VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY

JNANASAGARA CAMPUS, BALLARI-583105

Department of Studies in

Computer Science

SYLLABUS

Master of Science in Computer Science

(III Semester)

With effect from

2021-22

VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY

Department of Computer Science

Jnana Sagara, Ballari - 583105

Distribution of Courses/Papers in Postgraduate Programme I to IV Semester as per Choice Based Credit System (CBCS) Proposed for PG Programs

III – SEMESTER

With Practical

Semester	Category	Subject code	Title of the Paper	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
				IA	SEE	Total	L	T	P		
THIRD	DSC9	21CSC3C9L	Multimedia & Animation	30	70	100	4	-	-	4	3
	DSC10	21CSC3C10L	Data Analytics	30	70	100	4	-	-	4	3
	DSE1	21CSC3E1AL	A. Data Mining	30	70	100	4	-	-	4	3
		21CSC3E1BL	B. Cryptographic & Network Security								
		21CSC3E1CL	C. Artificial Intelligence								
	DSE2	21CSC3E2AL	1. Digital Image Processing	30	70	100	4	-	-	4	3
		21CSC3E2BL	2. Social Networking and Analysis								
		21CSC3E2CL	3. Software Testing								
	GEC1	21CSC3G1AL	A. Web Designing	20	30	50	1	1	-	2	1
		21CSC3G1BL	B. Computer Networks and Internet Technologies								
		21CSC3G1CL	C. Introduction to C Programming.								
	SEC3	21CSC3S3LP	Research Methodology	20	30	50	1	-	2	2	1
	DSC9P7	21CSC3C9P	Multimedia & Animation Lab	20	30	50	-	-	4	2	4
	DSC10P8	21CSC3C10P	Data Analytics Lab	20	30	50	-	-	4	2	4
Total Marks for III Semester						**600**				**24**	

Dept Name: Computer Science

Semester-III
DSC9: Multimedia & Animation

Course Title: Multimedia & Animation	Course code: 21CSC3C9L
Total Contact Hours: 52	Course Credits: 04
Formative Assessment Marks: 30	Duration of ESA/Exam: 03 Hours
Summative Assessment Marks: 70	

Course Outcomes (CO's):

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

1. Deploy the right multimedia communication models.
2. Apply QoS to multimedia network applications with efficient routing techniques.
3. Solve the security threats in the multimedia networks.
4. Develop the real-time multimedia network applications.

DSC11: Multimedia & Animation

Unit	Description	Hours
1	Introduction, multimedia information representation, multimedia networks, multimedia applications, Application and networking terminology, network QoS and application QoS, Digitization principles,. Text, images, audio and video.	**12 Hours**
2	Text and image compression,, compression principles, text compression- Run length, Huffman, LZW, Document Image compression using T2 and T3 coding, image compression- GIF, TIFF and JPEG	**10 Hours**
3	Audio and video compression, audio compression – principles, DPCM, ADPCM, Adaptive and Linear predictive coding, Code-Excited LPC, Perceptual coding, MPEG and Dolby coders video compression, video compression principles.	**10 Hours**
4	**V**ideo compression standards: H.261, H.263, MPEG, MPEG 1, MPEG 2, MPEG-4 and Reversible VLCs, MPEG 7 standardization process of multimedia content description, MPEG 21 multimedia framework.	**10 Hours**
5	Notion of synchronization, presentation requirements, reference model for synchronization, Introduction to SMIL, Multimedia operating systems, Resource management, process management techniques.	**10 Hours**

References:

1. K. R. Rao, Zoran S. Bojkovic, Dragorad A. Milovanovic, "Multimedia CommunicationSystems", Pearson education, 2004.
2. John Billamil, Louis Molina, "Multimedia : An Introduction", PHI, 2002.
3. Fred Halsall, "Multimedia Communications", Pearson education, 2001.
4. Raif Steinmetz, Klara Nahrstedt, "Multimedia: Computing, Communications and Applications", Pearson education, 2002.

DSC10: Data Analytics

Course Title: Data Analytics	Course code: 21CSC3C10L
Total Contact Hours: 52	Course Credits: 04
Formative Assessment Marks: 30	Duration of ESA/Exam: 03 Hours
Summative Assessment Marks: 70	

Course Outcomes (CO's):

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

1. A brief methodological description and some descriptive statistics of data.
2. Concerning data quality issues.
3. Converting data to different scales or scale types and reducing data dimensionality.

DSC10: Data Analytics

Unit	Description	Hours
1	**Introductory:** Introduction to Data, Big Data and Data Science, Big Data Architectures, Small Data, What is Data? A Short Taxonomy of Data Analytics, Examples of Data Use, A Project on Data Analytics. Descriptive Statistics: Scale Types, Descriptive Univariate Analysis, Descriptive Bivariate Analysis.	**12 Hours**
2	**Multivariate Analysis:** Multivariate Frequencies, Multivariate Data Visualization, Multivariate Statistics, Infographics and Word Clouds. Data Quality and Preprocessing: Data Quality, Converting to a Different Scale Type, Converting to a Different Scale, Data Transformation, Dimensionality Reduction.	**10 Hours**
3	**Clustering:** Distance Measures, Clustering Validation, Clustering Techniques. Frequent Pattern Mining: Frequent Itemsets, Association Rules, Behind Support and Confidence, Other Types of Pattern.	**10 Hours**
4	**Cheat Sheet and Project on Descriptive Analytics:** Cheat Sheet of Descriptive Analytics, Project on Descriptive Analytics. Regression: Predictive Performance Estimation, Finding the Parameters of the Model, Technique and Model Selection.	**10 Hours**
5	**Classification:** Binary Classification, Predictive Performance Measures for Classification, Distance-based Learning Algorithms, Probabilistic Classification Algorithms.	**10 Hours**

References:

1. Anil Maheshwari, "Data Analytics", 1st Edition, McGraw Hill Education, 2017. ISBN-13: 978-9352604180.
2. Data Analytics: Principles, Tools, and Practices by Dr. Gaurav Aroraa, Chitra Lele, Dr. Munish Jindal.

DSE 1: A. Data Mining

Course Title: Data Mining	Course code: 21CSC3E1AL
Total Contact Hours: 52	Course Credits: 04
Formative Assessment Marks: 30	Duration of ESA/Exam: 03 Hours
Summative Assessment Marks: 70	

Course Outcomes (COs):

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

1. Perform the preprocessing of data and apply mining techniques on it.
2. Use data analysis tools for scientific applications.
3. Implement various supervised machine learning algorithms.

DSE 1: Data Mining

Unit	Description	Hours
1	**Introduction to data mining (DM):** Motivation for Data Mining - Data Mining-Definition and Functionalities — Classification of DM Systems - DM task primitives - Integration of a Data Mining system with a Database or a Data Warehouse - Issues in DM — KDD Process.	**12 Hours**
2	**Data Pre-processing:** Data summarization, data cleaning, data integration and transformation, data reduction, data discretization and concept hierarchy generation, feature extraction, feature transformation, feature selection, introduction to Dimensionality Reduction, CUR decomposition.	**10 Hours**
3	**Concept Description, Mining Frequent Patterns, Associations and Correlations:** What is concept description? - Data Generalization and summarization-based characterization - Attribute relevance - class comparisons, Basic concept, efficient and scalable frequent item-set mining methods, mining various kind of association rules, from association mining to correlation analysis, Advanced Association Rule Techniques, Measuring the Quality of Rules.	**10 Hours**
4	**Classification and Prediction:** Classification vs. prediction, Issues regarding classification and prediction, Statistical-Based Algorithms, Distance-Based Algorithms, Decision Tree- Based Algorithms, Neural Network-Based Algorithms, Rule-Based Algorithms, Combining Techniques, accuracy and error measures, evaluation of the accuracy of a classifier or predictor. Neural Network Prediction methods: Linear and nonlinear regression, Logistic Regression Introduction of tools such as DB Miner / WEKA / DTREG DM Tools.	**10 Hours**
5	**Cluster Analysis:** Clustering: Problem Definition, Clustering Overview, Evaluation of Clustering Algorithms, Partitioning Clustering -K-Means Algorithm, K- Means Additional issues, PAM Algorithm; Hierarchical Clustering — Agglomerative Methods and divisive methods, Basic Agglomerative, Hierarchical Clustering, Strengths and Weakness; Outlier Detection, Clustering high dimensional data, clustering Graph and Network data.	**10 Hours**

References:

1. J. Han, M. Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann
2. M. Kantardzic, "Data mining: Concepts, models, methods and algorithms, John Wiley &

Sons 3. Inc.
3. M. Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson Education.

DSE 1: B. Cryptographic & Network Security

Course Title: Cryptographic & Network Security	Course code: 21CSC3E1BL
Total Contact Hours: 52	Course Credits: 04
Formative Assessment Marks: 30	Duration of ESA/Exam: 03 Hours
Summative Assessment Marks: 70	

Course Outcomes (COs):

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

1. Apply the knowledge of mathematics to perceive the foundations of Cryptography and network security and explain the security principles.
2. Design solutions for problems on classical encryption techniques and illustrate symmetric and asymmetric cryptographic algorithms.
3. Develop solutions for problems on public key cryptosystems
4. Analyze different authentication protocols, integrity protocols and key agreement protocols.
5. Apply the knowledge of engineering fundamentals to comprehend existing network security protocols.

DSE 1: B. Cryptographic & Network Security

Unit	Description	Hours
1	**Computer and Network Security Concepts**: Computer Security concepts, The OSI Security Architecture, Security Attacks, Services and Mechanisms, A Model of Network Security. Introduction to Number Theory: Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality.	**12 Hours**
2	**Symmetric Ciphers**: Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor machine, Steganography Block Cipher and The Data Encryption Standard: Traditional Block Cipher Structures, The Data Encryption Standard, DES Example, Strength of DES, Block Cipher Design principles.	**10 Hours**
3	**Advanced Encryption Standards**: Finite field Arithmetic, AES Structure, AES Transformation Functions, AES key Expansion, An AES Example, AES Implementation. BLOCK CIPHER OPERATION: Multiple Encryption and triple DES, Electronic Code Book, Cipher Block. Random Bit Generation and Stream Ciphers: Principles of Pseudorandom Number Generation, Pseudorandom Number Generators, Pseudorandom Number Generation using a block cipher, Stream Cipher,RC4.	**10 Hours**
4	**Asymmetric Ciphers**: Public Key Cryptography and RSA: Principles of Public-Key Cryptosystems, The RSA Algorithm, Other Public Key Cryptosystems : Diffie -Hellman Key Exchange. Cryptographic Data Integrity Algorithms: Cryptographic Hash Functions: Applications of Cryptographic hash functions, Two simple hash Functions, Secure Hash Algorithm.	**10 Hours**

5	**Message Authentication Codes**: Authentication Requirements, Authentication Functions, Requirements for Message Authentication Codes, Security of MACs, MACs based on Hash Functions: HMAC. Digital Signatures: Digital Signatures, NIST Digital Signature Algorithm.	**10 Hours**

References:

1. William Stallings, Cryptography and Network Security, Seventh Edition, Prentice Hall of India, 2017.
2. Charlie Kaufman, Radia Perlman, Mike Speciner, Network Security: Private Communication in a Public World, Second Edition, Pearson Education Asia, 2002.
3. Atul Kahate, Cryptography and Network Security, Tata McGraw Hill, 2003.

DSE 1: C. Artificial Intelligence

Course Title: Artificial Intelligence	Course code: 21CSC3E1CL
Total Contact Hours: 52	Course Credits: 04
Formative Assessment Marks: 30	Duration of ESA/Exam: 03 Hours
Summative Assessment Marks: 70	

Course Outcomes (COs):

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

1. Gain knowledge about fundamentals of Artificial Intelligence and its importance.
2. Explore essential skills to implement different applications of AI used in daily life.
3. Get familiar about robotic systems and their components.

DSE 1: C. Artificial Intelligence

Unit	Description	Hours
1	**Introduction to AI** : Overview of AI, AI Techniques, AI problems, AI Techniques, Goals of AI, importance and areas of AI, problem characteristics, Production System Characteristics, Issues in design of search programs. The level of the model. Intelligent Systems: Definition and understanding of Intelligence, Types of Intelligence, Human Intelligence vs Machine Intelligence.	**12 Hours**
2	**AI Applications**: Virtual assistance, Travel and Navigation, Education and Healthcare, Optical character recognition, E-commerce and mobile payment systems, Image based search and photo editing. AI Examples in daily life: Installation of AI apps and instructions to use AI apps.	**10 Hours**
3	**Heuristic Search Techniques**: Generate and Test, Hill Climbing, Best First Search, Problem reduction, Constraint satisfaction- Cryptarithmetic and problems.	**10 Hours**
4	Knowledge representation & mapping, approaches to knowledge to representation, issues in knowledge representation, Representing simple facts in logic, representing instance and relationships, Forward v/s Backward chaining.	**10 Hours**
5	**AI programming language:** Prolog- objects, relationships, facts, rules and variables, Prolog: Syntax and data structures, representing objects & relationships by using "trees" and "lists", use of cut, I/O of characters and structures.	**10 Hours**

References:

1. Rich & Knight , Artificial Intelligence, TMH
2. Cloksin & Mellish , Programming In Prolog, Narosa Publishing House.
3. Nillson Harcourt, Principles of Artificial Intelligence, Asia & Morgan.
4. Janakiraman, Sarukesi & Gopal Krishnan MacJmillan. Foundation of Artificial Intelligence & Expert System, MacMillan.

DSE 2: A. Digital Image Processing

Course Title: Digital Image Processing	Course code: 21CSC3E2AL
Total Contact Hours: 52	Course Credits: 04
Formative Assessment Marks: 30	Duration of ESA/Exam: 03 Hours
Summative Assessment Marks: 70	

Course Outcomes (COs):

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

1. Explain fundamentals of image processing.
2. Compare transformation algorithms.
3. Contrast enhancement, segmentation and compression techniques.

DSE 2: A. Digital Image Processing

Unit	Description	Hours
1	**Introduction:** Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Sampling and Quantization, Representing Digital Images (Data structure), Some Basic Relationships Between Pixels- Neighbors and Connectivity of pixels in image, Applications of Image Processing: Medical imaging, Robot vision, Character recognition, Remote Sensing.	**12 Hours**
2	**Image Enhancement In The Spatial Domain :** Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods.	**10 Hours**
3	**Image Enhancement In Frequency Domain:** Introduction, Fourier Transform, Discrete Fourier Transform (DFT), properties of DFT, Discrete Cosine Transform (DCT), Image filtering in frequency domain.	**10 Hours**
4	**Image Segmentation:** Introduction, Detection of isolated points, line detection, Edge detection, Edge linking, Region based segmentation- Region growing, split and merge technique, local processing, regional processing, Hough transform, Segmentation using Threshold.	**10 Hours**
5	**Image Compression:** Introduction, coding Redundancy , Inter-pixel redundancy, image compression model, Lossy and Lossless compression, Huffman Coding, Arithmetic Coding, LZW coding, Transform Coding, Sub-image size selection, blocking, DCT implementation using FFT, Run length coding.	**10 Hours**

References:

1. Milan Sonka, ”Image Processing, analysis and Machine Vision”, Thomson Press India Ltd, Fourth Edition.
2. Fundamentals of Digital Image Processing- Anil K. Jain, 2nd Edition, Prentice Hall of India.
3. S. Sridhar , Digital Image Processing, Oxford University Press, 2nd Ed, 2016.

DSE 2: B. Social Networking and Analysis

Course Title: Social Networking and Analysis	Course code: 21CSC3E2BL
Total Contact Hours: 52	Course Credits: 04
Formative Assessment Marks: 30	Duration of ESA/Exam: 03 Hours
Summative Assessment Marks: 70	

Course Outcomes (COs):
At the end of the course, students will be able to:

1. To understand the concept of semantic web and related applications.
2. To learn knowledge representation using ontology.
3. To understand human behavior in social web and related communities.
4. To learn visualization of social networks.

DSE 2: B. Social Networking and Analysis

Unit	Description	Hours
1	**Introduction:** Introduction to Semantic Web. Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks - Applications of Social Network Analysis.	**12 Hours**
2	**Modelling, Aggregating and Knowledge Representation** : Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modelling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data - Advanced representations.	**10 Hours**
3	**Extraction and Mining Communities in Web Social Networks** : Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social networks - Multi-Relational characterization of dynamic social network communities.	**10 Hours**
4	**Predicting Human Behaviour and Privacy Issues** : Understanding and predicting human behavior for social communities - User data management - Inference and Distribution - Enabling new human experiences - Reality mining - Context - Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.	**10 Hours**

5	**Visualization and Applications of Social Networks**: Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams - Hybrid representations - Applications - Cover networks - Community welfare - Collaboration networks - Co-Citation networks.	**10 Hours**

References:

1. Guandong Xu ,Yanchun Zhang and Lin Li, ―Web Mining and Social Networking – Techniques and applications, First Edition, Springer, 2011.
2. Dion Goh and Schubert Foo, ―Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively, IGI Global Snippet, 2008.
3. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, ―Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling, IGI Global Snippet, 2009.
4. John G. Breslin, Alexander Passant and Stefan Decker, ―The Social Semantic Web, Springer, 2009.

DSE 2: C. Software Testing

Course Title: Software Testing	Course code: 21CSC3E2CL
Total Contact Hours: 52	Course Credits: 04
Formative Assessment Marks: 30	Duration of ESA/Exam: 03 Hours
Summative Assessment Marks: 70	

Course Outcomes (COs):

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

1. Understand importance of testing techniques in software quality management and assurance
2. Identify various types of software risks and its impact on different software application.
3. Create test case scenarios for different application software using various testing techniques.
4. Apply different testing methodologies used in industries for software testing.

DSE 2: C. Software Testing

Unit	Description	Hours
1	**Introduction:** Software Testing, Importance of testing, Roles and Responsibilities, Testing Principles, Attributes of Good Test, V-Model, Test Case Generation , SDLC Vs STLC, Software Testing Life Cycle-in detail. Types of Testing: Testing Strategies: Unit Testing, Integration Testing, System Testing, Smoke, Regression Testing, Acceptance Testing. Clean Room Software Engineering. Functional/Non Functional Testing. Testing Tools, Categorization of testing methods: Manual Testing, Automation Testing and Automated Testing Vs. Manual Testing.	**12 Hours**
2	**Non Functional Testing:** Performance Test, Memory Test , Scalability Test, Compatibility Test, Security Test, Cookies Test, Session Test, Recovery Test, Installation Test, Ad-hoc Test, Risk Based Test, Compliance Test. McCall's Quality Factors, FURPS.	**10 Hours**
3	**Software Testing Methodologies:** Validation & Verification, White/Glass Box Testing, Black Box Testing, Grey Box Testing, Statement Coverage Testing, Branch Coverage Testing, Path Coverage Testing, Conditional Coverage Testing, Loop Coverage Testing, Boundary Value Analysis, Equivalence Class Partition, State Based Testing, Cause Effective Graph, Decision Table, Use Case Testing, Exploratory testing and Testing Metrics, Testing GUI	**10 Hours**
4	**Test Cases Design:** Write Test cases, Review Test cases, Test Cases Template, Types of Test Cases, Difference between Test Scenarios and Test Cases. Test Environment setup, Understand the SRS, Hardware and software requirements, Test Data.	**10 Hours**
5	**Test Execution:** Execute test cases, Error/Defect Detecting and Reporting, DRE(Defect Removal Efficiency), Object ,Types of Bugs , Art of Debugging,. Debugging Approaches, Reporting the Bugs, Severity and priority, Test Closure, Criteria for test closure, Test summary report. QA & QC & Testing: Quality	**10 Hours**

	Assurance, What is Quality Control, Differences of QA , QC & Testing.	

References:

1. Roger S.Pressman, Software engineering- A practitioner's Approach, McGraw-Hill International Editions
2. Ian Sommerville, Software engineering, Pearson education Asia.
3. Software Testing Techniques, 2nd edition, Boris Beizer, 1990.
4. Software Testing: Principles and Practices by Srinivasan Desikan.
5. Software Testing and Quality Assurance: Theory and Practice by Kshirasagar Naik and Priyadarshi Tripathy.
6. Software Quality Approaches: Testing, Verification, and Validation: Software Best Practice by Michael Haug and Eric W Olsen.

GEC 1: A. Web Designing

Course Title: Web Designing	Course code: 21CSC3G1AL
Total Contact Hours: 26	Course Credits: 02
Formative Assessment Marks: 20	Duration of ESA/Exam: 1 Hour
Summative Assessment Marks: 30	

Course Outcomes (COs):

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

1. Understand the concepts of web design.
2. Understand the concepts of list and tables.
3. Using HTML, CSS in developing the website applications.

GEC 1: A. Web Designing

Unit	Description	Hours
1	Introduction to WWW: Protocols and programs, secure connections, application and development tools, the web browser, What is server, choices, Logging users, dynamic IP Web Design: Web site design principles, planning the site and navigation.	**9 Hours**
2	Introduction to HTML: The development process, Html tags and simple HTML forms, web site structure. Style sheets : Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, list, tables, borders and boxes, margins, padding lists, positioning using CSS, CSS2	**9 Hours**
3	Javascript: Client side scripting, What is Javascript, How to develop Javascript, simple Javascript, variables, functions, conditions, loops and repetition.	**8 Hours**

References:

1. Web Technologies, Black Book, Dreamtech Press, 2018.
2. Steven Holzner, "HTML Black Book", Dremtech press, 2000.
3. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel Pearson, 4th edition,
   2012.

GEC 1: B. Computer Networks and Internet Technologies

Course Title: Computer Networks and Internet Technologies	Course code: 21CSC3G1BL
Total Contact Hours: 26	Course Credits: 02
Formative Assessment Marks: 20	Duration of ESA/Exam: 1 Hour
Summative Assessment Marks: 30	

Course Outcomes (COs):
At the end of the course, students will be able to:

GEC 1: B. Computer Networks and Internet Technologies

Unit	Description	Hours
1	**Introduction:** Growth of computer networking, Complexity in network system, Motivation and Tools: Resource sharing, Growth of the internet, probing the internet, interpreting the ping response, tracing a route. Transmission Media: Copper wires, glass fibers.	**9 Hours**
2	**Communications**: Introduction, the need for asynchronous communications, Half and Full duplex asynchronous communication, Long distance Communication: Sending signals across long distances, Modem hardware used for Modulations and Demodulation, spread spectrum.	**8 Hours**
3	**Computer Networks:** Definition, network types, network topology, network devices, OSI model, TCP/IP model, Local Area Network (LAN), Wide Area Network (WAN), Search Engines: Popular search engines, how to register a web site on internet, Blogs, Overview of HTML.	**9 Hours**

References:

1. Douglas E Comer, Internetworking with TCP/IP, Vol. I-Principles, Protocols, & Architecture, 3/e, PHI.
2. V. Rajaraman, Introduction to Information Technology, PHI.
3. P. K. Singh, Introduction to Computer Networks, V. K. Publications, New Delhi.
4. Rachna Sharma, Computer Networks, University Science Press, Laxmi Publications.

GEC 1: C. Introduction to C Programming

Course Title: Introduction to C Programming	Course code: 21CSC3G1CL
Total Contact Hours: 26	Course Credits: 02
Formative Assessment Marks: 20	Duration of ESA/Exam: 1 Hour
Summative Assessment Marks: 30	

Course Outcomes (COs):

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

1. Develop a C program.
2. Control the sequence of the program and give logical outputs.
3. Implement strings in your C program.
4. Manage I/O operations in your C program.

GEC 1: C. Introduction to C Programming

Unit	Description	Hours
1	**Introduction to Programming Concepts:** Software, Classification of Software, Algorithms and Flowcharts, Overview of C Language: History of C, Character set, C tokens, Identifiers, Keywords, structure of C program, executing a C program. Constants, variables, data types, declaration of variables.	**9 Hours**
2	**Managing Input and Output Operations:** The scanf() & printf() functions for input and output operations, reading a character, writing a character, (the getchar() & putchar() functions). Control Statements: Decision making with if statement, simple if statement, the if..else statement.	**8 Hours**
3	**Arrays:** Declaring and Initializing, One Dimensional Arrays, Two Dimensional Arrays, Multi Dimensional Arrays. Strings: Declaring and Initializing strings, Operations on strings. Structures, Unions, Pointers.	**9 Hours**

References:

1. Balaguruswamy, “Programming In ANSI C”, 4th Edition, TMH Publications, 2007.
2. Ashok N. Kamthane, “Programming with ANSI and Turbo C”, Pearson Education, 2006.
3. Mahapatra, “ Thinking In C ”, PHI Publications, 1998.
4. Yashwant Kanetkar, “Let Us C”, 13th Edition, PHP, 2013.

SEC 3: Research Methodology

Course Title: Research Methodology	Course code: 21CSC3S3LP
Total Contact Hours: 39 (13L+26P)	Course Credits: 02
Formative Assessment Marks: 20	Duration of ESA/Exam: 01 Hour
Summative Assessment Marks: 30	

Course Outcomes (COs):

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

SEC 3: Research Methodology

Unit	Description	Hours
1	**Introduction to Research** Nature and importance of research- Aims, Objectives and Principles: Fundamental research vs. applied research with examples: Qualitative vs Quantitative research: Theoretical research vs. experimental research with examples: Selection of a research problem and Sources of literature – Journals, Conferences, Books. Types of sources: Literature Survey engines- Scopus, web of Science, Google Scholar, PubMed, NCBI, Scihub, etc. Science citation index: Citations, h-index, i10 index, impact factor.	7
2	**Methods of Data Collection** Data Collection Methods- Framing a hypothesis, designing controlled experiments, choosing the sample-size, sampling bias, importance of independent replicates, conducting an experiment, maintaining a lab-notebook to record observations: Identifying experimental errors. Case-studies on well-designed experiments vs. poorly designed experiments. Correlations vs. Causation .Good laboratory Practices. Safety practices in laboratories; Introduction to Chemdraw, Chemsketch and other basic softwares.	6
3	**Data analysis (Practical)** **Data Presentation and Writing:** Technical presentation, technical writing, Formatting citations ; MS Excel for plotting the data (pie chart, plots, bar charts) **Analysis using software tools:** Descriptive Statistics: Mean, standard deviation, variance, plotting data and understanding error-bars. Curve Fitting: Correlation and Regression. Distributions: Normal Distribution, Gaussian distribution, skewed distributions. Inferential Statistics: Hypothesis testing and understanding p-value. Parametric tests: Student's t-test, ANOVA. Tests to analyse categorical data: Chi-square test.	26

References :

1. C.R. Kothari, Research Methodology: Methods and Techniques, II Ed. New Age International Publishers, (2009).
2. Shanthibhushan Mishra, Shashi Alok, Handbook of Research Methodology, I Ed, 2017, Educreation Publishers.

3. Basic Statistical Tools in Research and Data Analysis (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5037948/).
4. Introduction to Statistical methods with MATLAB (MATLAB and Simulink Training (mathworks.com)