Academic Program - UG

Syllabus 2025-26

VII & VIII Semester B.E.

Computer Science and Engineering

SHRI DHARMASTHALA MANJUNATHESHWARA COLLEGE OF ENGINEERING & TECHNOLOGY,
DHARWAD – 580 002
(An Autonomous Institution approved by AICTE & Affiliated to VTU, Belagavi)

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SDM College of Engineering & Technology, Dharwad

It is certified that the scheme and syllabus for VII & VIII semesters of UG program in Computer Science and Engineering is recommended by Board of Studies of Computer Science and Engineering Department and approved by the Academic Council, SDM College of Engineering &Technology, Dharwad. This scheme and syllabus will be in force from the academic year 2025-26 till further revision.

Principal Chairman BoS & HoD

Department of Computer Science and Engineering

College Vision and Mission

Vision

To develop competent professions with human values

Mission

- To have contextually relevant Curricula.
- To promote effective Teaching Learning Practices supported by Modern Educational Tools and Techniques.
- To enhance Research Culture.
- To involve the Industrial Expertise for connecting Classroom contents to real-life situations.
- To inculcate Ethics and soft-skills leading to overall personality development.

QUALITY POLICY:

In its quest to be a role model institution, committed to meet or exceed the utmost interest of all the stake holders.

Core Values:

- Competency
- Commitment
- Equity
- Team work and Trust

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

VISION

To develop competent professionals in the field of Computer Science and Engineering with human values.

MISSION

1. To have contextually relevant curricula in line with industry trends and body of knowledge stated by IEEE/ACM.
2. To promote OBE based effective Teaching Learning Practices supported by modern educational tools and techniques.
3. To enhance research.
4. To involve the industrial expertise for connecting classroom contents to real-life situations.
5. To inculcate ethics and soft-skills leading to overall personality development.

Program educational Objectives (PEO)

I. To prepare students for successful careers in Industry, Research and Institutions of higher learning

II. To encourage students to work in teams to address industrial and socially relevant problems / projects.

III. To provide students with a sound mathematical, scientific and engineering fundamentals necessary to formulate, analyse and solve engineering problems.

IV. To promote student awareness and commitment to lifelong learning and professional ethics during the course of professional practice.

PROGRAMME OUTCOMES (POs) and Programme Specific Outcomes (PSOs)

Program Outcomes (POs):

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific outcomes (PSOs):

13. **System Inception and Elaboration:** Conceptualize the software and/or hardware systems, system components and process/procedures through requirement analysis, modeling /design of the system using various architectural / design patterns, standard notations, procedures and algorithms.
14. **System Construction:** Implement the systems, procedures and processes using the state-of-the-art technologies, standards, tools and programming paradigms.
15. **System Testing and Deployment:** Verify and validate the systems, procedures and processes using various testing and verification techniques and tools.

SDM COLLEGE OF ENGINEERING AND TECHNOLOGY, DHARWAD

Department of Computer Science and Engineering

VII Semester

Scheme of Teaching and Examinations 2025 – 26

Sl. No	Course	Course code	Course Title	TD/PSB	Teaching Hours/Week			Examination				Credits
					Lecture	Tutorial	Practical / Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	PCC	22UCSC700	Cryptography and Network Security	CSE	4	0	0	03	50	100	100	4
2	PEC	22UCSE7XX	Program Elective Course -IV	CSE	3	0	0	03	50	100	100	3
3	PEC	22UCSE7XX	Program Elective Course -V	CSE	3	0	0	03	50	100	100	3
4	OEC	22UCSO7XX	Open Elective Course -II	CSE	3	0	0	03	50	100	100	3
5	PCCL	22UCSL701	Cryptography and Network Security Laboratory	CSE	0	0	2	03	50	50	100	1
6	PROJ	22UCSL702	Major Project-I	CSE	0	0	12	03	50	50	100	6
								Total			**600**	**20**
Program Elective Course -IV												
7	PEC-IV	22UCSE720	Distributed Systems and Applications	CSE	3	0	0	03	50	100	100	3
8	PEC-IV	22UCSE721	Natural Language Processing	CSE	3	0	0	03	50	100	100	3
Program Elective Course -V												
9	PEC-V	22UCSE730	Deep Learning and Applications	CSE	3	0	0	03	50	100	100	3
10	PEC-V	22UCSE731	Software Testing	CSE	3	0	0	03	50	100	100	3
Open Elective Course-II												
11	OEC-II	22UCSO740	Blockchain Technology	CSE	3	0	0	03	50	100	100	3
12	OEC-II	22UCSO741	Parallel Architectures, Computing and Programming	CSE	3	0	0	03	50	100	100	3

PCC: Professional Core Course, PCCL: Professional Core Course laboratory, L: Lecture, T: Tutorial, P: Practical, CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation. PEC: Program elective course, OEC: Open elective course, PROJ: Project. TD: Teaching department, PSB: Paper setting Board.
Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses are added supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course. The minimum numbers of students' strength for offering Open Elective Course are as prescribed by the DAP.
Open Elective Courses (OEC): Students belonging to a particular stream of Engineering and Technology are entitled to opt for the open electives offered by their parent Department and other departments provided that they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor. The minimum numbers of students' strength for offering Open Elective Course are as prescribed by the DAP.
Major Project-I: The objective of the project work is to encourage development of independent learning, innovative attitude, communication skills, organisation, time management, presentation skills, team work, punctuality, setting and meeting deadlines. In Major project the students are expected to identify the state-of-the-art technology in their domain of interest by an extensive literature survey and select a topic from an emerging area relevant to their branch/interdisciplinary and define the problem for the project work. The project shall consist of a team of students not more than 2-4. Each batch shall be assigned with a faculty member. A committee constituted by HOD consisting of minimum 2 faculty members shall evaluate for CIE. There is SEE, a viva voce examination which shall be examined by two examiners constituted by the HoD. The rubrics of evaluation includes objectives defined, literature review, demonstration of the project work carried out, report, project presentation, communication skill and question and answer session.
AICTE activity point: Every regular student, who is admitted to the 4-year degree program, is required to earn 100 activity points in addition to the total credits earned for the program. The activity points earned by the student shall be reflected on the students VIII semester grade card. The activities to earn the points can be spread over the duration of the program. However, minimum prescribed duration should be fulfilled. Activity points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression. In case student fails to earn the prescribed activity points; VIII semester grade card shall be issued only after earning the required activity Points. Students shall be eligible for the award of degree only after the release of the VIII semester grade card.

SDM COLLEGE OF ENGINEERING AND TECHNOLOGY, DHARWAD

Department of Computer Science and Engineering

VIII Semester

Scheme of Teaching and Examinations 2025 – 26

Sl. No	Course	Course code	Course Title	TD/PSB	Teaching Hours/Week			Examination				Credits
					Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	TS	22UCSL800	Technical Seminar/Independent study	CSE	0	0	2	-	50	-	50	1
2	PROJ or INT	22UCSL801	Major Project-II/Internship	CSE	12 Weeks			03	50	50	100	10
3	INT	22UCSL802	Summer Internship	CSE	4 Weeks			03	50	50	100	3
								Total			**250**	**14**

L: Lecture, T: Tutorial, P: Practical, CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation., TD: Teaching department, PSB: Paper setting Board.

Technical Seminar/Independent study: Students are expected to learn how to conduct a literature survey to identify the state-of-the-art technology in their chosen engineering domain. They are required to select an emerging topic beyond the syllabus relevant to their branch of study, understand the concept, analyse it, and present it effectively with technical innovations or novel work in a 15–20-minute session, followed by a 5-minute question and answers with their classmates and faculty. Additionally, students must develop effective communication skills and understand the modalities of technical interactions. They are required to submit a seminar report following the format provided by the DUGC. The technical seminar is evaluated for CIE based on the rubrics prescribed by the DUGC.

Summer Internship: Students must undergo an internship in private industries, R&D organizations, Center of Excellence, laboratories of reputed institutions, government and semi-government organizations, PSUs, construction companies, or entrepreneurial organizations to gain exposure to the external professional environment. The internship should be completed over a period of four weeks during the summer vacation after the IV or VI semester and must be completed before the VII semester. Students are required to prepare a report on the work carried out during the internship and submit both the report and the internship certificate during the VIII semester. The internal faculty will monitor student performance and award CIE marks in the VIII semester. Additionally, there will be a SEE, in which students must present their work before a panel of two examiners constituted by the HoD during the SEE of the VIII semester.

Major Project-II: This project work is intended for students who do not undertake an internship. The objective of the project is to foster independent learning, an innovative mindset, communication skills, organization, time management, presentation skills, teamwork, punctuality, and the ability to set and meet deadlines. In this project, students are expected to conduct an extensive literature survey to identify state-of-the-art technology in their domain of interest, select a topic from an emerging area relevant to their branch or an interdisciplinary field, and define the problem for their project work. Each project team shall consist of 2 to 4 students and will be assigned

a faculty mentor. The department shall conduct three project reviews as per the schedule provided by DAP, which must be recorded as part of the project evaluation for CIE, along with marks awarded by the faculty guide. A committee constituted by the HoD, consisting of a minimum of two faculty members, shall conduct the reviews and evaluate the CIE. For SEE, students must appear for a viva-voce examination, which will be assessed by a panel of two examiners—one internal and one external—constituted by the HoD. The rubrics of evaluation includes objectives defined, literature review, demonstration of the project work carried out, report, project presentation, communication skill and question and answer session.
Internship: The internship is intended for students who do not undertake a project. Students must undergo an internship in private industries, R&D organizations, Center of Excellence, laboratories of reputed institutions, government and semi-government organizations, PSUs, construction companies, or entrepreneurial organizations to gain exposure to the external professional environment. The internship shall be for a duration of 12 weeks during the VIII semester, either through placement or on an individual basis. Students are required to prepare a report on the work carried out during the internship and submit both the report and the internship certificate during the VIII semester. The department shall conduct three project reviews as per the schedule provided by DAP, which must be recorded as part of the project evaluation for CIE. A committee constituted by the HoD, consisting of a minimum of two faculty members, shall conduct the reviews and evaluate the CIE. For SEE, students must appear for a viva-voce examination, which will be assessed by a panel of two examiners—one internal and one external—constituted by the HoD. The rubrics of evaluation includes objectives defined, literature review, demonstration of the work carried out, report, project presentation, communication skill and question and answer session.
AICTE activity point: Every regular student, who is admitted to the 4-year degree program, is required to earn 100 activity points in addition to the total credits earned for the program. The activity points earned by the student shall be reflected on the students VIII semester grade card. The activities to earn the points can be spread over the duration of the program. However, minimum prescribed duration should be fulfilled. Activity points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression. In case student fails to earn the prescribed activity points; VIII semester grade card shall be issued only after earning the required activity Points. Students shall be eligible for the award of degree only after the release of the VIII semester grade card.

VII Semester

22UCSC700 Cryptography and Network Security (4-0-0) 4

Contact Hours: 52

Course Learning Objectives (CLOs): This is a 4-credit course focuses Cryptography and network security aspects for secure transmission of message over a communication network. It also deals with IP security, web security aspects and protection against various viruses and worms.

Course Outcomes (Cos):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/ PSOs (13-15)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	To Understand and apply Symmetric key cryptographic theories, algorithms	-	1, 2	-
CO-2	Apply different Asymmetric Cryptographic algorithms/ operations on different applications.	13	1, 2	-
CO-3	Analyze different methods for authentication and access control	-	3	-
CO-4	Apply Public and Private key algorithms for Key management,	2	-	1
CO-5	Understand and apply necessary techniques to build protection mechanisms for secure online	-	-	13

Pos/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Mapping Level	1.7	2.3	2.0	3.0	3.0	-	-	-	-	-	-	-	2.0	2.0	3.0

Pre-requisites: Knowledge of Computer Networks and Basic Mathematics.

Contents:

Unit-I

Introduction to security attacks - services and mechanism - introduction to cryptography - Conventional Encryption: Conventional encryption model - classical encryption techniques - substitution ciphers and transposition ciphers – cryptanalysis – steganography - stream and block ciphers - Modern Block Ciphers: Block ciphers principals - Shannon's theory of confusion and diffusion - feistel structure - data encryption standard(DES) - strength of DES - differential and linear cryptanalysis of DES - block cipher modes of operations - triple DES – AES. **12 Hrs**

Unit-II

Confidentiality using conventional encryption - traffic confidentiality - key distribution - random number generation - Introduction to graph - ring and field - prime and relative prime numbers - modular arithmetic - Fermat's and Euler's theorem - primality testing - Euclid's Algorithm - Chinese Remainder theorem - discrete algorithms. **10 Hrs**

Unit-III

Principles of public key crypto systems - RSA algorithm - security of RSA - key management – Diffle-Hellman key exchange algorithm - introductory idea of Elliptic curve cryptography – Elgamel encryption - Message Authentication and Hash Function: Authentication requirements - authentication functions - message authentication code - hash functions - birthday attacks – security of hash functions and MACS. **10 Hrs**

Unit-IV

MD5 message digest algorithm - Secure hash algorithm (SHA) Digital Signatures: Digital Signatures - authentication protocols - digital signature standards (DSS) - proof of digital signature algorithm - Authentication Applications: Kerberos and X.509 - directory authentication service. **10 Hrs**

Unit-V

Electronic Mail Security: Pretty good privacy, notation, operational description, S/MIME, RFC5322, Multipurpose internet mail extensions, S/MIME functionality.

IP Security: IP Security overview, applications of IPsec, benefits of IPsec, Routing applications, IPsec documents, IPsec services, transport and tunnel modes, IP Security policy, Security associations, Security associations database, Security policy database. **10 Hrs**

Reference Books:

1. William Stallings, "Cryptography and Network Security", 6/E, Pearson Education, 2014.
2. Atul Kahate, "Cryptography and Network Security", 3/E, McGraw-Hill Education (India) Pvt. Ltd., 2013
3. Bruce Schinner, "Applied Cryptography", 2/E, PHI publication 2007.
4. Radia Perlman, Mike Speciner, & Charlie Kaufman, "Network Security: Private communication in a Public World", 2/E, Pearson Education Asia, 2002.

22UCSL701 Cryptography and Network Security LAB (0-0-2) 1

Contact Hours: 26

Course Learning Objectives (CLOs): To enable our students to master the fundamental principles of computing and to develop in them the skills needed to solve practical problems using contemporary computer-based technologies and practices to cultivate a community of professionals who will serve the public as resources on state-of-the-art computing science and information technology.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course, the student will be able to:		**Mapping to POs(1-12)/ PSOs (13-15)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Understand the process of capturing Network traffic using tools(Ethereal,Wireshark, Tcpdump)	-	1, 2	-
CO-2	Implement Cryptographic algorithms in C/C++/Java	13	1, 2	-
CO-3	Understand Buffer Over Flow attacks, Intrusion Detection Systems and Honeypots.	-	3	-
CO-4	Create applications in Client Server architecture.	2	-	1
CO-5	Set up secure mail and web communication channels.	-	-	13

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Mapping Level	1.7	2.3	2.0	3.0	3.0	-	-	-	-	-	-	-	2.0	2.0	3.0

Pre-requisites: Knowledge of Computer Networks and Basic Mathematics.

SL.No LIST OF EXPERIMENTS:

1 Working with Sniffers for monitoring network communication using:
a) Ethereal b) Wire shark c) Snort d) tcp dump.

2 Implementation and Performance evaluation of various cryptographic algorithms in C/C++ a) DES b) RSA.

3 Using IP TABLES on Linux and setting the filtering rules.

4 Using open SSL for web server - browser communication.

5 Configuring S/MIME for e-mail communication.

6 Using NMAP for ports monitoring.

7 Secure Socket programming.

8 Study Intrusion Detection Systems and Honey pots.

22UCSL702 **Major Project – I** **(0-0-12) 6**

Contact Hours: 156

Course Learning Objectives (CLOs): This course focuses on the following learning perspectives:
Understand the domain through proper modeling and analysis using the state-of-art technology. Then apply relevant Software Engineering Principles to develop modular and robust applications through the use of Standards and tools. At the end build appropriate test cases, verification and validation techniques in order to make the project reliable and maintainable.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12) / PSOs (13-15)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Identify** the problem and **formulate** the problem statement.	1, 8, 2,12	-	-
CO-2	**Perform** a detailed survey on the chosen problem statement.	1, 8, 2,12	-	-
CO-3	**Analyze** the problem scenario and **design** the solutions to complex engineering problem using software engineering principles or appropriate research methodology.	-	3, 5, 8, 13,12, 11, 15	6, 7
CO-4	**Identify** and **implement** a feasible solution using appropriate technology, tools, procedures and techniques.	-	4, 5, 8, 14,12, 15	-
CO-5	**Verify** and **validate** the proposed system for correctness and to demonstrate compliance with the design and hence the stated requirements/ research gap.	-	5, 8,15,12	-
CO-6	**Prepare** the report and **communicate** effectively through presentation.	-	8, 9,10	-

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Mapping Level	3	3	3	3	3	1	1	3	3	3	2	3	3	3	3

Prerequisites: Different programming languages / tools, Software Engineering Principles.

Major Project-I: The objective of the project work is to encourage development of independent learning, innovative attitude, communication skills, organisation, time management, presentation skills, team work, punctuality, setting and meeting deadlines. In Major project the students are expected to identify the state-of-the-art technology in their domain of interest by an extensive literature survey and select a topic from an emerging area relevant to their branch/interdisciplinary and define the problem for the project work. The project shall consist of a team of students not more than 2-4. Each batch shall be assigned with a faculty member. A committee constituted by HOD consisting of minimum 2 faculty members shall evaluate for CIE. There is SEE, a viva voce examination which shall be examined by two examiners constituted by the HoD. The rubrics of evaluation includes objectives defined, literature review, demonstration of the project work carried out, report, project presentation, communication skill and question and answer session.

References:

1. Grady Booch, “Object-Oriented Analysis and Design with Applications”, Second Edition, Addison-Wesley Publications.
2. Pankaj Jalote, “An Integrated Approach to Software Engineering”, Third Edition, Springer Publications.
3. Project Manual, prepared by the CSE Department, S D M College of Engineering and Technology, Dharwad

22UCSE720 Distributed Systems and Applications (3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): This course is at undergraduate level for 3 credits with emphasis on the principles of distributed systems and to design the solutions for message passing, clock synchronization, consistency and fault tolerance at basic level.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/ PSOs (13-15)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Explain** the characteristics of distributed system, **define** architectures of distributed systems and **understand** the functioning of communication protocols in distributed systems.	-	1,2,13	-
CO-2	**Comprehend** the need for synchronization strategies in a distributed system	13,14	1,3,5,15	2
CO-3	**Explain** principles of consistency and replication strategies in a distributed system.	-	1,2,13	-
CO-4	**Elucidate** the principles of fault tolerance strategies in a distributed system.	-	1,2,13	-
CO-5	**Explain** the characteristics of distributed file system	-	1,3,5,15	2

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Mapping Level	2.0	1.6	2.0	-	2.0	-	-	-	-	-	-	-	2.4	3.0	2.0

Pre-requisites: Knowledge of

- Computer Networks
- Operating Systems

Contents:

Unit-I

Introduction: Definition, goals, types of distributed systems; Architectures: styles, system architectures; Processes: code migration; Communication: Remote procedure call, Message-oriented communication, Stream-oriented communication.

9 Hrs

Unit-II

Synchronization: Clock Synchronization, Logical Clocks, Mutual Exclusion, Election Algorithms. **7 Hrs**

Unit-III

Consistency and Replication: Introduction, Data-centric Consistency Models, Client-centric Consistency Models, Replica Management. **8 Hrs**

Unit-IV

Fault Tolerance & Security: Introduction, Process Resilience, Reliable Client-Server Communication, Reliable Group Communication; Security: Introduction to Security.

8 Hrs

Unit-V

Distributed file systems: Client-server architectures, cluster-based distributed file systems, symmetric architectures and processes. **7 Hrs**

Reference Books:

1. Andrew S Tanenbaum & Maarten van Steen, “Distributed Systems Principles and Paradigms”, 2/E, Pearson Prentice Hall, 2007.

22UCSE721 Natural Language Processing (3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):

This course focuses on the concepts, techniques and applications of natural language processing

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/ PSOs (13-15)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Explain the Concepts of mathematics and linguistic foundations of natural language processing	-	1	-
CO-2	To apply the Naïve Bayes algorithm for text classification and its application in sentiment analysis.	-	1,2,3, 14	13
CO-3	Understand the role of logistic regression in NLP classification tasks.	-	1,2,3, 14	5, 13
CO-4	Implement sequence-based NLP tasks such as text generation and sentiment analysis using RNNs/LSTMs.	-	1,2,3, 14	5, 13
CO-5	Understand fine-tuning and prompt engineering for LLMs.	-	1,2,3, 14	5, 13
CO-6	Implement key NLP applications such as Machine Translation, Question Answering, and Information Retrieval, focusing on deep learning models, transformer-based approaches, and real-world challenges.	-	1,2,3, 14	5, 13
CO-7	Understand techniques for labeling linguistic features, including syntax, semantics, and discourse, to enhance NLP model training and performance.	-	1,2,3, 14	5

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Mapping Level	2	2	2	-	1	-	-	-	-	-	-	-	1	2	-

Prerequisites: 1. Basic knowledge on Mathematical foundation, Linguistic essentials
2. Knowledge of Finite Automata, Regular Expression and Grammar and Machine Learning.

Contents:

Unit-I

Introduction: Mathematical Foundations, Linguistic Essentials, Corpus Based Work **5 Hrs**

Unit-II

Foundations of NLP : Basics of Natural Language Processing Regular Expressions, Tokenization; Minimum Edit Distance; N-gram Language Models.
Fundamental Algorithms of NLP : Naive Bayes & Text Classification; Sentiment Analysis. **8 Hrs**

Unit-III

Neural Structures for NLP : Logistic Regression; Vector Semantics and Embeddings; RNNs and LSTMs; Transformers; Large Language Models. **8 Hrs**

Unit-IV

NLP Applications : Machine Translation; Question Answering, Information Retrieval, & RAG. **8 Hrs**

Unit-V

Annotating Linguistic Structure: Sequence Labelling for Parts-of-Speech (POS) Tagging and Named Entity Recognition (NER); Context-Free Grammars and Constituency Parsing; Dependency Parsing; Information Extraction: Relations, Events, and Time; Semantic Role Labelling and Argument Structure; Coreference Resolution and Entity Linking; Discourse Coherence **8 Hrs**

References:

1. Dan Jurafsky, James H Martin, Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition, Pearson Education India,2nd edition (2013).
2. Christopher Manning “Foundations of Statistical Natural Language Processing,” MIT Press, July 1999.
3. Kao, Anne, and Steve R. Poteet, eds. Natural language processing and text mining. Springer Science & Business Media, 2007.

22UCSE730 Deep Learning and Applications (3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):

This is a 3-credit elective course at undergraduate level focusing on the architecture of Deep Learning and building blocks used in the Deep Learning based solutions. Students learn about feedforward neural networks, convolutional neural networks, recurrent neural networks and various optimization algorithms.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/ PSOs (13-15)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Explain the basic principles of Artificial Intelligence, Machine Learning and Deep Learning.	-	1	-
CO-2	Understand and implement neural networks to solve basic classification and regression Problems.	-	1	-
CO-3	Understand and implement data augmentation, feature extraction, Fine-tuning of a pretrained convnet.	-	1	-
CO-4	Explore deep-learning models to process text, timeseries, and sequence data.	-	1,2,3	14
CO-5	Explain and Apply LSTM, Variational autoencoders, Generative Adversarial Networks for the given problem scenario.	-	1,2,3	14

POs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Mapping Level	2	2	2	-	-	-	-	-	-	-	-	-	-	1	-	-

Prerequisites: Knowledge of Linear Algebra, probability and Machine Learning.

Contents:

Unit-I

Fundamentals of Deep Learning: Artificial Intelligence, History of Machine learning: Probabilistic Modelling, Early Neural Networks, Kernel Methods, Decision Trees, Random forests and Gradient Boosting Machines. **7 Hrs**

Unit-II

Neural Networks: Anatomy of Neural Network, Introduction to Keras: Keras, TensorFlow, Theano and CNTK, Setting up Deep Learning Workstation, Classifying Movie Reviews: Binary Classification, Classifying newswires: Multiclass Classification. **8 Hrs**

Unit-III

Deep learning for computer vision, Introduction to convnets, Training a convnet from scratch on a small dataset, Using a pretrained convnet, Visualizing what convnets learn. **8 Hrs**

Unit-IV

Deep learning for text and sequences, Working with text data, Understanding recurrent neural networks, Sequence processing with convnets. **8 Hrs**

Unit-V

Generative deep learning, Text generation with LSTM, Generating images with variational autoencoders, Introduction to generative adversarial networks. **8 Hrs**

Reference Books:

1. Francois Chollet, Deep Learning with Python, Manning Publications, 2017, ISBN-10, 9781617294433.
2. Ian Good fellow and Yoshua Bengio and Aaron Courville, Deep Learning, An MIT Press book,2016.
3. Aston Zhang, Zachary C. Lipton, Mu Li, and Alexander J. Smola,Dive into Deep Learning Release 0.8.0, 2020.
4. C. M. Bishop, Pattern Recognition and Machine Learning (Information Science and Statistics),Springer, 2006.

22UCSE731 Software Testing (3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): This course discusses the notations and terminologies used in software testing with Principles of Programming, Software Development Process from the perspective of quality, maintenance, testing, programming style. Further, it focuses on System quality through: requirements, design, coding, verification and validation procedures and applications, case studies, use of tools / programming techniques for design and implementation.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/ PSOs (13-15)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Map** inputs to the expected outputs of the system by understanding the system behavior represented in the form of: requirements and design specifications / Models.	1, 13	-	-
CO-2	**Identify** appropriate functional testing techniques for different software testing scenarios	2, 14	1	-
CO-3	**Apply** structural testing criteria to evaluate the adequacy of test cases.	-	3, 13	-
CO-4	**Explain** the purpose and scope of different levels of software testing.	13	3	-
CO-5	**Design** and **document** integration test cases and test plans.	14	15	-
CO-6	**Apply** system and interaction testing techniques to evaluate software behavior and inter-component communication under various operational conditions.	-	15, 13	-

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Mapping Level	2.5	3.0	2.0	-	-	-	-	-	-	-	-	-	2.5	3.0	2.0

Pre-requisites: Knowledge of

- Programming language
- Software Engineering
- Object Oriented System Analysis and Design

Contents:

Unit-I

Basics of Software Testing: Humans, Errors and Testing, Software Quality, Requirements Behavior and Correctness, Correctness versus Reliability, Testing and Debugging, Test Metrics, Testing and Verification, Test-generation Strategies, Static Testing. A Perspective on Testing: Definitions, Test Cases, Insights from Venn Diagram, Identifying Test Cases, Error and fault taxonomies, Levels of testing.
Examples: Generalized pseudocode, the Triangle problem, the NextDate function, the Commission problem, the SATM system, the Currency converter. **9 Hrs**

Unit-II

Functional Testing: Boundary Value Testing - Boundary value analysis, Robustness testing, Worst-case testing, Special Value Testing, Examples, Random Testing, Guidelines.
Equivalence Class Testing - Equivalence classes, Equivalence test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations,
Decision Table Based Testing - Decision tables, Test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations**.** **7 Hrs**

Unit-III

Structural Testing: Overview, Statement testing, Program testing, Condition testing,
Path testing - DD paths, Test coverage metrics, Basis path testing, guidelines and observations
Dataflow testing: Definition-Use testing, Slice-based testing, Guidelines and observations. **8 Hrs**

Unit-IV

Levels of Testing: Traditional view of testing levels, Alternative life-cycle models, The SATM system, Separating integration and system testing.
Integration Testing: A closer look at the SATM system, Decomposition-based, call graph-based, Path-based integrations. **8 Hrs**

Unit-V

System Testing: Threads, Requirement Specification, Finding Threads, Structural strategies for thread testing, SATM test threads System testing guidelines, ASF testing example.
Interaction Testing: Context of interaction, A taxonomy of interactions, Interaction, composition, and determinism, Client/Server Testing **7 Hrs**

Reference Books:

1. Paul C. Jorgensen: Software Testing, A Craftsman‟s Approach, 3rd Edition, Auerbach Publications,2008.
2. Aditya P Mathur: Foundations of Software Testing, Pearson Education, 2008.

3. Mauro Pezze, Michal Young: Software Testing and Analysis – Process, Princip Techniques,Wiley India, 2009.
4. Software testing Principles and Practices – Gopalaswamy Ramesh, Srinivasan Desikan, 2nd Edition, Pearson, 2007.
5. Software Testing – Ron Patton, 2nd edition, Pearson Education, 2004.

22UCSO740 Block Chain Technology (3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):

This course focuses on understanding emerging abstract models for Blockchain Technology and familiarizes the functional/operational aspects of crypto currency ecosystem. Identify major research challenges and technical gaps existing between theory and practice in crypto currency domain.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/ PSOs (13-15)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Demonstrate** the basics of Block chain concepts using modern tools/technologies.	-	3, 4, 5	1,13
CO-2	**Analyze** the role of block chain applications in different domains including cyber security.	-	3, 5	-
CO-3	**Evaluate** the usage of Block chain implementation/features for the given scenario.	-	1, 3, 4	14
CO-4	**Exemplify** the usage of bitcoins and its impact on the economy.	3	-	-
CO-5	**Analyze** the application of specific block chain architecture for a given problem.	3	2	6

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Mapping Level	1.0	2.4	1	2	1	-	-	-	-	-	-	-	1.0	1.0	-	-

Prerequisites: Programming and Data Structures, Cryptography, Computer Networks

Contents:

Unit-I

Introduction: Introduction to Blockchain, How Blockchain works, Blockchain vs. Bitcoin, Practical applications, public and private key basics, pros and cons of Blockchain, Myths about Bitcoin. **7 Hrs**

Unit-II

Blockchain Architecture and Types: Architecture, versions, variants, use cases, Life use cases of Blockchain, Blockchain vs. shared Database, Introduction to crypto currencies, Types, Applications. **8 Hrs**

Unit-III

Blockchain Data Structures and Working: Concept of Double Spending, Hashing, Mining, Proof of work. Introduction to Merkel tree, Privacy, payment verification, Resolving Conflicts, Creation of Blocks. **8 Hrs**

Unit-IV

Bitcoins: Introduction to Bitcoin, key concepts of Bitcoin, Merits and Demerits Fork and Segwits, Sending and Receiving bitcoins, choosing bitcoin wallet, Converting Bitcoins to Fiat Currency. **8 Hrs**

Unit-V

Ethereum: Introduction to Ethereum, Advantages and Disadvantages, Ethereum vs. Bitcoin, Introduction to Smart contracts, usage, application, working principle, Law and Regulations. Case Study. **8 Hrs**

Reference Books:

1. Arshdeep Bikramaditya Signal, Gautam Dhameja, Priyanshu Sekhar Panda “Beginning Blockchain: A Beginner's Guide to Building Blockchain Solutions” Apress Publications, 2018.
2. Arshdeep Bahga, Vijay Madisetti, “Blockchain Applications: A Hands-On Approach”, VPT Publications, 2017.
3. Swan Melanie, “Blockchain: Blueprint for New Economy”, O’Reilly Publications, 2018.
4. Aravind Narayan, Joseph Bonneau, Edward Felten at al “Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction” Princeton University Press, 2016
5. Daniel Drescher, “Blockchain Basics: A Non-Technical Introduction in 25 Steps”, Apress Publications, 2017.

Additional References:

1. https://www.guru99.com/blockchain-tutorial.html
2. https://developer.ibm.com/technologies/blockchain/gettingstarted/

22UCSO741 Parallel Architectures, Computing and Programming (3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):

This 39-hour course intends to provide introductory knowledge of parallel architecture, design and analysis of parallel algorithms and parallel programming.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/ PSOs (13-15)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Explain** the need for parallelism with scientific and business applications and scope for parallel computing.	1,3	2	5
CO-2	**Estimate** the performance of computing systems using Amdahl's law and SPEC rating.	1	2	-
CO-3	**Explain** the parallel computing architectures and models and their communication models, **Design** parallel algorithm for a given scenario.	1	-	6
CO-4	**Understand** the design principles of parallel algorithms.	3	2	-
CO-5	**Write** and **execute** the MPI and OpenMP programs.	2	-	-

POs/PSOs	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**
Mapping Level	3.0	2.4	2.0	-	1.0	1.0

Prerequisites: Knowledge of

- Computer Organization
- High level Programming course
- Assembly Language Programming

Contents:

Unit-I

Introduction to parallel computing: Motivating Parallelism, Scope for Parallel Computing; Flynn's classification of architectures. Need for parallel computers Models of computation Analyzing parallel algorithms

Self Study :High end processors, GPUs etc. **6 Hrs**

Unit-II

Performance Measurement Techniques: Benchmark programs, SPEC ratings, Amdahl's law. **6 Hrs**

Unit-III

Parallel Programming Platform: Implicit parallelism, Limitations of Memory System Performance, Dichotomy of Parallel Computing, Physical organization of Parallel Platforms, Communication Costs in Parallel Machines, Inter Connection Networking and Routing. **9 Hrs**

Unit-IV

Principles of Parallel Algorithm Design: Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping techniques for load balancing, Methods for Containing Interaction Overhead, Parallel Algorithm Models. **9 Hrs**

Unit-V

Message Passing Programming: Message passing Model, Message Passing Interface, Circuit Satisfiability, (MPI_Init, MPI_Comm_rank, MPI_Comm_size, MIP_Finalize, Compiling and Running MPI Programs), Introducing Collective Communication.
Shared Memory Programming: Parallel for loop, declaring private variables, critical sections, Reductions, performance improvements. **9 Hrs**

Reference Books:

1. Introduction to Parallel Computing : Anant Grama, Anshul Gupta ,George Karpis,Vipin Kumar, second edition, 2011,Pearson
2. Parallel Programming: Michel J Quinn 2009 Tata McGrawHill.
3. Jonathan Lazer et al "Research Methods in Human Computer Interaction", 2nd Edition, Morgan Kaufmann Publication 2017.

VIII Semester

22UCSL800 Technical Seminar/Independent Study (0-0-2) 1

Contact Hours: 26

Course Learning Objectives (CLOs): This course is a one credit self-learning based research / Development oriented activity leading to publication or a study of subjects outside regular UG course offerings; enabling the students to engage in independent and life-long learning in the broadest context of trends of technological change and communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/ PSOs (13-16)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Learn** a technical report independently through self-learning mode.	12	2,3,5,8	-
CO-2	**Prepare** a technical report with a given specification and standards.	10	5	-
CO-3	**Present** effectively the knowledge through verbal and written communication mode.	10	5	-

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Mapping Level	-	2.0	2.0	-	2.0	-	-	2.0	-	3.0	-	3.0	-	-	-

Course Guidelines:

Students are expected to pick a research-oriented activities or study of subjects outside current Body-of-Knowledge of Computer Science & Engineering at SDMCET. Prior to registration, a detailed plan of work should be submitted by the student to the committee appointed by DUGC for approval. The various rules to be followed are listed below:

1. This course is offered at 8th semester. Student from 5th and 6th semester can also register only if their CGPA is 9 and above. Duration may be spread across two semesters. But, physically this course will be reflected in the 8th semester scheme and grade sheet.
2. Guide for this course is must and will be chosen by students by interacting with faculty.

3. In consultation with Guide, Students will prepare the courses description and its outcomes, which he/she promises to accomplish and is to be finally approved by DUGC.
4. Grading is done by the Guide based on the seminar and the report submitted by the students; which are to be in line with the policy established by DUGC's Grade Committee from time to time. Other assessment tool may include demonstration, seminar, quiz, tests, Viva-Voce, publications etc. as the case is. If the Guide wishes, they can form their own examination body for evaluation with the approval of the committee on the behalf of DUGC.
5. Work worth of minimum of 26-30 Hrs spread across 10 to 12 weeks starting from the date of registration is to be ensured by the Guide.
6. Course content should belong to the Body-of-Knowledge (As per ACM, 2008 or its extensions).

Department of CSE will encourage the students to publish a paper in a reputed journal/conference or get certification through the use of well recognized MOOCS like NPTEL, Coursera, Swayam. Udacity etc…for their self-study and demonstrate highest level of ethics and professional practices.

22UCSL801 Major Project – II/Internship (12 Weeks) 10

Contact Hours: 12 Weeks

Course Learning Objectives (CLOs): This course focuses on the following learning perspectives:

Understand the domain through proper modeling and analysis using the state-of-art technology. Then apply relevant Software Engineering Principles to develop modular and robust applications through the use of Standards and tools. At the end build appropriate test cases, verification and validation techniques in order to make the project reliable and maintainable.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12) / PSOs (13-15)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Perform** a survey on the chosen problem statement.	-	1, 8, 2,12	-
CO-2	Prepare a detailed **design** using software engineering principles or appropriate research methodology.	3, 5, 8, 13,12	11, 15	6, 7
CO-3	**Implement** the design using appropriate technology, tools, procedures and techniques.	4, 5, 8, 14,12	15	-

CO-4	**Verify** and **validate** the proposed system for correctness and to demonstrate compliance with the design and hence the stated requirements/ research gap.	5, 8,15,12	-	-
CO-5	**Prepare** the report and **communicate** effectively through presentation.	8, 9,10	-	-

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Mapping Level	3	3	3	3	3	1	1	3	3	3	2	3	3	3	3

Prerequisites: Different programming languages / tools, Software Engineering Principles

Major Project-II: This project work is intended for students who do not undertake an internship. The objective of the project is to foster independent learning, an innovative mindset, communication skills, organization, time management, presentation skills, teamwork, punctuality, and the ability to set and meet deadlines. In this project, students are expected to conduct an extensive literature survey to identify state-of-the-art technology in their domain of interest, select a topic from an emerging area relevant to their branch or an interdisciplinary field, and define the problem for their project work. Each project team shall consist of 2 to 4 students and will be assigned a faculty mentor. The department shall conduct three project reviews as per the schedule provided by DAP, which must be recorded as part of the project evaluation for CIE, along with marks awarded by the faculty guide. A committee constituted by the HoD, consisting of a minimum of two faculty members, shall conduct the reviews and evaluate the CIE. For SEE, students must appear for a viva-voce examination, which will be assessed by a panel of two examiners—one internal and one external—constituted by the HoD. The rubrics of evaluation includes objectives defined, literature review, demonstration of the project work carried out, report, project presentation, communication skill and question and answer session.

Internship: The internship is intended for students who do not undertake a project. Students must undergo an internship in private industries, R&D organizations, Center of Excellence, laboratories of reputed institutions, government and semi-government organizations, PSUs, construction companies, or entrepreneurial organizations to gain exposure to the external professional environment. The internship shall be for a duration of 12 weeks during the VIII semester, either through placement or on an individual basis. Students are required to prepare a report on the work carried out during the internship

and submit both the report and the internship certificate during the VIII semester. The department shall conduct three project reviews as per the schedule provided by DAP, which must be recorded as part of the project evaluation for CIE. A committee constituted by the HoD, consisting of a minimum of two faculty members, shall conduct the reviews and evaluate the CIE. For SEE, students must appear for a viva-voce examination, which will be assessed by a panel of two examiners—one internal and one external—constituted by the HoD. The rubrics of evaluation includes objectives defined, literature review, demonstration of the work carried out, report, project presentation, communication skill and question and answer session.

Reference Books:

1. Grady Booch, "Object-Oriented Analysis and Design with Applications", Second Edition, Addison-Wesley Publications.
2. Ian Sommerville, "Software Engineering", Ninth Edition, Addison-Wesley Publications.
3. Project Manual, prepared by the CSE Department, S D M College of Engineering and Technology, Dharwad

22UCSL802 | Summer Internship | (4 Weeks)3 Credits

Contact Hours: 4 Weeks

Course Learning Objectives (CLOs): Internship provides an opportunity to get industry exposure to real time scenarios that include professional skill development programs and adhere to the professional standards.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12) / PSOs (13-16)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Explore** the domain knowledge	1, 8, 2,12	-	-
CO-2	**Apply** the knowledge and skills in the professional career.	3,5, 8, 13,12	11, 16	6, 7
CO-3	**Prepare** a technical report	4,5, 8, 14,12	16	-
CO-4	**Demonstrate** the knowledge gained through presentation.	5, 8, 15,12	-	-

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Mapping Level	3	3	3	3	3	1	1	3	3	3	2	3	3	3	3

Prerequisites: Knowledge of both theory and practical courses learnt in all the previous semesters and relevant value-added information.

Summer Internship: The students are to undergo internship in Private industries/ R&D organizations/Centres of Excellence/Laboratories of Reputed Institutions/ Govt. & Semi Govt. organizations, PSUs, construction companies, entrepreneurial organizations, inter departments within the college etc. to get an exposure to the external world for a period of 4 weeks in the summer vacation after VI sem and before start of VII semester. The students are to prepare a report on the internship work carried out. The internal faculty shall monitor the student and award CIE marks. There is a SEE in which the student shall present his work before a panel of examiners consisting of HoD, Guide and one faculty member during VIII semester. The performance shall be communicated to the CoE office and the same shall reflect in the VIII semester grade card.

CIE and SEE Evaluation (from 2023-24 batch)
Courses with LTP 3-0-0 and 4-0-0 or 2-2-0/3-2-0

Continuous Internal Evaluation (CIE):

- Two Internal Assessments and one Improvement test each of 20 marks and one hour duration.
- Two higher scores from three tests are taken representing 40 marks.
- Question Paper pattern for Internal Assessment: 3 questions of 10 marks each with maximum of two sub divisions. Q.3 is compulsory and one question to be answered from Q.1 and Q.2.
- Course Teacher Assessment (CTA): Minimum two components such as quiz, seminar, written assignment, any technical activity related to course each of 5marks. Total CTA marks-10
- CIE=40 (from tests)+10(from CTA) =50 marks

Semester End Examination (SEE):

- SEE is conducted for 100 marks with 3 hours duration. It is reduced to 50 marks.
- Question Paper pattern for SEE: Five units with built in choice. Each question with maximum of three sub divisions.
- Two questions are to be set from each unit with built in choice, for example Q1 or Q2 in unit –I, Q 3 or Q 4 in unit-II and so on.
- A total of 5 full questions to be answered choosing one full question from each unit. All five units are to be answered compulsorily.
- Each question is of 20 marks.
- The Question paper is to be set for duration of 3 hours both for 3 and 4 credits courses.

The Question paper is to be set for 100 marks for 3 and 4 credits courses.