Department of Computer Science and Applications

School of Mathematical and Physical Sciences (SMPS)

Curriculum Framework & Syllabus
of
Bachelor of Computer Applications (B.C.A.)
Semester 7th to 8th New Syllabus
w.e.f. 2025-2026
Based on
National Education Policy(NEP) - 2020

Date of BoS: 21/02/2025

Doctor Harisingh Gour Vishwavidyalaya, Sagar
(A Central University)
Sagar-Madhya Pradesh 470003

COURSE STRUCTURE AND SYLLABUS OF BCA 7th and 8th SEMESTER AS PER NEP 2020 AND U NIVERSITY GUIDELINES

B.C.A.: Seventh Semester

Level / Semester	Nature of Course	Courses Code	Course Title	M M	L	T	P	C
L-8 Seventh Semester	Discipline Specific: Major-1	CSA-DSM-711	Machine Learning	100	4	0	0	4
		CSA-DSM-712	Lab Based on Machine Learning	100	0	0	2	2
	Discipline Specific: Minor -1	CSA-DSM-713	Data Mining and Warehousing	100	5	1	0	6
	Multi-Discipline: Major-3	CSA-MDM-711	Research Methodology	100	5	1	0	6
	Internship/Minor Research Project	CSA-SEC-711	Internship / Minor Research Project	100	0	0	0	2
							Total Credits	20

Course up to 4-8 credit may be selected from SWAYAM Portal, as notified by the department

B.C.A.: Eighth Semester

Level / Semester	Nature of Course	Courses Code	Course Title	MM	L	T	P	C
L-8 Eighth Semester	Discipline Specific: Major-1	CSA-DSM-811-A CSA-DSM-811-B CSA-DSM-811-C CSA-DSM-811-D	Elective:1 (Select any one of the following) Cloud Computing Blockchain Technology Deep Learning #MOOCs on SWAYAM Portal	100	5	1	0	6
	Discipline Specific: Major-2	CSA-DSM-812-A CSA-DSM-812-B CSA-DSM-813-C CSA-DSM-814-D	Elective:2 (Select any one of the following) Information Security & Cryptography Mobile Computing Digital Forensic #MOOCs on SWAYAM Portal	100	5	1	0	6
	Discipline Specific: Dissertation	CSA-DSM-813	Dissertation	100				12
							Total Credits	24
Exit with Degree in Bachelor of Computer Applications (Honours) with Research								

DSM: Discipline Specific: Major/Minor, MDM: Multi – Disciplinary Major, AEC: Ability Enhancement Course, VEC: Value Enhancement Course, SEC: Skill Enhancement Course, L: Lecture, T: Tutorial, P: Practical, C: Credit, MM: Maximum Mark

#Students have the option to select maximum 4-8 credits from MOOCs available on the SWAYAM Portal, as notified by the department at the beginning of each semester. The credit of the course may be equivalent to the course offered by the university however, with the permission of the department reallocation of the credit of higher and lower level may be considered only if the minimum credit requirements of curriculum and credit framework of undergraduate programs is fulfilled.

BCA (Semester – VII)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-DSM-711	Machine Learning	04	-	-	04	20	20	60	100

Course Learning Objectives: *The course aims to provide students with the theoretical knowledge and practical skills necessary to identify, formulate, and resolve problems utilising machine learning algorithms. It will instruct them on how to select, implement, and assess various models on real-world datasets, thereby enabling the application of machine learning techniques across diverse domains.*

Unit wise Learning Outcomes:

Upon successful completion of the course, the students

UO1: will gain basic understanding, importance of Machine Learning.

UO2: will understand concepts of feature extraction, linear regression and fuzzy clustering.

UO3: will understand how to select appropriate machine learning algorithms based on the characteristics of a given problem and dataset.

UO4: will understand the mathematical foundations of common machine learning algorithms

UO5: will understand and interpret the results of machine learning models to provide actionable insights.

UNIT –I: Concept of Machine Learning, Applications of Machine Learning, Key elements of Machine Learning, Types of Machine Learning methods - supervised, unsupervised learning, Semi-supervised learning and Reinforcement learning, Supervised vs. Unsupervised Learning Vs reinforcement Learning.

UNIT –II: Supervised Learning (Regression/Classification): Basic methods: Distance based methods, Nearest-Neighbours, Decision Trees, Naive Bayes, Linear models: Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, Nonlinearity and Kernel Methods, Beyond Binary Classification: Multi- class/Structured Outputs, Ranking.

UNIT- III: Unsupervised Learning: Clustering: K-means/Kernel K-means, Dimensionality Reduction: PCAand kernel PCA, Matrix Factorization and Matrix Completion, Generative Models (mixture models and latent factor models).

UNIT- IV: Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests) ,Overfitting and Underfitting.

UNIT –V: Association rules learning, Apriori and FP-growth, ARIMA, ML in real time applications.

Essential Reading:

1. Oliver Theobald (2024), "Machine Learning for Absolute Beginners: A Plain English Introduction (Third Edition).
2. Aurélien Géron, (2022) "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow 3e" –3rd Edition
3. Andreas, C., & Müller, G. (2020). Introduction to machine learning with python: A guide for data scientists. O'Reilly Media.

Suggested Reading and links:

1. Kaggle.com for various datasets of Machine Learning
2. swayam-plus.swayam2.ac.in for various machine learning courses

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ME – Mid – I Exam.; IA – Internal Assessment; ESE – End Semester Exam.

BCA (Semester – VII)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-DSM-712	Lab Based on Machine Learning	-	-	02	02	20	20	60	100

Course Learning Objectives: *The course aims to provide students with the practical skills necessary to identify, formulate, and resolve problems utilising machine learning algorithms. It will instruct them on how to select, implement, and assess various models on real-world datasets, thereby enabling the application of machine learning techniques across diverse domains.*

Unit wise Learning Outcomes:

Upon successful completion of the course, the students

UO1: will gain basic understanding, importance of Machine Learning.

UO2: will understand concepts of feature extraction, linear regression and fuzzy clustering.

UO3: will understand how to select appropriate machine learning algorithms based on the characteristics of a given problem and dataset.

UO4: will understand the mathematical foundations of common machine learning algorithms

UO5: will understand and interpret the results of machine learning models to provide actionable insights.

- The list of practicals will be decided by the course coordinator based on the syllabus of theory paper of Machine Learning.
- Students may use various online coding practices platforms like Hackerrank, MachineHack, Google Colab etc. to practice and course coordinators may monitor their progress through these platforms.

ME – Mid – I Exam.; IA – Internal Assessment; ESE – End Semester Exam.

21/2/25

21/2/25

BCA (Semester – VII)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-DSM-713	Data Mining and Warehousing	05	01	-	06	20	20	60	100

Course Learning Objectives: *The course aims to provide students with the theoretical knowledge and practical skills necessary to understand the value of Historical data and data mining in solving real-world problems.*

Unit wise Learning Outcomes:
Upon successful completion of the course, the students
UO1: will gain basic fundamental principles of Data Warehousing and Data Mining.
UO2: will understand the architecture of a data mining system.
UO3: will understand how to perform classification, association and prediction of data.
UO4: will understand the mathematical foundations of data warehousing

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UNIT –I: INTRODUCTION TO DATA MINING: Definition of Data Mining, Kind of Data, Data Mining functionalities, Kind of patterns, Classification of data mining systems, Data Mining task primitives, Data Mining task primitives, Integration of Data Mining system with a Database, Major Issues in Data Mining, Application of Data Mining.

UNIT- II: MINING FREQUENT PATTERNS, ASSOCIATIONS AND CORRELATIONS: Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods, Pattern Evaluation Methods, Applications of frequent pattern and associations. Frequent Pattern and Associate Mining: A Road Map, Mining Various Kinds of Association Rules, Constraint-Based Frequent Pattern Mining, Extended Applications of Frequent Patterns.

UNIT- III: CLASSIFICATION: Basic Concepts, Decision Tree Induction, Bayesian Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy: Ensemble Methods, Handling Different Kinds of Cases in Classification.

UNIT –IV: CLUSTER ANALYSIS: Basic Concepts of Cluster Analysis, Clustering structures, Major Clustering Approaches, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Model Based Clustering - The Expectation-Maximization Method.

UNIT -V: DATA WAREHOUSING: Data Data Warehousing: Overview, Definition, Data Warehousing Components, Building a Data Warehouse, Warehouse Database, Mapping the Data Warehouse to a Multiprocessor Architecture, Difference between Database System and Data Warehouse, Multidimensional Data Model, Data Cubes, Stars, SnowFlakes.

Essential Reading:

1. Jiawei Han, "Data mining concepts and techniques", 4th edition, 2022
2. Parteek Bhatia, Data Mining and Data Warehousing: Principles and Practical Techniques, Cambridge University Press, 2019
3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson, First impression,2014.

Suggested Readings and links:

1. https://onlinecourses.swayam2.ac.in/cec19_cs01/preview
2. Dr. Jugnesh Kumar, "Data Warehouse and Data Mining: Concepts, techniques and real life applications", bpb publications, 2024

ME – Mid – I Exam.; IA – Internal Assessment; ESE – End Semester Exam.

BCA (Semester – VII)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-MDM-711	Research Methodology	05	01	-	06	20	20	60	100

Course Learning Objectives: *The course aims to provide students with the in-depth knowledge of philosophical methodologies and techniques which are essential for research. It covers several research-based topics such as Research design, descriptive statistics and data types related to research. This course helps students to design research writings such as proposals and theses.*

Unit wise Learning Outcomes:
Upon successful completion of the course, the students
UO1: will gain basic fundamentals of designing research writings.
UO2: will understand the use of different data collection methods.
UO3: will understand relevant sampling techniques and where to use these techniques.
UO4: will analyze and interpret research data effectively
UO5: will document research findings in the form of proposals, paper or theses.

UNIT –I: **Introduction**: Evolution of Scientific Inquiry, Scientific Research: Definition, Characteristics, types, need of research. Formulating a research question: Identification of the problem, Assessing the status of the problem, Literature Review and Identifying Research Gaps, Research Proposal Writing.

UNIT –II: Data Collection: Primary and Secondary data, Structured and unstructured data, Types of Data – Categorical, nominal & Ordinal, Concept of dependent and independent variable, Methods of Collecting Data: Observation, field investigations, Direct studies – Reports, Records or Experimental observations. Sampling methods.

UNIT- III: Descriptive statistics: Measures of central tendency and variability, representation of data: stem and leaf diagram, histogram, boxplot, and ogive; bar diagram and its variations, Pie charts; probability distributions: discrete and continuous, joint and conditional probability; theory of attributes: coefficient of association and coefficient of colligation.

UNIT- IV: Statistical Inference: Parameter and statistic, sampling distributions, confidence intervals and margin of error, developing hypotheses, hypothesis testing; Non-parametric tests: Student t-test, chi-square test, Mann-Whitney U test, Kruskal-Wallis test, Spearman's rank correlation coefficient

UNIT –V: Regression and Classification: Correlation: measure and significance, simple linear regression, multiple linear regression, one-way classification, analysis of variance, two-way classification, analysis of covariance, curvilinear regression, factorial experiments. Data Analysis, Visualization and Interpretation.

Essential Reading:

1. Thomas, C. G. (2021). Research methodology and scientific writing. Thrissur: Springer.
2. C.R. Kothari, and G.Garg., (2019) Research Methodology: Methods and Techniques. New Age International Publishers.

Suggested Reading and links:

3. Marra, M., & Nielsen, B. B. (2025). Research methodology: Best practices for rigorous, credible, and impactful research. *Journal of International Business Studies*, 1-3.
4. https://www.ncrm.ac.uk/resources/online/

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BCA (Semester – VII)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-SEC-711	Internship/Research Minor Project	-	-	-	02	20	20	60	100

Course Learning Objectives: *Summarize and evaluate the internship experience and obtain basic research experience related to student academic growth.*

Guidelines:

This internship/research minor project program is designed for graduate students interested in receiving academic credit for their internship/Minor research project. The assignments are constructed to help students think critically about their beginning of research objectives and career and how this internship will enrich students.

Mid I and Mid II assessment: The progress of the research project will be evaluated as MID I and Mid II assessment through seminar/presentation, write-up/synopsis/progress report by the course coordinator assigned by the head of the department.

Final Examination: For the final external evaluation is based on a brief summary of the project in the form of the hard and soft copy and it will be evaluated by the course coordinator as well as an external examiner.

Other rules will be as per the guidelines of the University.

ME – Mid – I Exam.; IA – Internal Assessment; ESE – End Semester Exam.

BCA (Semester – VIII)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-DSM-811-A	Cloud Computing	05	01	-	06	20	20	60	100

Course Learning Objectives: *This course aims to equip the students with parallel and distributed computing and cloud computing concepts. Students will learn about cloud computing's characteristics, benefits, and historical developments. They will learn cloud computing architecture, service models (IaaS, PaaS, SaaS), deployment models, and emerging paradigms like Edge Computing and Mobile Cloud Computing.*

Unit wise Learning Outcomes:

Upon successful completion of the course, the students

UO1: will understand cloud computing's characteristics, benefits, and historical developments, including distributed systems and virtualization.

UO2: will be able to compare and contrast cloud computing architectures, service models, and deployment models.

UO3: will understand and develop a cloud computing application. compare and contrast cloud computing architectures, service models, and deployment models

UNIT –I: Introduction to Cloud Computing: Definition, Characteristics, Components, Cloud provider, SAAS, PAAS, IAAS and other Organizational scenarios of clouds, Administering & Monitoring cloud services, benefits and limitations, Deploy application over cloud. Comparison among SAAS, PAAS, IAAS.

UNIT –II: Cloud computing platforms: Infrastructure as service: Amazon EC2, Platform as Service: Google App Engine, Microsoft Azure Utility Computing, Elastic Computing, SLA, clusters, cloud analytics, challenges of cloud environment, HPC in the cloud, Deployment models: Public, Private, Hybrid, Community

UNIT –III: Parallel Processing Concepts: Physical Organization and building blocks of High Performance Computing Systems, Processors and Multi-Core Architectures, Vector processing, Super-scalar, In-order execution, Instruction-Level Parallelism etc., FMA, 32 and 64 bit types, ISA, Accelerators such as GPGPUs and Xeon Phi. Threads and Processes, Multi-processing OS, Parallel I/O, General concepts.

UNIT- IV: Parallel Programming Models and Parallel Algorithms Design: Application domains of HPC, Decomposition Techniques: Data parallelism, Functional parallelism, Divide and Conquer etc

UNIT- V: SaaS: Introduction to SaaS, Cloud Services, Web 19 services, Web 2.0, Web OS; Case studies related to IaaS, PaaS and SaaS, Economics of the cloud.

Essential Reading:

1. Thomas Erl, Eric Barcelo Monroy, (2023), "Cloud Computing: Concepts, Technology, Security, and Architecture", 2nd Edition, Pearson.

2. Dan C. M., (2022), "Cloud Computing Theory and Practice", MK, 3rd Edition.

2. Antony T. V., Toby J., Robert E. L., (2017), "Cloud Computing, TMH.

Suggested Reading and links:

1. K. Hwang, G. C. Fox, J. Dongarra, Distributed and Cloud Computing: From Parallel Processing to the Internet of Things, Morgan Kaufmann, 2011

2. https://onlinecourses.nptel.ac.in/noc21_cs14/preview

ME – Mid – I Exam.; IA – Internal Assessment; ESE – End Semester Exam.

BCA (Semester – VIII)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-DSM-811-B	Blockchain Technology	05	01	-	06	20	20	60	100

Course Learning Objectives: *The objective of this course is to introduce students to deep learning algorithms and their applications in order to solve real problems.*

Unit wise Learning Outcomes:
Upon successful completion of the course, the students
UO1: will understand the basic concepts of block chain

UO2: will be able to Paraphrase the list of consensus and Demonstrate and Interpret working of Hyper ledger Fabric

UO3: will be able to Implement SDK composer tool and explain the Digital identity for government.

UO4: will understand basics of Financial software and tools of blockchain

UNIT –I: History: Digital Money to Distributed Ledgers -Design Primitives: Protocols, Security, Consensus, Permissions, Privacy- : Block chain Architecture and Design-Basic crypto primitives: Hash, Signature, Hash chain to Block chain-Basic consensus mechanisms.

UNIT –II: Requirements for the consensus protocols-Proof of Work (PoW)-Scalability aspects of Block chain consensus protocols: Permissioned Block chains-Design goals-Consensus protocols for Permissioned Block chains.

UNIT- III: Decomposing the consensus process-Hyper ledger fabric components-Chain code Design and Implementation: Hyper ledger Fabric II:-Beyond Chain code: fabric SDK and Front End-Hyper ledger composer tool.

UNIT- IV: Block chain in Financial Software and Systems (FSS): -Settlements, -KYC, -Capital markets-Insurance, Block chain in trade/supply chain: Provenance of goods, visibility, trade/supply chain finance, invoice management/discounting.

UNIT –V: Block chain for Government: Digital identity, land records and other kinds of record keeping between government entities, public distribution system / social welfare systems: Block chain Cryptography: Privacy and Security on Block chain

Essential Reading:

1. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman Ramakrishna, (2018), "Hands-On Block chain with Hyper ledger: Building decentralized applications with Hyperledger Fabric and Composer"

2. Mark Gates, (2017) "Block chain: Ultimate guide to understanding block chain, bit coin, crypto currencies, smart contracts and the future of money", Wise Fox Publishing and Mark Gates.

Suggested Reading and links:

1. Bahga, Vijay Madisetti, "Block chain Applications: A Hands-On Approach", Arshdeep Bahga, Vijay Madisetti publishers 2017.
2. https://tech.seas.harvard.edu/free-blockchain

ME – Mid – I Exam.; IA – Internal Assessment; ESE – End Semester Exam

BCA (Semester – VIII)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-DSM-811-C	Deep Learning	05	01	-	06	20	20	60	100

Course Learning Objectives: *The objective of this course is to introduce students to deep learning algorithms and their applications in order to solve real problems.*

Unit wise Learning Outcomes:

Upon successful completion of the course, the students

UO1: will be able to describe the feed-forward and deep networks.

UO2: will be able to design single and multi-layer feed-forward deep networks and tune various hyper-parameters

UO3: will be able to implement deep neural networks to solve a problem.

UO4: will analyse performance of deep networks

UNIT I: Introduction to Deep Learning: Definition, Applications, Neural Networks, Machine Learning vs Deep Learning, Deep Learning Libraries (Tensorflow, Keras, PyTorch), Types (Supervised Learning, Unsupervised Learning, Reinforcement Learning) and their Comparison.

UNIT II: Neural Networks: Basics, Types, Intuitions, Neurons, Kernels, Biases, Weights, Initialization, Gradient Descent, Heuristics, Training (Holdout Method, K-Fold Cross-Validation Method, Bootstrap Sampling, Lazy vs Eager Learner), Evaluation (Regression, Classification and Clustering), Perceptrons

UNIT III: Deep Feedforward Network: Feed-forward Networks, Gradient-based Learning, Hidden Units, Architecture Design, Computational Graphs, Back Propagation, Regularization, Parameter Penalties

UNIT IV: Convolution Networks: Convolution Operation, Pooling, Basic Convolution Function, Convolution Algorithm, Unsupervised Features and Neuroscientific for convolution Network..

UNIT V: Sequence Modelling: Recurrent Neural Networks (RNNs), Bidirectional RNNs, Encoder Decoder Sequence-to-Sequence Architectures, Deep Recurrent Network, Recursive Neural Networks and Echo State networks.

Essential Reading:

1. Charu C. Aggarwal, "Neural Netowork and Deep Learning: a textbook 2nd edition, 2023, Springer

2. Simon Haykin, Neural networks and Learning Machines, Third Edition, Pearson, 2016.

3. Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2016

Suggested Reading and links:

1. https://onlinecourses.nptel.ac.in/noc20_cs62
2. https://github.com/lijqhs/deeplearning-notes

ME – Mid – I Exam.; IA – Internal Assessment; ESE – End Semester Exam.

BCA (Semester – VIII)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSA-DSM-812-A	Information Security and Cryptography	05	01	-	06	20	20	60	100

Course Learning Objectives: *The course offers a broad overview of the fundamentals of information security covering topics such as cryptography, steganography, Digital signatures, & Hashing Techniques.*

Unit wise Learning Outcomes:
Upon successful completion of the course, the students
U01: will be able to identify the major types of threats to information security
U02: will be able to describe the role of cryptography in security
U03: will understand the strengths and weaknesses of private and public key crypto systems
U04: will understand malwares and memory exploits

Unit-I: Information Security: Understand the meaning of information security, Security models, security attacks, security services and mechanisms, Understand security threats: Social Engineering (Phishing), firewalls, Computer threats.

Unit-II: Symmetric Key Cryptography: Classical Encryption and Decryption Techniques, Stream Cipher, Block Ciphers, Data Encryption Standard (DES), Triple DES, Modes of DES (ECB, CBC, CFB, OFB), Advanced Encryption Standard, Confidentiality using symmetric encryption.

Unit- III: Public key cryptography: Symmetric and asymmetric techniques (Diffie-Hellman, Needham-Schroeder), Key distribution, RSA, Elliptic Curve Cryptography, Message Authentication and Hash Function, Cryptographic hash function, Non Cryptographic Hash function, Birthday problem, birthday attack.

Unit-IV: Digital Signature: Digital signature schemes: RSA and DSS (Digital Signature Standard), Cryptanalysis, Message integrity and authentication protocols: definition and applications, Collision resistant hashing, authenticated encryption: security against active attacks.

Unit-V: Information Hiding: Principles of Steganography and Watermarking, basics of information hiding, data hiding in raw (BMP) images - color representation (RGB, YUV, HSV), LSB (least significant bit) embedding, attacking LSB embedding (Sample Pairs Analysis), Steganalysis.

Recommended Books:

1. William Stallings, (2024) Cryptography and network security, Pearson Education, 8th edition.

2. Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, (2018) Handbook of Applied Cryptography, CRC Press.

3. Behrouz A Forouzan, (2018). "Cryptography And Network Security" McGraw Hill Publications.

Suggested Readings:

1. https://www.youtube.com/watch?v=a5vI8mqMIjU

ME – Mid – I Exam.; IA – Internal Assessment; ESE – End Semester Exam.

BCA (Semester – VIII)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSM-DSM-812 -B	Mobile Computing	05	01	-	06	20	20	60	100

Course Learning Objectives: *The course offers a broad overview of the fundamentals of mobile computing topics such as its applications, architecture, protocols and security mechanisms.*

Unit wise Learning Outcomes:
Upon successful completion of the course, the students
UO1: will understand the basic concepts of mobile computing.
UO2: will learn the basics of mobile telecommunication system
UO3: will be familiar with the network layer protocols
UO4: will understand about different mobile platforms and application development
U05: will understand the basis of transport and application layer protocols

UNIT –I: Introduction: Introduction to Mobile Computing — Applications of Mobile Computing- Generations of Mobile Communication Technologies- Multiplexing — Spread spectrum -MAC Protocols — SDMA- TDMA- FDMA- CDMA

UNIT –II: Mobile Telecommunication System: Introduction to Cellular Systems — GSM — Services & Architecture — Protocols — Connection Establishment — Frequency Allocation — Routing — Mobility Management — Security — GPRS- UMTS — Architecture — Handover — Security

UNIT- III: Mobile Network Layer: Mobile IP — DHCP — AdHoc– Proactive protocol-DSDV, Reactive Routing Protocols — DSR, AODV , Hybrid routing –ZRP, Multicast Routing- ODMRP, Vehicular Ad Hoc networks (VANET) –MANET Vs VANET — Security.

UNIT- IV: Mobile Transport And Application Layer : Mobile TCP– WAP — Architecture — WDP — WTLS — WTP –WSP — WAE — WTA Architecture — WML

UNIT –V: Mobile Platforms And Applications : Mobile Device Operating Systems — Special Constraints & Requirements — Commercial Mobile Operating Systems — Software Development Kit: iOS, Android, BlackBerry, Windows Phone — MCommerce — Structure — Pros & Cons — Mobile Payment System — Security Issues

Essential Reading:

1. Raj Kamal "Mobile Computing" Oxford Higher Education, Third Edition, 2018.
2. John Horton, "Android Programming with Kotlin", PACKT Publication, 2019.

Suggested Reading and links:

1. Yan Jhang, "Mobile Edge Computing", Simula SpringerBriefs on Computing, 2021.
2. Prashant Kumar Pattnaik, Rajib Mall, "FUNDAMENTALS OF MOBILE COMPUTING", PHI Learning, 2015.
3. https://archive.nptel.ac.in/courses/106/106/106106147/

ME – Mid – I Exam.; IA – Internal Assessment; ESE – End Semester Exam.

Kit: iOS, Android, BlackBerry, Windows Phone — MCommerce — Structure — Pros & Cons —

BCA (Semester – VIII)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSM-DSM-812 -C	Digital Forensic	05	01	-	06	20	20	60	100

Course Learning Objectives: *The course offers a broad overview of the fundamentals of digital forensic techniques and its applications.*

Unit wise Learning Outcomes:
Upon successful completion of the course, the students
UO1: will understand the basic concepts of digital forensic.
UO2: will learn the basics of various tools of digital forensics.
UO3: will be familiar with the network layer protocols to help in digital forensics.

Unit 1: Basics of Digital Forensics: Tools and Techniques, Evidence Collection and Preservation: Chain of Custody, Wireshark and other tools, Device security policy, Cyber Security best practices

Unit 2: Analysis of Digital Evidence: Data Hiding Techniques, Swap Files, Slack space, Unallocated and Allocated space, ADS, File Systems, Metadata, and Logs, Significance of host firewall and Ant-virus, Management of host firewall and Antivirus.

Unit 3: Mobile Forensics: Investigating Smartphones, Network Forensics: Packet Analysis and Traffic Monitoring, Wi-Fi security, Configuration of basic security policy and permissions.

Unit 4: Incident Response Management: Planning and Execution, Social Engineering Attacks and Mitigation Strategies.

Unit 5: Ethical Hacking and Vulnerability Assessment: Types of Hackers, Hacking ethics and responsibilities.

Essential Reading:
1. Thomas J. Holt, Adam M. Bossler, Kathryn C. Seigfried-spellar, (2022), "Cybercrime and Digital Forensics: An Introduction", 3RD EDITION Paperback

2. Tarun Vashishth,"Cyber Forensics Up and Running: A hands-on guide to digital forensics tools and technique" Paperback – Import, 11 December 2023

Suggested Readings:

1. Kevin Beaver, "Hacking for Dummies", January 2013
2. https://onlinecourses.swayam2.ac.in/cec20_lb06/preview

ME – Mid – I Exam.; IA – Internal Assessment; ESE – End Semester Exam.

BCA (Semester – VIII)

Course Code	Course Title	L	T	P	C	Sessional		ESE	Total
						ME	IA		
CSM-DSM-813	Dissertation	-	-	-	12	20	20	60	100

Course Learning Objectives:

1. Define a clear problem statement or research question pertinent to the chosen field of study, demonstrating a comprehensive understanding of the subject matter.
2. Design and implement a systematic methodology or approach to address the identified problem, utilizing appropriate tools, techniques, and resources.
3. Develop and implement a solution or model to address the defined problem, leveraging relevant theories, algorithms, and technologies, and critically evaluating the outcomes.

Course Learning Outcomes:

Upon successful completion of the course, the students

1. Demonstrate the ability to identify and define a problem statement or research question within the chosen domain of study for the minor project.
2. Apply appropriate research methodologies, data collection techniques, and analytical tools to investigate and address the defined problem or question effectively.
3. Develop and implement a well-structured plan to execute the project, research project including timelines, resource allocation, and milestones for monitoring progress.

Guidelines:

Overview: Every student should do a dissertation individually or in some cases, it may be in a group of two students. The type of dissertation must be research-based and require submission of at least one paper in a research journal/Conference.

Research Supervisor: Any faculty appointed in the department of the Computer Science and Applications will be a supervisor for the dissertation work.

Platform: The dissertation can be on any platform e.g., WINDOWS, UNIX, LINUX, Mac OS, etc. The dissertation can be done using any language or package learned within or outside the course such as, Python, R, Hadoop, Spark etc.

Venue: The dissertation can be done in the University itself or in a reputed research organization/IT industry. If a student carried his/her dissertation outside Sagar they may be exempted from mandatory attendance.

MID-1 and MID 2: The progress of the dissertation will be evaluated as MID-I and internal assessment through seminar/presentation, write-up/synopsis/ progress report.

Final Examination: For the final external evaluation, a brief summary of the dissertation in the form of hard and soft copy report along with the developed codes, output, results, software, hardware (as applicable) etc. should be submitted to the university at least one week prior to the date of the examination for the benefit of the external examiner.

ME – Mid – I Exam.; IA – Internal Assessment; ESE – End Semester Exam.