

Draft

REVISED DIPLOMA CURRICULUM OF COMPUTER SCIENCE AND ENGINEERING (SECOND YEAR)

For the State of Meghalaya
(June, 2023)



National Institute of Technical Teachers' Training & Research
Block – FC, Sector – III, Salt Lake City, Kolkata – 700 106

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COMPUTER SCIENCE AND ENGINEERING

SEMESTER - III

SL. No	Category of Course	Code No	Course Title	Study Scheme			Evaluation Scheme									Total Marks	Credits	
				Pre-requisite	Contact Hours/ week			Theory						Practical				
					L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment					
									Class Test	Assignment	Attendance		Sessional	Viva voce				
1	Program Core	CSPC201	Computer Programming		2	0	0	60	20	15	5	-	-	-	100	2		
2		CSPC 203	Scripting Language – Python		2	0	0	60	20	15	5	-	-	-	100	2		
3		CSPC205	Data Structures & Algorithms		3	0	0	60	20	15	5	-	-	-	100	3		
4		CSPC207	Computer System Organization		3	1	0	60	20	15	5	-	-	-	100	4		
5		CSPC209	Computer Programming Lab		0	0	4	-	-	-	-	40	40	20	100	2		
6		CSPC211	Scripting Languages Lab		0	0	4	-	-	-	-	40	40	20	100	2		
7		CSPC213	Data Structures & Algorithms Lab		0	0	4	-	-	-	-	40	40	20	100	2		
8	Summer Internship	SI201	Summer Internship-1		0	0	0	-	-	-	-	40	40	20	100	2		
Total					10	1	12	240	80	60	20	160	160	80	800	19		

PCC: Program Core Course; SI: Summer Internship-I (4 weeks) after IInd Sem

COMPUTER SCIENCE AND ENGINEERING

SEMESTER – IV

SL. No	Category of Course	Code No	Course Title	Study Scheme				Evaluation Scheme								Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory						Practical			
					L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment				
									Class Test	Assignment	Attendance		Sessional	Viva voce			
1	Program Core	CSPC202	Operating Systems	CSPC205	3	0	0	60	20	15	5	-	-	-	100	3	
2		CSPC204	Introduction to DBMS	CSPC203	2	0	0	60	20	15	5	-	-	-	100	2	
3		CSPC206	Computer Networks		2	0	0	60	20	15	5	-	-	-	100	2	
4		CSPC208	SSAD/Software Engineering		3	0	0	60	20	15	5	-	-	-	100	3	
5		CSPC210	Internet of Things (IoT)		2	1	0	60	20	15	5	0	0	0	100	3	
6		CSPC212	Operating Systems Lab	CSPC205	0	0	2	-	-	-	-	40	40	20	100	1	
7		CSPC214	DBMS Lab	CSPC211	0	0	4	-	-	-	-	40	40	20	100	2	
8		CSPC216	Computer Networks Lab		0	0	4	-	-	-	-	40	40	20	100	2	
9	Open Elective	CEOE202	Open Elective - 1 (Disaster Management)		3	0	0	60	20	15	5	-	-	-	100	3	
10	Minor Project	PR202	Minor Project		0	0	4	0	0	0	0	80	80	40	200	2	
11	Mandatory	AU202	Essence of Indian Knowledge and Tradition		2	0	0	0	0	0	0	0	0	0	0	0	
Total					18	0	14	360	120	90	30	200	200	100	1100	23	

PCC: Program Core Course; OE: Open Elective; MP: Minor Project; MC: Mandatory Course

SEMESTER - III COURSES

COMPUTER PROGRAMMING

L	T	P		Course Code No.: CSPC201
2	0	0		
Total Contact hrs.: Lecture: 30 Tutorial: 0 Practical: 0 Credit : 2			Total marks: 100	Theory: End Term Exam.: 60 P.A: 40

Rationale:

This course enables students to develop structured solutions to problems and implementing them using computers. This involves two parts: i) Formulating a solution for a given problem as a well-defined sequence of actions, and ii) Expressing solution in a machine-readable form or a programming language. For the second part, we will learn the common units of programming languages. The first part can only be learned through the repeated practice of solving problems.

Course Outcomes:

After completion of the course, the students will be able to

- Formulate basic problems computationally
- Demonstrate use of Conditional Statements, Loops, Arrays, Functions etc.
- Write code snippets to execute them.

Details Course Contents:

The language of choice will be C. The focus will be on problem solving and problem where these ideas can be applied. The main focus of the class will to take examples of problems where these ideas can be employed.

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
I	Introduction to Problem Solving (computational way of thinking); Variables and Representation	
II	Arithmetic, Relational, Logical and Bitwise Operators; Input, Output, Formatting and File I/O	
III	Conditional Statements, Repeat Statements, Loops and Nested Loops	
IV	Arrays and Memory Organization, Strings, Multidimensional Arrays, Functions and Parameter Passing	
V	Recursion and Recursive solutions	

Suggested Lab Work:

This is a skill course. Topics/concepts taught in the class should be practiced in the Lab same week and practiced regularly during the semester till student becomes confident about it. Students should work on solved and unsolved problems listed in the text books. Teacher also should formulate problems and give them as assignment. This course is all about some theory and a lot of practice.

Reference Books:

1. Let Us C, Yashavant Kanetkar
2. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House
3. C Programming Absolute Beginner's Guide, Dean Miller and Greg Perry
4. The C Programming Language, Kernighan and Ritchie, Prentice Hall of India
5. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill
6. C Programming & Data Structures, B. A. Fouruzan and R. F. Gilberg, CENGAGE Learning.
7. Outline of Programming with C, Byron Gottfried, Schaum, McGraw-Hill

SCRIPTING LANGUAGE - PYTHON

L	T	P		Course Code No.: CSPC203
2	0	0		
Total Contact hrs.: Lecture: 30 Tutorial: 0 Practical: 0 Credit : 2			Total marks: 100	Theory: End Term Exam.: 60 P.A: 40

Rationale:

This course is included for developing understanding of how to work with a scripting language.

Course outcomes:

After completion of the course, the students will be able to

- Build program with a scripting language
- Develop the ability to use any other scripting language on their own.

Detailed Course Content:

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
I: Introduction, Variables and Data Types	History, Features, setting up path, Installation and Working with Python, Basic Syntax Understanding Python variables, Numeric data types, Using string data type and string operations, Basic Operators, Understanding coding blocks, Defining list and list slicing, Other Data Types (Tuples, List, Dictionary - Python, Arrays, Associative Arrays/Hashes)	
II: Control Structures	Conditional blocks using if, else and elif, For loops and iterations, while loops, Loop manipulation using continue, break and else (and pass in Python), Programming using conditional and loops block	
III: Functions, Modules and Packages	Organizing Perl codes using functions, Organizing Perl projects into modules, Importing own module as well as external modules, Understanding Packages	
IV: File I/O, Text Processing, Regular Expressions	Understanding read functions, Understanding write functions, Programming using file operations, Powerful pattern matching and searching, Power of pattern searching using regex	

V: Frameworks	Frameworks - Web2Py, Django, Ruby on Rails, Struts (any one of these or any other)	
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Suggested Lab Work:

This is a skill course. Topics/concepts taught in the class should be practiced in the Lab same week and practiced regularly during the semester till student becomes confident about it. Students should work on solved and unsolved problems listed in the text books. Teacher also should formulate problems and give them as assignment. This course is all about some theory and a lot of practice.

Reference Books:

1. Taming Python by Programming, Jeeva Jose, Khanna Publishing House
2. Starting Out with Python, Tony Gaddis, Pearson
3. Core Python Programming, Wesley J. Chun, Prentice Hall
4. Python Programming: Using Problem Solving Approach, Reema Thareja, Oxford University
5. Introduction to Computation and Programming Using Python. John V. Guttag, MIT Press.
6. Beginning Python using Python 2.6 and Python 3, James Payne, Wrox publishing
7. Practical Programming: An Introduction to Computer Science using Python 3, Paul Gries, ThePragmatic Bookshelf

DATA STRUCTURES & ALGORITHMS

L	T	P		Course Code No.: CSPC205
3	0	0		
Total Contact hrs.: Lecture: 45 Tutorial: Practical: 0 Credit : 3			Total marks: 100	Theory: End Term Exam.: 60 P.A: 40

Rationale:

This course is to provide strong foundation for designing, developing and implementing solutions to computational problems through computer programs using appropriate data structures and algorithms.

Course outcomes:

After completion of the course, students will be able to

- Formulate various data structures problems
- Analyse any given data structures problem
- Develop solution of the problems demonstrating understanding of Data Structures
- Identify applications of data structure in algorithms
- Solve real-life computational problems by exploiting the knowledge and skill of data structures and algorithms

Detailed Course Content:

UNIT NO. & TITLE	CONTENT	TIME ALLOTTED (HRS.)
I: Introduction and Overview	Introduction, Basic Terminology, Elementary, data types, Data Structures, Data Structure Operation, Algorithms; Complexity; Time- space Tradeoff.	
II: Preliminaries	Introduction, Mathematical notation and Functions, Algorithmic Notation, Control Structures, Complexity of Algorithms, Sub algorithms, Variables and Data Types.	
III: Arrays, Records and Pointers	Introduction, Linear Arrays, Representation of Linear Arrays in Memory, Traversing Linear Arrays ,Inserting and Deleting, Sorting: Bubble Sort, Search: Linear Search & Binary Search, Multidimensional Arrays, Pointers; Pointer Arrays, Records; Record Structures, Representation of Records in Memory; parallel Arrays, Matrices: Spares Matrices	

IV: String Processing	Introduction, Basic Terminology, Storing Strings, Character Data Type, String Operation, Word Processing, Pattern matching Algorithms.	
V: Linked Lists	Introduction, Linked Lists, Representation of Linked Lists in Memory, Traversal of a Linked List, Searching a Linked List, Memory Allocation Garbage Collection, Insertion into a linked list, Deletion from a Linked List, Header Linked Lists, Two – Ways Lists	
VI: Stacks, Queues, Recursion	Introduction, Stacks, Array Representation of Stacks, Arithmetic Expression; Polish Notation, Quicksort, an Application Stacks, Recursion, Towers of Hanoi, Implementation of Recursive Procedures by Stacks, Queues, Defuse, Priority Queues	
VII: Trees	Introduction, Binary Trees, Representing Binary Trees in Memory, Traversing Binary Trees, Traversal Algorithms using Stacks, Header Nodes; Threads, Binary Search Trees, Trees, Searching and Inserting in a Binary Search Tree, Deleting in a Binary Search Tree, Heap, Heapsort, Path Lengths; Huffman's Algorithm, General Trees	
VIII: Graphs and Their Application	Introduction, Graph Theory Terminology, Sequential Representation of Graphs; Adjacency matrix, path matrix, Warshall's Algorithm, Shortest Paths, Linked Representation of a Graph, Operations on Graphs, Traversing a Graph.	
IX: Sorting and Searching	Introduction, Sorting: Inserting Sort, Selection Sort, Merging, Merge-sort, Radix Sort, Linear searching, Binary searching, Interpolation searching, Hashing.	
X: Introduction to File Organization	Sequential, Index-Sequential and Direct file Organization	

Suggested Lab Work:

This is a skill course. Topics/concepts taught in the class should be practiced in the Lab same week and practiced regularly during the semester till student becomes confident about it. Students should work on solved and unsolved problems listed in the text books. Teacher also should formulate problems and give them as assignment. This course is all about some theory and a lot of practice.

Reference Books:

1. Data Structures, R.S. Salaria, Khanna Book Publishing, New Delhi
2. Data Structures Using C, Reema Thareja, Oxford University Press India.
3. Classic Data Structures, Samanta Debasis, Prentice Hall of India.
4. Fundamentals of Data Structure in C, Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan, University Press, India.
5. Data Structures: A Pseudo code approach with C, Richard F. Gilberg, Behrouz A. Forouzan, CENGAGE Learning, India.
6. Data Structures and Algorithms: Concepts, Techniques and Applications, G. A. V. Pai, McGraw- Hill Education, India.

COMPUTER SYSTEM ORGANIZATION

L	T	P		Course Code. No.: CSPC207
3	1	0		
Total Contact hrs.: Lecture: 45 Tutorial: 15 Practical: 0 Credit : 4			Total marks: 100	Theory: End Term Exam.: 60 P.A: 40

Rationale:

This course enables the students to have a thorough understanding of the basic structure and operation of a digital computer, its architectures and computational designs.

Course outcomes:

After completion of the course, students will be able to

- Discuss the functioning of computer system and its various subcomponents.
- Explain computing requirement for a specific purpose,
- Analyse performance bottlenecks of the computing device
- Choose appropriate computing device for a given use case.

Detailed Course Content:

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
I	Structure of Computers: Computer Functional units, Von-Neumann architecture, Bus structures, Basic Operational Concepts, Data representation (Fixed and Floating point), Error detecting codes. Register Transfer and Micro Operations: Register transfer, Bus and memory transfers, Arithmetic micro-operations, Logic micro-operations, Shift micro-operations, and Arithmetic logic shift unit.	
II	Micro Programmed Control: Control memory, Address sequencing, and design of control unit. Computer Arithmetic: Addition and Subtraction, Multiplication and Division algorithms, Floating-point arithmetic operation, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Vector Processing, Array Processors.	
III	Introduction to Microprocessor Architecture: Instruction Set Architecture design principles from programmer's perspective. One example microprocessor (Intel, ARM, etc.).	
IV	Assembly Language Programming: Simple programs, Assembly language programs involving logical, branch and call	

	instructions, sorting, evaluation of arithmetic expressions, string manipulation, assembler directives, procedures and macros.	
V	Memory and Digital Interfacing: addressing and address decoding, interfacing RAM, ROM, EPROM, programmable peripheral interface, various modes of operation and interfacing to processor, inter-facing keyboard, displays, etc.	

Reference Books:

1. Computer System Architecture, M. Moris Mano, Pearson/PHI, India.
2. Microprocessors Interface, Douglas V.Hall, Tata McGraw-Hill.
3. Computer Organization, Carl Hamacher, Zvonks Vranesic, SafeaZaky, McGraw-Hill
4. Advanced Microprocessors and Peripherals- Architecture, Programming and interfacing,A.K.Ray, K.M.Bhurchandi, Tata McGraw-Hill, New Delhi, India.
5. Computer Organization and Design: A Hardwar/Software Interface (MIPS Edition) byPatterson and Hennessy

COMPUTER PROGRAMMING LAB

L	T	P		Course Code No.: CSPC209
0	0	4		
Total Contact hrs.: Lecture: 0 Tutorial: 0 Practical: 60 Credit : 2			Total marks: 100	Practical: End Term Exam.: 40 P.A: 60

Rationale:

This Lab course is intended to practice what is taught in theory class of 'Computer Programming' and become proficient in computer programming. Computer programming is all about regular practice. Students should work on solved and unsolved problems listed in the text books, and the problems given by the teacher. Some of the topics that should necessary be covered in lab are listed below.

Course outcomes:

After completion of the course, student will be able to

- write code snippets for given programs
- compile the program,
- debug the program
- execute the program.

Detailed Course Content:

Sl. No.	Topics for Practice	Hours
1	Familiarization with programming environment (Editor, Compiler, etc.)	
2	Programs using I/O statements and various operators	
3	Programs using expression evaluation and precedence	
4	Programs using decision making statements and branching statements	
5	Programs using loop statements	
6	Programs to demonstrate applications of n dimensional arrays	
7	Programs to demonstrate use of string manipulation functions	
8	Programs to demonstrate parameter passing mechanism	
9	Programs to demonstrate recursion	
10	Programs to demonstrate use of pointers	
11	Programs to demonstrate command line arguments	
12	Programs to demonstrate dynamic memory allocation	
13	Programs to demonstrate file operations	

The language of choice will be C. This is a skill course. More you practice, better it will be.

Reference Books:

1. Let Us C, Yashavant Kanetkar
2. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House
3. C Programming Absolute Beginner's Guide, Dean Miller and Greg Perry
4. The C Programming Language, Kernighan and Ritchie, Prentice Hall of India
5. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill
6. C Programming & Data Structures, B. A. Fouruzan and R. F. Gilberg, CENGAGE Learning.

SCRIPTING LANGUAGES LAB

L	T	P		Course Code No.: CSPC211
0	0	4		
Total Contact hrs.: Lecture: 0 Tutorial: 0 Practical: 60 Credit : 2			Total marks: 100	Practical: End Term Exam.: 40 P.A: 60

Rationale:

This Lab course is intended to practice whatever is taught in theory class of 'Scripting Languages' and become proficient in scripting. Computer programming is all about regular practice. Students should work on solved and unsolved problems listed in the text books, and the problems given by the teacher. Some of the topics that should necessary be covered in lab are listed below.

Course outcomes:

At the end of the course student will be able to

- Build program with a scripting language
- Demonstrate the ability to build any other scripting language on their own.

Course Content:

S.No.	Topics for Practice	Hours
1	Practice basic coding syntax	
2	Write and execute scripts based on data types	
3	Write and execute Python scripts with conditionals and loops	
4	Write and execute Scripts based on Functions and Modules	
5	File Processing scripts	
6	Write and execute Regular Expressions	
7	Write and execute SQL Queries	
8	Write and execute scripts using DBI	
9	Develop a simple web application	

Teacher may choose any one scripting language. This is a skill course. More student practice and try to find solution on their own, better it will be.

Reference Books:

1. Taming Python by Programming, Jeeva Jose, Khanna Publishing House
2. Starting Out with Python, Tony Gaddis, Pearson
3. Core Python Programming, Wesley J. Chun, Prentice Hall

4. Python Programming: Using Problem Solving Approach, Reema Thareja, Oxford University Press
5. Introduction to Computation and Programming Using Python. John V. Guttag, MIT Press.
6. Beginning Python using Python 2.6 and Python 3, James Payne, Wrox publishing
7. Practical Programming: An Introduction to Computer Science using Python 3, Paul Gries, ThePragmatic Bookshelf

DATA STRUCTURES & ALGORITHMS LAB

L	T	P		Course Code No.: CSPC213
0	0	4		
Total Contact hrs.: Lecture: 0 Tutorial: 0 Practical: 60 Credit : 2			Total marks: 100	Practical: End Term Exam.: 40 P.A: 60

Rationale:

This Lab course is intended to practice whatever is taught in theory class of 'Data Structures', 'Algorithms' and is an extension of previous course on 'Computer Programming'. Students should work on problems listed in the text books, and the problems given by the teacher. Some of the topics that should necessarily be covered in lab are listed below. This Lab course requires a good coordination between theory course in Data Structures and Algorithms.

Course outcomes:

After completion of the course, student will be able to

- Write programs for creating and doing different operations on various data structures.
- Implement various algorithms learnt in the course on Algorithms.
- Demonstrate good command over Data Structures and its applications in Algorithms.

Detailed Course Content:

Sl. No.	Topics for Practice	Hours
1	Write a program using recursive and non-recursive functions to perform search operation in a given list of integers using linear search technique	
2	Search operation in a given list of integers using binary search technique	
3	Write a program to implement insertion sorting for a given random data	
4	Write a program to implement bubble sorting for a given random data	
5	Write a program to implement quick sorting for a given random data	
6	Write a program to implement selection sorting for a given random data	
7	Write a program to implement heap sorting for a given random data	
8	Write a program to implement Hashing tables	
9	Write a program to implement single linked list	
10	Write a program to implement double linked list	
11	Write a program to implement circular linked list	

12	Write a program to Implement Stack operations using array and linked list	
13	Write a program to Implement Queue operations using array and linked list.	
14	Write a program to implement Breadth First Search (BFS)	
15	Write a program to implement Depth First Search (DFS)	
16	Write a program to implement a binary tree of integers	
17	Write a program to find the minimum depth of a binary tree	

Use 'C' as programming language for the purpose. This is a skill course. More student practice and try to find solution on their own, better it will be.

Reference Books:

1. Data Structures, R.S. Salaria, Khanna Book Publishing
2. Data Structures Using C, Reema Thareja, Oxford University Press India.
3. Classic Data Structures, Samanta Debasis, Prentice Hall of India.
4. Fundamentals of Data Structure in C, Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan, University Press, India.
5. Data Structures: A Pseudo code approach with C, Richard F. Gilberg, Behrouz A. Forouzan, CENGAGE Learning, India.
6. Data Structures and Algorithms: Concepts, Techniques and Applications, G. A. V. Pai, McGraw- Hill Education, India.

SEMESTER - IV COURSES

OPERATING SYSTEMS

L	T	P		Curri. Ref. No.: CSPC202
3	0	0		
Total Contact hrs.: Lecture: 45 Tutorial: 0 Practical: 0 Credit : 3 Prerequisite: CSPC205			Total marks: 100	Theory: End Term Exam.: 60 P.A: 40

Rationale:

This course is included to introduce various ideas in implementing operating systems, particularly UNIX. Introduce to various options available so as to develop capacity to compare, contrast, and evaluate the key trade-offs between different design choices.

Course outcomes:

After completion of the course, students will be able to

- Demonstrate basic knowledge about Operating System
- Apply OS concepts such as processes, memory and file systems to system design
- Configure OS in an efficient and secure manner.

Detailed Course Content:

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
I	Overview of Operating System, basic concepts, UNIX/LINUX Architecture, Kernel, services and systems calls, system programs.	
II	Process Management: Process concepts, operations on processes, IPC, Process Scheduling, Multi- threaded programming Memory management: Memory allocation, Swapping, Paging, Segmentation, Virtual Memory, various faults.	
III	File management: Concept of a file, access methods, directory structure, file system mounting, file sharing and protection, file system structure and implementation, directory implementation, free- space management, efficiency and performance. Different types of file systems	
IV	I/O System: Mass storage structure - overview, disk structure, disk attachment, disk scheduling algorithms, swap space management, RAID types.	
V	OS Security: Authentication, Access Control, Access Rights, System Logs	

Reference Books:

1. Operating System Concepts, Silberschatz and Galvin, Wiley India Limited
2. UNIX Concepts and Applications, Sumitabha Das, McGraw-Hill Education
3. Operating Systems, Internals and Design Principles, Stallings, Pearson Education, India
4. Operating System Concepts, Ekta Walia, Khanna Publishing House
5. Modern Operating Systems, Andrew S. Tanenbaum, Prentice Hall of India
6. Operating systems, Deitel & Deitel, Pearson Education, India

INTRODUCTION TO DBMS

L	T	P		Course Code No.: CSPC204
2	0	0		
Total Contact hrs.: Lecture: 30 Tutorial: 0 Practical: 0 Credit : 2 Prerequisite: CSPC203			Total marks: 100	Theory: End Term Exam.: 60 P.A: 40

Rationale:

This course covers the development of database-driven applications using the capabilities provided by modern database management system software. The concepts include conceptual modeling, relational database design and database query languages.

Course outcomes:

After completing the course, the students will be able to

- Explain the procedure for designing a database and database-based applications
- Explain the principle of using a DBMS
- Discuss the critical role of database system in designing several information system-based software systems or applications.

Detailed Course Content:

As a part of the lab, project work is included.

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
I	Introduction; Database System Concepts and Architecture	
II	Data Modeling using the Entity-Relationship Model; The Enhanced Entity-Relationship (EER) model	
III	The Relational Data Model and Relational Database Constraints; ER/EER to Relational Model map-ping; Relational Algebra and Relational Calculus	
IV	SQL-99: Schema definition, Constraints, Queries, and Views; Security; Introduction to SQL programming Techniques	
V	Functional dependencies and normalization for relational databases; Relational database design algorithms and further dependencies.	

Reference Books:

1. Fundamentals of Database Systems, Elmasri & Navathe, Pearson Education
2. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata McGraw-Hill.
3. Database System Concepts, Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill, New Delhi, India.
4. Introduction to Database Systems, C.J.Date, Pearson Education
5. Introduction to SQL, Rick F.Vander Lans, Pearson Education

COMPUTER NETWORKS

L	T	P		Course Code No.: CSPC206
2	0	0		
Total Contact hrs.: Lecture: 30 Tutorial: 0 Practical: 0 Credit : 2			Total marks: 100	Theory: End Term Exam.: 60 P.A: 40

Rationale:

This course enables the students to understand functioning of computer networks and popular networking protocols

Course outcomes:

After completion of the course, students will be able to

- Discuss computer networks, issues, limitations, options available.
- Justify the care that needs to be taken while developing applications designed to work over computer networks
- Configure basic LAN
- Connect computers to LAN

Detailed Course Content:

UNIT NO. & TITLE	CONTENT	TIME ALLOTTED (HRS.)
I	Introduction to computer networks; Network Models- OSI Reference Model, TCP/IP Model;	
II	Transmission Media – principles, issues and examples; Wired Media – Coaxial, UTP, STP, Fiber Optic Cables; Wireless Media – HF, VHF, UHF, Microwave, Ku Band; Network topologies; Data Link Layer –design issues, example protocols (Ethernet, WLAN, Bluetooth); Switching Techniques;	
III	Network Layer - design issues, example protocols (IPv4); Routing - principles/issues, algorithms (Distance-vector, Link-state) and protocols (RIP, OSPF);	
IV	Transport Layer - design issues, example protocols (TCP); Application Layer Protocols (SMTP, DNS).	
V	Functioning of Network Devices – NIC, Hub, Switch, Router, Wi-Fi Devices; Network Management System and example protocol (SNMP).	

Reference Books:

1. Computer Networks, 4th Edition (or later), Andrew S. Tanenbaum, PHI
2. TCP/IP Illustrated, Volume-1, W. Richard Stevens, Addison Wesley
3. Data and Computer Communications, William Stallings, PHI
4. An Engineering Approach to Computer Networking, S. Keshav, Addison Wesley/Pearson
5. An Integrated Approach to Computer Networks, Bhavneet Sidhu, Khanna Publishing House

SSAD/SOFTWARE ENGINEERING

L	T	P		Course Code No.: CSPC208
3	0	0		
Total Contact hrs.: Lecture: 45 Tutorial: 0 Practical: 0 Credit : 3			Total marks: 100	Theory: End Term Exam.: 60 P.A: 40

Rationale:

This course is to inculcate essential technology and software engineering knowledge and skills essential to build a reasonably complex usable and maintainable software iteratively. It emphasizes on structured approach to handle software development and enhance communication skills.

Course outcomes:

After completion of the course, students will be able to

- Discuss the introductory concepts of software engineering and techniques
- Work in a small team to deliver a soft-ware system.
- Demonstrate various software technologies, process and project management skills

Course Content:

As per the course design, concepts learned as part of this course will/should be used in the Minor Project (Proj.202). These two courses should go hand in hand to be effective.

UNIT NO. & TITLE	CONTENT	TIME ALLOTTED (HRS.)
I	Introduction to Software Engineering, Lifecycle, Process Models - Traditional v/s Agile processes.	
II	Development Activities - Requirements Gathering and Analysis, Design Concepts, Software architecture and Architectural styles, Basic UI design, Effective Coding and Debugging techniques.	
III	Software Testing Basics, Unit, Integration, System and Acceptance Testing, Introduction to various testing techniques (e.g. Stress testing), Writing and executing test cases, Quality Assurance.	
IV	Project Management - Project management concepts, Configuration and Release Management, Version Control and its tools (Git), Release Planning, Change Management, Software Maintenance, Project Metrics.	
V		

Reference Books:

1. Software Engineering – A Practitioner’s Approach, 7th Edition, Roger Pressman.
2. Software engineering, Ian Sommerville, Pearson Education
3. An Integrated Approach to Software Engineering, Pankaj Jalote, Springer Verlag
4. Software Engineering, Nasib Singh Gill, Khanna Book Publishing Co. India.
5. Software Engineering, K. K. Agarval, Yogesh Singh, New Age International Publishers

INTERNET OF THINGS (IOT)

L	T	P		Course Code No.: CSPC210
2	1	0		
Total Contact hrs.: Lecture: 30 Tutorial: 15 Practical: 0 Credit : 3			Total marks: 100	Theory: End Term Exam.: 60 P.A: 40

Rationale:

Internet of Things (IoT) is presently an important technology with wide ranging interest from Government, academia and industry. IoT cuts across different application domain verticals ranging from civilian to defense sectors which includes agriculture, space, health care, manufacturing, construction, water, mining, etc. Today it is possible to build different IoT solutions such as shopping system, infrastructure management in both urban and rural areas, remote health monitoring and emergency notification systems, and transportation systems. Therefore, it is very important to learn the fundamentals of this emerging technology.

Course outcomes:

After completion of the course, students will be able to

- Discuss various aspect of IoT
- Explain application of IoT tools
- Demonstrate basic implementation skills

Detailed Course Content:

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
I	Introduction to IoT; Sensing; Actuation	
II	Basics of IoT Networking, Communication Protocols, Sensor networks	
III	Introduction to Arduino programming, Integration of Sensors/Actuators to Arduino	
IV	Implementation of IoT with Raspberry Pi; Data Handling Analytics	

Reference Books:

1. https://nptel.ac.in/noc/individual_course.php?id=noc17-cs22
2. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Rajand Anupama C. Raman (CRC Press)

3. Internet of Things by Dr. Jeeva Jose, Khanna Publishing House (Edition 2017)
4. "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti(Universities Press)
5. *Internet of Things: Architecture and Design Principles*, Raj Kamal, McGraw Hill
6. Research papers

OPERATING SYSTEMS LAB

L	T	P		Course Code No.: CSPC212
0	0	2		
Total Contact hrs.: Lecture: 0 Tutorial: 0 Practical: 30 Credit : 1 Prerequisite: CSPC205			Total marks: 100	Practical: End Term Exam.: 40 P.A: 60

Rationale:

This Lab course is intended to practice and do experiment on concepts taught in theory class of 'Operating Systems' and gain insight into functioning of the Operating Systems.

Course outcomes:

After completion of the course, students will be able to

- Apply Operating System concepts such as processes, memory and file systems to system design
- Configure Operating System in an efficient and secure manner
- Use Operating System suitably

Detailed Course Content:

Sl. No.	Topics for Practice	Hours
1	Revision practice of various commands like man, cp, mv, ln, rm, unlink, mkdir, rmdir, etc. and many more that were learnt in IT Workshop course and later.	
2	Implement two way process communication using pipes	
3	Implement message queue form of IPC	
4	Implement shared memory and semaphore form of IPC	
5	Simulate the CPU scheduling algorithms - Round Robin, SJF, FCFS, priority	
6	Simulate Bankers algorithm for Deadlock Avoidance and Prevention	
7	Simulate all FIFO Page Replacement Algorithm using C program	
8	Simulate all LRU Page Replacement Algorithms using C program	
9	Simulate Paging Technique of Memory Management	
10	Practice various commands/utilities such as catnl, uniq, tee, pg, comm, cmp, diff, tr, tar, cpio, mount, umount, find, umask, ulimit, sort, grep, egrep, fgrep cut, paste, join, du, df, ps, who, etc. and many more.	

This is a skill course. More student practice and try to find solution on their own, better it will be.

Reference Books:

1. Operating System Concepts, Silberschatz, Abraham and Galvin, Peter, Wiley India Limited
2. UNIX Concepts and Applications, Sumitabha Das, McGraw-Hill Education
3. Operating System Concepts, Ekta Walia, Khanna Publishing House

DBMS LAB

L	T	P		Course Code No.: CSPC214
0	0	4		
Total Contact hrs.: Lecture: 0 Tutorial: 0 Practical: 60 Credit : 2 Prerequisites: CSPC211			Total marks: 100	Practical: End Term Exam.: 40 P.A: 60

Rationale:

This Lab course is intended to practice whatever is taught in theory class of 'Introduction to DBMS'. A few sample case studies are listed with some suggested activities. More case studies may be added to this list. Students need to develop these case studies, apply all relevant concepts learnt in theory class as the course progress, identify activities/operations that may be performed on the database. It will be a good idea to also use concepts learnt in the course on Software Engineering/SSAD.

Course outcomes:

After completing the course, the students will be able to

- Demonstrate the procedure to design a database and database-based applications
- Use a DBMS
- Explain the critical role of database system in designing several information system-based software systems or applications.

Detailed Course Content:

Sl. No.	Topics for Practice	Hours
1	Case Study-1: Employee database – 'Create' employee table, 'Select' and display an employee matching a given condition, 'Delete' duplicate records, delete rows using triggers, insert and update records, find net salary, etc.	
2	Case Study-2: Visitor Management database	
3	Case Study-3: Students Academic database	
4	Case Study-4: Inventory Management System database	
5	Case study-5: Bank Operations database	
6	Case Study-6: Bus Operator (Roadways) – Do related activities such as prepare E-R Model, Relational Model, do Normalisation, Create Tables, Insert data, Delete Data, Query database, create stored procedures, etc.	

This is a skill course. More student practice and try to find solution on their own, better it will be.

Reference Books:

1. Elmasri & Navathe, Fundamentals of Database Systems, Pearson Education
2. Raghurama Krishnan, Johannes Gehrke, Database Management Systems, Tata McGraw-Hill, New Delhi, India.
3. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, McGraw-Hill, New Delhi, India.
4. Introduction to Database Systems, C.J.Date, Pearson Education
5. Introduction to SQL, Rick F.Vander Lans, Pearson Education

COMPUTER NETWORKS LAB

L	T	P		Course Code No.: CSPC216
0	0	4		
Total Contact hrs.: Lecture: 0 Tutorial: 0 Practical: 60 Credit : 2			Total marks: 100	Practical: End Term Exam.: 60 P.A: 40

Rationale:

This Lab course is intended to practice whatever is taught in theory class of 'Computer Networks'. Some of the things that should necessary be covered in lab are network issues, limitations, how to configure and to connect computers.

Course outcomes:

After completion of the course, students will be able to

- Discuss computer networks, issues, limitations, options available.
- Configure basic small LAN
- Connect computers to the LAN.

Detailed Course Content:

Sl. No.	Topics for Practice	Hour
1	Showing various types of networking cables and connectors, identifying them clearly	
2	Looking at specifications of cables and connectors of various companies on Internet, find out differences.	
3	Making patch cords using different types of cables and connectors - crimping, splicing, etc.	
4	Demonstration of different type of cable testers, using them for testing patch cords pre-pared by the students in Lab and standard cables prepared by professionals	
5	Configuring computing devices (PC, Laptop, Mobile, etc.) for network, exploring different options and their impact - IP address, gateway, DNS, security options, etc.	
6	Showing various networking devices - NICs, Hub, Switch, Router, Wi-Fi access point, etc.	
7	Looking at specifications of various networking devices various companies on Internet, find out differences.	
8	Network simulation tool (e.g. Cisco Packet Tracer)	
9	Setting up a small wired LAN in the Lab	
10	Setting up a small wireless LAN in the Lab	

This is a skill course. More student practice and try to find solution on their own, better it will be.

Reference Books:

1. Cisco press books on CCNA
2. User manual of networking devices available in the lab
3. Wiki pages on networking devices

OPEN ELECTIVE – 1

DISASTER MANAGEMENT

L	T	P		Course Code No.: CEOE202
3	0	0		
Total Contact hrs.: Lecture: 45 Tutorial: 0 Practical: 0 Credit : 3			Total marks: 100	Theory: End Term Exam.: 60 P.A: 40

Rationale:

This course is included in the curriculum to enable the students to learn about various types of natural and man-made disasters. It gives an exposure of pre- and post-disaster management for some of the disasters. It helps the students to know various information and organisations in disaster management in India and also exposes them to technological tools and their role in disaster management

Course outcomes:

After completing this course, student will be able to

- Identify various types of disasters
- Discuss the precautions and awareness regarding various disasters
- Decide first action to be taken under various disasters
- Identify the organisations in India, which are dealing with disasters
- Select IT tools to help in disaster management

Detailed Course Content:

UNIT NO. & TITLE	CONTENT	TIME ALLOTTED (HRS.)
I: Understanding Disaster	Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity – Disaster and Development, and disaster management.	
II: Types, Trends, Causes, Consequences and Control of Disasters	Geological Disasters (earthquakes, landslides, tsunami, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire); Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters) Global Disaster Trends – Emerging Risks of Disasters – Climate Change and Urban Disasters.	

III: Disaster Management Cycle and Framework	<p>Disaster Management Cycle – Paradigm Shift in Disaster Management.</p> <p>Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Micro zonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness.</p> <p>During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation Centre – Incident Command System – Relief and Rehabilitation –</p> <p>Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, Hyogo Framework of Action.</p>	
IV Disaster Management in India	<p>Disaster Profile of India – Mega Disasters of India and Lessons Learnt.</p> <p>Disaster Management Act 2005 – Institutional and Financial Mechanism, National Policy on Disaster Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national), Non-Government and Inter Governmental Agencies</p>	
V: Applications of Science and Technology for Disaster Management	<p>Geo-informatics in Disaster Management (RS, GIS, GPS and RS).</p> <p>Disaster Communication System (Early Warning and Its Dissemination).</p> <p>Land Use Planning and Development Regulations, Disaster Safe Designs and Constructions, Structural and Non Structural Mitigation of Disasters</p> <p>S&T Institutions for Disaster Management in India</p>	

References

1. Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management
2. Bhandani, R. K., An overview on natural & man-made disasters and their reduction, CSIR, New Delhi
3. Srivastava, H. N., and Gupta G. D., Management of Natural Disasters in developing countries, Daya Publishers, Delhi
4. Alexander, David, Natural Disasters, Kluwer Academic London
5. Ghosh, G. K., Disaster Management, A P H Publishing Corporation
6. Murthy, D. B. N., Disaster Management: Text & Case Studies, Deep & Deep Pvt. Ltd.

AUDIT COURSES

ESSENCE OF INDIAN KNOWLEDGE & TRADITION

L	T	P		Course Code No.: AU202
2	0	0		
Total Contact hrs.: Lecture: 30 Tutorial:0 Practical: 0 Credit : 0			Max. Marks: 100	Min. Passing Marks:40

Rationale:

To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system, this course is very much required. The knowledge gained in this course makes the students understand the traditional knowledge and analyze and apply it in their day-to-day life.

Course Outcomes:

At the end of the course, the student will be able to:

- Identify the concept of Traditional knowledge and its importance.
- Explain the need for and importance of protecting traditional knowledge.
- Illustrate the various enactments related to the protection of traditional knowledge.
- Interpret the concepts of Intellectual property to protect the traditional knowledge.
- Explain the importance of Traditional knowledge in Agriculture and Medicine.

Course Content Details:

Sl. No.	Topics for practice	Time Allotted (Hrs.)
I	वेद,	2
II	उत्तवेद (आयुर्वेद, धनुर्वेद, गन्धर्वेद, स्थानत्य आदद)	2
III	वेदोाग (शिक्षा, कलन, ननरुत, व्याकरण, ज्योनतष छाद),	2
IV	उत्ताइग (धशासर, र्ी र्ीोीोीोीसा, नुराण, तकशास)	2
V	Modern Science and Indian Knowledge System	2
VI	Yoga and Holistic Health care	2
VII	Case Studies	3

References:

Books:

- 1.Cultural Heritage of India - V. Sivaramakrishna, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014.
- 2.Modern Physics and Vedant- Swami Jitatmanand, Bharatiya Vidya Bhavan.
- 3.The Wave of Life - Fritzo Capra.
4. The Tao of Physics - Fritzo Capra.
- 5.Tarasangraha of Annam Bhatta, International - V. N. Jha, Chinmay Foundation, Velliarnad, Amakum.
- 6.Science of Consiousness Psychotherapy and Yoga Practices -R. N. Jha, Vidyanidhi Prakasham, Delhi, 2016.

