FACULTY OF COMPUTER SCIENCE AND APPLICATIONS

SYLLABUSFOR

Master of Computer Applications

2nd Meeting of Board of Studies

(UnderCreditBasedContinuousEvaluationGradingSystem)

Session:2026-27

TheHeritageInstitution

KANYAMAHAVIDYALAYAJALANDHAR

(Autonomous)

KANYA MAHA VIDYALAYA JALANDHAR

SCHEME AND CURRICULUM OF MCA PROGRAMME
PG DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS

Programme Outcomes

1. Apply advanced knowledge of computing fundamentals, mathematics, and domain-specific principles to analyze and solve computing problems.
2. Analyze complex computing problems, identify requirements, and formulate appropriate computational models and solutions.
3. Select and apply appropriate modern computing tools, frameworks, programming languages, cloud platforms, and software development practices for solving complex computing problems.
4. Evaluate and integrate emerging computing technologies such as Artificial Intelligence, Data Science, Cloud Computing, Cyber Security, Internet of Things, and Machine Learning to develop innovative computing solutions.
5. Design and develop secure, scalable, sustainable, reliable, and efficient software solutions that satisfy user, organizational, and societal requirements.
6. Engage in independent learning, continuous professional development, and adaptation to emerging technologies and industry practices.
7. Communicate technical concepts, project outcomes, and research findings effectively through oral, written, and digital media with technical and non-technical stakeholders.
8. Demonstrate professional ethics, legal responsibilities, cybersecurity awareness, and integrity while developing computing solutions.
9. Conduct investigations using research methodologies, experimentation, data analysis, and interpretation to solve complex computing problems.
10. Demonstrate leadership, teamwork, project management, and decision-making skills while working effectively in multidisciplinary environments.
11. Apply innovation, entrepreneurship, and research skills to develop technology-driven solutions for real-world problems.
12. Evaluate the societal, ethical, environmental, and sustainability impacts of computing solutions and promote responsible and inclusive technological practices.

KANYA MAHA VIDYALAYA JALANDHAR
SCHEME AND CURRICULUM OF EXAMINATION OF TWO-YEAR DEGREE PROGRAMME
PG DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS
MASTER OF COMPUTER APPLICATIONS (MCA)
SEMESTER-I

Course Code	Course Title	Course Type	Credits		Marks				Examination time (in hours)
					Total	Ext.		CA	
			L-T-P	Total		L	P		
MCAL-1121	Design and Analysis of Algorithm	C	4-0-0	4	100	70	-	30	3
MCAL-1122	Web Technologies	C	4-0-0	4	100	70	-	30	3
MCAL-1123	Data Science Foundation	C	4-0-0	4	100	70	-	30	3
MCAL-1124	Probability and Statistical Techniques	C	4-0-0	4	100	70	-	30	3
MCAL-1125 (Opt-II)	Elective-I	E	4-0-0	4	100	70	-	30	3
MCAP-1126	Programming Lab based on Web Technologies	C	0-0-2	2	50	-	35	15	3
MCAP-1127	Programming Lab based on Data Science	C	0-0-2	2	50	-	35	15	3
MCAL-1128	*Software Engineering (Bridge Course)	B	2-0-0	2	50	35	-	15	3
MCAL-1129	*Programming in C (Bridge Course)	B	2-0-0	2	50	35	-	15	3
MCAL-1130	* Fundamental Mathematics for computing (Bridge Course)	B	2-0-0	2	50	35	-	15	3
**Students can opt any one of the following interdisciplinary courses	IDE								
Total				**24**					
IDEC-1101	Effective Communication Skills								
IDEM-1362	Basics of Music (Vocal)								
IDEI -1313	Human Rights and Constitutional Duties								

IDEW-1275	Indian Heritage: Contribution to the world
(Credits of these courses will not be added to SGPA/CGPA)**	

*** For students having no mathematics background at 10 +2 or graduation level, compulsory bridge courses have to be qualified. Credits and grade points of these courses will not be included to the SGPA/CGPA of the semester/programme.**

Options for Elective										
Opt - I	MCAL-1125	Advanced Computer Graphics	E	4-0-0	4	100	70	-	30	3
Opt -II	MCAL-1125	Information Security	E	4-0-0	4	100	70	-	30	3
Opt -III	MCAL-1125	Soft Computing	E	4-0-0	4	100	70	-	30	3
Opt -IV	MCAL-1125	***Skill oriented MOOCS (related to IT/AI/ Computer)	E	4-0-0	4					

*****Skill Oriented MOOCS courses can be explored on Swayam Portal, NPTEL and other websites offering MOOCS with at least 4 credits, otherwise Dept. will provide a list of available MOOCS Courses.**

Note: Student can opt any of one Elective Courses

KANYA MAHA VIDYALAYA JALANDHAR
SCHEME AND CURRICULUM OF EXAMINATION OF TWO-YEAR DEGREE PROGRAMME
PG DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS
MASTER OF COMPUTER APPLICATIONS (MCA)
SEMESTER-II

Course Code	Course Title	Course Type	Credits		Marks				Examination time(in hours)
					Total	Ext.		CA	
			L-T-P	Total		L	P		
MCAL-2121	Full Stack Development	C	4-0-0	4	100	70	-	30	3
MCAL-2122	Advanced Database Management System	C	4-0-0	4	100	70	-	30	3
MCAL-2123	Machine Learning	C	4-0-0	4	100	70	-	30	3
MCAL-2124	Software Project Management	C	4-0-0	4	100	70	-	30	3
MCAL-2125 (Opt- II)	Elective –II	E	4-0-0	4	100	70	-	30	3
MCAP-2126	Programming Labbasedon Advanced Database Management System	C	0-0-2	2	50	-	35	15	3
MCAP-2127	Programming Labbased on Full Stack Development	C	0-0-2	2	50	-	35	15	3
VACH-2401	HumanRights and Constitutional Duties	VAC	2-0-0	2	50	35	-	15	3
Total				**26**					

OptionsforElective-II										
Opt -I	MCAL-2125	Big Data Analyticsand Business Intelligence	E	4-0-0	4	100	70	-	30	3
Opt -II	MCAL-2125	Theoryof Computation	E	4-0-0	4	100	70	-	30	3
Opt-III	MCAL-2125	Microprocessor and Its Applications	E	4-0-0	4	100	70	-	30	3
Opt -IV	MCAL-2125	*SkillOriented MOOCS (Relatedt o IT/AI/ Computer)	E	4-0-0	4					

***Skill Oriented MOOCS courses can be explored on Swayam Portal, NPTEL and other websites offering MOOCS with at least 4 credits, otherwise Dept. will provide a list of available MOOCS Courses.**

Note: Student can opt any of one Elective Courses

MASTER OF COMPUTER APPLICATIONS (SEMESTER – I)
(Two Year Degree Programme) (CBCEGS)
(Session 2026-27)
COURSE TITLE: DESIGN AND ANALYSIS OF ALGORITHM
COURSE CODE: MCAL-1121

L-T-P:4-0-0 **Max.Marks:100**
Credits:4 **Theory:70**
Examination Time: 3 Hours **CA:30**

Mid Semester Examination: 30% weightage
End Semester Examination: 70% weightage

Course Outcomes:

CO1: Evaluate the efficiency and correctness of algorithms using asymptotic notations and recurrence relations.
CO2: Apply algorithmic strategies such as divide-and-conquer, greedy, and dynamic programming to solve computational problems.
CO3: Design and implement efficient algorithmic solutions using Backtracking and Branch-and-Bound techniques for combinatorial and optimization problems.
CO4: Analyze graph algorithms and computational complexity to distinguish between tractable, intractable, and NP-complete problems.

Bloom Taxonomy Mapping

CO	Bloom Level	Unit
CO1	L5	
CO2	L3	
CO3	L6	
CO4	L4	

CO–PO Mapping Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	–	2	–	–	–	–	1	–	–
CO2	3	3	3	–	3	–	–	–	–	1	–	–
CO3	3	3	3	2	3	–	–	1	–	1	2	–
CO4	3	3	2	3	2	–	–	–	–	1	1	–

Correlation Levels

- **3** – High
- **2** – Moderate
- **1** – Low
- **–** – No Correlation

MASTER OF COMPUTER APPLICATIONS (SEMESTER – I)
(Two Year Degree Programme) (CBCEGS)
(Session 2026-27)
COURSE TITLE: DESIGN AND ANALYSIS OF ALGORITHM
COURSE CODE: MCAL-1121

L-T-P:4-0-0 **Max.Marks:100**
Credits:4 **Theory:70**
Examination Time: 3 Hours **CA:30**

Mid Semester Examination: 30% weightage
End Semester Examination: 70% weightage

Instructions for Paper Setter -
Eight questions of equal marks (14 Marks each) are to set, two in each of the four sections (A-D). Questions of sub-sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

UNIT–I

Introduction to Algorithms: Definition and characteristics of algorithms, analyzing algorithms, importance of algorithm design, asymptotic notations.
Basic Sorting and Searching Algorithms: Bubble sort, insertion sort, selection sort, linear search, binary search.

UNIT–II

Greedy Method: General strategy, fractional knapsack problem, minimum spanning tree – Prim's and Kruskal's algorithms.
Dynamic Programming: General strategy, matrix chain multiplication, 0/1 knapsack problem, Floyd-Warshall all-pairs shortest paths.

UNIT–III

Backtracking: General method, N-Queens problem, sum of subsets, graph coloring, Hamiltonian cycle.
Amortized Analysis: Aggregate, accounting, and potential methods – example of stack operations.

UNIT–IV

Graph Algorithms: BFS and DFS traversal, connected components, topological sort, articulation points.
NP-Completeness: P, NP, NP-Complete.

References/Text Books:(Latest Editions/Reprints)

1. Cormen, Leiserson, Rivest, and Stein – *Introduction to Algorithms*, PHI.

2. Horowitz, Sahni, Rajasekaran – *Fundamentals of Computer Algorithms*, Galgotia.
3. Aho, Hopcroft, Ullman – *The Design and Analysis of Computer Algorithms*, Pearson Education.
4. Kleinberg and Tardos – *Algorithm Design*, Pearson.
5. Dasgupta, Papadimitriou, Vazirani – *Algorithms*, McGraw-Hill.

MASTER OF COMPUTER APPLICATIONS (SEMESTER – I)
(Two Year Degree Programme) (CBCEGS)
(Session 2026-27)
COURSE TITLE: WEB TECHNOLOGIES
COURSE CODE: MCAL-1122

L-T-P:4-0-0 **Max.Marks:100**
Credits:4 **Theory:70**
Examination Time: 3 Hours **CA:30**

Mid Semester Examination: 30% weightage
End Semester Examination: 70% weightage

Course outcomes:

CO1 Apply HTML5, CSS, JavaScript, and client–server architecture principles to develop interactive and responsive web pages.

CO2 Develop dynamic web applications using Java Servlets, JSP, and web application frameworks.

CO3 Implement database connectivity using JDBC and develop server-side web applications using PHP.

CO4 Evaluate middleware and emerging web technologies to recommend appropriate solutions for modern web application development.

Bloom's Distribution

CO	Bloom Level
CO1	L3
CO2	L3
CO3	L3
CO4	L5

CO–PO Mapping Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	–	3	–	–	–	–	1	–	–
CO2	3	3	3	–	3	–	–	–	–	1	–	2
CO3	3	2	3	–	3	–	–	–	–	1	–	–
CO4	2	3	2	2	3	1	1	–	1	2	2	3

MASTER OF COMPUTER APPLICATIONS (SEMESTER – I)
(Two Year Degree Programme) (CBCEGS)
(Session 2026-27)
COURSE TITLE: WEB TECHNOLOGIES
COURSE CODE: MCAL-1122

L-T-P:4-0-0 **Max.Marks:100**
Credits:4 **Theory:70**
Examination Time: 3 Hours **CA:30**

Mid Semester Examination: 30% weightage
End Semester Examination: 70% weightage

Instructions for Paper Setter -
Eight questions of equal marks (14 Marks each) are to set, two in each of the four sections (A-D). Questions of sub-sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

UNIT –I

Web Essentials, Markup languages, CSS Basics of Client side programming, Java script language, java script objects, host objects, Browsers and DOM

UNIT –II

Basics of Server side programming, Java servlets- Life cycle, Servlet API, Reading Servlet parameters, Handling HTTP requests and responses, Cookies and Session Tracking ASP/JSP, Basics of ASP/JSP objects, simple ASP and JSP pages

UNIT –III

Representing Web data, Database connectivity, JDBC, Dynamic web pages, XML, DTD, XML schema, DOM, SAX, XQuery, Building web applications, cookies, sessions, open source environment Introduction to PHP, basics, PHP File handling, file upload, cookies, error handling, PHP MySQL introduction

UNIT –IV

Middleware technologies, Ecommerce architecture and technologies, Ajax, Advanced web technologies and tools. Case Studies: PHP and MySQL case studies.

References/Text Books:(Latest Editions/Reprints)

1. Jeffery C Jackson, “Web Technology-A Computer Science Perspective”, Pearson Education
2. Chris Bates, “Web Programming- Building Internet Applications”, Wiley India
3. *Web Technologies: HTML, JavaScript, PHP, Java, JSP, ASP.NET, XML and Ajax, Black Book* by Kogent Learning Solutions Inc.,
4. *Web Technologies: A Developer's Perspective* by N.P. Gopalan and J. Akilandeswari,
5. *Java Server Programming: Java EE6 (J2EE 1.6) Black Book* by Kogent Learning Solutions Inc.
6. *Beginning PHP and MySQL: From Novice to Professional* by W. Jason Gilmore,
7. *XML: How to Program* by Deitel & Deitel.

MASTER OF COMPUTER APPLICATIONS (SEMESTER – I)
(Two Year Degree Programme) (CBCEGS)
(Session 2026-27)
COURSE TITLE: DATA SCIENCE FOUNDATION
COURSE CODE: MCAL-1123

L-T-P:4-0-0 **Max.Marks:100**
Credits:4 **Theory:70**
Examination Time: 3 Hours **CA:30**

Mid Semester Examination: 30% weightage
End Semester Examination: 70% weightage

Course outcomes:

CO1: Apply Python programming concepts including data types, operators, control structures, and functions to develop solutions for computational problems.

CO2: Implement appropriate data structures and Python functions to organize, process, and solve computing problems efficiently.

CO3: Develop object-oriented Python applications using file handling and database connectivity for data management and analysis.

CO4: Analyze and visualize datasets using appropriate Python libraries and visualization techniques to support data-driven decision making.

Bloom's Distribution

CO	Bloom Level
CO1	L3
CO2	L3
CO3	L3
CO4	L5

CO–PO Mapping Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	–	3	–	–	–	–	1	–	–
CO2	3	3	3	–	3	–	–	–	–	1	–	2
CO3	3	2	3	–	3	–	–	–	–	1	–	–
CO4	2	3	2	2	3	1	1	–	1	2	2	3

MASTER OF COMPUTER APPLICATIONS (SEMESTER – I)
(Two Year Degree Programme) (CBCEGS)
(Session 2026-27)
COURSE TITLE: DATA SCIENCE FOUNDATION
COURSE CODE: MCAL-1123

L-T-P:4-0-0 **Max.Marks:100**
Credits:4 **Theory:70**
Examination Time: 3 Hours **CA:30**

Mid Semester Examination: 30% weightage
End Semester Examination: 70% weightage

Instructions for Paper Setter -
Eight questions of equal marks (14 Marks each) are to set, two in each of the four sections (A-D). Questions of sub-sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

UNIT -I

Introduction to Python: Basic syntax, Literals, Variables and Identifiers, variables, Operators Data types (Numbers, Booleans, Strings), Control Structures (if, if-else, for loop, while loop, break/continue), Nested conditions, String Operations

UNIT -II

Introduction to Data Structures in Python: List, Tuple, Sets, Dictionary, Operations on Data Structures (Declarations, Iterations, Adding/deleting element, min/max/sorting, merge, select).
Functions: Fundamental Concepts, arguments passing, block structure, scope, Program routine, recursion, iteration vs recursion, Lambda function

UNIT -III

Files: Working with Files, File Handling (Read, Write etc.), String Processing, Exception Handling, use of Libraries.
OOPs in Python: Introduction to Object Oriented Programming Classes, Methods, Objects, Functions as objects, multiple inheritance.
Using Databases and SQL: Database Concepts, Using Databases and SQL: Database Concepts, SQLite Manager Firefox Add-on, SQL basic summary, Basic Data modeling, Programming with multiple tables.

UNIT- IV

Advance Topics in Python: Working with Numpy, Working with Scipy.
Plotting and Visualization in Python: Plotting using Matplotlib library (Histogram, Box Plot, Scatter Plot, Bar Graphs, Line Graph, etc)
Data Science: Working with Pandas, Working with Scikit-Learn, Basics of Correlation, Regression

Reference/Text Books:(Latest Editions/Reprints)

1. Charles Dierbach, Introduction to Computer Science Using Python: A Computational Problem-Solving Focus, Wiley Publications,
2. Guttag John V, Introduction To Computation And Programming Using Python, PHI, .
3. Jeeva Jose and Sojan P. Lal, Introduction to Computational & Problem Solving Through Python, Khanna Publishers,
4. Mark J. Guzdial, Introduction to Computing and Programming in Python, arson Education
5. Kenneth Lambert, Fundamentals of Python, Course Technology, Cengage Learning,
6. Mark Lutz, Learning Python, O'Reilly Media

MASTER OF COMPUTER APPLICATIONS (SEMESTER – I)
(Two Year Degree Programme) (CBCEGS)
(Session 2026-27)
COURSE TITLE: PROBABILITY AND STATISTICAL TECHNIQUES
COURSE CODE: MCAL-1124

L-T-P:4-0-0 **Max.Marks:100**
Credits:4 **Theory:70**
Examination Time: 3 Hours **CA:30**

Mid Semester Examination: 30% weightage
End Semester Examination: 70% weightage

Course Outcomes:

CO1: Apply the fundamental principles of probability to analyze uncertain events and solve probabilistic problems.

CO2: Interpret discrete and continuous probability distributions by identifying their assumptions, characteristics, and applications.

CO3: Apply regression and correlation techniques to analyze relationships among variables and solve data analysis problems.

CO4: Evaluate datasets using goodness-of-fit tests to determine the suitability of theoretical probability distributions.

Bloom Level

CO1 – L3
CO2 – L2
CO3 – L3
CO4 – L5

CO–PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	–	–	2	–	–	–	–	1	–	–
CO2	3	3	–	1	2	–	–	–	–	1	–	1
CO3	3	3	2	2	3	–	–	–	–	1	–	2
CO4	3	3	1	3	2	–	–	–	–	1	1	2

MASTER OF COMPUTER APPLICATIONS (SEMESTER – I)
(Two Year Degree Programme) (CBCEGS)
(Session 2026-27)
COURSE TITLE: PROBABILITY AND STATISTICAL TECHNIQUES
COURSE CODE: MCAL-1124

L-T-P:4-0-0 **Max.Marks:100**
Credits:4 **Theory:70**
Examination Time: 3 Hours **CA:30**

Mid Semester Examination: 30% weightage
End Semester Examination: 70% weightage

Instructions for Paper Setter -
Eight questions of equal marks (14 Marks each) are to set, two in each of the four sections (A-D). Questions of sub-sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.
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Unit-I

Basic Statistics: Measures of central tendency, measures of dispersion, range quartile deviation, mean deviation, standard deviation, coefficient of variation, Skewness and Kurtosis, problems.
Statistical Methods: Correlation and Regression –Karl Pearson's coefficient of correlation and rank correlation problems, regression analysis-lines of regression, problems. Curve fitting: curve fitting by the method of least square.

Unit-II

Probability: Introduction, sample space and events, Axioms of probability, Addition and multiplication theorems, conditional probability, Baye's Theorem.
Discrete, continuous and mixed random variables, probability mass, probability density and cumulative distribution functions.

Unit-III

Probability Distributions: Random variables (discrete and continuous), Binomial, Poisson and normal distributions- problems (no derivations for mean and standard deviation)

Unit-IV

Sampling theory: Introduction to sampling distributions, standard error, type-I and type-II errors. Test of hypothesis of means, Neyman-Pearson Fundamental Lemma, tests for one sample and two sample problems for normal populations, tests for proportions.

References/Text Books: (Latest Editions/Reprints)

1. An Introduction to Probability and Statistics by V.K. Rohatgi& A.K. Md.E.Saleh.
2. Introduction to Probability and Statistics by J.S. Milton &J.C.Arnold.
3. Introduction to Probability Theory and Statistical Inference by H.J. Larson.
4. Introduction to Statistical Methods by Guptha ,C.B and Vijay Guptha.
5. An Outline of Statistical Theory, Vols. I & II by Goon, A.M., Gupta, M.K. and Das Gupta.
6. Fundamentals of Mathematical Statistics by Gupta and Kapoor .
7. Mathematical Statistics by Kapur, J.N. and Saxena.

MASTER OF COMPUTER APPLICATIONS (SEMESTER – I)
(Two Year Degree Programme) (CBCEGS)
(Session 2026-27)
(Elective -I)
COURSE TITLE: INFORMATION SECURITY
COURSE CODE: MCAL-1125

L-T-P:4-0-0 **Max.Marks:100**
Credits:4 **Theory:70**
Examination Time: 3 Hours **CA:30**

Mid Semester Examination: 30% weightage
End Semester Examination: 70% weightage

Course Outcome:

CO1: Explain the fundamental concepts, terminology, and significance of cyber security in protecting information systems.

CO2: Identify information security threats, vulnerabilities, and appropriate security measures to protect computing systems.

CO3: Apply email security and web security mechanisms to ensure secure communication and information exchange.

CO4: Analyze the role of firewalls and Intrusion Detection Systems (IDS) in protecting information systems against cyber threats.

CO Bloom Level

CO1 – L2
CO2 – L3
CO3 – L3
CO4 – L4

CO–PO Mapping Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	–	–	2	2	–	–	–	1	–	–
CO2	3	3	2	–	3	3	1	–	–	1	–	2
CO3	3	2	2	–	3	3	1	–	–	1	–	2
CO4	3	3	2	2	3	3	1	–	–	1	–	2

MASTER OF COMPUTER APPLICATIONS (SEMESTER – I)
(Two Year Degree Programme) (CBCEGS)
(Session 2026-27)
(Elective -I)
COURSE TITLE: INFORMATION SECURITY
COURSE CODE: MCAL-1125

L-T-P:4-0-0 **Max.Marks:100**
Credits:4 **Theory:70**
Examination Time: 3 Hours **CA:30**

Mid Semester Examination: 30% weightage
End Semester Examination: 70% weightage

Instructions for Paper Setter -
Eight questions of equal marks (14 Marks each) are to set, two in each of the four sections (A-D). Questions of sub-sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

Unit-I

Overview of Security: Introduction to Information Security, Principles of Information security, Services and attacks, functional requirements of security. Current trends in security**,** Protection versus security. Aspects of security– confidentiality, authentication, integrity, non-repudiation, availability, Access controls.

Unit-II

Information Security Threats: Virus, Worms, Bots, Adware, Spyware, Ransomware, DoS and DDoS attacks, Trojanhorse, buffer overflow; system threats- intruders; communication threats- tapping and piracy.

Authentication-Types of Authentications - Biometric Authentication and Multi factor authentication.

Information Security Solutions – Encryption -Objectives, types- Symmetric Key Encryption, Asymmetric Key encryption. Data Encryption Algorithms -DES, TDES, RSA, ECC**.**

Unit-III

Integrity-Message Integrity, Message authentication, Hash Functions – MD5, SHA.

Email attacks and Email Security – Threats, Best Practices - PGP, S/MIME, TLS.

Web security Services – Types, Web Application Firewalls, Web filtering, Vulnerability assessment scanners, Fuzzing tools, Black box and white box testing tools.

Unit-IV

Network Security – Firewalls-Introduction, Characteristic, Types: Packet Filter, Stateful and Stateless Packet Filter, Attacks of Packet Filter.

Intrusion detection system - Intruders, Intrusion Detection, Behavior of Authorized user and Intruder, Approaches for Intrusion Detection: Statistical Anomaly Detection and Rule based Detection.

References/Text Books:(Latest Editions/Reprints)

1. William Stallings, Cryptography and Network Security – Principles and Practice(7^{th}ed.), Pearson Education of India,2017.
2. Adam J.Elbirt, Understanding and Applying Cryptography and Data Security CRC Press, Taylor Francis Group, New York,2015.
3. Charles P.Pfleeger and SLPfleeger, Jonathan Margulies, Security in Computing (6thedition 2023), Addison-Wesley Professional.
4. PeterW. Singer and Allan Friedman, Cybersecurity and Cyberwar: What Everyone Needs to Know, Oxford University Press, 2014.
5. NIIT, Introduction To Information Security Risk Management -Paperback – January2003,Prentice Hall of India.
6. Hossein Bidgoli, Hand book of information Security, Threats, Vulnerabilities, Prevention, Detection and Management, John Wiley & Sons, 2006.
7. Steve G Watkins, An Introduction to Information Security and ISO27001, IT Governance Publishing, 2013.

MASTER OF COMPUTER APPLICATIONS (SEMESTER – I)
(Two Year Degree Programme) (CBCEGS)
(Session 2026-27)
COURSE TITLE:PROGRAMMING LAB BASED ON WEB TECHNOLOGIES
COURSE CODE: MCAP-1126

L-T-P:0-0-2 **Max.Marks:50**
Credits:2 **Practical: 35**
Examination Time: 3 Hours **CA:15**

Mid Semester Examination: 30% weightage
End Semester Examination: 70% weightage

Course Outcomes:

CO1: Design and develop responsive web pages using HTML5, CSS, JavaScript, and client–server architecture principles.

CO2: Develop and deploy dynamic web applications using Java Servlets, JSP, and web application frameworks.

CO3: Implement database-driven web applications using JDBC and PHP with appropriate data validation and server-side processing.

CO4: Integrate, test, and evaluate modern web technologies and middleware components to develop secure, scalable, and efficient web applications.

CO	Bloom Level
CO1	L6
CO2	L6
CO3	L3
CO4	L6

CO–PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	–	3	–	–	–	–	1	–	–
CO2	3	3	3	–	3	–	–	–	–	1	–	2
CO3	3	2	3	1	3	–	–	–	–	1	–	1
CO4	2	3	3	2	3	1	1	1	1	2	2	3

MASTER OF COMPUTER APPLICATIONS (SEMESTER – I)
(Two Year Degree Programme) (CBCEGS)
(Session 2026-27)
COURSE TITLE:PROGRAMMING LAB BASED ON WEB TECHNOLOGEIS
COURSE CODE: MCAP-1126

L-T-P:0-0-2	**Max.Marks:50**
Credits:2	**Practical: 35**
Examination Time: 3 Hours	**CA:15**

Practical based on:

Web Technologies: HTML: Basic HTML tags, HTML Forms, HTML tables. CSS: Basic CSS styling, Internal CSS, Linking External CSS, CSS box model, JavaScript: Adding dynamic functionality to HTML page, insert, update and delete HTML elements at runtime, JavaScript Objects, Servlets: Creating a Servlet, handling GET and POST requests with Servlets, extracting parameters from GET and POST requests, JDBC: Connecting to a MySQL database, Create, Read, Update and Delete records using JDBC, PHP: Basics of PHP, Exception handling in PHP, handling file uploads in PHP, AJAX and XML: Making asynchronous requests using AJAX, basics of XML

MASTER OF COMPUTER APPLICATIONS (SEMESTER – I)
(Two Year Degree Programme) (CBCEGS)
(Session 2026-27)
COURSE TITLE: PROGRAMMING LAB BASED FOUNDATION OF DATA SCIECNE
COURSE CODE: MCAP- 1127

L-T-P:0-0-2 **Max.Marks:50**
Credits:2 **Practical: 35**
Examination Time: 3 Hours **CA:15**

Course Outcomes:

CO1: Builds programming proficiency using Python fundamentals.

CO2: Focuses on application development with OOP, file handling, and databases.

CO3: Emphasizes practical data processing and analysis using Python libraries.

CO4: Covers visualization and presentation of analytical results, an essential skill in data science.

CO Bloom Levelt
CO1 – L3
CO2 – L6
CO3 – L3
CO4 – L6

CO–PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	–	3	–	–	–	–	1	–	–
CO2	3	2	3	–	3	–	–	–	–	1	–	1
CO3	3	3	2	2	3	–	–	–	–	1	–	3
CO4	2	3	3	2	3	–	–	–	1	2	2	3

MASTER OF COMPUTER APPLICATIONS (SEMESTER – I)
(Two Year Degree Programme) (CBCEGS)
(Session 2026-27)
COURSE TITLE: PROGRAMMING LAB BASED FOUNDATION OF DATA SCIECNE
COURSE CODE: MCAP- 1127

L-T-P:0-0-2 **Max.Marks:50**
Credits:2 **Practical: 35**
Examination Time: 3 Hours **CA:15**

Practical based on:

Develop mini project based on real-world use-cases and implement general problems in Python and programs based on:

String analyzer (count vowels, reverse etc.)
List filtering using conditions
Contact book using dictionaries
Recursive factorial and Fibonacci
Basic calculator with function
Read from a file and process data
Student grade management using classes
Exception-handling

MASTER OF COMPUTER APPLICATIONS (SEMESTER – I)
(Two Year Degree Programme) (CBCEGS)
(Session 2026-27)
Course title: SOFTWARE ENGINEERING
COURSE CODE: MCAL-1128

L-T-P: 2-0-0 **Max. Marks: 50**
Credits: 2 **Theory: 35**
Examination Time: 3 Hours. **CA: 15**
Course Outcomes:

After passing course the student will be able to:
CO1: Identify and evaluate various process model used for development of software.
CO2: Analyze gathered data to form requirement specifications and formulate design from this requirement specifications.
CO3: Comprehend activities involved in software project management.
CO4: Apply testing techniques on basic building blocks and control structure of a software.

CO–Bloom's Taxonomy Mapping

CO	Bloom's Level
CO1	L2
CO2	L4
CO3	L2
CO4	L3

CO–PO Mapping Matrix
Correlation:3 = High, 2 = Moderate, 1 = Low, – = No Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	–	2	–	–	–	–	–	–	2
CO2	3	3	3	2	2	–	–	–	–	–	–	2
CO3	2	2	2	3	2	–	–	–	2	2	2	2
CO4	3	2	3	3	3	–	–	–	–	–	–	2

Correlation Levels:

- **3** – High
- **2** – Moderate
- **1** – Low
- **–** – No Mapping

MASTER OF COMPUTER APPLICATIONS (SEMESTER – I)
(Two Year Degree Programme) (CBCEGS)
(Session 2026-27)
Course title: SOFTWARE ENGINEERING
COURSE CODE: MCAL-1128

L-T-P: 2-0-0 **Max. Marks: 50**
Credits: 2 **Theory: 35**
Examination Time: 3 Hours. **CA: 15**

Instructions for Paper Setter -
Eight questions of equal marks (7 marks each) are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

UNIT – I

Introduction to Software: Definition, Software characteristics, Software Components, Software Applications.
Introduction to Software Engineering: Definition, Software Engineering Paradigms, Waterfall Model, Prototyping Model, Incremental Model, Spiral Model.

UNIT – II

Requirement, Analysis and Specifications – Problem Analysis, Requirement Gathering Tools (Questionnaire, Interview, Group Discussion, and Observation), SRS Document and its Characteristics, Structured Analysis: Data Flow Diagram, Data Dictionaries.
Software Design – Characteristics, Structure Chart, Coupling, Cohesion, Functional Independence.

UNIT – III

Project Management – SPMP Document, Size Estimation (LOC, Function Point), COCOMO (Basic, Intermediate and Complete COCOMO), Effort Estimation, Development Time Estimation, Project Scheduling (Work Breakdown Structure, Activity Network, Critical Path Method, Gantt Chart, PERT Chart), Staffing.
Risk management and Control, software Maintenance and its types, Software Reuse, Software Reliability.

UNIT – IV

Coding– Coding Standards and Guidelines, Code Walkthrough, Code Inspection.
Testing - Test Case Design, Unit Testing, Black Box Testing (Equivalence Class Partitioning, Boundary Value Analysis), White Box Testing (Statement, Branch, Condition, Path Coverage), Cyclomatic Complexity, Integration Testing, System Testing (Alpha, Beta, Acceptance), Validation And Verification, Performance Testing.

References / Textbooks:

1. Roger S. Pressman, Software Engineering, McGraw-Hill series (2014) , 8th Edition.
2. Pankaj Jalote, A concise introduction to Software Engineering, Wiley (2008).
3. Rajib Mall, Fundamentals of Software Engineering, PHI Learning (2018), 5th Revised Edition
4. Kogent Learning Solutions Inc., Software Engineering, Dreamtech Press (2012)
5. Bruce R.Maxim, Roger S. Pressman, Software Engineering: A Practioner's Approach, McGraw Hill Education (2019), Eighth edition
6. David A. Gustafson, Schaum's Outline of Software Engineering, McGraw Hill (2020), 1st Edition

MASTER OF COMPUTER APPLICATIONS (SEMESTER – I)
(Two Year Degree Programme) (CBCEGS)
(Session 2026-27)
COURSE TITLE: PROGRAMMINGIN C
COURSE CODE: MCAL-1129

L-T-P:2-0-o **Max.Marks:50**
Credits:2 **Theory: 35**
Examination Time: 3 Hours **CA:15**

Mid Semester Examination: 30% weightage
End Semester Examination: 70% weightage
Course Outcomes:

CO1: Explain the fundamental concepts of C programming, including data types, operators, and programming constructs.

CO2: Develop C programs using control structures to solve computational problems.

CO3: Apply arrays, functions, and strings to design efficient solutions for diverse programming problems.

CO4: Implement C programs using pointers, structures, and unions for efficient data storage and manipulation.

CO	Bloom Level
CO1	L2
CO2	L3
CO3	L3
CO4	L3

CO–PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	–	–	2	–	–	–	–	1	–	–
CO2	3	3	2	–	3	–	–	–	–	1	–	–
CO3	3	3	3	–	3	–	–	–	–	1	–	–
CO4	3	2	3	–	3	–	–	–	–	1	–	1

ASTER OF COMPUTER APPLICATIONS (SEMESTER – I)
(Two Year Degree Programme) (CBCEGS)
(Session 2026-27)
COURSE TITLE: PROGRAMMINGIN C
COURSE CODE: MCAL-1129

L-T-P:2-0-0 **Max.Marks:50**
Credits:2 **Theory: 35**
Examination Time: 3 Hours **CA:15**

Mid Semester Examination: 30% weightage
End Semester Examination: 70% weightage

Instructions for Paper Setter -
Eight questions of equal marks (7 Marks each) are to set, two in each of the four sections (A-D). Questions of sub-sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

Unit-I

Fundamentals: Character set, Identifiers and Keywords, Data types, Constants, Variables, Expressions, Statements, Symbolic Constants.

Operations and Expressions: Arithmetic operators, Unary operators, Relational Operators, Logical Operators, Assignment and Conditional Operators, Library functions. Data Input and Output statements

Unit-II

ControlStatements: Preliminaries,While,do–whileandforstatements,Nestedloops, if–else, Switch, Break – Continue statements.

ProgramStructureStorageClass: StorageClasses-Auto,extern,registerand static.

Unit-III

Functions: Briefoverview,defining,accessingfunctions,passingargumentsto function,specifying argument data types, function prototypes, recursion.

Arrays: Defining,processingan array,passingarraysto afunction,multi–dimensional arrays.

Strings: Stringdeclaration, stringfunctions and stringmanipulation.

Unit-IV

Structures & Unions: Defining and processing a structure, user defined data types, structuresand pointers, passing structures to functions, self-referenced structure, and unions.

Pointers: Fundamentals, pointer declaration, passing pointer to a function, pointer and one-dimensional arrays, operation on pointers, pointers & multi–dimensional arrays of pointers, passing functions

References/Textbooks: (Latest Editions/Reprints)

1. E Balagurusamy, Programming in ANSI C, Tata McGraw-Hill, 2002.
2. Byron Gottfried, Schaum's Outline Programming with C, McGraw Hill, 1996.
3. Brian W. Kernighan, Dennis M. Ritchie, The C Programming language, Prentice Hall, 1988.
4. Stephen G. Kochan, Programming in C, Pearson Education, 2015. Note: The latest editions of the books should be followed.

Master of Computer Applications (CBCEGS) SEMESTER – I
(Session -2026-27)
COURSE CODE: MCAL-1125
(Elective-I) (Option-1)
ADVANCED COMPUTER GRAPHICS

L-T-P:4-0-0 **Max.Marks:100**
Credits:4 **Theory:70**
Examination Time: 3 Hours **CA:30**

Mid Semester Examination: 30% weightage
End Semester Examination: 70% weightage

Course Outcomes:

CO1: Understand the fundamental concepts and applications of computer graphics.

CO2: Apply geometric transformations and viewing techniques in 2D graphics.

CO3: Develop skills in 3D transformations and projection methods.

CO4: Analyze and implement techniques for 3D viewing and hidden surface removal.

CO	Bloom Level
CO1	L2
CO2	L3
CO3	L4
CO4	L3

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	–	–	1	–	1	–	–	–	–
CO2	3	3	2	–	2	1	–	–	1	2	–	–
CO3	2	3	2	–	2	1	–	1	3	1	–	1
CO4	2	2	2	–	3	1	1	1	–	3	1	1

Master of Computer Applications (CBCEGS) SEMESTER – I
(Session 2026-27)
COURSE CODE: MCAL-1125
(Elective-I) (Option-1)
ADVANCED COMPUTER GRAPHICS

L-T-P:4-0-0 **Max.Marks:100**
Credits:4 **Theory:70**
Examination Time: 3 Hours **CA:30**

Mid Semester Examination: 30% weightage
End Semester Examination: 70% weightage

Instructions for Paper Setter -
Eight questions of equal marks (16 Marks each) are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

UNIT–I

Elements of Computer Graphics: Introduction to computer graphics; types of computer graphics; applications; overview of raster and random scans.
Drawing Algorithms: Line drawing algorithms – DDA, Bresenham's; circle and ellipse drawing algorithms, area filling – boundary fill and flood fill algorithms.

UNIT–II

2D Geometric Transformations: Basic transformations – translation, rotation, scaling, reflection, shear; matrix representations; homogeneous coordinates; composition of transformations.
2D Viewing and Clipping: Window and viewport; window-to-viewport transformation; point and line clipping – Cohen-Sutherland, polygon clipping – Sutherland-Hodgman algorithm.

UNIT–III

3D Geometric Transformations: Translation, rotation, scaling, reflection; composite transformations in 3D; transformation matrices.
Projections: Types of Projections: Parallel and Perspective
3D Viewing and Clipping: Viewing transformations in 3D; projection matrices; 3D clipping.

UNIT–IV

Hidden Surface Removal: Z-buffer algorithm; painter's algorithm; scan-line method; Warnock's algorithm.
Ray Tracing and Texturing: Introduction, Antialiasing techniques of ray tracing, Distributed ray tracing, Advantages and disadvantages; Texture – Texture mapping, Bump mapping and Normal mapping.

References/Textbooks: (Latest Editions/Reprints)

1. Donald Hearn and M. Pauline Baker – *Computer Graphics with OpenGL*
2. F.S. Hill Jr. and Stephen M. Kelley – *Computer Graphics Using OpenGL*

3. Roy A. Plastock and Gordon Kalley – *Theory and Problems of Computer Graphics*
4. James D. Foley et al. – *Computer Graphics: Principles and Practice*

Master of Computer Applications (CBCEG-S) SEMESTER – I
(Session 2026-27)
COURSE CODE: MCAL-1125
(Elective-I) (Option-1I)
SOFT COMPUTING

L-T-P:4-0-0 **Max.Marks:100**
Credits:4 **Theory:70**
Examination Time: 3 Hours **CA:30**

Mid Semester Examination: 30% weightage
End Semester Examination: 70% weightage

Instructions for Paper Setter -
Eight questions of equal marks (16 Marks each) are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

Course outcomes:
CO1: Explain the fundamental concepts of genetic algorithmsnder s, including selection, crossover, mutation, and their role in optimization problems.
CO2: Understand supervised and unsupervised learning techniques And neural networks
CO3: Explain the concepts of fuzzy sets, fuzzy logic, and fuzzy relations for modeling uncertain and imprecise information.
CO4: Analyse genetic algorithms, neural networks, and fuzzy logic techniques

CO Bloom Level
CO1 L2
CO2 L2
CO3 L2
CO4 L4

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	–	–	–	–	–	–	–	–
CO2	3	2	2	3	2	–	–	–	–	–	–	–
CO3	3	2	1	2	–	–	–	–	–	–	–	1
CO4	3	3	2	3	2	1	–	–	2	1	2	1

Master of Computer Applications (CBCEGS) SEMESTER – I

(Session 2026-27)
COURSE CODE: MCAL-1125
(Elective-I) (Option-1I)
SOFT COMPUTING

L-T-P:4-0-0 **Max.Marks:100**
Credits:4 **Theory:70**
Examination Time: 3 Hours **CA:30**

Mid Semester Examination: 30% weightage
End Semester Examination: 70% weightage

Instructions for Paper Setter -
Eight questions of equal marks (16 Marks each) are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

UNIT-I

Introduction to Evolutionary Computing & Genetic Algorithms. How Genetic Algorithms work, General Genetic Algorithm, Encoding techniques, Different types of Selection and Crossover techniques, Mutation techniques. A case study of Travelling Salesman Problem using GA Techniques.
Introduction to other Evolutionary Techniques: PSO, Ant Colony Optimization.

UNIT-II

Basics of Neural Networks: Fundamental concept, Model of an Artificial Neuron, Neural Network Architectures, Various types of Learning and Activation Functions.
Supervised Learning: Perceptron learning, Linear Separability, Delta Rule or Widrow Hoff Rule.

UNIT-III

Back Propagation algorithm, ADALINE, MADALINE and Associative Memories.
Un–supervised Learning: Kohonen Self Organization Feature maps and Adaptive Resonance Theory.

UNIT-IV

Introduction to Fuzzy Logic and Fuzzy Sets, Fuzzy Relations,Fuzzyfication, Defuzzyfication; Introduction to Hybrid soft Computing; Applications of Advance Computing in Pattern Recognition, Signal Processing & Image Retrieval.

References/Text Books: (Latest Editions/Reprints)

1. David E. Goldberg, Genetic Algorithms in Search Optimization and Machine Learning, Pearson Education.
S. N. Sivanandam, S. N. Deepa, Principles of Soft Computing, Wiley Publications.
3. How to Solve It: Modern Heuristics, by ZbigniewMichalewicz, David B.Fogel, Second Edition Springer Verilag-2004, ISBN- 3-540-22494-7.
4. Gallant Stephen I , Neural Network Learning & Extent Systems, MIT Press, 1993.
5. Aleksander& Morton, Neural Computing, Chapman & Hall, 1991.

6. Singh, Ikvinderpal, Soft Computing, Khanna Book Publishing Co. (P) Ltd., Delhi.
7. Kosko, Neural Networks & Fuzzy Systems, PHI, 1991

COURSE CODE: MCAL-2121
FULL STACK DEVELOPMENT

L-T-P: 4-0-0 **Max. Marks: 100**
Credits: 4
Examination Time: 3 Hours **Theory : 70**
CA: 30

Mid Semester Examination: 30% weightage
End Semester Examination: 70% weightage
Course Outcomes: After passing this course, the student will be able to:

CO1: Comprehend server-side applications using Node.js and Express.js, including RESTful APIs and middleware, to handle HTTP requests, routing, and error handling effectively.
CO2: Analyze the structure and behavior of React-based Single Page Applications (SPAs), leveraging components, state, props, lifecycle methods, and hooks to manage UI rendering and user interactions.
CO3: Evaluate and configure full-stack architectures using MERN/MEAN stacks, addressing cross-origin communication through CORS and proxies to ensure secure and efficient frontend-backend integration.
CO4: Design and deploy full-stack web applications with features such as file uploads, real-time updates, role-based access, and testing, utilizing tools like Multer, Socket.IO, Jest, Postman, and deployment platforms (Render, Vercel).

CO–Bloom's Taxonomy Matrix

CO	BT Level
CO1	L3
CO2	L4
CO3	L5
CO4	L6

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	3	–	–	–	1	–	–	2
CO2	3	3	3	2	3	–	–	–	1	–	–	2
CO3	3	3	3	2	3	1	–	1	1	1	–	2
CO4	3	3	3	3	3	1	–	1	2	2	2	2

Master of Computer Applications (CBCEGS) SEMESTER – II
(Session 2026-27)
COURSE CODE: MCAL-2121
FULL STACK DEVELOPMENT

L-T-P: 4-0-0 **Max. Marks: 100**
Credits: 4
Examination Time: 3 Hours **Theory : 70**
CA:30

Instructions forPaperSetter -
Eightquestionsofequalmarks(14Markseach)aretoset,twoineachofthefoursections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions,selecting atleast one question fromeach section. The fifth question may be attempted from any section.

Unit-I

Node.js and Express.js: Introduction to Node.js andnpm, creating basics Node.js server, Understanding modules and package management in Node.js., Express framework basics, Middleware,RESTAPIdevelopment,HandlingJSONandURL-encodeddata,Errorhandling IntroductiontoRESTfulAPIsandtheirprinciples,UsingExpress.jsframeworkfordeveloping web applications and APIs, Express routing & middleware,Route definition,HTTP request and response handling,Building RESTful API endpoints for CRUD (Create, Read, Update, Delete) operations.

Unit–II

Introduction to React and Single Page Applications (SPA),JSX syntax and transformation using Babel,Functional vs Class components,React Rendering Process and VirtualDOM, Creating reusable components,Component composition and nesting, Props: Passing data parenttochild,,IntroductiontostateinReactTheuseStatehook:syntaxandusage,Conditional rendering based on state, Handling user input and form data, React Lifecycle (old: componentDidMountetc./new:useEffect),useEffecthook:dependencies,cleanup,multiple effects,Data fetching fromexternal APIs,Basic error handling and loading indicators

Unit-III

What is Full Stack Development?, Overview of MERN and MEAN stacks, **CORS Configuration:**What isCORSandwhyit matters,Handlingcross-originrequestsinExpress, CORS middleware and origin whitelisting, **Proxy Setup:** Setting up frontend proxies for development, Avoiding CORS issues in React/Angular,

Unit-IV

Testing: Unit testing (Jest for backend, React Testing Library for frontend), Postman for Pagination, Search, Filtering, Real-time updates with Socket.IO,Role-based permissions.
U**singMulterforFileUploads:** InstallingandconfiguringMulter,Acceptingsingle/multiple files,

Validating and filtering file types, Storing images locally vs. using cloud storage, B**ackendDeploymentwithRender:**Creating a productionbuild,Environmentvariable setup.

Frontend Deployment with Vercel: Deploy React/Angular project, Setup environment variablesandAPIURL

Reference/TextBooks: (Latest Editions/Reprints)

1. *Mario Casciaro and Luciano Mammino, Node.js Design Patterns, 4th Edition, Packt Publishing, 2024.*
2. *Alex Banks and Eve Porcello, Learning React: Modern Patterns for Developing React Apps, 3rd Edition, O'Reilly Media, 2023.*
3. *David Choi, Full-Stack React, TypeScript, and Node: Build Cloud-Ready Web Applications Using Modern Tools, Latest Edition, Packt Publishing, 2024.*
4. *Ethan Brown, Web Development with Node and Express: Leveraging the JavaScript Stack, 3rd Edition, O'Reilly Media, 2024.*
5. *Lucas Fernandes da Costa, Testing JavaScript Applications, Manning Publications, Latest Edition/Reprint.*

MASTEROFCOMPUTERAPPLICATIONS(SEMESTER–II)
(TwoYearDegreeProgramme)(CBCEGS)
(Session 2026-27)
COURSETITLE:ADVANCEDDATABASEMANAGEMENTSYSTEM
COURSE CODE: MCAL-2122

L-T-P:4-0-0 **Max.Marks:100**
Credits: 4
ExaminationTime: 3Hours **Theory:70**
CA:30

MidSemesterExamination:30%weightage
EndSemesterExamination:70%weightage

CourseOutcomes:Afterpassingthiscourse, thestudentwillbeableto:

CO1:Applyadvanceddatabaseconceptsto designand manageefficient relationaldatabase systems.
CO2: Develop procedural database programs to enhance functionality and maintain data integrity.
CO3: Understand and utilize various types of NoSQL databases for managing unstructureddata.
CO4:Performadvancedoperations indocument-orienteddatabases for scalable data management.

CO	BT Level
CO1	L3
CO2	L3
CO3	L2
CO4	L3

CO/PO	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
CO1	3	3	2	–	3	–	–	–	–	–	–	–
CO2	3	2	3	–	3	–	–	–	1	–	–	–
CO3	2	2	2	3	2	1	–	–	–	–	–	–
CO4	3	3	3	3	3	1	–	–	2	–	1	1

MASTEROFCOMPUTERAPPLICATIONS(SEMESTER–II)
(TwoYearDegreeProgramme)(CBCEGS)
(Session 2026-27)
COURSETITLE:ADVANCEDDATABASEMANAGEMENTSYSTEM
COURSE CODE: MCAL-2122

L-T-P:4-0-0 **Theory:70**
ExaminationTime:3Hours

InstructionsforPaperSetter -
Eightquestionsofequalmarks(14Markseach)aretoset,twoineachofthefoursections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions,selecting atleast one question fromeach section. The fifth question may be attempted from any section.

UNIT–I

Relational SQL Enhancements: Join types and subqueries, Set operations: UNION, INTERSECT, EXCEPT, Working with Indexes and Views.
TransactionManagement:ACIDproperties,concurrencyissues,lockingprotocols

UNIT–II

PL/SQLEnhancements:Structure,variables,datatypes,controlstatements,built-infunctions, cursors (implicit and explicit), procedures, functions, packages, and exception handling. TriggersandEventHandling:Row-levelvsStatement-leveltriggers. Introductionto DataEngineering: Big Data: Concept, characteristics, benefits, CAP theorem.

UNIT–III

NoSQLDatabases: Need, characteristics, and classification(Key-Value, Document, Column-Family,Graph). MongoDB: Installation and setup, collections, CRUD operations, MongoDB shell, schema-less design.

UNIT–IV

AdvancedMongoDBOperations:SQL-to-MongoDBquerymapping,Projection,sorting, limiting, aggregation, Indexing strategies, Replication, sharding

Reference/Text Books: (Latest Editions/Reprints)

1. C.J.Date, *AnIntroductiontoDatabaseSystems*,PearsonEducation.
2. H.F.Korth& A.Silberschatz, *DatabaseSystemConcepts*, McGraw-Hill.
3Elmasri&Navathe, *FundamentalsofDatabaseSystems*,Addison-Wesley.
4. AdamFowler,*NoSQLforDummies*,Wiley.
5. PramodSadalage&MartinFowler,*NoSQLDistilled*,Pearson.
6. MongoDB,Inc.,*MongoDB:TheDefinitiveGuide*,O'ReillyMedia.

L-T-P:4-0-0 **Max.Marks:100**

Credits: 4

ExaminationTime: 3Hours **Theory:70**

CA:30

MidSemesterExamination:30%weightage
EndSemesterExamination:70%weightage

CourseOutcomes:Afterpassingthiscourse, thestudentwillbeableto:

CO1:ComprehendtheMachineLearning Techniques.

CO2:CompareandexplainLinearRegressionandMultipleLinearRegressions. CO3:

Anlayze the concepts of Clustering and Classification Techniques.

CO4:Explain theconceptsofArtificialNeuralNetworks and apply them to solve machine learning problems.

CO	BT Level
CO1	L2
CO2	L4
CO3	L4
CO4	L3

CO/PO	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
CO1	3	2	1	2	–	–	–	–	–	–	–	–
CO2	3	3	2	2	2	–	–	–	1	–	–	–
CO3	3	3	2	2	2	–	–	–	2	–	–	1
CO4	3	3	3	3	3	1	–	–	2	1	2	1

MASTEROFCOMPUTERAPPLICATIONS(SEMESTER –II)

(TwoYearDegreeProgramme)(CBCEGS) (Session 2026-27)

COURSETITLE:MACHINELEARNING

COURSE CODE: MCAL-2123

L-T-P:4-0-0 **Max.Marks:100**

Credits: 4

ExaminationTime: 3Hours **Theory:70**

CA:30

MidSemesterExamination:30%weightage

EndSemesterExamination:70%weightage

InstructionsforPaperSetter-

Eightquestionsofequalmarks(14Markseach)aretoset,twoineachofthefoursections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions,selecting atleast one question fromeach section. The fifth question may be attempted from any section.

UNIT-1

Introduction: Well-Posed learning problems, Basic concepts, Designing a learning system, Types of machine learning: Learning associations, Supervised learning, Unsupervised, Semi-supervised and Reinforcement learning, Data Pre-processing Technique

UNIT-II

Linear Regression, Relationship between attributes using Covariance and Correlation, Relationship between multiple variables: Regression (Linear, Multivariate) in prediction. Multiple Linear Regressions Polynomial Regression, Regularization methods, Categorical Variables in Regression.

Regression: Linear regression, Multiple regression, Polynomial regression. Nearest Neighbours,
Evaluationparameters.

UNIT-III

Classification: Bayesian learning, Logistic Regression, DecisionTree Learning: Entropyand Gini Index based decision tree**,** Support vector machines, and Evaluation parameters. Ensemblers, Naïve Bayes Classifier

Clustering: Distance Measures in Algorithmic Methods, Different clustering methods (Distance, Density, Hierarchical), Iterative distance-based clustering. **Classification:** Naïve Bayes Classifier, Model Assumptions, Probability estimation, Required data processing

UNIT-IV

Artificial Neural Networks: Basic Concepts of Artificial Neurons,Perceptron, Training a perceptron, Training a perceptron, Gradient Decent & MomentumBased Optimization, Back propagation Algorithm. Basic concepts of Genetic Algorithms, Basic Concepts of Convolutional Neural Networks.

References/Textbooks: (Latest Editions/Reprints)

1. Christopher M. Bishop, *Pattern Recognition and Machine Learning*, Springer, Latest Reprint.
2. Ethem Alpaydin, *Introduction to Machine Learning*, 4th Edition, MIT Press, 2020.
3. Tom M. Mitchell, *Machine Learning*, McGraw-Hill Education, Latest Reprint.
4. D. Michie, D. J. Spiegelhalter, and C. C. Taylor (Eds.), *Machine Learning, Neural and Statistical Classification*, Ellis Horwood/Overseas Press, Latest Reprint.
5. Aurélien Géron, *Hands-On Machine Learning with Scikit-Learn, Keras& TensorFlow*, 3rd Edition, O'Reilly Media, 2022.
6. Kevin P. Murphy, *Machine Learning: A Probabilistic Perspective*, MIT Press, Latest Reprint.

MASTEROFCOMPUTERAPPLICATIONS(SEMESTER–II)
(TwoYearDegreeProgramme)(CBCEGS) (Session 2026-27)
COURSETITLE:SOFTWAREPROJECTMANAGEMENT
COURSE CODE: MCAL-2124

L-T-P:4-0-0 **Max.Marks:100**
Credits: 4
ExaminationTime: 3Hours **Theory:70**
CA:30

MidSemesterExamination:30%weightage
EndSemesterExamination:70%weightage

CourseOutcomes:Afterpassingthiscourse, thestudentwillbeableto:

CO1:Understandandpracticetheprocessofprojectmanagement

CO2:Developthescopeofwork,provideaccuratecost estimatesandtoplanthevarious activities.

CO3:Understandanduserisk management analysistechniquesthat identifythe factorsthat put a project at risk and to quantify the likely effect ofrisk on project timescales

CO4: Plan and manage project resources, human resources, and work schedules for successful project execution.

CO	**BT Level**
CO1	L2
CO2	L3
CO3	L3
CO4	L3

CO/PO	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**	**P11**	**P12**
CO1	2	2	1	–	–	1	–	1	–	1	–	–
CO2	3	3	2	–	2	1	1	–	1	2	1	–
CO3	2	3	2	–	2	1	–	2	3	1	–	1
CO4	2	2	2	–	3	1	2	1	1	3	1	1

MASTEROFCOMPUTERAPPLICATIONS(SEMESTER–II)
(TwoYearDegreeProgramme)(CBCEGS) (Session 2026-27)
COURSETITLE:SOFTWAREPROJECTMANAGEMENT COURSE CODE: MCAL-2124

L-T-P:4-0-0 **Max.Marks:100**
Credits: 4
ExaminationTime: 3Hours **Theory:70**
CA:30

MidSemesterExamination:30%weightage
EndSemesterExamination:70%weightage

InstructionsforPaperSetter -
Eightquestionsofequalmarks(14Markseach)aretoset,twoineachofthefoursections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions,selecting atleast one question fromeach section. The fifth question may be attempted from any section.

UNIT-I

Fundamentals: Basic Definitions, Project Stakeholders, Project Management Processes, Project Initiating Processes.

Project Planning - Identify Requirements, Creating the Work Breakdown structure, developing the Project Schedule, Project Cost Estimate, Planning Quality, Organizing the Project Team, Planning for Potential Risks

UNIT-II

Project Evaluation and Planning: Overview of Project Planning, Software processes and process models. Cost Benefit Analysis, Cash Flow Forecasting, Cost-Benefit Evaluation Techniques, Risk Evaluation.

Project costing, COCOMO 2, Project Sequencing and Scheduling Activities, Scheduling resources, Critical path analysis, Network Planning, Risk Management, Nature and Types of Risks, Managing Risks, Risk Planning and Control, PERT and Monte Carlo Simulation techniques.

UNIT-III

Project Execution and Management: Project Executing Processes, Acquiring and Developing the Project Team, Managing the Project Team, Managing Stakeholder Expectations, Directing and Managing the Project while assuring Quality.

ProjectMonitoringandControllingProcesses:VerifyingandControllingScope,Managing

ScheduleandCost,ControllingQuality,MonitoringandControllingRisks.IntegratedChange Control, Project Closing Process, Collecting Data, Visualizing Progress, Cost Monitor in greview techniques, Project termination review, earned value analysis, Change Control,

Software Configuration Management (SCM), Managing Contracts, Types of Contracts and Stages in Contract Placement, Contract Management and Acceptance.

Organizational Behaviour, Selecting The Right Person for The Job, Motivation, The Oldman – Hackman JobCharacteristics Model, working in Groups, Organizationand teamstructures, Decision Making, Leadership, Organizational Structures, Stress ,Health and Safety.

Overviewofprojectmanagementtoolsfor software.

Reference/TextBooks: (Latest Editions/Reprints)

1. RobertK.Wysocki, "EffectiveSoftwareProjectManagement",Wiley
2. Mathiazhagan P Sakthimuthiah K Richu A Vikkash.M, "Software Project Management", Alpha International Publication.
3. IanSommerville,SoftwareEngineering,SeventhEdition,PearsonEducation.
4. Chandramouli/Dutt,"SoftwareProjectManagement",PearsonEducation.
5. R.S.Pressman,SoftwareEngineering:APractitioner'sApproach,SixthEdition,Tata
6. McGraw-Hill.
7. BobHughes,MikeCotterell,"SoftwareProjectManagement",TataMcGrawHill.
8. Royce,"SoftwareProjectManagement:AUnifiedFramework,PearsonEducation.

MASTEROFCOMPUTERAPPLICATIONS(SEMESTER–II)
(TwoYearDegreeProgramme)(CBCEGS)
(Session 2026-27)
COURSETITLE:THEORYOFCOMPUTATION
COURSE CODE: MCAL-2125

L-T-P:4-0-0 **Max.Marks:100**
Credits: 4
ExaminationTime: 3Hours **Theory:70**
CA:30

MidSemesterExamination:30%weightage
EndSemesterExamination:70%weightage

CourseOutcomes:

CO1: Comprehend various grammars in the Chomsky hierarchyand their closure properties.
CO2:DefineproductionrulesforContext FreeGrammar(CFG),Convert CFGintoChomsky and Greibach Normal Form.
CO3:ApplyPumpingLemmatoidentifymembershipofalanguage.
CO4:ConstructcomputingmachineslikeFiniteAutomata,PushdownAutomata,Turing machine, etc.

CO	BT Level
CO1	L2
CO2	L3
CO3	L3
CO4	L3

CO/PO	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
CO1	3	2	1	–	–	1	–	–	–	–	–	–
CO2	3	3	2	–	2	1	–	–	1	–	–	–
CO3	3	3	1	–	1	–	–	–	2	–	–	–
CO4	3	3	2	1	2	1	–	–	2	1	1	–

MASTEROFCOMPUTERAPPLICATIONS
(SEMESTER–II)
(TwoYearDegreeProgramme)(CBCEGS)
(Session 2026-27)
COURSETITLE:THEORYOFCOMPUTATION
COURSE CODE: MCAL-2125

L-T-P:4-0-0 **Max.Marks:100**
Credits: 4
ExaminationTime: 3Hours **Theory:70**
CA:30

MidSemesterExamination:30%weightage
EndSemesterExamination:70%weightage

InstructionsforPaperSetter -
Eightquestionsofequalmarks(14Markseach)aretoset,twoineachofthefoursections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions,selecting atleast one question fromeach section. The fifth question may be attempted from any section.

UNIT-I

Chomsky Hierarchy, regular expressions, Operations on Regular Sets, Regular grammars, LinearGrammar,equivalenceofRegularGrammars,propertiesofregularlanguages,pumping lemma, Closure properties.

UNIT-II

Finite Automata – DFA, transition graphs, non-deterministic FA, equivalence of DFA and NDFA, Minimization of NFA, ε-NFA and its conversion into NFA, Mealy and Moore Machines.

ContextFreeLanguages–Leftmostandrightmostderivation,parsingandambiguity,Chomsky normal form, Greibach Normal form.

UNIT-III

PushdownAutomata–NDPDA,DPDA,contextfreelanguagesandPDA,comparisonof deterministic and non-deterministic versions, closure properties, pumping lemma for CFL Context SensitiveLanguages, Variations, Linear BoundedAutomata,ClosureProperties, The Kuroda Normal Form, One sided Context Sensitive Grammars.

UNIT-IV

Turing Machines, variations, halting problem, Post Correspondence Problem (PCP) PropertiesofLL(k)andLR(k)grammars,Decidability,RecursiveandRecursivelyEnumerable

Languages, Closure properties.

References/Textbooks:

1. 1.K.L.P.MishraandN.Chandrasekaran,“TheoryofComputerScience,ThirdEdition”, PHI Learning Private Limited
2. 2.John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, “Introduction to Automata Theory”,Languages and Computation, Pearson Education.
3. 3.M. Sipser, “Introduction to the Theory of Computation”, Second Edition, Cengage Learning.
4. 4.K.V.N.Sunitha,N.Kalyani,“FormalLanguagesandAutomataTheory”,McGraw-Hill
5. 5.StephenWolfram,“TheoryandApplicationsofCellularAutomata”,WorldScientifi
6. 6.G.E.Revesz,“IntroductiontoFormalLanguages”,DoverPublications.
7. 7.M.A.Harrison,“IntroductiontoFormalLanguageTheory”, Addison-Wesley
8. 8.R.K. Shukla,”TheoryofComputation”,Cengage Learning.
9. 9.PeterLinz,AnIntroductiontoFormalLanguagesandAutomata,ThirdEdition, Narosa Publishers.

MASTEROFCOMPUTERAPPLICATIONS(SEMESTER–II)
(TwoYearDegreeProgramme)(CBCEGS) (Session 2026-27)
COURSETITLE:PROGRAMMIINGLABBASEDONADVACNEDDATABASE MANAGEMENT SYSTEM
COURSECODE:MCAP-2126

L-T-P:0-0-2 **Max.Marks:50**
Credits: 2
ExaminationTime: 3Hours **Practical:35**
CA:15

Continuous Assessment: 30% weightage
EndSemesterExamination:70%weightage

Course Outcomes:
CO1: Apply advanced SQL concepts such as joins, subqueries, set operations, views, and indexes to manage relational databases.
CO2: Develop PL/SQL programs using procedures, functions, packages, cursors, exception handling, and triggers.
CO3: Apply MongoDB concepts to perform CRUD operations and design schema-less databases.
CO4: Implement advanced MongoDB operations such as aggregation, indexing, replication, and sharding for efficient database management.

CO	Bloom's Level
CO1	L3
CO2	L6
CO3	L3
CO4	L6

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	–	3	–	–	–	–	–	–	2
CO2	3	2	3	2	3	–	–	–	–	–	–	2
CO3	3	2	2	–	3	–	–	–	–	–	–	2
CO4	3	2	3	2	3	–	–	–	–	–	–	2

MASTEROFCOMPUTERAPPLICATIONS(SEMESTER–II)
(TwoYearDegreeProgramme)(CBCEGS) (Session 2026-27)

COURSETITLE:PROGRAMMIINGLABBASEDONADVACNEDDATABASE MANAGEMENT SYSTEM
COURSECODE:MCAP-2126

L-T-P:0-0-2 **Max.Marks:50**
Credits: 2
ExaminationTime: 3Hours **Practical:35**
CA:15

LabBased on:

AdvancedSQL Practices

- Executecomplexjoinsandnestedsubqueries
- Performset operations(UNION,INTERSECT, EXCEPT)
- Createandmanage viewsandindexes

PL/SQLProgramming

- Developprocedures,functions,andpackages
- Implementcursorsandexceptionhandling
- Designand testtriggers(row-leveland statement-level)

NoSQLDatabase Concepts

- Installandconfigure MongoDB
- PerformCRUDoperationsusingMongoDBshell
- Understandschema-lessdesignthroughpracticalexamples

Advanced MongoDBOperations

- Applyprojection,sorting,limiting,andaggregation
- Implementindexing,replication,andsharding

MASTEROFCOMPUTERAPPLICATIONS(SEMESTER–II)
(TwoYearDegreeProgramme)(CBCEGS) (Session 2026-27)
COURSETITLE:PROGRAMMIINGLABBASEDONFULLSTACK DEVELOPMENT
COURSECODE:MCAP-2127

L-T-P:0-0-2 **Max.Marks:50**
Credits: 2
ExaminationTime: 3Hours **Practical:35**
CA:15

Continuous Assessment: 30% weightage
EndSemesterExamination:70%weightage
Afterpassing thiscourse,thestudentwillbeableto:

CO1: Develop basic server-side applications using Node.js, npm, modules, and Express.js routing.

CO2: Implement RESTful APIs using CRUD operations and handle JSON and URL-encoded data.

CO3: Develop React applications using components, state, props, forms, hooks, and conditional rendering.

CO4: Integrate React frontend with Express backend APIs and build a simple MERN stack mini project.

CO	Bloom's Level
CO1	L6
CO2	L3
CO3	L6
CO4	L6

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	3	–	–	–	–	–	–	2
CO2	3	2	3	2	3	–	–	–	–	–	–	2
CO3	3	2	3	2	3	–	–	–	–	1	–	2
CO4	3	3	3	2	3	–	–	–	2	2	2	2

MASTEROFCOMPUTERAPPLICATIONS(SEMESTER–II)
(TwoYearDegreeProgramme)(CBCEGS) (Session 2026-27)

COURSETITLE:PROGRAMMIINGLABBASEDONFULLSTACK DEVELOPMENT
COURSECODE:MCAP-2127

L-T-P:0-0-2 **Max.Marks:50**
Credits: 2
ExaminationTime: 3Hours **Practical:35**
CA:15

Continuous Assessment: 30% weightage
EndSemesterExamination:70%weightage

LabBasedonFullStackDevelopment:

1. **Working onNode.js**
   - InstallNode.jsandnpm.
   - CreateabasicNode.jsHTTP server.
   - Use built-inandcustommodules.
   - SetupanExpress.jsserverwithbasic routing.
2. **RESTAPI:**
   - CreateRESTfulroutesforCRUDoperations.
   - HandleJSONandURL-encoded data.
3. **ReactSetupand Components:**
   - SetupaReactprojectusingcreate-react-app.
   - Createandrenderfunctional/classcomponents.
4. **State andProps:**
   - UseuseStateandpropsto manage and passdata.
   - Implementconditionalrendering.
5. **Formsand Hooks:**
   - Handleuserinputandformsubmission.
   - UseuseEffectforlifecycle behavioranddatafetching.
6. **APIIntegration:**
   - FetchdatafromExpressAPI and displayinReact UI.
   - Implementloading/errorstates.
7. **MERNStackMiniProject(Backend+ Frontend):**
   - Buildasimplefull-stackapplication(e.g.,TaskManager or Blog).

MASTEROFCOMPUTERAPPLICATIONS(SEMESTER–II)
(TwoYearDegreeProgramme)(CBCEGS) (Session 2026-27)
COURSETITLE:HUMANRIGHTSANDCONSTITUTIONALDUTIES
COURSE CODE: VACH-2401

L-T-P:2-0-0 **Max.Marks:50**
Credits: 2
ExaminationTime: 3Hours **Theory:35**
CA:15

MidSemesterExamination:30%weightage
EndSemesterExamination:70%weightage

CourseOutcomes:Afterpassingthiscourse, thestudentwillbeableto:

CO1:Understandtheconcept,requirementsandmethodologiesusedtofulfilhuman aspirations
CO2:Understandandapplyvaluestolive inharmonywithotherhumanbeingsandsocietyas a whole.
CO3:Understandaboutthebalancerequiredtoliveinharmonywith nature.
CO4:Applywhattheyhavelearnttotheirownselfinreallifesettingstoachievemutualgoals

MASTEROFCOMPUTERAPPLICATIONS(SEMESTER–II)
(TwoYearDegreeProgramme)(CBCEGS) (Session 2026-27)
COURSETITLE:HUMANRIGHTSANDCONSTITUTIONALDUTIES
COURSE CODE: VACH-2401

L-T-P:2-0-0 **Total Marks:50**
Theory:35
CA:15

ExaminationTime:3Hours

InstructionsforthePaperSetters–
Eight questions of equal marks (7 Marks each) are to be set, two in each of the four sections(A-D).Questionsmaybesubdividedintoparts(exceedingfour).Candidatesare requiredtoattempt fivequestions,selectingat least onequestionfromeachsection. The fifth question may be attempted from any section.

UNIT-I

Human Rights : Meaning, Nature , Characteristics and Classification
InternationalframeWork:UnitedNationDeclarationofHumanRights

UNIT-II

IndianPerspective ofHumanRights:FundamentalRights
ProtectiveMechanisminIndia:Thecomposition,Powers,FunctionsofNationalHuman Rights Commission of India (NHRC)

UNIT-III

HumanDuties:Meaning,Nature,CharacteristicsandClassification Application of Human Duties in a Modern Professional life.

UNIT-IV

FundamentalDutiesintheIndianConstitution
FundamentalDutieswithspecialreferencetoCorporateSocialResponsibility(CSR)and Ethical Business Practices.

References/Textbooks: (Latest Editions/Reprints)

1. UnitedNation.TheUnitedNationsandHumanRights1945-1995.Geneva:United Nation Blue Books Series, Vol. VII, 1996.
2. Shastry,S.N.IntroductiontoHumanRightsandDuties.Pune:UniversityofPunePress, 2011.
3. Deol, SatnamSingh. HumanRights inIndia-Theoryandpractice. NewDelhi:Serials Publication,2011.
4. V.P. Srivastavand R.S. Narayan(ed.), United NationonHumanRights ,VolII, Indian Pub. Distributor , New Delhi, 2002.
5. Professional Ethics: A contemporary-based approach to understanding and applying business professional EthicsWesley. E. Donahue, 2021
6. ProfessionalEthicsandHumanValuesR.S.Naagrazan.NewageInternational Publishers , New Delhi, 2006.
7. CorporatesocialresponsibilityinIndia:CasesandDevelopmentafterthelegal mandate: Nayan Mitra and Rene Schmidpeter, Atlantic Publisher 2017.

MASTEROFCOMPUTERAPPLICATIONS(SEMESTER–II)
(TwoYearDegreeProgramme)(CBCEGS)
(Session 2026-27)
COURSE CODE: MCAL-2125
COURSE TITLE: MICROPROCESSOR AND ITS APPLICATIONS

L-T-P:4-0-0 **Max.Marks:100**
Credits:4 **Theory:70**
Examination Time: 3 Hours **CA:30**

Course Outcome:

CO1: Explain the architecture, functional units, and operating principles of the 8086/8088 microprocessor.
CO2: Analyze the pin configuration, memory organization, and memory interfacing techniques of the 8086/8088 microprocessor.
CO3: Explain the input/output interfacing mechanisms and interrupt structure of the 8086/8088 microprocessor.
CO4: Implement basic 8086/8088 assembly language programs and computational and interfacing operations.

CO	BT Level
CO1	L2
CO2	L4
CO3	L2
CO4	L3

CO/PO	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
CO1	3	2	1	–	–	1	–	–	–	–	–	–
CO2	3	3	2	–	2	1	–	–	1	–	–	–
CO3	3	2	2	–	2	–	–	1	1	–	–	–
CO4	3	3	3	1	3	1	–	–	2	1	1	–

MASTEROFCOMPUTERAPPLICATIONS(SEMESTER–II)
(TwoYearDegreeProgramme)(CBCEGS) (Session 2026-27)
COURSE CODE: MCAL-2125
COURSE TITLE: MICROPROCESSOR AND ITS APPLICATIONS

L-T-P:4-0-0 **Max.Marks:100**
Credits:4 **Theory:70**
Examination Time: 3 Hours **CA:30**

InstructionsforthePaperSetters–
Eight questions of equal marks (7 Marks each) are to be set, two in each of the four sections(A-D).Questionsmaybesubdividedintoparts(exceedingfour).Candidatesare requiredtoattempt fivequestions,selectingat least onequestionfromeachsection. The fifth question may be attempted from any section.

UNIT - I

Microprocessor, Microcontroller and Microcomputer. Architecture of a Microcomputer: General Architecture of a microcomputer system. Microprocessor unit, input unit, output unit, memory unit and auxiliary storage unit Architecture of 8086/ 8088 Microprocessor: internal architecture of the 8086 / 8088 microprocessor, Description of various pins, configuring the8086/8088 microprocessor for minimum and maximum mode systems, system clock, bus cycle.

UNIT -II

Memory Interface of 8086/8088Microprocessor:Address space and data organization, hardware organization of memory address space, memory bus status code, memory control signals, read/write bus cycles, program and data storage memory, dynamic RAM system.

UNIT – III

Input/Output Interface of the 8086/8088 Microprocessor: I/O interface, I/O address space and data transfer, I/O instructions, Output ports, 8255A Programmable Peripheral Interface (PPI), Serial communication interface (USART and UART) – the RS-232 C interface. Interrupt Interface of 8086/8088 Microprocessor: Types of Interrupt, Interrupt Vector Table (IVT).

UNIT – IV

8086/8088 assembly language programming: General structure of an assembly language program, steps in the development of an assembly language program, addressing modes, Instruction set: data movement instructions, arithmetic instructions, logical instructions, shift and rotate instructions, jumping and looping instructions, string processing, interrupt instructions and stack operations.

References/Text Books: (Latest Editions/Reprints)

1. Walter Triebel: The 8086 Microprocessor – Architecture, Software and Interfacing Techniques, PHI, Delhi.
2. Walter Triebel: The 8088 Microprocessor – Architecture, Software and Interfacing Techniques, PHI, Delhi.
3. Douglas V. Hall: Microprocessors and Interfacing – Programming and Hardware, Tata McGraw Hill Publishing Company Ltd., New Delhi.
4. Peter Abel: IBM PC Assembly Language and Programming, PHI, Delhi.