VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY
JNANASAGARA CAMPUS, BALLARI-583105

Department of Studies in

Computer Science

SYLLABUS

Master of Science
(IV Semester)

With effect from
2022-23

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

IV-SEMESTER

Semester No.	Category	Subject code	Title of the Paper	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
				IA	Sem. Exam	Total	L	T	P		
FOURTH	DSC11	21CSC4C11L	Internet of Things	30	70	100	4	-	-	4	3
	DSC12	21CSC4C12L	Machine Learning	30	70	100	4	-	-	4	3
	DSE3	21CSC4E3AL	A. Business Intelligence	30	70	100	4	-	-	4	3
		21CSC4E3BL	B. Cloud Computing								
		21CSC4E3CL	C. Mobile Computing								
	DSE4	21CSC4E4AL	1. Pattern Recognition	30	70	100	4	-	-	4	3
		21CSC4E4BL	2. Soft computing								
		21CSC4E4CL	3. Computer Forensic and Cyber Security								
	GEC2	21CSC4G2AL	A. Multimedia & Animation	20	30	50	2	-	-	2	1
		21CSC4G2BL	B. Artificial Intelligence								
		21CSC4G2CL	C. R Programming.								
	DSC12P9	21CSC4C12P	Machine Learning Lab	20	30	50	-	-	4	2	4
	Project	21CSC4C1R	Major Project	30	70	100		-	8	4	4
Total Marks for IV Semester						**600**				**24**	

Dept Name: Computer Science
Semester-IV

DSC11: Internet of Things

Course Title: Internet of Things	Course code: 21CSC4C11L
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. Realize the evolution of IOT in Mobile Devices, Cloud & Sensor Networks.
2. Study the building blocks of IOT, its characteristics and application areas of IOT.
3. Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi.
4. Explore the architecture, its components and working of IOT components.

DSC11: Internet of Things

Unit	Description	Hours
1	**Introduction & Concepts:** Introduction to Internet of Things, Definitions and Characteristics of IoT, Physical Design of IoT, Things in IoT, IoT Protocols, Logical Design of IoT, IoT Functional Blocks, IoT Communication Models, IoT Communication APIs, IoT Enabling Technologies, Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems, IoT levels and Development Templates, IoT Level-1, IoT Level-2, IoT Level-3, IoT Level-4, IoT Level-5, IoT Level-6.	**10 Hours**
2	**IoT Platform Design Methodology:** Introduction, IoT Design Methodology: Step1: Purpose and requirement specification, Step2: Process Specification, Step 3: Domain Model Specification, Step 4: Information Model Specification, Step 5: Service Specification, Step 6: IoT Level Specification, Step 7: Function View Specification Step 9: Device and Component Integration, Step 10: Application Development. Case Study: Weather Monitoring.	**12 Hours**
3	**Python Programming:** Introduction, Installing Python, Python Data Types and Data Structures, Control Flow, Functions, Modules, Packages, File Handling, Date Time applications, Classes, Python Packages of Interest for IoT.	**10 Hours**
4	**Raspberry Pi:** Basic Building Blocks - The Board, Linux on Raspberry Pi, Raspberry pi interfaces, programming Raspberry Pi with python Case Studies (any 2 to be covered): Home Automation, Environment, Weather, Agriculture, Productivity Applications.	**10 Hours**
5	**Cloud:** IoT physical servers and cloud offerings: introduction to cloud storage models and communication Networks , frame work-django, designing a RESTful web API, amazon web services for IoT , SkyNetIoT messaging platforms Data Analytics for IoT; Introduction Apache Hadoop, using Hadoop Map Reduce for Batch Data Analysis.	**10 Hours**

References:

1. Arshdeep Bahga, Vijay Madisetti Internet Of Things-A Hands on Approach, University of Penn, http://www.internet-of-things-book.com

2. Adrian McEwen & Hakim Cassimally Designing the Internet of Things, ISBN 978-81-265-5686-1 Wiley Publication.
3. Ovidiu Vermesan, Peter Friess Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems. River Publishers Series in Communication.

DSC12: Machine Learning

Course Title: Machine Learning	Course code: 21CSC4C12L
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. Explain the characteristics of datasets and compare the trivial data and big data for various applications.
2. Illustrate implement machine learning techniques and computing environment that are suitable for the applications under consideration.
3. Describe various ways for implementation of selecting suitable model parameters for different machine learning techniques.
4. Discuss machine learning libraries and mathematical and statistical tools with modern technologies like Hadoop and MapReduce.

DSC12: Machine Learning

Unit	Description	Hours
1	**The Art of Machine Learning for Predictive Data Analytics**: Different Perspectives on Prediction Models, Choosing a Machine Learning Approach, Matching Machine Learning Approaches to Projects Matching Machine Learning Approaches to Data and Your Next Steps. Descriptive Statistics & Data Visualization for Machine Learning: Descriptive Statistics for Continuous Features, Central Tendency, Variation, Descriptive Statistics for Categorical Features, Populations & Samples.	**10 Hours**
2	**Machine Learning for Predictive Data Analytics:** What is Predictive Data Analytics?, What is Machine Learning?, How does Machine Learning Work?, What can go wrong with Machine Learning?, The Predictive Data Analytics Project Life Cycle: CRISP-DM and Predictive Data Analytics Tools. Data to Insights to Decisions: Converting Business Problems into Analytics Solutions, Assessing Feasibility, Designing the Analytics Base Table and Designing & Implementing Features. Data Exploration: The Data Quality Report, Getting to Know the Data, Identifying Data Quality Issues, Handling Data Quality Issues, Advanced Data Exploration and Data Preparation.	**12 Hours**
3	**Probability-based Learning:** Bayes' Theorem, Bayesian Prediction, Conditional Independence &Factorization, Standard Approach: The Naive Bayes Model, A Worked Example. Error-based Learning: Simple Linear Regression, Measuring Error, Error Surfaces, Standard Approach: Multivariable Linear Regression with Gradient Descent, Multivariable Linear Regression, Gradient Descent, Choosing Learning Rates & Initial Weights, A Worked Example. Handling Categorical Target Features: Logistic Regression, Modeling Non-linear Relationships, Multinomial Logistic Regression and Support Vector Machines.	**10 Hours**
4	**Information-based Learning:** Decision Trees, Shannon's Entropy Model, Information Gain, Standard Approach: The ID3 Algorithm, A Worked Example: Predicting Vegetation Distributions, Alternative Feature Selection & Impurity Metrics, Handling Continuous Descriptive Features, Predicting Continuous Targets, Tree Pruning and Model Ensembles. Similarity-based Learning	**10 Hours**

5	Feature Space, Measuring Similarity Using Distance Metrics, Standard Approach: The Nearest Neighbor Algorithm, Handling Noisy Data, Efficient Memory Search Data Normalization, Predicting Continuous Targets, Other Measures of Similarity Feature Selection.	**10 Hours**

References:

1. Tom M. Mitchell, "Machine Learning", McGraw-Hill Education (INDIAN EDITION), 2013.
2. Ethem Alpaydin," Introduction to Machine Learning", 2nd Ed., PHI Learning Pvt. Ltd, 2013.
3. T. Hastie, R. Tibshirani, J. H. Friedman, "The Elements of Statistical Learning", Springer; 1stedition, 2001.

DSE 3: A. Business Intelligence

Course Title: Business Intelligence	Course code: 21CSC4E3AL
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 the turbulent business environment and describe how organizations survive.
2. Comprehend the need for computerized support of managerial decision making.
3. Describe the business intelligence methodology and concepts.
4. Discuss the various types of analytics

DSE 3: A. Business Intelligence

Unit	Description	Hours
1	An overview of Business Intelligence, Analytics, and Decision Support: Changing Business environments and computerized Decision support, A framework for BI, Intelligence creation, Use, and BI Governance, Successful BI implementation, Analytics overview, Brief Introduction to Big Data Analytics. 245 Data Warehousing: Data Warehousing definitions and concepts, Data Warehousing process overview, Data Warehousing architectures, Data Warehousing development, Data integration and the extraction, transformation, and load process.	**12 Hours**
2	Business Reporting, Visual Analytics, and Business performance Management: Business Reporting definitions and concepts, Data and Information Visualization, Different types of Charts and Graphs, Performance Dashboards, Business Performance Management, Performance measurement, Balanced scoreboards, Six sigma as a Performance measurement system.	**10 Hours**
3	Text and Web Analytics: Text analytics and text mining overview, Natural language processing, Text Mining applications, Text mining process, Sentiment analysis, Search engines, Web Usage mining, Social Analytics. Big Data Analytics: Big Data definition and technologies, Big data and data warehousing, Big data and stream analytics, Applications of stream analytics.	**10 Hours**
4	Business Analytics: Emerging Trends and Future Impacts: Location- based analytics for organizations, Analytics applications for consumers, The web 2.0 revolution and online social networking.	**10 Hours**
5	Cloud computing and BI, Impacts of analytics in organizations: an overview, Issues of legality, privacy and ethics, An overview of the analytical ecosystem.	**10 Hours**

References:

1. Galit Shmueli, Nitin R Patel, Peter C Bruce, "Data Mining for Business Intelligence", Wiley Publications, 2016
2. Carlo Vercellis, "Business Intelligence: Data Mining and Optimization for Decision Making", Wiley Publications, 2015
3. David Loshin Morgan, Kaufman, "Business Intelligence: The Savvy Manager"s Guide", Second Edition, 2012.
4. Cindi Howson, "Successful Business Intelligence: Secrets to Making BI a Killer App", McGraw-Hill, 2007.

5. Ralph Kimball , Margy Ross , Warren Thornthwaite, Joy Mundy, Bob Becker, “The Data Warehouse Lifecycle Toolkit”, Wiley Publication Inc.,2007.
6. Larissa T. Moss, S. Atre, “Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making”, Addison Wesley, 2003.

DSE 3: B. Cloud Computing

Course Title: Cloud Computing	Course code: 21CSC4E3BL
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 key dimensions of Cloud Computing and characteristics.
2. Analyze and infer the benefits and drawbacks of Cloud computing.
3. Analyze and apply the various types of virtualization and capacity planning metrics to Clouds.
4. Identify the uses of different Cloud Service.

DSE 3: B. Cloud Computing

Unit	Description	Hours
1	**Defining Cloud Computing**: Cloud Types, The NIST model, The Cloud Cube Model, Deployment models, Service models, Examining the Characteristics of Cloud Computing, Paradigm shift, Benefits of cloud computing, Disadvantages of cloud computing; Assessing the value proposition: Early adopters and new applications, the laws of cloudonomics, cloud computing obstacles, behavioral factors relating to cloud adoption, measuring cloud computing costs, specifying SLAs	**12 Hours**
2	**Understanding Cloud Architecture:** Exploring the Cloud Computing Stack, Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols; Understanding Services and Applications by Type: Defining IaaS, Defining PaaS, Defining SaaS, Defining IDaaS.	**10 Hours**
3	**Understanding Abstraction and Virtualization:** Using Virtualization Technologies, Load balancing and Virtualization, Understanding Hypervisors; Capacity Planning: Defining Baseline and Metrics, Baseline measurements, System metrics, Load testing, Resource ceilings, Server and instance types, Network Capacity, Scaling.	**10 Hours**
4	**Understanding Service Oriented Architecture:** Introducing Service Oriented Architecture, Event-driven SOA or SOA 2 0, The Enterprise Service Bus, Service catalogs, Defining SOA Communications, Business Process Execution Language, Business process modeling, Managing and Monitoring SOA, SOA management tools, SOA security, The Open Cloud Consortium, Relating SOA and Cloud Computing	**10 Hours**
5	**Understanding Cloud Security:** Securing the Cloud, the security boundary, Security service boundary, Security mapping, Securing Data, Brokered cloud storage access, Storage location and tenancy, Encryption, Auditing and compliance, Establishing Identity and Presence, Identity protocol standards, Windows Azure identity standards	**10 Hours**

References:

1. David S Linthicum, Cloud Computing and SOA Convergence in Your Enterprise: A Step-by-Step Guide (free e-book available)
2. Kai Hwang Geoffrey, C. Fox, Jack J. Dongarra, Distributed and Cloud Computing from Parallel Processing to the Internet of Things", Morgan Kaufman Publishers,

2012
3. Gautam Shroff, Enterprise Cloud Computing Technology Architecture Applications (free e-book available)
4. Toby Velte Anthony, Velte, Robert Elsenpeter, cloud Computing, A Practical Approach.

DSE 3: C. Mobile Computing

Course Title: Mobile Computing	Course code: 21CSC4E3CL
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. Describe the concepts of mobile computing and cellular networks.
2. Learn the basic concepts of wireless networks.
3. Description and applications of Ad hoc networks.

DSE 3: C. Mobile Computing

Unit	Description	Hours
1	Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, Mobile computing Architecture, Design considerations for mobile computing, Mobile Computing through Internet, Making existing applications mobile enabled. GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in Cellular systems, WCDMA, GPRS 3G, 4G.	**12 Hours**
2	Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP : Architecture, Traditional TCP, Classical TCP, improvements in WAP, WAP applications.	**10 Hours**
3	Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.	**10 Hours**
4	Cloud Architecture model, Types of Clouds: Public Private & Hybrid Clouds, Resource management and scheduling, Clustering, Data Processing in Cloud: Introduction to Map Reduce for Simplified data processing on Large clusters.	**10 Hours**
5	Ad hoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.	**10 Hours**

References:

1. Mehrotra , GSM System Engineering.
2. M. V. D. Heijden, M. Taylor, Understanding WAP, Artech House.
3. Charles Perkins, Mobile IP, Addison Wesley.
4. Charles Perkins, Ad hoc Networks, Addison Wesley.
5. Judith Hurwitz, Robin Bllor, Marcia Kaufmann, Fenn Halper, Cloud Computing for Dummies, 2009.

DSE 4: A. Pattern Recognition

Course Title: Pattern Recognition	Course code: 21CSC4E4AL
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. Summarize the various techniques involved in pattern recognition.
2. Categorize the various pattern recognition techniques into supervised and unsupervised.
3. Illustrate the artificial neural network based pattern recognition.
4. Discuss the applications of pattern recognition in various applications.

DSE: A. Pattern Recognition

Unit	Description	Hours
1	**Introduction:** Application of Pattern Recognition, statistical Decision Theory, Image Processing and Analysis.	**10 Hours**
2	**Probability:** Introduction, Probability of Events, Random Variables, Joint Distribution and Densities, Moments of Random variables, Estimation of Parameters from samples, Minimum Risk Estimations.	**10 Hours**
3	**Statistical Decision Making**: Introduction, Baye's Theorem, Multiple Features, Conditionally Independent Features, Decision Boundaries,- Estimation of Error rates, Characteristic centers, Estimating the Composition of Populations.	**12 Hours**
4	**Non Parametric Decision Making:** Introduction, Histograms, Kernel and Windows Estimators, Nearest Neighbor Classification Techniques, Adaptive Decision Boundaries, Adaptive Discriminate Functions, Minimum Squared.	**10 Hours**
5	**Artificial Neural Networks:** Introduction, Nets without Hidden layers, Nets with Hidden layers, The Back – Propagation Algorithm, Hopfied Nets – An Application: Classifying Sex from facial images.	**10 Hours**

References:

1. Earl Gose, Richard Johnsonbaugh and Steve Jost, Pattern Recognition and Image Analysis, PHI, 1997.
2. Fu.K.S., Syntactic Methods in Pattern Recognition, Academic Press, 1974.
3. Tray Y Young and Thomas W Calvert, Classification, Estimation and Pattern Recognition, American Elsevier Publication Company Inc., 1994.
4. Duda R.O. and Hart P.E., Pattern Classification and Scene Analysis, John Wiley.

DSE 4: B. Soft Computing

Course Title: Soft Computing	Course code: 21CSC4E4BL
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 learn the basic concepts of Soft Computing.
2. To become familiar with various techniques like neural networks, genetic algorithms and fuzzy systems.
3. To apply soft computing techniques to solve problems.

DSE 4: B. Soft Computing

Unit	Description	Hours
1	**Introduction to Soft Computing:** Introduction-Artificial Intelligence-Artificial Neural Networks-Fuzzy Systems-Genetic Algorithm and Evolutionary Programming-Swarm Intelligent Systems-Classification of ANNs-McCulloch and Pitts Neuron Model-Learning Rules: Hebbian and Delta- Perceptron Network-Adaline Network-Madaline Network.	**10 Hours**
2	**Artificial Neural Networks:** Back propagation Neural Networks - Kohonen Neural Network -Learning Vector Quantization -Hamming Neural Network - Hopfield Neural Network- Bi-directional Associative Memory -Adaptive Resonance Theory Neural Networks- Support Vector Machines - Spike Neuron Models.	**10 Hours**
3	**Fuzzy Systems:** Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets - Classical Relations and Fuzzy Relations -Membership Functions - Defuzzification - Fuzzy Arithmetic and Fuzzy Measures - Fuzzy Rule Base and Approximate Reasoning - Introduction to Fuzzy Decision Making.	**12 Hours**
4	**Genetic Algorithms:** Basic Concepts- Working Principles -Encoding- Fitness Function - Reproduction - Inheritance Operators - Cross Over - Inversion and Deletion -Mutation Operator - Bit-wise Operators -Convergence of Genetic Algorithm.	**10 Hours**
5	**Hybrid Systems:** Hybrid Systems -Neural Networks, Fuzzy Logic and Genetic -GA Based Weight Determination - LR-Type Fuzzy Numbers - Fuzzy Neuron - Fuzzy BP Architecture - Learning in Fuzzy BP- Inference by Fuzzy BP - Fuzzy ArtMap: A Brief Introduction - Soft Computing Tools - GA in Fuzzy Logic Controller Design - Fuzzy Logic Controller	**10 Hours**

References:

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, Neuro-Fuzzy and Soft Computing‖, Prentice-Hall of India, 2002.
2. Kwang H.Lee, First course on Fuzzy Theory and Applications‖, Springer, 2005.
3. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic-Theory and Applications‖, Prentice Hall, 1996.
4. James A. Freeman and David M. Skapura, Neural Networks Algorithms, Applications, and Programming Techniques‖, Addison Wesley, 2003.

DSE 4: C. Computer Forensic & Cyber Security

Course Title: **Computer Forensic & Cyber Security**	Course code: 21CSC4E4CL
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. Define and cite appropriate instances for the application of computer forensics Correctly collect and analyze computer forensic evidence
2. Identify the essential and up-to-date concepts, algorithms, protocols, tools, and methodology of Computer Forensics
3. Understand the threats in networks and security concepts.
4. Apply authentication applications in different networks.
5. Understand security services for email, Awareness of firewall and it applications.

DSE 4: C. Computer Forensic & Cyber Security

Unit	Description	Hours
1	Computer Forensics: Definition and Cardinal Rules, Data Acquisition and Authentication Process, Windows Systems-FAT12, FAT16, FAT32 and NTFS, UNIX file Systems, mac file systems, computer artifacts, Internet Artifacts, OS Artifacts and their forensic applications	**09 Hours**
2	Cyber Crime and computer crime: Introduction to Digital Forensics, Definition and types of cybercrimes, electronic evidence and handling, electronic media, collection, searching and storage of electronic media, introduction to internet crimes, hacking and cracking, credit card and ATM frauds, web technology, cryptography, emerging digital crimes and modules.	**10 Hours**
3	Forensic Tools and Processing of Electronic Evidence: Introduction to Forensic Tools, Usage of Slack space, tools for Disk Imaging, Data Recovery, Vulnerability Assessment Tools, Encase and FTK tools, Anti Forensics and probable counters, retrieving information, process of computer forensics and digital investigations, processing of digital evidence, digital images, damaged SIM and data recovery, multimedia evidence, retrieving deleted data: desktops, laptops and mobiles, retrieving data from slack space, renamed file, ghosting, compressed files.	**11 Hours**
4	Introduction to Digital forensics, Forensic software and handling, forensic hardware and handling, analysis and advanced tools, forensic technology and practices, Biometrics: face, iris and fingerprint recognition, Audio-video evidence collection, Preservation and Forensic Analysis.	**11 Hours**
5	Ethical hacking, Attack Vectors, Cyberspace and Criminal Behaviour, Clarification of Terms, Traditional Problems associated with Computer Crimes, Realms of Cyber world, brief history of the internet, contaminants and destruction of data, unauthorized access, computer intrusions, white-collar crimes, viruses and malicious code, virus attacks, pornography, software piracy, mail bombs, exploitation, stalking and obscenity in internet, Cyber psychology, Social Engineering.	**11 Hours**

References:

1. Altheide& H. Carvey Digital Forensics with Open Source Tools, Syngress, 2011. ISBN: 9781597495868.
2. Charles P. Fleeger, "Security in Computing", Prentice Hall, New Delhi, 2009.
3. Behrouz A.Forouzan, Cryptography & Network Security‖, Tata McGraw Hill, India, New Delhi, 2009.
4. William Stallings, Cryptography and Network Security, Prentice Hall, New Delhi, 2006.
5. Chalie Kaufman, Radia Perlman, Mike Speciner, Network Security: Private Communication in a Public Network‖, Pearson Education, New Delhi, 2004

GEC 2: A. Multimedia & Animation

Course Title: Multimedia & Animation	Course code: 21CSC4G2AL
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. Deploy the right multimedia communication models.
2. Apply QoS to multimedia network applications with efficient routing techniques.

GEC 2: A. 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.	**9 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	**8 Hours**
3	**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.	**9 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.

GEC 2: B. Artificial Intelligence

Course Title: Artificial Intelligence	Course code: 21CSC4G2BL
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. 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

GEC 2: B. Artificial Intelligence

Unit	Description	Hours
1	**Overview of AI:** Definition of Artificial Intelligence, Philosophy of AI, Goals of AI, Elements of AI system, Programming a computer without and with AI, AI Techniques, History of AI.	**9 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.	**9 Hours**
3	**Robotics:** Introduction to Robotics, Difference in Robot System and Other AI Program, Components of a Robot.	**8 Hours**

References:

1. https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_tutorial.pdf.
2. Kevin Knight, Elaine Rich, Shivashankar B. Nair, ”Artificial Intelligence”, Third Edition, July 2017.

GEC 2: C. R Programming

Course Title: R Programming	Course code: 21CSC4G2CL
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 an R script and execute it.
2. Install, load and deploy the required packages, and build new packages for sharing and reusability.
3. Extract data from different sources using API and use it for data analysis.
4. Visualize and summarize the data.
5. Design application with database connectivity for data analysis.

GEC 2: C. R Programming

Unit	Description	Hours
1	**Introduction**: R interpreter, Introduction to major R data structures like vectors, matrices, arrays, list and data frames, Control Structures, vectorized if and multiple selection, functions.	**9 Hours**
2	**Installing, loading and using packages**: Read/write data from/in files, extracting data from web-sites, Clean data, Transform data by sorting, adding/removing new/existing columns, centering, scaling and normalizing the data values, converting types of values, using string in-built functions, Statistical analysis of data for summarizing and understanding data, Visualizing data using scatter plot, line plot, bar chart, histogram and box plot.	**9 Hours**
3	**Designing GUI**: Building interactive application and connecting it with database.	**8 Hours**

References:

1. Cotton, R., Learning R: a step by step function guide to data analysis. 1st edition. O'reilly Media Inc.
2. Gardener, M.(2017). Beginning R: The statistical programming language, WILEY
3. Lawrence, M., & Verzani, J. (2016). Programming Graphical User Interfaces in R. CRC press.

CBCS Question Paper Pattern for PG Semester End Examination with Effect from the AY 2021-22

Disciplines Specific Core (DSC) and Discipline Specific Elective (DSE)

Paper Code: **Paper Title:**

Time: 3 Hours **Max.**

Marks: 70

Note: Answer any *FIVE* of the following questions with Question No. 1 (Q1) Compulsory, each question carries equal marks.

Q1. 14 Marks

Q2. 14 Marks

Q3. 14 Marks

Q4. 14 Marks

Q5. 14 Marks

Note: Question No.1 to 5, *one question from each unit* i.e. (Unit I, Unit II, ….). The Questions may be a whole or it may consists of sub questions such as a,b, c etc…

Q6. 14 Marks

Note :Question No.6, *shall be from Unit II and III,* the Question may be a whole or it may consists of sub questions such as a,b, c etc…

Q7. 14 Marks

Note: Question No.7, *shall be from Unit IV and V*,the Question may be a whole or it may consists of sub questions such as a,b, c etc…

Q8. 14 Marks

Note: Question No-8 shall be from *Unit II, Unit III , Unit IV and Unit V*. The question shall have the following sub questions and weightage. i.e a – 05 marks, b – 05 marks, c – 04 marks.

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Skill Enhancement Courses (SECs)

Paper Code: **Paper Title:**

Time: 1 Hours **Max.**

Marks: 30

There shall be Theory examinations of Multiple Choice Based Questions [MCQs] with Question Paper set of A, B, C and D Series at the end of each semester for SECs for the duration of One hour (First Fifteen Minutes for the Preparation of OMR and remaining Forty-Five Minutes for Answering thirty Questions). The Answer Paper is of OMR (Optical Mark Reader) Sheet.

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Question Paper Pattern for Subjects with Tutorial

For the subjects with Tutorial component, there is no Semester-End Examination (SEE) to the component C3. The liberty of assessment of C3 is with the concerned faculty. The faculty must present innovative method of evaluation of component C3 before the respective BoS for approval and the same must be submitted to the Registrar and Registrar(Evaluation) before the commencement of the academic year.

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Date Course Coordinator Subject Committee Chairperson