples of BCH codes	6
6	Convolutional Codes: Tree codes, trellis codes, polynomial description of convolutional codes, distance notions for convolutional codes, the generating function, matrix representation of convolutional codes, decoding of convolutional codes, distance and performance bounds for convolutional codes, examples of convolutional codes, Turbo codes, Turbo decoding.	8

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References:

1. Information theory, coding and cryptography - Ranjan Bose; TMH.
2. Information and Coding - N Abramson; McGraw Hill.
3. Introduction to Information Theory - M Mansurpur; McGraw Hill.
4. Information Theory - R B Ash; Prentice Hall.
5. Error Control Coding - Shu Lin and D J Costello Jr; Prentice Hall.

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Course Title: Blockchain Technology	Code: PECICB701C
Type of Course: Theory	Course Designation: Professional Elective
Semester: 7th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
PECICB701C.CO1	Explain the basic notion of distributed systems.	Analyze	K4
PECICB701C.CO2	Understand the working of an immutable distributed ledger and trust model that defines Blockchain.	Understand	K2
PECICB701C.CO3	Evaluate the essential components of a Blockchain platform.	Evaluate	K5
PECICB701C.CO4	Apply the knowledge to use the Blockchain technology	Apply	K3

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	2	3	3
CO2	3	3	3	-	2	-	-	-	-	-	-	2	3	2
CO3	2	2	1	2	3	1	-	1	1	3	-	2	3	2
CO4	2	3	1	2	2	1	1	2	1	3	-	2	3	2
AVG.	2.5	2.75	1.25	1	1.75	0.33	0.25	0.75	0.5	1.5	-	2	3	2.25

University Syllabus:

Unit	Content	Hrs/Unit
1	Introduction: Public - Key Cryptography, Hashing, Distributed Systems, Distributed Consensus.	6
2	Technology Stack: Blockchain, Protocol, Currency, Blockchain Mining, Bitcoin Blockchain: Structure, Operations, Features, Consensus Model, Incentive Model	6
3	Ethereum Blockchain: Smart Contracts, Ethereum Structure, Operations, Consensus Model, Incentive Model.	6
4	Tiers of Blockchain Technology: Blockchain 1.0, Blockchain 2.0, Blockchain 3.0, Types of Blockchain: Public Blockchain, Private Blockchain, Semi-Private Blockchain, Sidechains.	10
5	Types of Consensus Algorithms: Proof of Stake, Proof of Work, Delegated Proof of Stake, Proof Elapsed Time, Deposit-Based Consensus, Proof of Importance, Federated Consensus or Federated Byzantine Consensus, Practical Byzantine Fault Tolerance. Blockchain Use Case: Supply Chain Management.	8

References:

1. Kirankalyan Kulkarni, Essentials of Bitcoin and Blockchain, Packt Publishing.
2. Tiana Laurence, Blockchain for Dummies, 2nd Edition 2019, John Wiley & Sons.
3. Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks by Imran Bashir, Packt Publishing (2017).
4. Blockchain: Blueprint for a New Economy by Melanie Swan, Shroff Publisher O'Reilly Publisher Media; 1st edition (2015).
5. Mastering Bitcoin: Programming the Open Blockchain by Andreas Antonopoulos.

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THEORY

Course Title: Artificial Intelligence & Machine Learning	Code: PECICB702A
Type of Course: Theory	Course Designation: Professional Elective
Semester: 7th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
PECICB702A.CO1	Acquaint with fundamentals of artificial intelligence and machine learning.	Remember	K1
PECICB702A.CO2	Learn feature extraction and selection techniques for processing data set.	Analyse	K4
PECICB702A.CO3	Understand basic algorithms used in classification and regression problems.	Understand	K2
PECICB702A.CO4	Familiarize with concepts of reinforced and deep learning.	Apply	K3
PECICB702A.CO5	Implement machine learning model in engineering problems.	Evaluate	K5

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	1	1	-	1	-	-	1	1	3	2
CO2	2	2	3	-	1	1	-	1	-	1	1	-	3	3
CO3	3	2	1	2	3	1	-	1	1	2	1	-	3	2
CO4	3	3	2	2	3	1	2	1	0	2	1	-	3	2
CO5	3	3	3	2	2	1	-	1	-	1	1	-	2	2
AVG	2.8	2.6	2.2	1.2	2	1	0.4	1	0.2	1.2	1	0.2	2.8	2.2

University Syllabus:

Unit	Content	Hrs/unit
1	Introduction to AI & ML: History of AI, Comparison of AI with Data Science, Need of AI in Mechanical Engineering, Introduction to Machine Learning. Basics: Reasoning, problem solving, Knowledge representation, Planning, Learning, Perception, Motion and manipulation. Approaches to AI: Cybernetics and brain simulation, Symbolic, Sub-symbolic, Statistical. Approaches to ML: Supervised learning, Unsupervised learning, Reinforcement learning	4
2	Feature Extraction and Selection: Feature extraction: Statistical features, Principal Component Analysis. Feature selection: Ranking, Decision tree - Entropy reduction and information gain, Exhaustive, best first, Greedy forward & backward, Applications of feature extraction and selection algorithms in Mechanical Engineering.	7
3	Classification & Regression: Decision tree, Random forest, Naive Bayes, Support vector machine. Regression: Logistic Regression, Support Vector Regression. Regression trees: Decision tree, random forest, K-Means, K-Nearest Neighbor (KNN). Applications of classification and regression algorithms in Mechanical Engineering.	6
4	Development of ML Model: Problem identification: classification, clustering, regression, ranking. Steps in ML modeling, Data Collection, Data pre-processing, Model Selection, Model training (Training, Testing, K-fold Cross Validation),	6

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	Model evaluation (understanding and interpretation of confusion matrix, Accuracy, Precision, Recall, True positive, false positive etc.), Hyper parameter Tuning, Predictions.	
5	Reinforced and Deep Learning: Characteristics of reinforced learning; Algorithms: Value Based, Policy Based, Model Based; Positive vs Negative Reinforced Learning; Models: Markov Decision Process, Q Learning. Characteristics of Deep Learning, Artificial Neural Network, Convolution Neural Network. Application of Reinforced and Deep Learning in Mechanical Engineering.	7
6	Applications: Human Machine Interaction, Predictive Maintenance and Health Management, Fault Detection, Dynamic System Order Reduction, Image based part classification, Process Optimization, Material Inspection, Tuning of control algorithms.	6

References:

1. Deisenroth, Faisal, Ong, Mathematics for Machine Learning, Cambridge University Press, 2020.
2. B Joshi, Machine Learning and Artificial Intelligence, Springer, 2020.
3. Parag Kulkarni and Prachi Joshi, “Artificial Intelligence – Building Intelligent Systems”, PHI learning Pvt. Ltd., ISBN – 978-81-203-5046-5, 2015
4. Stuart Russell and Peter Norvig (1995), “Artificial Intelligence: A Modern Approach,” Third edition, Pearson, 2003.
5. Solanki, Kumar, Nayyar, Emerging Trends and Applications of Machine Learning, IGI Global, 2018.
6. Mohri, Rostamizadeh, Talwalkar, Foundations of Machine Learning, MIT Press, 2018.
7. Kumar, Zindani, Davim, Artificial Intelligence in Mechanical and Industrial Engineering, CRC Press, 021.
8. Zsolt Nagy - Artificial Intelligence and Machine Learning Fundamentals-Apress (2018)
9. Artificial Intelligence by Elaine Rich, Kevin Knight and Nair, TMH

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THEORY

Course Title: Malware Analysis	Code: PECICB702B
Type of Course: Theory	Course Designation: Professional Elective
Semester: 7th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
PECICB702B.CO1	Introduce the basics of malware and various attacks due to malware and its components.	Remember	K1
PECICB702B.CO2	Gains knowledge of basic hardware block and software weakness analysis.	Evaluate	K5
PECICB702B.CO3	Analysis of malware and its effect prevention of a different malware attack technique by introduction of different software's.	Understand	K2
PECICB702B.CO4	Description of malware attacks and different functionality.	Analyse	K4
PECICB702B.CO5	Application of the knowledge and use of its for the prevention.	Apply	K3
PECICB702B.CO6	Case studies in mobile platform.	Explain	K2

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	-	-	-	-	0	-	1	1	3	3
CO2	3	3	3	-	2	-	-	-	1	-	1	2	3	2
CO3	2	2	1	2	3	1	-	1	1	3	1	2	3	2
CO4	3	3	2	2	3	1	2	1	1	2	1	1	3	2
CO5	3	2	3	2	1	-	-	-	0	1	1	1	2	2
CO6	3	2	3	2	2	2	-	-	1	-	1	2	2	2
AVG	2.83	2.33	2.33	1.33	1.83	0.67	0.33	0.33	0.67	1	1	1.5	2.67	2.17

University Syllabus:

Unit	Content	Hrs/Unit
1	Introduction: Introduction to malware, OS security concepts, malware threats, evolution of malware, malware types-viruses, worms, rootkits, Trojans, bots, spyware, adware, logic bombs, malware analysis, static malware analysis, dynamic, malware analysis.	3
2	Static Analysis:X86 Architecture- Main Memory, Instructions, Opcodes and Endianness, Operands, Registers, SimpleInstructions, The Stack, Conditionals, Branching, Rep Instructions, C Main Method and Offsets. Antivirus Scanning, Fingerprint for Malware, Portable Executable File Format, The PE File Headers and Sections, The Structure of a Virtual Machine, Reverse- Engineering- x86 Architecture, recognizing c code constructs in assembly, c++ analysis, Analyzing Windows programs, Anti-static analysis techniques-obfuscation, packing, metamorphism, polymorphism.	12

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3	Dynamic Analysis: Live malware analysis, dead malware analysis, analyzing traces of malware- system-calls, api-calls, registries, network activities. Anti-dynamic analysis techniques- anti-vm, runtime-evasion techniques, , Malware Sandbox, Monitoring with Process Monitor, Packet Sniffing with Wireshark, Kernel vs. User-Mode Debugging, OllyDbg, Breakpoints, Tracing, Exception Handling, Patching	10
4	Malware Functionality: Downloader, Backdoors, Credential Stealers, Persistence Mechanisms, Privilege Escalation, Covert malware launching- Launchers, Process Injection, ProcessReplacement, Hook Injection, Detours, APC injection.	5
5	Malware Detection Techniques: Signature-based techniques: malware signatures, packed malware signature, metamorphic and polymorphic malware signature Non-signature based techniques: similarity-based techniques, machine-learning methods, invariant inferences. Android Malware: Malware Characterization, Case Studies – Plankton, DroidKungFu, AnserverBot, Smartphone (Apps) Security	6

References:

1. Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software by Michael Sikorski and Andrew Honig
2. Malware Analyst's Cookbook and DVD Tools and Techniques for Fighting Malicious Code Michael Hale Ligh, Steven Adair, Blake Hartstein, Matthew Richard Wiley publications.

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Course Title: Mobile Applications and Services	Code: PECICB702C
Type of Course: Theory	Course Designation: Professional Elective
Semester: 7th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
PECICB702C.CO1	Remember and Understand what mobile app is and its various aspects , design, development, logic and tools	Understand	K2
PECICB702C.CO2	Remember and Understand the development of the various mobile apps using Android framework, tools and components of Android Studio	Understand	K2
PECICB702C.CO3	Remember and Understand the design of the various mobile apps using its communication framework, tools and other components of android framework	Understand	K2
PECICB702C.CO4	Understand & Apply the graphics display techniques in mobile development	Apply	K3
PECICB702C.CO5	Understand and apply the multimedia and multithreading in mobile apps development	Apply	K3
PECICB702C.CO6	Application & Deployment of mobile apps	Develop	K3

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	3	-	-	-	-	-	2	3	2	2
CO2	3	3	2	2	3	-	-	-	-	-	2	3	2	2
CO3	3	3	2	2	3	-	-	-	-	-	2	3	2	2
CO4	3	3	2	2	2	-	-	-	-	-	-	3	3	2
CO5	3	3	2	2	2	-	-	-	-	-	-	3	3	2
CO6	3	3	2	2	2	-	-	-	-	-	-	3	3	2
AVG.	3	3	2	2	2.5	0	0	0	0	0	2	3	2.5	2

University Syllabus:

Unit	Content	Hrs/Unit
1	Introduction: Introduction to Mobile Computing - Introduction to Android Development Environment. Factors in Developing Mobile Applications - Mobile Software Engineering, Frameworks and Tools, Generic UI Development, Android User	9
2	App Development: Framework, Architecture, Design, Technology Selection, Development Process, Development Tools. Intents on UIs, VUIs - Designing the Right UI, Multichannel and Multimodal UIs. Intents and Services- Android Intents and Services, Characteristics of Mobile Application, Successful Mobile Development. Storing and Retrieving Data - Synchronization and Replication of Mobile Data, Getting the Model Right, Android Storing and Retrieving Data, Working with a Content Provider, Text-to-Speech Techniques, Mobile App Development Hurdles etc.	9
3	Communications over Network and Web: Communications Via Network and the Web - State Machine, Correct Communications Model, Android Networking and Web. Telephony - Deciding Scope of an App, Wireless Connectivity and Mobile Apps, Android Telephony. Notifications and Alarms – Performance, Performance and Memory Management, Android Notifications and Alarms etc.	5

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4	Graphics and Threading: Graphics - Performance and Multithreading, Graphics and UI Performance, Android Graphics. Multimedia - Mobile Agents and Peer-to-Peer Architecture, Android Multimedia. Location - Mobility and Location Based Services, maps.	5
5	Packaging, Testing & Deployment: Packaging and Deploying, APK files, Testing – alpha, beta, Use of simulator, testing on real devices, Deploying in Marketplace, Performance Best Practices, Android Field Service App	4
6	Security and Hacking: Security - Active Transactions, Rooting, more on Security aspects like Secure profile – work profile, user profile. Hacking Android.	4

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Course Title: Soft Skill & Interpersonal Communication	Code: OECICB701A
Type of Course: Theory	Course Designation: Open Elective
Semester: 7th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
OECICB701A.CO1	Define Soft Skills; Process, Importance and Measurement of Soft Skill Development.	Remember	K1
OECICB701A.CO2	Write precise briefs or reports and technical documents.	Apply	K3
OECICB701A.CO3	Demonstrate interpersonal relations; communication models, process and barriers; team communication; developing interpersonal relationships through effective communication; listening skills; essential formal writing skills; corporate communication styles – assertion, persuasion, negotiation.	Apply	K3
OECICB701A.CO4	Analyze Skills, Methods, Strategies and Essential tips for effective public speaking.	Analyze	K4
OECICB701A.CO5	Prepare to participate in group discussion / meetings / interviews and prepare & deliver presentations	Apply	K3
OECICB701A.CO6	Discuss on various Interview Skills, Presentation Skills, Etiquette and Manners, Time Management, Personality Development	Understand	K2

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	3	1	1	3	1	3	1	2	2	1	1
CO2	3	2	1	2	2	1	1	2	2	1	2	3	2	1	1
CO3	2	2	1	2	3	2	1	2	2	1	2	3	2	1	1
CO4	3	2	1	2	2	1	1	2	2	1	2	3	2	1	1
CO5	1	1	1	-	3	1	1	3	1	3	1	2	2	1	1
CO6	2	2	1	2	3	2	1	2	2	1	2	3	2	1	1
AVG.	2	1.67	1	1.33	2.67	1.33	1	2.33	1.67	1.67	1.67	2.67	2	1	1

University Syllabus:

Unit	Content	Hrs/Unit
1	Soft Skills: An Introduction: Definition and Significance of Soft Skills; Process, Importance and Measurement of Soft Skill Development. Self-Discovery: Discovering the Self; Setting Goals; Beliefs, Values, Attitude, Virtue. Positivity and Motivation: Developing Positive Thinking and Attitude; Driving out Negativity; Meaning and Theories of Motivation; Enhancing Motivation Levels.	12

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2	<p>Interpersonal Communication: Interpersonal relations; communication models, process and barriers; team communication; developing interpersonal relationships through effective. Communication; listening skills; essential formal writing skills; corporate communication styles – assertion, persuasion, negotiation.</p> <p>Public Speaking: Skills, Methods, Strategies and Essential tips for effective public speaking.</p> <p>Group Discussion: Importance, Planning, Elements, Skills assessed; Effectively disagreeing, Initiating, Summarizing and Attaining the Objective.</p> <p>Non-Verbal Communication: Importance and Elements; Body Language. 5.</p> <p>Teamwork and Leadership Skills: Concept of Teams; Building effective teams; Concept of Leadership and honing Leadership skills.</p>	12
3	<p>Interview Skills: Interviewer and Interviewee – in-depth perspectives. Before, During and After the Interview. Tips for Success.</p> <p>Presentation Skills: Types, Content, Audience Analysis, Essential Tips – Before, During and After, Overcoming Nervousness.</p> <p>Etiquette and Manners: Social and Business. e-mail etiquette</p> <p>Time Management: Concept, Essentials, Tips.</p> <p>Personality Development: Meaning, Nature, Features, Stages, Models; Learning Skills; Adaptability Skills.</p>	12

References:

1. Managing Soft Skills for Personality Development – edited by B.N.Ghosh, McGraw Hill India, 2012
2. English and Soft Skills – S.P.Dhanavel, Orient Blackswan India, 2010.

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THEORY

Course Title: Bio Informatics	Code: OECICB701B
Type of Course: Theory	Course Designation: Open Elective
Semester: 7th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
OECICB701B.CO1	To give students an introduction to the basic practical techniques of bioinformatics. Emphasis will be given to the application of bioinformatics and biological databases to problem solving in real research problems.	Remember	K1
OECICB701B.CO2	The students will become familiar with the use of a wide variety of internet applications, biological database and will be able to apply these methods to research problems.	Evaluate	K5
OECICB701B.CO3	Describe the contents and properties of the most important bioinformatics databases, perform text- and sequence-based searches, and analyze and discuss the results in light of molecular biological knowledge	Understand	K2
OECICB701B.CO4	Explain the major steps in pairwise and multiple sequence alignment, explain the principle for, and execute pairwise sequence alignment by dynamic programming	Apply	K3

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	-	-	-	-	-	1	-	-	1	1	3	2
CO2	3	2	3	-	3	-	-	1	-	-	1	1	3	3
CO3	2	3	1	2	2	1	-	1	1	3	1	1	3	2
CO4	3	3	2	2	3	1	2	1	0	2	1	1	3	2
AVG	2.5	2.75	1.5	1	2	0.5	0.5	1	0.25	1.25	1	1	3	2.25

University Syllabus:

Unit	Content	Hrs/unit
1	Concepts of Cell, tissue, types of cell, components of cell, organelle. Functions of different organelles. Concepts of DNA: Basic Structure of DNA; Double Helix structure; Watson and crick model. Exons and Introns and Gene Concept. Concepts of RNA: Basic structure, Difference between RNA and DNA. Types of RNA. Concept of Protein: Basic components and structure. Introduction to Central Dogma: Transcription and Translation Introduction to Metabolic Pathways	7
2	Sequence Databases 2 Introduction to Bioinformatics. Recent challenges in Bioinformatics. Protein Sequence Databases, DNA sequence databases. sequence database search programs like BLAST and FASTA. NCBI different modules: Gen Bank; OMIM, Taxonomy browser, PubMed;	7
3	DNA Sequence Analysis, DNA Mapping and Assembly: Size of Human DNA, Copying DNA: Polymerase Chain Reaction (PCR), Hybridization and Microarrays, Cutting DNA into Fragments, Sequencing Short DNA Molecules, Mapping Long DNA Molecules. De Bruijn Graph. Sequence Alignment: Introduction, local and global alignment, pair wise and multiple alignment, Dynamic Programming Concept. Alignment algorithms: Needleman and Wunsch algorithm, Smith-Waterman.	8
4	Introduction Probabilistic models used in Computational Biology 8Probabilistic Models; Hidden Markov Model: Concepts, Architecture, Transition matrix, estimation matrix. Application of HMM in Bio informatics : Gene finding, profile searches, multiple	7

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	sequence alignment and regulatory site identification. Bayesian networks Model : Architecture, Principle ,Application in Bioinformatics.	
5	Biological Data Classification and Clustering 6 Assigning protein function and predicting splice sites: Decision Tree	7

References:

1. Des Higgins (Editor), Willie Taylor., Bioinformatics: Sequence, Structure and Databanks: A Practical Approach, ISBN: 978- 0199637904. 1st edition, Oxford University Press
2. David W. Mount., Bioinformatics: Sequence and Genome Analysis, ISBN: 978-0879697129 2nd edition, Cold spring harbor laboratory press
3. Introduction to Bioinformatics, ISBN: 978-8178085074 1st edition, Pearson Education
4. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins, ISBN: 978- 0471478782. Second Edition, John Wiley & Sons, Inc., Publication

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THEORY

Course Title: Business Analytics	Code: OECICB701C
Type of Course: Theory	Course Designation: Open Elective
Semester: 7th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
OECICB701C .CO1	Enable all participants to recognize, understand and apply the language, theory and models of the field of business analytics	Understand	K1
OECICB701C .CO2	Foster an ability to critically analyse, synthesize and solve complex unstructured business problems	Identify	K2
OECICB701C .CO3	Encourage an aptitude for business improvement, innovation and entrepreneurial action	Analyse	K4
OECICB701C .CO4	Encourage the sharing of experiences to enhance the benefits of collaborative learning	Configure	K2
OECICB701C .CO5	Instill a sense of ethical decision-making and a commitment to the long-run welfare of both organizations and the communities they serve	Implement	K3
OECICB701C .CO6	Create viable solutions to decision making problems	Secure	K4

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	2	-	3	-	-	2	2	2	3
CO2	2	2	2	3	-	-	-	-	-	-	-	2	3	3
CO3	2	3	2	2	2	-	-	2	-	-	-	2	2	3
CO4	3	3	3	2	-	-	-	-	-	-	3	2	3	2
CO5	2	2	2	2	-	-	-	-	-	-	2	2	2	-
CO6	3	2	3	2	-	-	-	-	-	-	2	3	-	2
AVG.	2.5	2.5	2.5	2.33	2	2	—	2.5	—	—	2.25	2.17	2.4	2.6

University Syllabus:

Unit	Content	Hrs/Unit
1	Introduction to Business Analytics: Need for Data-Driven Business Approach, Model Building in Business Analytics, Basic Principles of Business Analytics to Business Problems, Slicing and Dicing Marketing data with Pivot Tables, Excel Charts to summarise data	6
2	Pricing Analytics: Basic Concept of Pricing, Estimating Demand Curves and Optimize Price, Price Bundling, Non-Linear Pricing and Price Skimming	6
3	Business Forecasting: Simple Regression and Correlation, Multiple Regression to forecast sales, Modelling trend and Seasonality, Ratio to Moving Average Method, Winter's Method	4
4	Strategic Business Analytics: The STP framework, Value generation through STP framework, Managing the segmentation process, Segmentation in the Real world: Cluster Analysis, Hierarchical and Non-Hierarchical - K Means Clustering, Prediction of Customer's segment membership: Discriminant Analysis (DA), two Group DA	4
5	Positioning Strategies: Concept of Product positioning, conducting a Positioning Study, Perceptual Mapping using Principal Component Analysis (PCA), Multidimensional Scaling (MDS), Incorporating preferences into Perceptual Maps	6
6	Customer Lifetime Value (CLV): Concept of CLV, Comparison of CLV with related metrics, Analysing CLV, Extensions of CLV Analysis, Drivers of CLV, Uses of CLV metrics	6

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7	Product Designing: Concept of Product Designing, Conjoint Analysis as a de-compositional preference model, Steps in Conjoint Analysis, Uses of Conjoint Analysis, Drivers of CLV, Uses of CLV metrics	4
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THEORY

Course Title: Project Management and Entrepreneurship	Code: HSMC701
Type of Course: Theory	Course Designation: Compulsory
Semester: 7th	Contact Hours: 2L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
HSMC701.CO1	Examine role of entrepreneur in economic development	Apply	K3
HSMC701.CO2	Describe the steps to establish an enterprise	Remember	K1
HSMC701.CO3	Compare and classify types of entrepreneurs	Analyze	K4
HSMC701.CO4	Evaluate the entrepreneurial support in India	Evaluate	K5
HSMC701.CO5	Describe Special institutions for entrepreneurial development and assistance in India	Remember	K1
HSMC701.CO6	Explain project Identification	Create	K6

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	1	-	-	-	-	2	2	1	1	1
CO2	3	3	3	2	2	-	-	-	-	-	2	2	2	3	1
CO3	2	-	3	2	3	-	-	-	-	-	2	2	2	2	-
CO4	2	-	-	-	2	3	2	-	-	-	-	2	-	1	-
CO5	-	-	-	-	-	-	-	-	3	-	2	2	1	2	-
CO6	1	2	2	3	2	-	-	-	-	-	2	2	1	2	2
AVG.	2.00	2.33	2.50	2.25	2.20	2.00	2.00	0	3.00	0	2.00	2.00	1.40	1.83	1.33

University Syllabus:

Unit	Content	Hrs/Unit
1	Introduction: Meaning and Concept of Entrepreneurship, Innovation and entrepreneurship, Contributions of entrepreneurs to the society, risk-opportunities perspective and mitigation of risks	2
2	Entrepreneurship : An Innovation: Challenges of Innovation, Steps of Innovation Management, Idea Management System, Divergent v/s Convergent Thinking, Qualities of a prospective Entrepreneur Idea Incubation: Factors determining competitive advantage, Market segment, blue ocean strategy, Industry and Competitor Analysis (market structure, market size, growth potential), Demand-supply analysis Entrepreneurial Motivation: Design Thinking - Driven Innovation, TRIZ (Theory of Inventive Problem Solving), Achievement motivation theory of entrepreneurship – Theory of McClelland, Harvesting Strategies Information: Government incentives for entrepreneurship, Incubation, acceleration. Funding new ventures : bootstrapping, crowd sourcing, angel investors, Government of India's efforts at promoting entrepreneurship and innovation – SISI, KVIC, DGFT, SIDBI, Defense and Railways	8

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3	Closing the Window: Sustaining Competitiveness, Maintaining Competitive Advantage, the Changing Role of the Entrepreneur, Applications and Project Reports Preparation Project Management : Definitions of Project and Project Management, Issues and Problems in Project Management, Project Life Cycle - Initiation / Conceptualization Phase, Planning Phase, Implementation / Execution Phase, Closure / Termination Phase	6
4	Project Feasibility Studies –:Pre-Feasibility and Feasibility Studies, Preparation of Detailed Project Report, Technical Appraisal, Economic/Commercial/Financial Appraisal including Capital Budgeting Process, Social Cost Benefit Analysis Project Planning : Importance of Project Planning, Steps of Project Planning, Project Scope, Work Breakdown Structure (WBS) and Organization Breakdown Structure (OBS), Phased Project Planning	6
5	Project Scheduling and Costing : Gantt chart, CPM and PERT Analysis, Identification of the Critical Path and its Significance, Calculation of Floats and Slacks, Crashing, Time Cost Trade-off Analysis, Project Cost Reduction Methods Project Monitoring and Control : Role of Project Manager, MIS in Project Monitoring, Project Audit , Case Studies with Hands-on Training on MS-Project	6

References:

1. Innovation and Entrepreneurship by Drucker, P.F.; Harper and Row
2. Business, Entrepreneurship and Management: Rao, V.S.P. ;Vikas
3. Entrepreneurship: Roy Rajeev; OUP.
4. Entrepreneurship: Roy Rajeev; OUP.
5. Project Management for Engineering, Business and Technology: Nicholas, J.M., and Steyn, H.; PHI
6. Project Management: The Managerial Process: Gray, C.F., Larson, E.W. and Desai, G.V.; MGH

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Semester-VIII
THEORY

Course Title: Information Security Management System	Code: PECICB801A
Type of Course: Theory	Course Designation: Professional Elective
Semester: 8th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
PECICB801A.CO1	Learn the terminology, technology and its applications of Information Security Management.	Learn	K1
PECICB801A.CO2	Comprehend the concept of Security Analyst.	Understand	K2
PECICB801A.CO3	Analyze the tools, technologies & programming languages which are used in day-to-day security analyst job role.	Analyze	K4
PECICB801A.CO4	Understanding the importance of asset & owner identification.	Understand	K2
PECICB801A.CO5	Understanding the threats, vulnerabilities and impacts	Understand	K3
PECICB801A.CO6	Apply the techniques & tools used in information security system.	Apply	K4

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	2	-	-	-	2	-	-	-	3	2	1
CO2	3	2	3	3	-	-	-	-	-	-	-	2	3	1
CO3	2	3	3	2	-	-	-	2	-	-	-	3	2	1
CO4	3	3	2	1	-	-	-	-	-	-	1	3	3	2
CO5	2	2	2	2	-	-	-	-	-	-	2	2	1	-
CO6	3	2	2	2	-	-	-	-	-	-	2	3	-	-
AVG.	2.5	2.33	2.5	2	-	-	-	2	-	-	1.67	2.67	2.2	1.25

University Syllabus:

Unit	Content	Hrs/Unit
1	Information Security Overview, Threats and Attack Vectors, Types of Attacks, Common Vulnerabilities and Exposures, Security Attacks, Fundamentals of Information Security, Computer Security Concerns, Information Security Measures etc. Manage your work to meet requirements (NOS 9001).	6
2	Fundamentals of Information Security: Key Elements of Networks, Logical Elements of Network, Critical Information Characteristics, Information States etc. Work effectively with Colleagues (NOS 9002).	9
3	Data Leakage: What is Data Leakage and statistics, Data Leakage Threats, Reducing the Risk of Data Loss, Key Performance Indicators, Database Security etc.	6
4	Information Security Policies, Procedures and Audits: Information Security Policies-necessity-key elements & characteristics, Security Policy Implementation, Configuration, Security Standards-Guidelines & Frameworks etc.	6

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5	Information Security Management — Roles and Responsibilities: Security Roles & Responsibilities, Accountability, Roles and Responsibilities of Information Security Management, team-responding to emergency situation-risk analysis process etc.	9
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THEORY

Course Title: Distributed System	Code: PECICB801B
Type of Course: Theory	Course Designation: Professional Elective
Semester: 8th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
PECICB801B.CO1	Define the basic concepts of Distributed database system and distributed database management system with the architecture details.	Define	K1
PECICB801B.CO2	Design different distributed database strategies and processing issues in distributed database.	Design	K6
PECICB801B.CO3	Evaluate the different query optimization technique and transaction concurrency control management.	Evaluate	K5
PECICB801B.CO4	Identify the different reliability issues and types of failure occur in distributed database system.	Identify	K3
PECICB801B.CO5	Illustrate the architecture and query processing of parallel database system.	Illustrate	K2
PECICB801B.CO6	Examine the advanced concepts of distributed database like mobile database management system and multi-database management system.	Examine	K4

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	1	-	-	-	-	-	-	1	-	3	1
CO2	3	2	3	1	-	1	1	-	-	-	1	1	3	-
CO3	3	2	-	1	2	1	-	-	1	-	-	1	3	2
CO4	3	3	3	1	2	1	-	-	1	1	-	2	2	3
CO5	2	3	2	3	1	-	-	1	3	1	-	1	3	2
CO6	2	3	2	3	2	1	1	2	3	-	1	2	2	1
AVG.	2.67	2.3	2.4	1.67	1.75	1	1	1.5	2	1	1	1.4	2.67	1.8

University Syllabus:

Unit	Content	Hrs/Unit
1	Introduction Distributed Data Processing; What Is A DDBS; Advantages And Disadvantages Of DDBS; Problem Areas; Overview Of Database And Computer Network Concepts Distributed Database Management System Architecture Transparencies In A Distributed DBMS; Distributed DBMS Architecture; Global Directory Issues	12
2	Distributed Database Design Alternative Design Strategies; Distributed Design Issues; Fragmentation; Data Allocation Semantics Data Control View Management; Data Security; Semantic Integrity Control Query Processing Issues Objectives Of Query Processing; Characterization Of Query Processors; Layers Of Query Processing; Query Decomposition; Localization Of Distributed Data	12
3	Distributed Query Optimization Factors Governing Query Optimization; Centralized Query Optimization;	12

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THEORY

Course Title: Security Operations Management	Code: OECICB801A
Type of Course: Theory	Course Designation: Open Elective
Semester: 8th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
OECICB801A.CO1	Describe basic of security architecture of different security architecture.	Describe	K1
OECICB801A.CO2	Describe basics of security threat ethics and code of conduct.	Describe	K1
OECICB801A.CO3	Description of National and International Cyber Security concern Cyber Terrorism.	Describe	K1
OECICB801A.CO4	Building a Security Operations Centre with processes involve.	Apply	K3
OECICB801A.CO5	Developing knowledge of different Cyber Security Metrics and maturity model.	Analyze	K4
OECICB801A.CO6	Security Incident Reporting and Communication.	Explain	K2

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	-	-	-	-	-	-	-	1	3	3
CO2	3	3	3	-	2	-	-	-	-	-	-	-	3	2
CO3	2	2	1	2	3	1	-	1	1	3	-	-	3	2
CO4	3	3	2	2	3	1	2	1	-	2	-	-	3	2
CO5	3	2	3	2	1	-	-	-	-	1	-	-	2	2
CO6	3	2	3	2	2	2	-	-	-	-	-	-	2	2
AVG	2.83	2.5	2.33	2	2.2	1.33	2	1	0.5	2	0	1	2.67	2.17

University Syllabus:

UNIT	Details Contents	Hrs
1	Introduction to Security Operations: Security Overview & Architecture Evolution and Necessity of Industrial Security, Understanding the Security Operation analyst role, Introduction to the incident response lifecycle	6
2	Cyber Threat Landscape: Principle of Security and components Security Ethics & Code of Conduct	4
3	National and International Cyber Security concern Cyber Terrorism	4
4	Building a Security Operations Centre: Threat Modelling, Building Your Team, SIEM & Detection Engineering, Case Management, Other Tooling & Administration, Processes and Policies	6
5	Cyber Security Metrics, Maturity, and Measuring Success; SOC Maturity Model; Operationalizing MITRE ATTACK Matrix for Enterprise; Active Défense ; Security Orchestration, Automation, and Response ; Reporting and Metrics Additional Activities	8
6	Security Incident Reporting and Communication: Creating incident reports and documenting findings; Communication strategies for different stakeholders; Presenting incident analysis and	8

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	recommendations. CYBER CERT Crime Emergency Response Team(India)	
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References:

1. Charles A. Sennewald, Curtis Baillie (2016), Effective Security Management, Elsevier Inc.
2. James F. Broder Risk Analysis and the Security Survey
3. John Fay, Contemporary Security Management

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THEORY

Course Title: E-Commerce and Digital Payment System	Code: OECICB801B
Type of Course: Theory	Course Designation: Open Elective
Semester: 8th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
OECICB801B.CO1	Analyze the impact of E-commerce on business models and strategy.	Analyze	K4
OECICB801B.CO2	Illustrate the major types of E-commerce.	Understand	K2
OECICB801B.CO3	Explain the process that should be followed in building an E-commerce presence.	Analyze	K4
OECICB801B.CO4	Demonstrate an understanding of the foundations and importance of E-commerce	Understand	K2
OECICB801B.CO5	Identify the key security threats in the E-commerce environment and be aware of the ethical, social, and security issues of information systems.	Apply	K3
OECICB801B.CO6	Describe how procurement and supply chains, ERP relate to E-commerce.	Analyze	K4

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	2	1	1	2	1	1	2	2	2	3
CO2	3	2	2	3	1	2	1	1	-	1	-	2	3	3
CO3	2	3	3	2	2	2	1	2	1	1	-	3	2	2
CO4	2	2	2	1	1	1	1	1	-	1	3	2	3	2
CO5	2	2	2	2	1	1	1	1	1	1	2	2	1	-
CO6	3	2	2	2	1	2	1	1	-	1	2	3	-	2
AVG.	2.5	2.17	2.34	2	1.34	1.5	1	1.34	0.5	1	1.5	2.34	1.84	2

University Syllabus:

Unit	Content	Hrs/Unit
1	Overview, Definitions, Advantages & Disadvantages of E – Commerce, Threats of E – Commerce, Managerial Prospective, Rules & Regulations For Controlling E Commerce, Cyber Laws.	2
2	Technologies : Relationship Between E – Commerce & Networking, Different Types of Networking Commerce, Internet, Intranet & Extranet, EDI Systems Wireless Application Protocol: Definition, Hand Held Devices, Mobility & Commerce, Mobile Computing, Wireless Web, Web Security, Infrastructure Requirement For E – Commerce. Business Models of e – commerce: Model Based On Transaction Type, Model Based On Transaction Party - B2B, B2C, C2B, C2C, E – Governance.	4
3	E – strategy: Overview, Strategic Methods for developing E – commerce. Four C's : (Convergence, Collaborative Computing, Content Management & Call Center). Convergence: Technological Advances in Convergence :Types, Convergence and its implications, Convergence & Electronic Commerce. Collaborative Computing: Collaborative product development, contract as per CAD, Simultaneous Collaboration,	9

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	Security. Content Management: Definition of content, Authoring Tools & Content Management, Content: partnership, repositories, convergence, providers, Web Traffic & Traffic Management; Content Marketing. Call Center: Definition, Need, Tasks Handled, Mode of Operation, Equipment, Strength & Weaknesses of Call Center, Customer Premises Equipment.	
4	Supply Chain Management: E – logistics, Supply Chain Portal, Supply Chain Planning Tools (SCP Tools), Supply Chain Execution, SCE - Framework, Internet's effect on Supply Chain Power.	3
5	Electronic Payment Systems: Special features required in payment systems for e-commerce; Types of e-payment systems; E-cash and currency servers; e-cheques, credit cards, smart cards, electronic purses, and debit cards; Business issues and economic implications; Operational credit and legal risks of e-payment systems; Risk management options in e-payment systems; Components of an effective electronic payment system.	9
6	Unified Payment Interface System: UPI Concept, Features, Virtual Payment Address (VPA) meaning and benefits, UPI QR code concept, how to generate UPI QR code, BHIM app. Concept and history, Features, methods of payment in BHIM, how to accept IPO mandate in BHIM.	3
7	E – Marketing :: Home –shopping, E-Marketing, Tele-marketing Electronic Data Interchange : Meaning, Benefits, Concepts, Application, EDI Model, Protocols (UN EDI FACT / GTDI, ANSI X – 12), Data Encryption (DES / RSA). Risk of E – Commerce: Overview, Security for E – Commerce, Security Standards, Firewall, Cryptography, Key Management, Password Systems, Digital certificates, Digital signatures.	6

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THEORY

Course Title: Operations Research	Code: OECICB801C
Type of Course: Theory	Course Designation: Open Elective
Semester: 8th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
OECICB801C.CO1	Describe the basic concept of linear programming problem and various component of LPP formulation for solving Business Problems.	Describe	K1
OECICB801C.CO2	Identify different approaches for solving LPP problems such as Graphical Method, Simplex Method, Charnes' Big-M Method, Duality Theory, Transportation Problems and Assignment Problems etc.	Identify	K3
OECICB801C.CO3	Evaluate the applications of game theory such as 2-Person Zero-sum Game; Saddle Point; Mini-Max and Maxi-Min Theorems, Games without Saddle Point; Graphical Method; Principle of Dominance etc.	Evaluate	K5
OECICB801C.CO4	Understand the terms Feasible Solution, Basic and non-basic Variables, Basic Feasible Solution, Degenerate and Non-degenerate Solution, Convex set and the use of game theory.	Understand	K2
OECICB801C.CO5	Analyze different types of algorithms such as Floyd Algorithm, PERT-CPM etc. for Cost Analysis, Crashing, and Resource Allocation.	Analyze	K4
OECICB801C.CO6	Explain the concepts of Queuing Theory along with the some models such as Axiomatic Derivation of the Arrival & Departure (Poisson Queue), Poisson Queue Models: (M/M/1): (∞ /FIFO) and (M/M/1: N / FIFO) etc.	Explain	K2

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	1	1	-	-	-	2	-	2	2	2	1
CO2	2	2	-	2	-	-	-	-	2	-	2	-	3	2
CO3	2	2	1	2	1	-	-	-	2	-	2	-	2	1
CO4	1	2	1	2	-	-	-	-	1	-	1	2	2	1
CO5	1	2	-	2	-	-	-	-	1	-	2	-	3	2
CO6	1	1	-	1	-	-	-	-	-	-	1	-	2	-
AVG.	1.5	1.83	1	1.67	1	0	0	0	1.6	0	1.67	2	2.33	1.4

University Syllabus:

Unit	Content	Hrs/Unit
1	Basic LPP and Applications; Various Components of LP Problem Formulation. Solution of Linear Programming Problems: Solution of LPP: Using Simultaneous Equations and Graphical Method; Definitions: Feasible Solution, Basic and nonbasic Variables, Basic Feasible Solution, Degenerate and Non-degenerate Solution, Convex set and explanation with examples Solution of LPP by Simplex Method; Charnes' Big-M Method; Duality Theory. Transportation Problems and Assignment Problems.	14
2	Network Analysis: Shortest Path: Floyd Algorithm; Maximal Flow Problem (Ford-Fulkerson); PERTCPM (Cost Analysis, Crashing, Resource Allocation excluded). Inventory Control: Introduction to EOQ Models of Deterministic and Probabilistic ; Safety Stock; Buffer Stock.	10
3	Game Theory: Introduction; 2-Person Zero-sum Game; Saddle Point; Mini-Max and Maxi-Min Theorems (statement only) and problems; Games without Saddle Point; Graphical Method; Principle of Dominance	6

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4	Queuing Theory: Introduction; Basic Definitions and Notations; Axiomatic Derivation of the Arrival & Departure (Poisson Queue). Poisson Queue Models: (M/M/1): (∞ / FIFO) and (M/M/1: N / FIFO) and problems.	6
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THEORY

Course Title: Management Information System	Code: OECICB802A
Type of Course: Theory	Course Designation: Open Elective
Semester: 8th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
OECICB802.CO1	Understand the concepts of e-commerce, e-business and demonstrate practical applications within ERP, CRM, and SCM frameworks Examine role of entrepreneur in economic development	Understand	K2
OECICB802.CO2	Demonstrate knowledge of data communication and networking fundamentals	Apply	K3
OECICB802.CO3	Identify threats to computer systems such as viruses, hacking, phishing, and physical threats	Apply	K3
OECICB802.CO4	Application of DBMS concepts, including tables, records, attributes, keys, integrity constraints, and SQL commands, using popular software	Apply	K3
OECICB802.CO5	Understand data warehousing, data mart, metadata, multidimensional modelling, OLAP and Data Mining concepts	Understand	K2
OECICB802.CO6	Develop proficiency in using MS Office applications for tasks including data analysis, database management, and presentation creation	Create	K6

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	3	3	1	4	-	-	1	-	-	1	-	1	1	1
CO2	2	-	-	2	-	-	-	1	-	4	1	-	1	-	1
CO3	2	-	2	3	3	-	-	1	-	3	1	-	1	1	1
CO4	3	2	2	1	3	-	-	1	-	1	1	-	-	1	-
CO5	3	2	2	1	3	-	-	1	-	1	1	-	1	-	1
CO6	3	1	3	2	4	-	-	1	-	-	3	-	1	1	1
AVG.	2.2	1.3	2.0	1.7	2.8	-	-	1.0	-	1.5	2.7	-	0.83	0.67	0.83

University Syllabus:

Unit	Content	Hrs/Unit
1	E-commerce / E-business: Overview, Definitions, Advantages & Disadvantages of E-commerce Business models of e-commerce: models based on transaction party (B2B, B2C, B2G, C2B, C2C, E-Governance), models based on revenue models Implementation ecommerce business, online and offline marketing	3

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2	ERP, CRM, SCM, ERP (Enterprise Resource Planning): Concepts of ERP, architecture of ERP, Generic modules of ERP, Applications of ERP, concept of XRP (extended ERP) Features of commercial software like SAP, Oracle Apps, MS Dynamics NAV CRM (Customer Relationship Management): Concepts of CRM, Features, application of CRM Sales force automation SCM (Supply Chain Management): Concepts of SCM, drivers of SCM, inbound & outbound Definition, brief description and applicability of: eProcurement, eTailing, eLogistics, eCollaboration, eIntegration. Case studies for ERP, CRM, and SCM	8
3	Data Communication & Networking: Need for computer networking, components of a data communication system, Network topology Types of networks: LAN, MAN, WAN; concepts of Internet, Intranet, Extranet, and WWW. Network protocols, Network Architecture	4
4	Threats to Computer Systems and Control Measures: Concepts of threats: Virus, hacking, phishing, spyware, spam, physical threats (fire, flood, earthquake, vandalism) Concepts of security measures: firewall, encryption	2
5	Database Management Systems (DBMS) [e.g. MS-Access/ Oracle/ MS SQL Server/ MySQL etc.] What is a DBMS; Need for using DBMS. Concepts of tables, records, attributes, keys, integrity constraints SQL: DDL & DML, DCL concepts, SQL commands [ANSI standard].	6
6	Data Warehousing and Data Mining: Concepts of Data warehousing, data mart, meta data, multidimensional modeling, Online Analytical Processing (OLAP), Online Transaction Processing (OLTP), Data mining concepts, knowledge discovery v. data mining, data mining applications.	3
7	MS Office Applications; MS Excel: Graphs and Charts–Calculation of various financial functions Performing Mathematical Calculations (using Formula and Functions), Searching, Sorting and Filtering, Min Media Mode, Reference Operators, Functions: Typing a Function, Creating a Column Chart: Changing the Size and Position of a Chart Saving MS Access: Tables and Queries, Forms, Relationship MS Power Point: Introduction–Toolbar, their Icons and Commands– Navigating in Power point– Creation of slides, animation, and templates–Designing Presentations– Slide show controls–Making notes on Pages and Handouts– Printing Presentations– Customizing Presentations–Auto content Wizard.	10

References:

1. Waman S Jawadekar: Management Information Systems – Text and Cases 3ed. McGraw Hill
2. Mahadeo Jaiswal & Monica Mittal: Management Information Systems, OUP
3. Forouzan: Data Communication & Networking, TMH.
4. Tanenbaum: Computer Networks, Pearson Education
5. Ivan Bayross: SQL & PL/SQL, BPB ISRD, Introduction to Database Management Systems, Tata McGraw Hill
6. Sadagopan: ERP: A Managerial Perspective, Tata McGraw Hill

Maulana Abul Kalam Azad University of Technology
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Syllabus and Curricular Mapping for B. Tech in Computer Science & Engineering
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Course Title: Multimedia Technology	Code: OECICB802B
Type of Course: Theory	Course Designation: Open Elective
Semester: 8th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
OECICB802B.CO1	Learn technical aspect of Multimedia Systems	Learn	K1
OECICB802B.CO2	Understand the standards available for different audio,video Image and text applications	Understand	K2
OECICB802B.CO3	Design various available storage model for multimedia and can give a comparison study between them	Design	K6
OECICB802B.CO4	Compare between different available multimedia document architecture	Compare	K4
OECICB802B.CO5	Explain technical aspects of popular multimedia web applications, including VoD and VoIP	Explain	K2
OECICB802B.CO6	Develop multimedia application and analyze the performance of the same	Develop	K3

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO2	-	-	-	2	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	2	1	-	-	-	-	-	-	-	-	-
CO4	-	-	-	2	1	-	-	-	-	-	-	-	1	-
CO5	-	-	-	2	1	-	-	-	-	-	-	-	1	-
CO6	-	-	3	2	1	-	-	-	-	-	-	-	1	2
AVG.	0	0	3	2	1	0	0	0	0	0	0	0	1	1.5

University Syllabus:

Unit	Content	Hrs/Unit
1	Introduction: Multimedia today, Impact of Multimedia, Multimedia Systems, Components and Its Applications	2
2	Text and Audio, Image and Video(14L) Text: Types of Text, Ways to Present Text, Aspects of Text Design, Character, Character Set, Codes, Unicode, Encryption; Audio: Basic Sound Concepts, Types of Sound, Digitizing Sound, Computer Representation of Sound (Sampling Rate, Sampling Size, Quantization), Audio Formats, Audio tools, MIDI Image: Formats, Image Color Scheme, Image Enhancement; Video: Analogue and Digital Video, Recording Formats and Standards (JPEG, MPEG, H.261) Transmission of Video Signals, Video Capture, and Computer based Animation.	10
3	Synchronization, Storage models and Access Techniques: Temporal relationships, synchronization accuracy specification factors, quality of service, Magnetic media, optical media, file systems (traditional, multimedia) Multimedia devices – Output devices, CD-ROM, DVD, Scanner, CCD	6
4	Image and Video Database, Document Architecture and Content Management (17L): Image representation, segmentation, similarity based retrieval, image retrieval by color, shape and texture; indexing- kd trees, R-trees, quad trees; Case studies- QBIC, Virage. Video Content, querying, video segmentation, indexing, Content Design and Development, General Design Principles Hypertext: Concept, Open Document Architecture (ODA), Multimedia and Hypermedia Coding Expert Group (MHEG), Standard Generalized Markup Language (SGML), Document Type Definition (DTD), Hypertext Markup Language (HTML) in Web Publishing. Case study of Applications	12
5	Multimedia Applications(4L): Interactive television, Video-on-demand, Video Conferencing, Educational Applications, Industrial Applications, Multimedia archives and digital libraries, media editors	6

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THEORY

Course Title: Introduction to Arts and Aesthetics	Code: OECICB802C
Type of Course: Theory	Course Designation: Open Elective
Semester: 8th	Contact Hours: 3L/week
Continuous Assessment: 25 Marks	Final Exam: 70 Marks

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
OECICB802C.CO1	To get a historical understanding on Western and Indian Aesthetics	Understand	K1
OECICB802C.CO2	To understand the aesthetic concepts from various Western and Indian philosophers	Understand	K2
OECICB802C.CO3	To analyze the contextual relevance of aesthetic theories	Analyze	K4
OECICB802C.CO4	To develop a culture of critical and analytical thinking	Develop	K2
OECICB802C.CO5	To analyze the interconnectedness of Art and emotion	Analyze	K3
OECICB802C.CO6	To understand various schools of literary criticism	Understand	K4

Mapping of COs with POs and PSOs (Course Articulation Matrix):

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	2	1	-	2	-	2	3	3	2	3
CO2	3	2	2	3	-	-	-	-	-	-	2	3	3	3
CO3	2	3	3	2	2	2	2	2	-	2	2	3	2	2
CO4	2	2	2	1	-	-	-	-	-	-	3	3	3	2
CO5	2	2	2	2	-	2	-	-	-	2	2	2	1	-
CO6	3	2	2	2	-	-	-	-	-	-	2	3	-	2
AVG.	2.5	2.17	2.33	2	2	1.67	2	2	-	2	2.33	2.83	2.2	2.4

University Syllabus:

Unit	Content	Hrs/Unit
1	Aestheticism in Art : What is aesthetics? ,Art and Aesthetics , Relationship of Art and Aesthetics , Relationship of Artist, Art and Aesthetics, The nature of aesthetics, its relation to philosophy and literature: Indian traditions., The nature of aesthetics and its relation to philosophy and literature: Western traditions.	9
2	Aesthetics and Philosophical Aesthetics: Second order Aesthetics, The World of Human Experience and Art and Experience. Art and its Definition: Art as Representation, Art as Expression and Art as Significant Form. Indian Aesthetics- Philosophy , Five Schools of Indian Aesthetics , Study of their emergence , Role in development of art	9
3	Art and Emotion: The Concept of Emotion, The Concept of Fiction and Fiction and Emotion. Literary Aesthetics: The Concept of Literature, Metaphor, Truth, Meaning and Interpretation.	6
4	Indian Art: World Views and Practices, Relation to Art (Literature, Architecture, Sculpture, Painting and	3

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	Dance)	
5	Study of the Technique involved in the following Art form: a. b. c. d. Dramatic performance and Acting Technique. Dance and Choreography. Television and Cinema. Poetry and Painting.	6
6	Art, Society and Morality: Views of Tolstoy and Post-modernism	3