



Dr. N.G.P. ARTS AND SCIENCE COLLEGE
(An Autonomous Institution, Affiliated to Bharathiar University, Coimbatore
Approved by Government of Tamilnadu and Accredited by NAAC with 'A++'
Grade (3rd Cycle)

Dr. N.G.P.- Kalapatti Road, Coimbatore-641048, Tamilnadu, India
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REGULATIONS 2025-26 for Post Graduate Programme
(Outcome Based Education model with Choice Based Credit System)
M.Sc. Computer Science Degree
(For the students admitted during the academic year 2025-26 and onwards)

Programme: M.Sc. Computer Science

Eligibility

Candidates for admission to the first year course leading to the Degree of Master of Science (COMPUTER SCIENCE) will be required to possess a pass in B.Sc. Computer Science / B.C.A. / B.Sc. Computer Technology / B.Sc. Information Technology / B.Sc. Information Sciences / B.Sc. Information Systems / B.Sc. Software Systems / B.Sc. Software Sciences / B.Sc. Applied Sciences (Computer Science / Computer Technology) / B.Sc. Electronics of any University in Tamil Nadu or an Examination accepted as equivalent thereto by the Academic Council, subject to such conditions as may be prescribed thereto are permitted to appear and qualify for the M.Sc. Computer Science Examination of this College after the programme of study of two academic years.

Programme Objectives

The Curriculum is designed to attain the following learning goals which students shall accomplish by the time of their graduation:

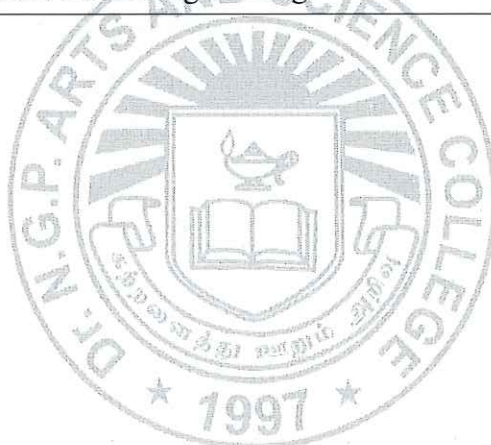
1. To embrace future developments and professional relevance in Computer Science.
2. To attain agility in advanced programming languages and software building for wide area of applications.
3. To explore with applications of Internet Technologies in the related profession with social and ethical responsibilities.
4. To handle the current techniques, skills and tools necessary for computing practice.
5. To engage in research-oriented activities and life-long learning for continuing professional development.



PROGRAMME OUTCOMES

On the successful completion of the program, the following are the expected outcomes.

PO Number	PO Statement
PO1	The ability to identify and analyze the requirements of Computer Science problems.
PO2	The understanding of professional and ethical responsibility in the field of computer science and to communicate effectively.
PO3	The ability to implement algorithms and paradigms with modern software tools.
PO4	The ability to function effectively on multi-disciplinary projects and problems.
PO5	The ability to recognize and respond towards research areas of computer science and the need for lifelong learning.



TOTAL CREDIT DISTRIBUTION

Part	Subjects	No. of Papers	Credit	Semester No.
III	Core	11	9X4=36 2X5=10	I to III
	Core Practical	6	12	I to III
	Extra Departmental Course (EDC)	1	5	II
	Discipline Specific Elective (DSE)	3	3 x 5=15	I to III
	Internship	1	2	III
	Project Work	1	12	IV
TOTAL CREDITS			92	



CURRICULUM - PROGRAMME NAME – M.Sc. Computer Science (2025 Batch)

Course Code	Course Category	Course Name	L	T	P	Instruction Hours		Exam (h)	Max Marks			Credits
						Week	Total		CIA	ESE	Total	
First Semester												
25CSP1CA	Core - I	Advanced Data Structures	4	-	-	4	48	3	25	75	100	4
25CSP1CB	Core - II	Advanced Java	4	-	-	4	48	3	25	75	100	4
25CSP1CC	Core - III	Information Security	5	-	-	5	60	3	25	75	100	5
25CSP1CD	Core - IV	Software Project Management	4	-	-	4	48	3	25	75	100	4
25CSP1CP	Core Practical I	Advanced Data Structures	-	-	4	4	48	3	40	60	100	2
25CSP1CQ	Core Practical II	Advanced Java	-	-	4	4	48	3	40	60	100	2
25CSP1DA	DSE -I	Digital Image Processing	5	-	-	5	60	3	25	75	100	5
25CSP1DB		Advanced Data Mining										
25CSP1DC		Computer Communication Networks										
Total			22		8	30	360				700	26



Course Code	Course Category	Course Name	L	T	P	Instruction Hours		Exam (h)	Max Marks			Credits
						Total	Week		CIA	ESE	Total	
Second Semester												
25CSP2CA	Core - V	Advanced Python Programming	4	-	-	4	48	3	25	75	100	4
25CSP2CB	Core - VI	Modern Database Management Systems	4	-	-	4	48	3	25	75	100	4
25CSP2CC	Core - VII	Neural Networks and Fuzzy Logic	4	-	-	4	48	3	25	75	100	4
25MTP2ED	EDC	Advanced Operations Research	5	-	-	5	60	3	25	75	100	5
25CSP2CP	Core Practical - III	Advanced Python Programming	-	-	4	4	48	3	40	60	100	2
25CSP2CQ	Core Practical - IV	Modern Database Management Systems	-	-	4	4	48	3	40	60	100	2
25CSP2DA	DSE -II	Deep Learning	5	-	-	5	60	3	25	75	100	5
25CSP2DB		Predictive Analytics										
25CSP2DC		Advanced Networks										
			22	-	08	30	360				700	26



Course Code	Course Category	Course Name	L	T	P	Instruction Hours		Exam (h)	Max Marks			Credits
						Total	Week		CIA	ESE	Total	
Third Semester												
25CSP3CA	Core - VIII	Data Science Essentials	4	-	-	4	48	3	25	75	100	4
25CSP3CB	Core - IX	Advanced Operating Systems	4	-	-	4	48	3	25	75	100	4
25CSP3CC	Core - X	Distributed Computing	4	-	-	4	48	3	25	75	100	4
25CSP3CD	Core - XI	Research Methodology	5	-	-	5	60	3	25	75	100	5
25CSP3CP	Core Practical - V	Data Science Essentials	-	-	4	4	48	3	40	60	100	2
25CSP3CQ	Core Practical - VI	Advanced Operating Systems	-	-	4	4	48	3	40	60	100	2
25CSP3TA	IT	Internship	-	-	-	-	-	3	40	60	100	2
25CSP3DA	DSE -III	Natural Language Processing	5	-	-	5	60	3	25	75	100	5
25CSP3DB		Business Analytics										
25CSP3DC		Network Security										
Total			22		08	30	360				800	28



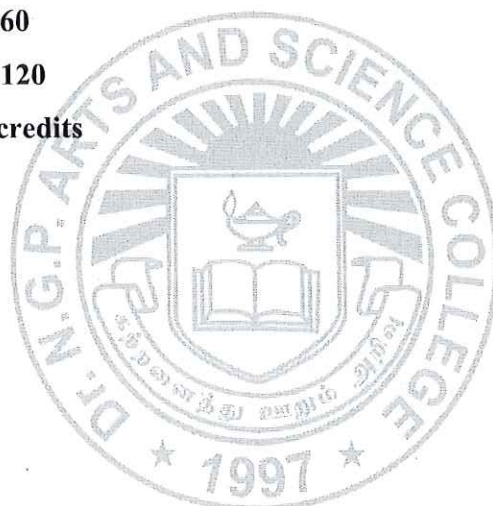
Course Code	Course Category	Course Name	L	T	P	Instruction Hours		Exam (h)	Max Marks			Credits
						Total	Week		CIA	ESE	Total	
Fourth Semester												
25CSP4CV	Core	Project and Viva voce	-	-	-	-	-	3	80	120	200	12
Total											200	12
*Grand Total											2400	92

Theory :CIA 25 : ESE 75

Practical/ IT : CIA 40 : ESE 60

Project : CIA 80 : ESE 120

***Total Credits does not exceed 92 credits**



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M.Sc. Computer Science(Students admitted during the AY 2025-26)

DISCIPLINE SPECIFIC ELECTIVE

Students shall select the desired course of their choice in the listed elective course during Semesters I, II and III

Semester I (Elective I)

List of Elective Courses

S. No.	Course Code	Name of the Course
1.	25CSP1DA	Digital Image Processing
2.	25CSP1DB	Advanced Data Mining
3.	25CSP1DC	Computer Communication Networks

Semester II (Elective II)

List of Elective Courses

S. No.	Course Code	Name of the Course
1.	25CSP2DA	Deep Learning
2.	25CSP2DB	Predictive Analytics
3.	25CSP2DC	Advanced Networks

Semester III (Elective III)

List of Elective Courses

S. No.	Course Code	Name of the Course
1.	25CSP3DA	Natural Language Processing
2.	25CSP3DB	Business Analytics
3.	25CSP3DC	Network Security

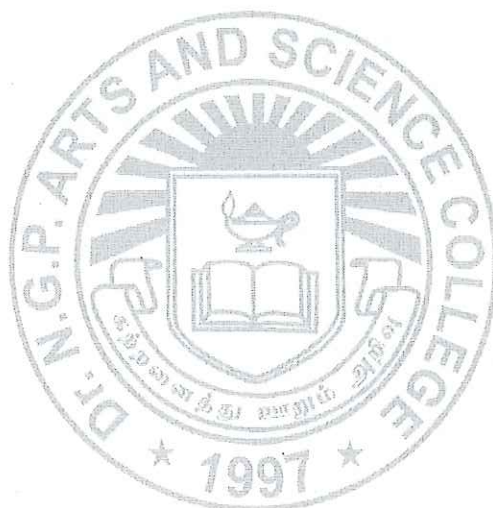


EXTRA CREDIT COURSES

The following are the courses offered under self study to earn extra credits:

Semester III

S. No.	Course Code	Name of the Course
1	25CSPSSA	IPR and Entrepreneurship
2	25CSPSSB	Organizational Behavior



Semester - I CORE I: ADVANCED DATA STRUCTURES							
Semester	Course Code	Course Name	Category	L	T	P	Credits
I	25CSP1CA	ADVANCED DATA STRUCTURES	CORE	48	-	-	4

Preamble	<p>This course has been designed for students to learn and understand</p> <ul style="list-style-type: none"> • operations of elementary data structures • the Tree data structure and Hashing for a specified application • various priority queues and disjoint sets
Prerequisite	Knowledge on Data Structures

Course Outcomes (COs)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Understand the operations of data structures Stack, Queues and Linked List.	K1
CO2	The functionalities and applications of Tree data structures.	K2
CO3	Demonstrate Hash functions and applications	K3
CO4	Apply the operations of Priority Queues and Heaps.	K4
CO5	Applying knowledge about disjoint sets.	K4

Mapping with Program Outcomes:					
COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓		✓	
CO4	✓	✓	✓	✓	
CO5	✓	✓	✓		✓



25CSP1CA	ADVANCED DATA STRUCTURES
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Syllabus

Unit	Content	Hrs	Resources
I	Elementary Data Structures Abstract Data Types (ADTs) - The List ADT - Simple Array Implementation of Lists - Simple Linked Lists - Implementation of list-Applications of Lists - Doubly Linked List - Circular Linked List - The Stack ADT - Stack Model - Implementation of Stacks - Applications - Queue ADT - Queue Model - Array Implementation of Queues - Applications of Queues.	10	Text Book
II	Trees Trees - Tree Traversals with an Application - Binary Trees - Implementation - The Search Tree ADT – Binary Search Trees - AVL Trees: Single Rotation - Double Rotation - Splay Trees - B-Trees - Red-Black Trees - Sets and Maps in the Standard Library - Sets - Maps - Implementation of set and map.	9	Reference Book
III	Hashing Hash Functions - Separate Chaining - Hash Tables without Linked Lists - Linear Probing - Quadratic Probing - Double Hashing - Rehashing.	9	Text Book
IV	Priority Queues Binary Heap - Structure Property - Heap-Order Property - Basic Heap Operations - Other Heap Operations - Applications of Priority Queues - The Selection Problem - Heaps - Skew Heaps - Binomial Queues.	10	Reference Book
V	The Disjoint Sets Equivalence Relations - The Dynamic Equivalence Problem - Smart Union Algorithms - Path Compression - Worst Case for Union-by-Rank and Path Compression - Slowly Growing Functions - An Analysis by Recursive Decomposition. Case Study: Data structures used in Web graph and Google maps.	10	You Tube Videos
Total		48	

Note: Case studies related to the above topics to be discussed (Examined Internal only)

Text book	1.	Data Structures and Algorithm Analysis in C++,2014, Mark Allen Weiss, 4th Edition, Pearson.
Reference Books	1.	S.Sahni,2018,"Data structures, Algorithms and Applications in C++, 2nd edition, University Press (India) Pvt.Ltd.
	2.	Lipschutz, 2016,"Data Structures", 3rd Edition, Tata McGraw Hills.

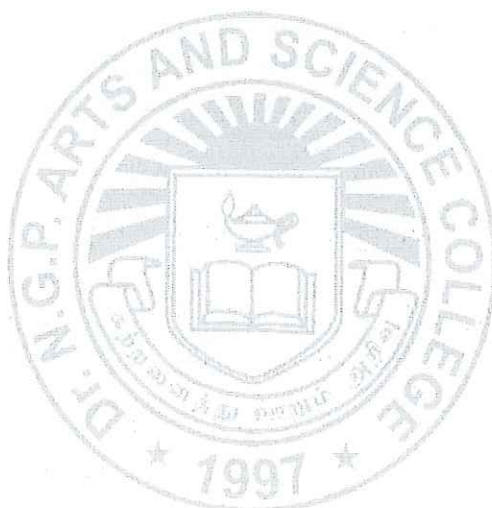


	3.	Michael T. Goodrich, R. Tamassia and Mount, 2017, "Data structures and Algorithms in C++", 3rd Edition, Wiley student edition, John Wiley and Sons.
	4.	R.G. Dromey, 2016, "How to solve it by Computers", 8th Edition, Pearson Education.

Journal and Magazines	Data Structures SpringerLink
E-Resources and Website	Advanced Data Structures GeeksforGeeks

Learning Method	Chalk and Talk/ Assignment/ Seminar
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Focus of the Course	Skill Development/ Employability
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Semester – I CORE II: ADVANCED JAVA							
Semester	Course Code	Course Name	Category	L	T	P	Credits
I	25CSP1CB	ADVANCED JAVA	CORE	48	-	-	4

Preamble	<p>This course has been designed for students to learn and understand</p> <ul style="list-style-type: none"> • advanced Java concepts to develop applications • the Concepts of Java Beans and Swing • database Connectivity using JDBC and Embedded SQL
Prerequisite	Knowledge on Java

Course Outcomes (COs)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Understand about Java beans and Swing.	K2
CO2	Understand the life cycle of Java Servlet.	K2
CO3	Develop and apply events in JSP and RMI.	K3
CO4	Learn the architecture and design of Enterprise Java Bean.	K2
CO5	Design applications implementing Database Connectivity using JDBC and Embedded SQL.	K5

Mapping with Program Outcomes:					
COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓		
CO2	✓	✓	✓		
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓		
CO5	✓	✓	✓	✓	✓



25CSP1CB	ADVANCED JAVA
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Syllabus

Unit	Content	Hrs	Resources
I	Java Beans and Swing Introduction: Advantages - Design patterns for Properties - Events - Methods and Design Patterns - Java Beans API - Swing : Introduction - Swing Is Built on the AWT - Two Key features of Swing - MVC Connections - Components and Containers - The Swing Packages - Simple Swing Applications - Exploring Swing.	10	Text Book
II	Java Servlet Introduction: Background - The life cycle of a Servlet - Using Tomcat for Servlet development - A Simple Servlet - The javax. servlet Packages - Reading Servlet Parameters - The javax. servlet. http packages - Handling Http request and responses - cookies - Session Tracking.	10	Reference Book
III	Java Server Pages, Remote Method Invocation Java Server Pages- Introduction - Tags: Variable Objects - Request String: Parsing Other Information - User Session - Cookies- Session 10objects. Java Remote method Invocation: Remote Interface- Passing Objects- RMI Process - Server side- Client side.	8	Text Book
IV	Enterprise Java Bean Enterprise Java Beans :The EJB Container - EJB Classes - EJB Interfaces - Deployment Descriptors: Referencing EJB - Sharing Resources - Security Elements - Query Elements - Assembly Elements - Session Java Bean: Stateless and Stateful- Creating a Session Java Bean- Entity Java Bean - Message - Driven Bean.	10	NPTEL
V	Database Connectivity JDBC Objects : The Concept of JDBC - JDBC Driver types - JDBC Packages - Database Connection - Statement Objects - ResultSet - Transaction Processing - JDBC and Embedded SQL : Tables and Indexing - Inserting, Selecting and Updating Data	10	You Tube Videos
Total		48	

Note: Case studies related to the above topics to be discussed (Examined Internal only)

Text book		
1.	Herbert Schildt, 2017, "Java The Complete Reference", 10th Edition, Tata McGraw Hill (Unit I-II).	
2.	Jim Keogh, 2006, "J2EE: The Complete Reference", McGraw Hill	



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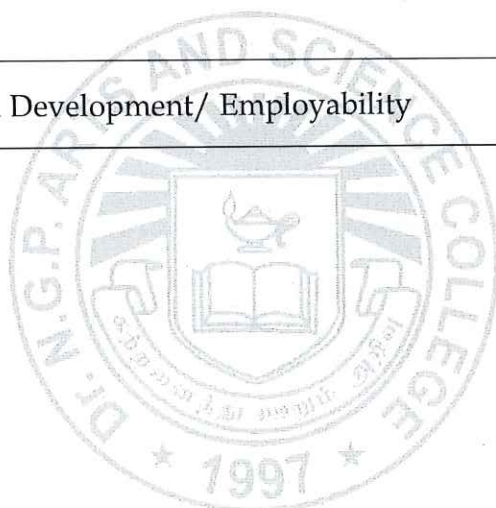
M.Sc. Computer Science(Students admitted during the AY 2025-26)

		Education (Unit III - V)
Reference Books	1.	Herbert Schildt, 2020, "Java, A Beginners Guide", 8th Edition, Oracle Press.
	2.	Bert Bates, Karthy Sierra, Eric Freeman, Elisabeth Robson, 2009, "Head First Design Patterns", 1st Edition, O'Reilly.
	3.	Robert Pattinson, 2018, "The Ultimate Beginners Guide for Advance Java", First Edition, Amazon Digital Services LLC.
	4.	E Ramaraj P Geetha S Muthukumaran, 2020, "Advanced JAVA Programming", First Edition, Pearson, Noida.

Journal and Magazines	https://coderanch.com/t/395092/java/Java-Developers-Journal
E-Resources and Website	https://www.geeksforgeeks.org/java/ https://www.javatpoint.com/java-tutorial

Learning Method	Chalk and Talk/ Assignment/Seminar
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Focus of the Course	Skill Development/ Employability
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Semester - I CORE III: INFORMATION SECURITY							
Semester	Course Code	Course Name	Category	L	T	P	Credits
I	25CSP1CC	INFORMATION SECURITY	CORE	60	-	-	5

Preamble	<p>This course has been designed for students to learn and understand</p> <ul style="list-style-type: none"> the crucial concepts of information systems security the best security practices and ethics the design and implementation of secure systems
Prerequisite	Knowledge on Cyber Security

Course Outcomes (COs)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Apply Basic Crypto and Symmetric Key Crypto.	K4
CO2	Demonstrate the Public Key Crypto.	K3
CO3	Understand the Advanced Cryptanalysis Concepts.	K2
CO4	Understand Authentication and Authorization.	K2
CO5	Apply Authentication Security Syllabus: Protocols.	K4

Mapping with Program Outcomes:					
COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓		✓	✓	
CO2		✓			✓
CO3	✓		✓	✓	✓
CO4	✓	✓			
CO5		✓	✓	✓	



25CSP1CC	INFORMATION SECURITY
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Syllabus

Unit	Content	Hrs	Resources
I	Crypto and symmetric key crypto Crypto Basics: Classic Crypto-Modern Crypto - Taxonomy of Cryptography and Cryptanalysis - Symmetric Key Crypto: Stream Ciphers - A5/1 - RC4 - Block Ciphers - DES - Triple DES - AES - Block Cipher Modes - Integrity.	12	Text Book
II	Public key Crypto RSA - Diffie Hellman - Elliptic Curve Cryptography - Public Key Notation - Uses for Public Key Infrastructure - Hash Functions: Cryptographic Hash Functions - Non Cryptographic Hashes - Uses for Hash Functions.	12	Reference Book
III	Advanced Cryptanalysis Enigma: Enigma Cipher Machine - Enigma Key Space - Rotors - Enigma Attack - RC4 in WEP: RC4 Algorithm - RC4 Cryptanalytic Attack - Preventing Attacks on RC4 - Linear and Differential Cryptanalysis: Tiny DES - Differential Cryptanalysis of TDES - Linear Cryptanalysis of TDES - RSA Timing Attack.	12	Text Book
IV	Authentication and Authorization Authentication: Authentication Methods - Passwords - Biometrics - Two Factor Authentication - Single Sign-On and Web Cookies - Authorization: Evolution of Authorization - Access Control Matrix - Multilevel Security Models - Firewalls - Intrusion Detection Systems.	12	NPTEL
V	Authentication and Real-World Security Protocols Authentication protocols: Simple Security Protocols - Authentication Protocols - Authentication using Symmetric and Public Keys - Session Keys - Authentication and TCP - Zero Knowledge Proofs - Real World Security Protocols: SSH - SSL - IPsec. Case Study: Security Issues - issues in Internet of Things (IoT) based Applications	12	You Tube Videos
Total		60	

Note: Case studies related to the above topics to be discussed (Examined Internal only)

Text book	1.	Mark Stamp, 2018, "Information Security: Principles and Practice", Wiley Publications, Second Edition.
	2.	William Stallings, 2022, "Cryptography and Network Security: Principles and Practice" Seventh Edition, Pearson.)
Reference	1.	Kim, David, Solomon, Michael G, 2018, "Fundamentals of information



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Books		systems security", Jones & Bartlett Learning.
	2.	Jason Andress, 2019, "Foundations of Information Security: A Straightforward Introduction", No Starch Press.
	3.	Andrej Volchkov, 2019, "Information Security Governance Framework and Toolset for CISOs and Decision Makers", Auerbach Publications.
	4.	Nina Godbole, 2017, "Information Systems Security, 2ed: Security Management, Metrics, Frameworks and Best Practices", Second Edition, Wiley.

Journal and Magazines	https://www.infosecurity-magazine.com/
E-Resources and Website	https://www.geeksforgeeks.org https://www.javatpoint.com

Learning Method	Chalk and Talk/Assignment/Seminar
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Focus of the Course	Skill Development/ Employability
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Semester - I							
CORE IV : SOFTWARE PROJECT MANAGEMENT							
Semester	Course Code	Course Name	Category	L	T	P	Credits
I	25CSP1CD	SOFTWARE PROJECT MANAGEMENT	CORE	48	-	-	4

Preamble	<p>This course has been designed for students to learn and understand</p> <ul style="list-style-type: none"> theoretical and methodological aspects in software project management numerous process models for choosing the appropriate projects the required skills for managing projects, project teams, and stakeholder
Prerequisite	Knowledge on Software Projects

Course Outcomes (COs)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Remember the process of Software Project Management.	K1
CO2	Identify the theoretical and methodological issues involved in modern Software Project Management.	K1
CO3	Prepare the activity planning and evaluate the risks involved in it	K3
CO4	Analyze project monitoring activities.	K3
CO5	Develop quality products by working as a team.	K4

Mapping with Program Outcomes:					
COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓		✓		✓
CO2		✓		✓	
CO3		✓	✓	✓	✓
CO4	✓	✓	✓		
CO5	✓			✓	✓



25CSP1CD	SOFTWARE PROJECT MANAGEMENT
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Syllabus

Unit	Content	Hrs	Resources
I	Importance of SPM Definition of Project - Software Project Vs Other Types of Project - Contract Management and Technical Project Management - Activities Covered by SPM - Plans, Methods and Methodologies - Some Ways of Categorizing Software Projects - Stakeholders - Setting Objectives - Information and Control in an organization.	10	Text Book
II	Methodologies and Technologies Choice of Process Models - The Waterfall Model - The Spiral Model - Software Prototyping - Agile Methods -Extreme Programming (XP) - Selecting the Most Appropriate Process Model. The Rapid Application Development - The V - Process Model - Software Effort Estimation: The Basis for Software Estimating - Software Effort Estimation Techniques - Bottom-up Estimating - The Top-down Approach and Parametric Models - Estimating by Analogy - COCOMO Parametric Productivity Model. Resource Allocation: The Nature of Resources - Identifying Resource Requirements - Scheduling Resources - Creating Critical Paths	10	Text Book
III	Activity Planning Project Schedules - Projects and Activities -Sequencing and Scheduling Activities - Network Planning Model - Formulating a Network Model - The Forward Pass - The Backward Pass - Identifying the Critical path - Activity Float - Shortening the Project Duration - Identifying Critical Activities - Activity-on Arrow Networks. Risk Management: Definition of Risk -Categories of Risk - Risk Identification - Risk Assessment - Risk Planning - Risk Management - Evaluating Risks to the Schedule - Applying the PERT Technique -Critical Chain Concepts.	9	Text Book
IV	Creating the Framework Collecting the Data - Visualizing Progress - Cost Monitoring - Earned Value Analysis - Prioritizing Monitoring - Getting the Project Back to Target - Change Control. Managing Contracts: Types of Contract - Stages in Contract Placement - Typical Terms of a Contract - Contract Management -Acceptance. Managing People in Software Environments: Understanding Behavior Organization Behavior: A Background - Selecting the Right Person for the Job -Instruction in the Best Methods - Motivation - The Oldham-Hackman Job Characteristics Model - Stress - Health and Safety - Some Ethical and Professional Concerns.	10	Text Book



V	Working in Teams Becoming a Team - Decision Making - Organizational Structures - Coordination Dependencies - Dispersed and Virtual Teams - Communication Genres - Communication Plans - Leadership. Software Quality: The Place of Software Quality in Project Planning - The Importance of Software Quality - Defining Software Quality - Product versus Process Quality Management- Quality Management Systems - Process Capability Models - Techniques to Help - Enhance Software Quality - Testing - Quality Plans - Acquisition Planning - Procurement - Case Study: Approaches to Software Life Cycle	9	Text Book
	Total	48	

	Note: Case studies related to the above topics to be discussed (Examined Internal only)
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Text book	1.	Bob Hughes, Mike Cotterell, Rajib Mall, 2017, "Software Project Management", 6th Edition, Tata McGraw Hill.
Reference Books	1.	Adolfo Villafiorita, 2018, "Introduction to Software Project Management", CRC Press.
	2.	S.A. Kelkar, 2016, "Software Project Management A Concise Study", 3rd Edition, PHI Learning Private Limited.
	3.	Bharat Bhushan Agarwal, ShivangiDhall, Sumit Prakash Tayal, 2016, "Software Project Management", 1st Edition, University Science Press Pvt. Ltd.
	4.	Ian Sommerville, 2017, "Software Engineering", 1st Edition, Person India Pvt, Ltd.

Journal and Magazines	https://www.ijsepm.latticescipub.com
E-Resources and Website	https://www.geeksforgeeks.org

Learning Method	Chalk and Talk/ Assignment/Seminar
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Focus of the Course	Skill Development/ Employability
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Semester - I							
CORE PRACTICAL -I: ADVANCED DATA STRUCTURES							
Semester	Course Code	Course Name	Category	L	T	P	Credits
I	25CSP1CP	ADVANCED DATA STRUCTURES	CORE		-	48	2

Preamble	<p>This course has been designed for students to learn and understand</p> <ul style="list-style-type: none"> organize and store data efficiently code optimization for performance and efficiently creating scalable, efficient solutions to complex problems
Prerequisite	Knowledge on problem solving techniques

Course Outcomes (COs)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Implementing fundamental data structures.	K2
CO2	Understand the time and space complexity of algorithms.	K3
CO3	Analyze tree and graph data structures.	K4
CO4	Implement and analyze code optimization.	K3
CO5	Evaluate efficient algorithms for problem-solving.	K5

Mapping with Program Outcomes:					
COs / POs	PO1	PO2	PO3	PO4	PO5
CO1			✓	✓	
CO2	✓	✓	✓	✓	
CO3	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓		✓



25CSP1CP	ADVANCED DATA STRUCTURES
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S.No	List of Programs
1	Program that implements stack (its operations) using i) Arrays ii) Linked list (Pointers).
2	Program that implements Queue (its operations) using i) Arrays ii) Linked list(Pointers)
3	Program to implement Doubly Linked List and Circularly Linked List.
4	Program to perform the operations Insert, Delete, Search for a key element in a binary search tree.
5	Program to implement the tree traversal methods.
6	Program to perform the operations Insert, Delete, Search for a key element in an AVL tree.
7	Program to implement Hash Tables using Linked List.
8	Program to Implement Hashing by using any one collision technique.
9	Program to Implement of Heap Operations.
10	Program to Implement of Heaps using Priority Queues.
11	Program to implement Dynamic Equivalence.
12	Program to implement Recursive Decomposition.

Text Book	1. Data Structures and Algorithm Analysis in C++,2014, Mark Allen Weiss, 4th Edition, Pearson.
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Learning Method	Demonstration/ Hands on Experiments
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Focus of the Course	Skill Development/ Employability
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Semester – I CORE PRACTICAL - II : ADVANCED JAVA							
Semester	Course Code	Course Name	Category	L	T	P	Credits
I	25CSP1CQ	ADVANCED JAVA	CORE		-	48	2

Preamble	<p>This course has been designed for students to learn and understand</p> <ul style="list-style-type: none"> • advanced usage of control flow statements • AWT components to design user interfaces • dynamic web page using JSP technology
Prerequisite	Knowledge on Java Programming

Course Outcomes (COs)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Understand advanced Java features.	K2
CO2	Apply AWT and Swing frameworks to design and develop applications.	K3
CO3	Analyze enterprise Java architectures and design patterns.	K4
CO4	Apply Servlet and JSP technologies to build dynamic web applications.	K4
CO5	Evaluate the performance and scalability of Java applications	K5

Mapping with Program Outcomes:					
COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓		✓
CO3	✓	✓	✓		✓
CO4	✓	✓	✓	✓	
CO5	✓	✓			



25CSP1CQ	ADVANCED JAVA
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S.No	List of Programs
1	Programs using Java control statements.
2	Programs to implement the Collection with Iterator.
3	Programs to create applet incorporating features such as images, shapes, background, and foreground color.
4	Create applications using simple GUI.
5	Programs to perform some applications using Java Bean.
6	Create applications using Swing.
7	Programs to demonstrate AWT Components with Event Handling.
8	Programs to perform Session Tracking.
9	Java servlet programs to implement sendredirect() Method (using Http servlet class).
10	Servlet programs using HTTP Servlet.
11	Create web applications using JSP.
12	Programs with JDBC to interact with database

Text Books	1.	Herbert Schildt, 2017, "Java The Complete Reference", 10th Edition, Tata McGraw Hill.
	2.	Jim Keogh, 2006, "J2EE: The Complete Reference", McGraw Hill Education.

Learning Method	Demonstration/ Hands on Experiments
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Focus of the Course	Skill Development/ Employability
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Semester - I DSE I: DIGITAL IMAGE PROCESSING							
Semester	Course Code	Course Name	Category	L	T	P	Credits
I	25CSP1DA	DIGITAL IMAGE PROCESSING	DSE	60	-	-	5

Preamble	<p>This course has been designed for students to learn and understand</p> <ul style="list-style-type: none"> the concepts of image sensing and acquisition the Image enhancement operations the Image filtering, compression and segmentation
Prerequisite	Knowledge on Digital Image Processing

Course Outcomes (COs)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Grasp image processing techniques and image sensing.	K2
CO2	Understand image enhancement operations.	K2
CO3	Gain knowledge on filtering and restoration.	K3
CO4	Understand image segmentation.	K3
CO5	Identify image compression and watermarking..	K5

Mapping with Program Outcomes:					
COs/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	
CO3	✓	✓	✓	✓	
CO4	✓			✓	
CO5	✓	✓	✓	✓	✓



25CSP1DA	DIGITAL IMAGE PROCESSING
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Syllabus

Unit	Content	Hrs	Resources
I	Digital Image Processing Origins - Example Fields - Steps in digital image processing - elements of visual perception - light and electromagnetic spectrum - image sensing and acquisition - image sampling and quantization - relationship between pixels.	12	Text Book
II	Intensity Transformation and Spatial Filtering Intensity Transformation Function - Histogram Processing - Fundamentals of Spatial Filtering - Smoothing Spatial Filters - Sharpening Spatial Filters - Low Pass Filters - Combining Spatial Enhancement methods -Filtering in the Frequency Domain-Selective Filtering - Fast Fourier Transform.	12	Text Book
III	Image Restoration and Reconstruction A model of the image degradation /restoration process - Noise models - Restoration in the presence of Noise only- Spatial Filtering - Periodic noise reduction using Frequency Domain Filtering - Estimating the Degradation Function - Wiener Filtering-Constrained Least Squares Filtering - Geometric Mean Filter.	12	Text Book
IV	Image Segmentation Point, Line and Edge Detection - Thresholding - Segmentation by Region Growing and Splitting and Merging - Super pixels - Region segmentation using Graph Cuts - Segmentation using Morphological Watersheds - The use of Motion in segmentation.	12	Text Book
V	Image Compression and Watermarking Fundamentals - Huffman coding - Golomb Coding - Arithmetic Coding - LZW Coding - Run - length Coding - Symbol based coding - Bit-plane coding - Block Transform coding - predictive coding- Wavelet coding. Case Study: Image Security: Steganography-Watermarking	12	Text Book
Total		60	

Note: Case studies related to the above topics to be discussed (Examined Internal only)

Text book	1.	Rafael C. Gonzalez, Richard E. Woods, 2020,"Digital Image Processing ", Fourth Edition, Pearson.
Reference Books	1.	Anil K Jain, 2015,"Fundamentals of Digital Image. Processing", Fourth Edition, Pearson Education.
	2.	KSanjay Sharma, 2015,"Fundamentals of Digital Image Processing", 5th



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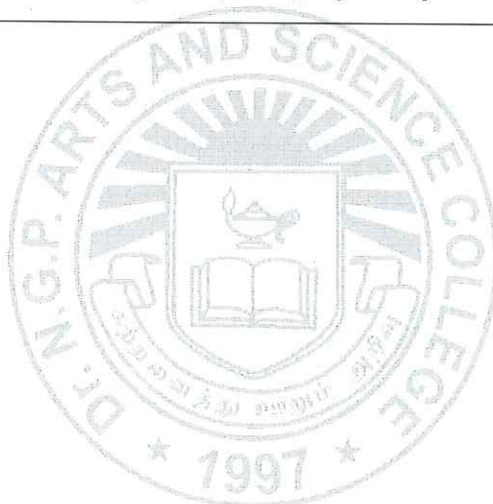
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		edition, SK Kataria and Sons.
	3.	Castleman, 2016, "Digital Image Processing ", First Edition , Pearson.
	4.	Dr. Shashidhar Sonnad, Dr.Vybhav.K, Dr.P.Joel Josephson ,Dr. Kapil Joshi, 2022, "Digital Image Processing ", First Edition, Book Rivers.

Journal and Magazines	https://www.sciencedirect.com/science/article/abs/pii/S0065253908608902 https://www.hilarispublisher.com/scholarly/digital-image-processingjournals-articles-ppts-list-257.html
E-Resources and Website	https://www.tutorialspoint.com/dip/dip_useful_resources.html

Learning Method	Chalk and Talk/ Assignment/Seminar
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Focus of the Course	Skill Development/ Employability
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Semester – I DSE I: ADVANCED DATA MINING							
Semester	Course Code	Course Name	Category	L	T	P	Credits
I	25CSP1DB	ADVANCED DATA MINING	DSE	60	-	-	5

Preamble	<p>This course has been designed for students to learn and understand</p> <ul style="list-style-type: none"> the concepts of data visualization techniques the Genetic algorithms and web mining the Support Vector Machines and text mining
Prerequisite	Knowledge on Data Mining

Course Outcomes (COs)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Understand the data visualization techniques.	K2
CO2	Understand the concepts of OLAP.	K2
CO3	Apply various regression and clustering methods.	K3
CO4	Explain the concept of mining data on web.	K4
CO5	Illustrate the role of data mining techniques with SVM.	K5

Mapping with Program Outcomes:					
COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	
CO2	✓	✓	✓	✓	
CO3	✓	✓		✓	✓
CO4	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓



25CSP1DB	ADVANCED DATA MINING
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Syllabus

Unit	Content	Hrs	Resources
I	Data Mining and Data Visualization Data Scales-Data Categories-Databases and Data Warehouses Data Mining-Supervised and Unsupervised Learning-Steps in Data Mining. Data Visualization Techniques: Graphics and Visualization- Summarization Vs Visualization- Graphics One Variable Diagrams- Multi-variable diagrams- Hierarchical Charts- Data Visualization Technology-Software for Data Visualization.	12	Text Book
II	Online Analytical Processing OLAP - Data Cubes and Cuboids-Aggregation Measures OLAP Schemas-OLAP Operations-OLAP Variants-Mobile OLAP-Multimedia OLAP. Decision Trees: Graph Theory Trees-Decision Trees-Measures for Node Splitting-Induction Algorithms- Pruning Decision Trees-Applications. Association Rules: Meaning of Association Rules-Association Rule Mining-The Apriori Principle-The FP-Growth Algorithm.	12	Text Book
III	Regression and Cluster Analysis Regression - Sample Covariance-Interpretation of Correlation Coefficient-Multivariate Data-Multiple Linear Regressions. Cluster Analysis: Meaning of Clustering- Cluster Display Dissimilarity Metrics-Clustering Algorithms-Cluster Validation Techniques..	12	Text Book
IV	Genetic Algorithms and Web Mining Genetic Algorithms: Genetic Operators-Mutation and Crossover-Implementation of GA. Web Mining: Web Search Engines-Web Mining-Implementing Web Mining-Web Structure Mining-Measures for Web Structure Mining PageRank Algorithm-Generalized PageRank Algorithm- Web Query Mining-Semantic Web Mining-Image Mining-Table Mining.	12	Text Book
V	Support Vector Machines and Text Mining Binary SVM-Lagrangian Formulation-Weighted SVM- Soft Margin SVM- Multi-class SVM-Kernels-Least Squares SVM Nonlinear SVM-Support Vector Regression-SVM Vs Statistical Classifiers. Text Mining: Text Mining Workflow- Term by document Matrix(TD-Matrix)- Text Classification Metrics for Text Mining-Applications of Text Mining. Case study: Detecting Parkinson's disease.	12	Text Book
Total		60	

Note: Case studies related to the above topics to be discussed (Examined)



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	Internal only)
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Text book	1.	Rajan Chattamvelli, 2016, "Data Mining Methods", 2nd Edition, Narosa Publishing House.
Reference Books	1.	J.Han and M. Kamber, 2011, "Data Mining Concepts and Techniques", 3rd Edition, Harcourt India Pvt. Ltd, New Delhi.
	2.	K.P. Soman, ShyamDiwakar, V.Ajay, 2003, "Insight into Data Mining Theory and Practice ",1st Edition, Prentice Hall of India Pvt. Ltd.
	3.	Pang-Ning Tan, Michael Steinbach, Vipin Kumar, 2019," Introduction to Data Mining", 2nd Edition, Pearson Education.
	4.	Arun.K.Pujari, 2013,"Data Mining Techniques",3rd Edition,University Press India Limited.

Journal and Magazines	https://link.springer.com/book/10.1007/978-3-031-22137-8
E-Resources and Website	https://www.ngdata.com/data-mining-resources

Learning Method	Chalk and Talk/ Assignment/Seminar
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Focus of the Course	Skill Development/ Employability
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Semester – I							
DSE I: COMPUTER COMMUNICATION NETWORKS							
Semester	Course Code	Course Name	Category	L	T	P	Credits
I	25CSP1DC	COMPUTER COMMUNICATION NETWORKS	DSE	60	-	-	5

Preamble	<p>This course has been designed for students to learn and understand</p> <ul style="list-style-type: none"> • the concepts of Communication Networks • the Networking Devices and the advanced types of Networks • the Network Applications and Management
Prerequisite	Knowledge on Computer Networks

Course Outcomes (COs)		
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Understand the concepts in Communication Network.	K2
CO2	Understanding the overview of Networking Devices.	K3
CO3	Impart knowledge on data link and link interfaces.	K4
CO4	Gain knowledge on VLANs and WLANs.	K4
CO5	Impart Knowledge on Wide area network and Ability to apply Network Applications.	K5

Mapping with Program Outcomes:					
COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓		✓	✓
CO4	✓		✓	✓	✓
CO5	✓	✓	✓	✓	✓



25CSP1DC	COMPUTER COMMUNICATION NETWORKS
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Syllabus

Unit	Content	Hrs	Resources
I	Communication Network Packet-Switched Networks-Packet Switching Versus Circuit Switching-Data, Packets, and Frames-The Internet and ISPs Classification of ISPs-Types of Packet-Switched Networks Connectionless Networks-Connection-Oriented Networks Packet Size and Optimizations-Foundation of Networking Protocols-Addressing Scheme in the Internet.	12	Text Book
II	Networking Devices Network Interface Cards (NICs)- Switching and Routing Devices-Wireless Switching and Routing Devices-Wireless Access Points and Base Stations-Wireless Routers and Switches-Antennas in Wireless Devices-Modems Multiplexers-Frequency-Division Multiplexing (FDM)- Time-Division Multiplexing..	12	Reference Book
III	Data Links and Link Interfaces Data Links-Data Link Types-Link Encoder-Error Detection and Correction on Links-Error Detection Methods-Cyclic Redundancy Check (CRC) Algorithm-Flow Control on Links-Stop-and-Wait Flow Control-Sliding-Window Flow Control-Link Access by Multiple Users-Wireless Channel Access by Multiple Users-Link Aggregation.	12	Text Book
IV	Local Area Networks Local Area Networks and Networks of LANs-LANs and Basic Topologies-LAN Protocols-Networks of LANs MAC/IP Address Conversion Protocols-Address Resolution Protocol (ARP)- Reverse Address Resolution Protocol (RARP)- Spanning-Tree Protocol (STP)- Virtual LANs (VLANs)- Wireless LANs-IEEE 802.11 Wireless LAN Standard.	12	Text Book
V	Wireless Wide Area Network and Management Wireless Wide Area Network and LTE Technology Infrastructure of Wireless Networks-Cellular Networks Mobile IP Management in Cellular Networks-Home Agents and Foreign Agents-Agent Discovery Phase-Registration Mobile IP Routing-Generations of Cellular Networks-Long Term Evolution (LTE) Technology. Basic Network Applications and Management: Overview of the Application Layer-Domain Name System (DNS)- Electronic Mail (EMail)- World Wide Web (WWW). Case study: Emerging concepts in next generation networks.	12	You Tube Videos
Total		60	



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	Note: Case studies related to the above topics to be discussed (Examined Internal only)
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Text book	1. Nader F. Mir, 2018, "Computer and Communication Networks", Second Edition, Pearson Education.
Reference Books	1. Behrouz A. Forouzan, 2007, "Data Communications and Networking", Fourth Edition, McGraw Hill Higher Education.
	2. Larry L. Peterson, Bruce S. Davie, 2011, "Computer Networks: A Systems Approach", 5th Edition, Morgan Kaufmann.
	3. Cory Beard, William Stallings, 2015, "Wireless Communication Networks and Systems", Pearson.
	4. William Stallings, 2010, "Data and Computer Communications", 9th Edition, Pearson.

Journal and Magazines	Computer networks and communications IEEE Journals & Magazine IEEE Xplore
E-Resources and Website	https://www.geeksforgeeks.org/basics-computer-networking

Learning Method	Chalk and Talk/ Assignment/Seminar
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Focus of the Course	Skill Development/ Employability
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