DAYANANDA SAGAR ACADEMY OF TECHNOLOGY & MANAGEMENT

CURRICULUM

Scheme and Syllabus V to VI Semester

Outcome Based Education

(Academic Year 2025-2026)

Department of Electronics & Communication Engineering

5th & 6th Semester B.E

ABOUT THE INSTITUTE

Dayananda Sagar Academy of Technology and Management- DSATM was established in 2011 with 5 UG Programmes and 1 PG Program, the programmes are approved by All India Council for Technical Education (AICTE) New Delhi, Affiliated to Visvesvaraya Technological University (VTU), Belagavi and DSATM is an autonomous institute from 2023-2024.

The Dayananda Sagar Institutions is one of pioneer institutions in India and abroad with six decades of excellence in Academic and Research. The newer campuses were necessary to accommodate the growing need of the technology and innovation.

DSATM nurtures the students in academic, research, sports, cultural and extracurricular activities.

- Creating an academic environment to nurture and develop competent entrepreneurs, leaders and professionals who are socially sensitive and environmentally conscious.
- Integration of Outcome Based Education and cognitive teaching and learning strategies to enhance learning effectiveness.
- Developing necessary infrastructure to cater to the changing needs of Business and Society.
- Optimum utilization of the infrastructure and resources to achieve excellence in all areas of relevance.
- Adopting learning beyond curriculum through outbound activities and creative assignments.
- Imparting contemporary and emerging techno-managerial skills to keep pace with the changing global trends.
- Facilitating greater Industry-Institute Interaction for skill development and employability enhancement.
- Establishing systems and processes to facilitate research, innovation and entrepreneurship for holistic development of students.
- Implementation of Quality Assurance System in all Institutional processes.

VISION OF THE INSTITUTE

To strive at creating the institution a centre of highest calibre of learning, so as to create an overall intellectual atmosphere with each deriving strength from the other to be the best of engineers, scientists with management & design skills.

MISSION OF THE INSTITUTE

- To serve its region, state, the nation and globally by preparing students to make meaningful contributions in an increasing complex global society challenges.
- To encourage, reflection on and evaluation of emerging needs and priorities with state-of-the-art infrastructure at institution.
- To support research and services establishing enhancements in technical, economic, human and cultural development.
- To establish interdisciplinary centre of excellence, supporting/ promoting student's implementation.
- To increase the number of Doctorate holders to promote research culture on campus.
- To establish IIPC, IPR, EDC, innovation cells with functional MOU's supporting student's quality growth**.**

QUALITY POLICY

Dayananda Sagar Academy of Technology and Management aims at achieving academic excellence through continuous improvement in all spheres of Technical and Management education. In pursuit of excellence cutting – edge and contemporary skills are imparted to the utmost satisfaction of the students and the concerned stakeholders.

ABOUT THE DEPARTMENT

The Department of Electronics and Communication Engineering (ECE) was established in the year 2011with an intake 120 and currently an intake of 180 from the academic year 2025-26. Now a days we cannot imagine the world without Electronics & Communication Engineering that has become an essential and inevitable part of our daily lives in almost all the fields. The Department focus is to train our students to get strong academic knowledge in the frontier areas of both Electronics & Communication engineering and also to make the students ready to meet real-world challenges. The Department has always been on a high growth path and has a rich blend of young and highly-experienced regular faculty members, most of them holding PhD from reputed universities.

The faculty members display a high level of dedication and enthusiasm towards both teaching and state-of-the-art research with strong commitment to engineering education who work with zeal and enthusiasm to provide a vibrant and optimum learning environment. The Department has been accredited by NBA and NAAC for providing high standards of education. To impart quality education by establishing research and learning environment to meet global needs and industrial standards is our department vision.

VISION OF THE DEPARTMENT

To impart quality education in the field of Electronics and Communication Engineering by establishing research and learning environment to meet global needs and industrial standards.

MISSION OF THE DEPARTMENT

M1: To provide quality and contemporary knowledge on latest technologies.

M2: To develop innovation and creativity among students enabling leadership and entrepreneurship skills with ethical values.

M3: To empower faculty with the knowledge in emerging areas of research.

M4: To ensure industry ready professionals with a research outlook.

M5: To establish center of excellence with industry and university collaborations.

PROGRAM EDUCATION OBJECTIVES (PEO'S):

PEO1: To ensure graduates with strong foundation in engineering, science and technology for successful career in Electronics and Communication Engineering.

PEO2: Graduates shall be technically competent with ability to analyze, design, develop, optimize and implement Electronics and Communication systems to meet global needs.

PEO3: Graduates shall build leadership and entrepreneurship qualities with professional ethics for the development of emerging technologies.

PROGRAM OUTCOMES (PO's)

Engineering Graduates will be able to:

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 modelling 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 (PSO's)

PSO1: Ability to design analyze and interpret data using modern tools with strong fundamentals of Electronics, Signal Processing and Communication, Embedded system, Computer science, Mathematics and Management.

PSO2: Adapt to emerging technologies with innovative idea and solution for novel problems.

PSO3: Ability to create innovative career path to be an entrepreneur and zest for higher studies.

PROPOSED UG CREDIT STRUCTURE IN ALIGNMENT WITH VTU

Sl.No	Semester	No. of Credits
1	1st Semester	20
2	2nd Semester	20
3	3rd Semester	21
4	4th Semester	21
5	5th Semester	22
6	6th Semester	22
7	7th Semester	20
8	8th Semester	14
Total		**160**

PROPOSED UG SCHEME

Sl. No	Course Category	BOS	TD	Teaching Hours/Week					Credits
				Lecture	Tutorial	Practical	Project	Total	
				L	T	P	S	(Hrs/week)	
1	BSC	MAT	MAT	3	0	0	0	3	3
2	IPCC-1	ECE	ECE	3	0	2	0	5	4
3	IPCC-2	ECE	ECE	3	0	2	0	5	4
4	PCC-1	ECE	ECE	3	0	0	0	3	3
5	PCC-2	ECE	ECE	3	0	0	0	3	3
6	PBL	ECE	ECE	0	0	2	2	4	2
7	AEC	ECE	ECE	0	0	2	0	2	1
8	SCR	ECE	ECE	0	0	2	0	2	1
9	NCMC	NSS / YOGA / PED							
10	AICTE Activity Points								
								Total	**21**

Percentage of Mapping– Theory & Practical - Scheme & Syllabus- 5th & 6th Sem

5th Sem & 6th Sem

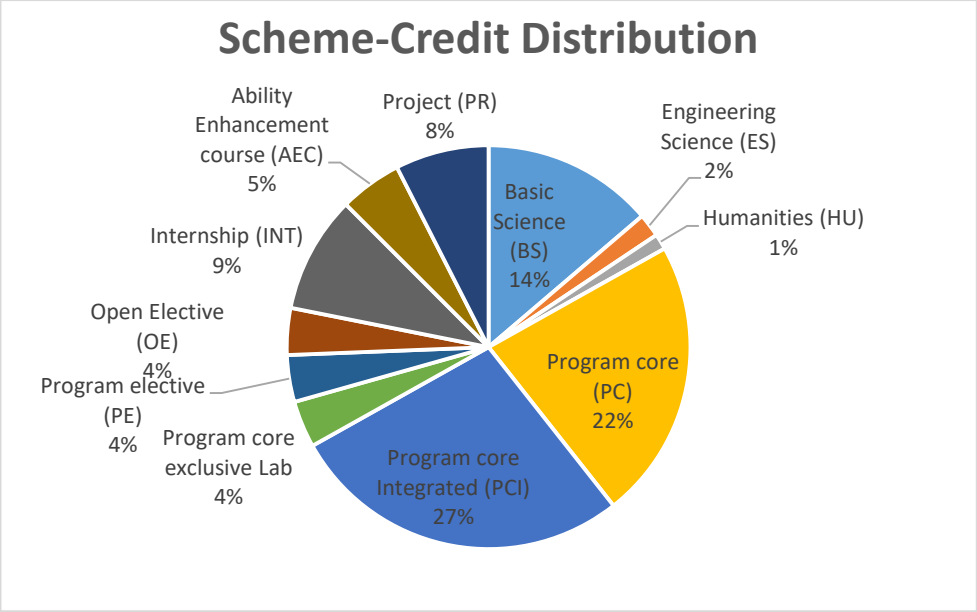
Sl. No	Course Category	Component			
		Theory	Practical	Outreach	YOGA/SPORTS
1	BSC	100%	--	--	--
2	IPCC-1	60%	40%	--	--
3	IPCC-2	60%	40%	--	--
4	PCC-1	100%	--	--	--
5	PCC-2	100%	--	--	--
6	PBL	--	100%	--	--
7	AEC	--	100%	--	--
8	SCR	--	--	100%	--
9	NCMC	--	--	--	100%
Total Percentage		**53%**	**47%**	**13%**	**13%**

Scheme Distribution

Department of Electronics & Communication Engineering

Course Component	Credits	% of Credits
Basic Science (BS)	22	13.75
Engineering Science (ES)	03	1.875
Humanities (HU)	02	1.25
Program core (PC)	36	22.5
Program core Integrated (PCI)	44	27.5
Program core exclusive Lab	06	3.75
Program elective (PE)	06	3.75
Open Elective (OE)	06	3.75
Internship (INT)	15	9.375
Ability Enhancement course (AEC)	08	5
Project (PR)	12	7.5
Total	**160**	**100**

Dreamt



SEMESTER WISE CREDIT BREAKDOWN FOR B.E. DEGREE CURRICULUM

BATCH 2023-2027

Course Category	Semester								Total Credits
	1st	2nd	3rd	4th	5th	6th	7th	8th	
Basic Sciences (BSC)	4	4	3	-	-	-			
Engineering Sciences (ESC)	6	6	-	3	-	-			
Humanities, Social Sciences and Management (HSMC)	2	2	-	-	3	-			
Ability Enhancement Course (AEC)	1	1	1	1	1	2			
Universal Human Values (UHV)	-	-	1	1	-	-			
Professional Core Courses (PCC)	3	3	6	6	3	3			
Integrated Professional core Course (IPCC)	4	4	8	8	8	8			
Professional Elective Course (PEC)	-	-	-	-	3	3			
Institutional Open Elective Courses (IOE)	-	-	-	-	-	3			
Internship (INT)	-	-	-	-	-	-			
Mini Project / Project Work (PW)	-	-	2	2	2	3			
Non-credit Mandatory Courses (NCMC)	-	-	-	-	-	-			
Mandatory Courses (Environment Studies)	-	-	-	-	2	-			
Total Credits	**20**	**20**	**21**	**21**	**22**	**22**			

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Affiliated to VTU
Approved by AICTE
Accredited by NAAC with A+ Grade
6 Programs Accredited by NBA
(CSE, ISE, ECE, EEE, MECH, CIVIL)

Scheme of Teaching and Examinations – 2025
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from 2025-26)

5th SEMESTER: Electronics & Communication Engineering (ECE)

Sl. No	Course Code	Course Title	Course Category	BOS	TD	Teaching Hours/Week					Credits	Examination			
						Lecture L	Tutorial T	Practical P	Project S	Total		SEE Duration (Hrs)	CIE Marks	SEE Marks	Total Marks
1	BEC501	Management and Entrepreneurship	HSMS	ECE	ECE	3	-	-	-	3	3	3	50	50	100
2	BEC502	Principles of Communication Systems	IPCC	ECE	ECE	3	-	2	-	5	4	3	50	50	100
3	BEC503	Microcontroller Programming - 8051	IPCC	ECE	ECE	3	-	2	-	5	4	3	50	50	100
4	BEC504	Engineering Electromagnetics	PCC	ECE	ECE	3	-	-	-	3	3	3	50	50	100
5	BEC505X	Professional Elective	PEC-I	ECE	ECE	3	-	-	-	3	3	3	50	50	100
6	BEC506	Mini Project	PROJ	ECE	ECE	-	-	-	4	4	2	3	50	50	100
7	BRM507	Research Methodology and Intellectual Property Right (RMIPR)	AEC	ECE	ECE	1	-	-	-	1	1	3	50	50	100
8	BEC508	Environmental Studies	MC	ECE	AD	2	-	-	-	2	2	2	50	50	100
9	BNSK509	National Service Scheme (NSS)	NCMC	ECE	ECE	-	-	2	-	2	0	-	100	-	100
	BPEK509	Physical Education (PE)													
	BYOK509	Yoga													
AICTE Activity Points Mandatory					**Total**						**22**		**500**	**400**	**900**

Professional Electives Course

Sl No	Course Code	Course Title	Sl No	Course Code	Course Title
1	BEC505A	Introduction to machine Learning	3	BEC505C	Fundamentals of computer vision
2	BEC505B	Data Structure Using C ++	4	BEC505D	Micro Electro Mechanical Systems

PCC: Professional Core Course, **PCCL:** Professional Core Course laboratory **MC:** Mandatory Course (Non-credit), **AEC:** Ability Enhancement Course, SEC: Skill Enhancement Course, **L:** Lecture, **T:** Tutorial, **P:** Practical, **CIE:** Continuous Internal Evaluation, **SEE:** Semester End Evaluation. **K :** The letter in the course code indicates common to all the stream of engineering. **PROJ:** Project /Mini Project, Project Phase -I, **PEC:** Professional Elective Course. **OEC:** Open Elective Course

Scheme of Teaching and Examinations – 2025
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from 2025-26)

6th SEMESTER: Electronics & Communication Engineering (ECE)

Sl. No	Course Code	Course Title	Course Category	BOS	TD	Teaching Hours/Week					Credits	Examination			
						Lecture	Tutorial	Practical	Project	Total		SEE Duration (Hrs)	CIE Marks	SEE Marks	Total Marks
						L	T	P	S						
1	BEC601	Embedded System Design	IPCC	ECE	ECE	3	-	2	-	5	4	3	50	50	100
2	BEC602	Digital Signal Processing	IPCC	ECE	ECE	3	-	2	-	5	4	3	50	50	100
3	BEC603	Fundamentals of CMOS VLSI	PCC	ECE	ECE	3	-	-	-	3	3	3	50	50	100
4	BEC604X	Professional Electives	PEC-II	ECE	ECE	3	-	-	-	3	3	3	50	50	100
5	BEC605X	Open Electives	OEC-I	ECE	ECE	3	-	-	-	3	3	3	50	50	100
6	BECP606	Project Phase-1	PROJ	ECE	ECE	-	-	-	4	4	2	-	100	-	100
7	BECL607	VLSI Lab	PCCL	ECE	ECE	-	-	2	-	2	1	3	50	50	100
8	BEC608X	Ability Enhancement Course	SDC/AEC	ECE	ECE	-		3	-	3	2	3	50	50	100
9	BNSK609	National Service Scheme (NSS)	NCMC	ECE		-	-	2	-	2	0	-	100	-	100
	BPEK609	Physical Education (PE)													
	BYOK609	Yoga													
AICTE Activity Points Mandatory Total											**22**		**550**	**350**	**900**

Professional Electives Course

Sl No	Course Code	Course Title	Sl No	Course Code	Course Title
1	BEC604A	Satellite Communication	3	BEC604C	Deep Learning
2	BEC604B	Automotive Electronics	4	BEC604D	Analog Integrated Circuit Design

Open Electives Course					
Sl No	**Course Code**	**Course Title**	**Sl No**	**Course Code**	**Course Title**
1	BEC605A	Communication Systems	3	BEC605C	Basic of Microcontroller
2	BEC605B	Basic VLSI Design	4	BEC605D	Optical & Satellite Communication
Ability Enhancement Course / Skill Enhancement Course					
Sl No	**Course Code**	**Course Title**	**Sl No**	**Course Code**	**Course Title**
1	BEC607A	Introduction to Robotics	2	BEC607B	Design for Testability

PCC: Professional Core Course, **PCCL:** Professional Core Course laboratory **MC:** Mandatory Course (Non-credit), **AEC:** Ability Enhancement Course, SEC: Skill Enhancement Course, **L:** Lecture, **T:** Tutorial, **P:** Practical, **CIE:** Continuous Internal Evaluation, **SEE:** Semester End Evaluation. **K :** The letter in the course code indicates common to all the stream of engineering. **PROJ:** Project /Mini Project, Project Phase -I, PEC**:** Professional Elective Course. **OEC:** Open Elective Course, **SDC**: Skill Development Course

IPCC: Integrated Professional Core Course,

PCC: Professional Core Course

PBL: Project Based Learning

AEC: Ability Enhancement Course,

NCMC: Non-Credit Mandatory Course

L: Lecture,

T: Tutorial,

P: Practical

S= SDA: Skill Development Activity,

CIE: Continuous Internal Evaluation,

SEE: Semester End Evaluation.

Integrated Professional Core Course (IPCC): Refers to Integrated Professional Core Course Theory Integrated with practical's of the same course. Credit for IPCC can be 04 and its Teaching Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper.

Non Credit Mandatory Course (NCMC) - National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), and Yoga (YOG) with the concerned coordinator of the course during the first week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.

Newly introduced subjects in the syllabus

SL No.	Courses	5th Semester	6th Semester
1.	**List of Existing Elective Courses**	1. Introduction to machine Learning 2. Data Structure Using C ++-- 3. Fundamentals of computer vision 4. Micro Electro Mechanical Systems	1. Satellite Communication 2. Automotive Electronics 3. Deep Learning 4. Analog Integrated Circuit Design
2.	**List of New Existing Elective Courses**	1. Introduction to machine Learning 2. Fundamentals of computer vision	1. Deep Learning 2. Analog Integrated Circuit Design
3.	**List of New Industry Aligned Courses**	1. Microcontroller Programming – 8051 2. Data Structure Using C ++	1. Embedded System Design 2. Deep Learning 3. Analog Integrated Circuit Design 4. Introduction to Robotics

5th SEMESTER

Semester	:	**5th Semester**				
Course Title	:	**Management and Entrepreneurship**				
Course Code	:	**BEC501**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**PCC**				
Stream	:	**ECE**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**(3:0:0:0)**		**SEE**	:	**50**
Total Hours	:	**40**		**SEE Duration**	:	**3 hours**
Credits	:	**03**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand how management theories apply to real-world organizational settings.
2	Obtain effective leadership skills, including communication, decision-making, and problem-solving.
3	Learn motivation, team dynamics, and organizational culture and techniques for generating, evaluating, and validating business ideas.
4	Enhance a mind-set that embraces innovation, risk-taking, and resilience for entrepreneurship.
5	Develop the ability to analyze complex situations, identify problems, and devise effective solutions in management and entrepreneurship.

Teaching-Learning Process Pedagogical

Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in Control Systems.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.

Scheme of Teaching and Examinations for BE Programme -2025-26 Outcome Based Education and Choice Based Credit System (CBCS) (Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Management:** Nature and Functions of Management – Importance, Definition, Management Functions, Levels of Management, Roles of Manager, Managerial Skills, Management & Administration, Management as a Science, Art & Profession **Planning:** Planning**-**Nature, Importance, Types, Steps and Limitations of Planning.	**8 Hours**
Pedagogy	**Collaborative learning on Top-Down Planning Model in industry**	
2	**Organizing and Staffing: Organization**-Meaning, Characteristics, Process of Organizing, Principles of Organizing, Span of Management (meaning and importance only), Departmentalization-Process Departmentalization, Purpose Departmentalization, Committees– Meaning, Types of Committees. **Staffing**-Need and Importance**,** Recruitment and Selection Process. **Directing and Controlling:** Meaning and Requirements of Effective Direction, Giving Orders; Motivation-Nature of Motivation, Motivation Theories (Maslow's Need-Hierarchy Theory and Herzberg's Two Factor Theory); Communication – Meaning, Importance and Purposes of Communication.	**8 Hours**
Pedagogy	**Think Pair Share on Direction and Controlling Organization**	
3	**Leadership-**Meaning, Characteristics, Behavioral Approach of Leadership; Coordination Meaning, Types, Techniques of Coordination; Controlling – Meaning, need for Control System, Benefits of Control, Essentials of Effective Control System, Steps in Control Process ,Roles and responsibilities of project manager, **Social Responsibilities of Business:** Meaning of Social Responsibility, Social Responsibilities of Business towards Different Groups, Social Audit, Business Ethics and Corporate Governance.	**8 Hours**
Pedagogy	**Group Discussion on Leadership Qualities with examples**	
4	**Entrepreneurship:** Introduction, Evolution of the concept of Entrepreneurship, Entrepreneurship today, Types of Entrepreneurs, Intrapreneurship, Entrepreneurial competencies, Capacity Building for Entrepreneurs. **Identification of Business Opportunities:** Introduction, Mobility of Entrepreneurs, Business opportunities in India, Models for Opportunity Evaluation.	**8 Hours**
Pedagogy	**Experiential Learning on Entrepreneurship ,Demonstration of Innovative Business Plan**	

5	**Business plans:** Introduction, purpose of a Business plan, contents of a Business plan, Procedure for setting up an Enterprise. **Institutions supporting Business opportunities:** Central level institutions- National Board for micro, small & medium Enterprises (NBMSME), MSME-DO, National Small Industries Corporation. State level institutions- state Directorate Industries and commerce, District Industries Centres, state financial Corporations, State Industrial Development Corporation (SIDC), and State Industrial Area Development Board (SIADB). Other Institutions - NABARD, Technical consultancy organization (TCO), Small Industries Development Bank of India(SIDBI), Export Promotion Councils, Non-governmental Organizations.	**8 Hours**
Pedagogy	**Case Study and Literature Review paper**	
	Pedagogical Initiatives (Not limited to): Think Pair and Share (Blended Learning): provides an opportunity for students to learn from one another Problem Solving: encourages cognitive thinking and enables creative problem solving Poster Presentation: allows students to represent the concepts visually in order to understand the topics easily. Case studies: maps different domains in real time applications .Demonstration: exhibits the implementation process.	

CIE for Control Systems (Professional Core Course (PCC)):

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Internal Assessment Test (IAT):

- For the Internal Assessment Test component of CIE, there are 25 marks and for Assignment component of the CIE, there are 25 marks. Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 25 marks
- The first test will be administered after 40-50% of the syllabus has been covered, and
- The second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Blooms RBT Levels. Emphasis to be given for higher order RBT levels

Semester-End Examination:

Theory SEE will be conducted as per the scheduled timetable (duration 03 hours).

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for 50 Marks. Total Marks scored will be CCA1+CCA2 and scaled down to 25 Marks.

- CCA1 after 4th week and CCA2 after 9th week. The evaluation includes either through quiz or rubrics
- CCA as project-based learning,
    - CCA is evaluated for 50 Marks with review 1 of 25 Marks after and review 2 of 25 Marks includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is 25 Marks

Total Marks scored for theory component of CIE (IAT+ CCA) is 50 Marks

Possible Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom.
- The assessment of these techniques shall be in rubrics.

The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

Note: L- Theory Lecture, T- Tutorial, P-Practical, S-Project, IPCC: Integrated Professional Core Course, CIE: Continuous Internal Evaluation, SEE: Semester End Examination.

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Principles of Management – P.C Tripathi, P.N Reddy, McGraw Hill Education, 6th Edition, 2017. ISBN-13:978-93-5260-535-4.
2	Entrepreneurship Development Small Business Enterprises- Poornima M Charantimath,2nd Edition, Pearson Education 2018, ISBN 978-81-317-6226-4
Reference Books	
1	Essentials of Management: An International, Innovation and Leadership perspective by Harold Koontz, Heinz Weihrich McGraw Hill Education, 10th Edition 2016. ISBN- 978-93-392-2286-4.

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level
CO1	**Understand** the basic skills of management to work in a team	L2
CO2	**Apply** the concepts of Entrepreneurship and their skills to develop a Business Proposal.	L3
CO3	**Analyze** the Management functions and Social responsibilities in business development.	L4
CO4	**Evaluate** the Business concepts to draft the Business plan and sources of funding.	L4
CO5	**Collaborate** the concept of management and entrepreneurship to set up an innovative plan for a small business.	L5

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1								2	1		1	1			
CO2								2	1	2	1	1			1
CO3								2	2	2	1	1			
CO4								3	3	2	2	2			1
CO5								3	3	2	2	2		1	2

Web links and Video Lectures (e-Resources)	
1	https://nptel.ac.in/courses/110107094 https://nptel.ac.in/courses/110106141 https://nptel.ac.in/courses/122106031

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember				
Understand	20	20		
Apply	20	20		
Analyze	10	10		
Evaluate			50	
Create				50

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	10	10		10			30	30%
CO2	10		10		10	10	40	40%
CO3		10			10	10	30	30%
CO4								
CO5								
Total	20	20	10	10	20	20	100	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	-
Understand	40
Apply	40
Analyze	20
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module 3	Module-4	Module-5		
CO1	10	10	10			30	30%
CO2	10		10	10	10	40	40%
CO3		10		10	10	30	30%
CO4							
CO5							
Total	20	20	20	20	20	100	100%

INTEGRATED PROFESSIONAL CORE COURSE (IPCC)

IPCC Course – Integrated Professional Core Course

Teaching Hours/Week (L: T:P: S)	3:0:2:0
Total Hours of Pedagogy	40 hours Theory + 20 Hours of Practical Classes
Credits:	04
Theory - Each Module	8 Hrs
Practical's	8-10 Programs / Experiments
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Theory

- The theory part of the IPCC shall be evaluated both by CIE and SEE.
- The practical part shall be evaluated by only CIE (no SEE).
- However, questions from the practical part of IPCC shall be included in the SEE question paper.

Integrated Professional Core Course (IPCC) - 4 Credit Course

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE) for the Theory component of the IPCC (Maximum marks 50)

Internal Assessment Test (IAT):

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are 25 marks and that for the practical component is 25 marks.
- 25 marks for the theory component are split into 15 marks for two Internal Assessment Tests (Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 15 marks) and 10 marks for Two Continuous Comprehensive Assessment(CCA) methods.

- The first Internal test at the end of 40-50% coverage of the syllabus
- The second Internal test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for 25 marks).
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Revised Blooms Taxonomy (RBT) Levels. Emphasis to be given for Higher order Thinking Skills(HOTS).

Continuous Internal Evaluation (CIE) for the practical component of the IPCC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and Marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report, **05 Marks** are for conducting the experiment, **05 Marks for** preparation of the laboratory record, **5 Marks** for conducting Open Ended Experiments Each experiment. Marks of all experiments' write-ups are added to 15 marks.
- The Practical laboratory test **(duration 03 hours)** at the end of the 15th week of the semester/after completion of all the experiments (whichever is early) shall be conducted for **50 Marks** and scaled down to **5 Marks.**
- The open-ended experiment after completion of all the experiments shall be conducted for 20 marks with a split-up for 5 Marks for writeup, 10 Marks for Execution, and 5 Marks for Viva-Voce.
  Marks for writeup, Execution and Viva-Voce is added and scaled down to 05 marks.
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for 25 marks.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

Semester End Examination (SEE) for IPCC Theory

SEE will be conducted as per the scheduled timetable, with common question papers for the course (duration 03 hours)

- The question paper will have ten questions. Each question is set for 20 marks.

- The question paper shall be set for 100 Marks. The medium of the question paper shall be English. **The duration of SEE is 03 hours.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module. The two questions shall be of same course outcome, program outcome and Blooms RBT level. Emphasis to be given for higher order RBT levels.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored by the student shall be proportionally scaled down to 50 Marks.
- The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only.
- Questions mentioned in the SEE paper may include questions from the practical component.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be (CCA1+CCA2)/2 and scaled down to **10 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The Assessment will be through rubrics.
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **20 Marks** after and review 2 of **30 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **10 Marks**

Total Marks scored for theory component of CIE (IAT+ CCA) is **25 Marks**

Possible Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom,
- The assessment of these techniques shall be in rubrics.
- The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

4 Credits Courses – Integrated Professional Core Course (IPCC)

Assessment Method	Component	Type of Assessments	Syllabus Coverage		Maximum Marks	Average	Reduced Marks	Minimum Passing Marks	Evaluation Details
Total CIE Theory + Practical					**50**	----	----	**20**	
CIE	**Theory**	Internal Assessment Test (IAT) – I	Module – 1 to 2.5		50	(50+50) / 2	**15**	6	Average of Two Internal test each of 50 Marks scale down the marks to 15 Marks
		Internal Assessment Test (IAT) – II	Module – 2.5 to 5		50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives / Activity based learning	Considering all the Modules		50	(50+50) / 2	**10**	4	Two CCA methods as per VTU Clause 22OB4.2 of regulations to be adopted. If CCA chosen is Project Based Learning, then one assessment method may be adopted
		CCA-2- Pedagogical Initiatives/ Activity based learning			50				
	Total CIE Theory						**25**	10	Scale down Marks of IAT and CCA to 25
	Practical	Conduction of Experiments	Performance-Continuous Evaluation of each experiment	05	15	Average of all Experiments	15	4	Performance of the Experiment (On completion of every experiment/progra

CIE			Record	05					m in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. 20 marks are for conducting the experiment and calculations/observations/output)
			Observation book	05					
		Practical Test	Write up	15	50	----	05	4	One Internal Practical Test after conduction of all Experiments for 50 Marks
			Execution	25					
			Viva-voce	10					
		Open Ended Experiment	Write up	05	20	----	05	2	One experiment for 20 marks. 20 marks reduced to 05 marks
			Execution	10					
			Viva-voce	05					
	Total CIE Practical						**25**	**10**	Scale down Marks of Experiments, Record, Observation, Practical Test and Open-Ended Experiment
SEE		Theory exam	Entire theory syllabus including questions from lab Component in respective Modules		100	----	50	20	SEE Exam is theory Exam conducted for 100 Marks, scored Marks are scaled down to 50 Marks

CIE + SEE	100	---	---	40	

- The Minimum Marks to be secured in CIE to appear for SEE shall be 10 (40% of Maximum Marks – 25) in the Theory Component and 10 (40% of Maximum Marks – 25) in the Practical component.
- The Laboratory Component for the IPCC shall be for CIE only.
- However, in SEE, the Questions from the Laboratory Component shall be included in the respective Modules only.

Note: If few of the 3 Credit Courses are Integrated course type, for such courses the method suggested for 4 Credit IPCC Course shall be followed

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**5th Semester**				
Course Title	**:**	**Principles of Communication System**				
Course Code	**:**	**BEC502**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Integrated**				
Category	**:**	**IPCC**				
Stream	**:**	**ECE**		**CIE**	**:**	**50**
Teaching hours/ week (L:T:P:S)	**:**	**3-0-2-0**		**SEE**	**:**	**50**
Total Hours	**:**	**40 + 12**		**SEE Duration**	**:**	**3 hrs**
Credits	**:**	**4 credits**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the concept of time and frequency domain representation of various analog modulation schemes, various noises and digitization process.
2	Understand the generation and detection process.
3	Compute the performance of various modulation schemes with noise.
4	Illustrate the concepts associated with transmitter and receiver.
5	Simulate real time application Vocoders and video transmission

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

DSATM

Scheme of Teaching and Examinations for BE Programme -2025-26

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**AMPLITUDE MODULATION FUNDAMENTALS:** Introduction, Amplitude Modulation: Time & Frequency –Domain description, Modulation Index, Switching modulator, Envelop detector. Time and Frequency –Domain description of DSBSC, Ring modulator, Coherent detection, Costas Receiver, Quadrature Carrier Multiplexing. SSB Modulation, Frequency Translation, Frequency- Division Multiplexing, (**Text1: 3.1, 3.2,3.3,3.4,3.5,4.2,4.3,4.4,10.2**).	8
Pedagogy	**Problem Solving**	
2	**FREQUENCY MODULATION:** Basic definitions, Frequency Modulation: Narrow Band FM, Wide Band FM, Transmission bandwidth of FM Signals, Generation of FM Signals, Demodulation of FM Signals, FM Stereo Multiplexing, Phase Locked Loop, Nonlinear Effects in FM Systems. The Super heterodyne Receiver **(Text1: 5.1,5.2,5.3,5.4,5.5,6.1,6.3,9.2,9.3).**	8
Pedagogy	**Case studies**	
3	**NOISE IN ANALOG MODULATION:** Shot Noise, Thermal noise, White Noise, Noise Equivalent Bandwidth Noise Figure. Noise in Analog Modulation: Introduction, Receiver Model, Noise in DSB-SC receivers, Noise in AM receivers, Threshold effect, Noise in FM receivers, Capture effect, FM threshold effect, FM threshold reduction, Pre-emphasis and De-emphasis in FM. **(Text1: 5.1, 6.1, 6.2, 6.3, 6.4, 6.5 6.6).**	8
Pedagogy	**Seminar presentation**	
4	**SAMPLING AND QUANTIZATION:** Introduction, Need for digitization. The Low pass sampling process, Pulse amplitude modulation, Time division multiplexing, PWM, PPM. Generation and Detection of PPM waves. The Quantization process, Quantization Noise, Pulse code modulation, line Codes, Differential encoding. **(ReferText2: 7.1,7.2,7.3,7.4,7.5,7.6,7.8,7.9)**	8
Pedagogy	**Think Pair and Share**	
5	**BASEBAND TRANSMISSION OF DIGITAL SIGNALS:** Introduction, Inter-symbol Interference, Eye Pattern, Nyquist criterion for distortion less Transmission, Baseband M-ary PAM Transmission, Delta Modulation**, (Text1: 7.10,8.1,8.4,8.5,8.6,8.7);** Application to Video + MPEG **(7.11 in Text1)**, Vocoder **(Refer Section 6.8 of Reference Book 1).**	8
Pedagogy	**Flipped Class Room**	

	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process

List of Programs:

Sl. No.	Experiments/Programs	COs
1.	Generate DSBSC signals using balanced modulator/lattice modulator (diode ring).	CO3, 4
2.	Design and test Frequency Modulation and Demodulation using PLL IC 565.	CO3, 4
3.	Design and test Pulse sampling, flat top sampling and reconstruction.	CO3, 4
4.	Design, set up and study the working of Pulse Amplitude Modulator and demodulator circuits.	CO3, 4
5.	Design, set up and study the working of a Pulse Position Modulator (PPM).	CO3, 4
6.	Design, setup and study a Pulse Width Modulator using op-amp	CO3, 4
	Experiments can be conducted using MATLAB/SCILAB/OCTAVE	
7.	Amplitude Modulation and demodulation: Generation and display the relevant signals and its spectrums.	CO3, 4, 5
8.	Frequency Modulation and demodulation: Generation and display the relevant signals and its spectrums.	CO3, 4, 5
9.	Sampling and reconstruction of low pass signals. Display the signals and its spectrum.	CO3, 4, 5
10.	Time Division Multiplexing and demultiplexing.	CO3, 4, 5
	Open ended Programs	
1	Perform Manchester coding on a given input sequence using Data formatting and Line Code Generator circuit.	CO3, 4, 5
2	Design and demonstrate PCM modulator and demodulator circuit.	CO3, 4, 5
3	Generate a)NRZ, RZ and Raised cosine pulse, b) Generate and plot eye diagram	CO3, 4, 5

CIE for Principles of Programming Using C (Integrated Professional Core Course (IPCC)):

This Course refers to professional theory core course integrated with practical. Credit for this course can be 03 and its Teaching Learning hours (L : T : P: S) can be considered as (3 : 0 : 2 : 0).

15 marks for the conduction of practical experiment and preparation of the Laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.

On completion of every program in the laboratory, the student shall be evaluated including viva-voce and marks shall be awarded on the same day.

Each program report can be evaluated for **15 marks** (Write-up – 3 marks, Execution – 8 marks .and Viva – 4 marks)

The Laboratory test (duration 2 hours / 3 hours) after completion of all the programs shall be conducted for 50 marks and scaled down to **10 marks.**

The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. This course is common to all branches of first year B.E/B.Tech. 2023-24 regulation.

Note: L- Theory Lecture, T- Tutorial, P-Practical, S-Project, IPCC: Integrated Professional Core Course, CIE: Continuous Internal Evaluation, SEE: Semester End Examination.

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	**Communication Systems**, Simon Haykins & Moher, 5th Edition, John Willey, India Pvt. Ltd, 2010, ISBN 978 – 81 – 265 – 2151 – 7.
Reference Books	
1	**Modern Digital and Analog Communication Systems,** B. P. Lathi, Oxford University Press., 4th edition.
2	**An Introduction to Analog and Digital Communication**, Simon Haykins, John Wiley India Pvt. Ltd., 2008, ISBN 978–81–265–3653–5
3	**Principles of Communication Systems**, H.Taub & D.L.Schilling, TMH, 2011.

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT
CO1	**Understand** and **remember** the concept of time and frequency domain representation of various analog modulation schemes, various noises and digitization process	**L1/L2**
CO2	**Apply** various metrics to compute the performance of various modulation schemes with the presence of noise.	**L3**
CO3	**Determine** the performance of analog communication systems and to multiplex and demultiplex the signals.	**L3**
CO4	**Analyze** generation, detection process and the performance of digital formatting process with quantization noise.	**L4**
CO5	**Simulate and Analyze** the various modulation / demodulation schemes using simulation tool (MATLAB).	**L4**

CO-PO MAPPING

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2	3													2	1
CO3		3												2	1
CO4			3						2	2				2	1
CO5				2	2				2	2		2		2	1

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**5th Semester**				
Course Title	:	**Microcontroller Programming - 8051**				
Course Code	:	**BEC503**				
Course Type (Theory/ Practical/ Integrated)	:	**Integrated**				
Category	:	**IPCC**				
Stream	:	**ECE**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**3:0:2:0**		**SEE**	:	**50**
Total Hours	:	**40+20**		**SEE Duration**	:	**03 hours**
Credits	:	**04**				

Course Learning Objectives:

Sl. No	Course Objectives
1	Comprehend the fundamental architecture and features of the 8051 microcontroller, its programming and basics of ARM Architecture.
2	Relate the different addressing modes and instructions in 8051 programming.
3	Examine Assembly Language and Embedded C program to interface different on chip peripherals and external devices.
4	Assess Assembly Language and Embedded C program of Timers/Counters.
5	Develop a proper solution for the real time problems using 8051.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.

DSATM

Scheme of Teaching and Examinations for BE Programme -2025-26

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Microprocessor and Microcontrollers:** Microprocessor block diagram, Block diagram of Microcontroller, Comparing Microcontroller and Microprocessor, A microcontroller survey. **The 8051 Architecture:** Microcontroller Hardware, Block Diagram, Programming Model, Program Counter and Data pointer, Flags, PSW, Stack Pointer, Internal RAM Organization, SFR's, Internal ROM. *Text Book 1: Chapter 1, 2(Selected Topics)*	8
Pedagogy	**Chalk & Talk**	
2	**Data Transfer and Addressing Modes:** Addressing Modes, External Data moves, PUSH and POP, Data exchange. **Logical Operations:** Byte Level, Bit Level, Rotate and swap. **Arithmetic Operations:** Arithmetic Instructions, signed number concepts signed and unsigned, BCD and ASCII. **Jump and Call Operations:** conditional jumps, unconditional jump instructions, Call instructions. *Text Book 1: Chapter 3, 4, 5 and 6*	8
Pedagogy	**Think, Pair, Share**	
3	**8051 Programming in C:** Data types and time delay in C, I/O programming in C, logic operations in C, data conversion programs in C, accessing code ROM space in C, data serialization using C. **8051 Interrupts:** Interrupts vs polling, interrupt service routine, steps in executing an interrupt, six interrupts, enabling and disabling an interrupt. *Text Book 2: Chapter 7, 11 (11.1 only)*	8
Pedagogy	**Case Study**	
4	**Timer Programming in assembly and C:** T0 and T1 Register, TMOD Register, Mode 1 Programming, Mode 2 Programming, Assembly and C programs. **Counter Programming:** TCON Register, Assembly and C programs. *Text Book 2: Chapter 9*	8
Pedagogy	**Experiential Learning**	
5	**Interfacing to the real world:** Keyboard Interfacing (except program), Electromechanical relays, Reed switch, Stepper motor interfacing, DC motor interfacing and PWM. **Memory Interface:** Semiconductor Memory, memory capacity, memory organization, speed, ROM, PROM, EPROM, EEPROM, Flash memory EPROM, Mask ROM, RAM, SRAM, NVRAM, DRAM.	8

	Introduction to ARM and ARM Architecture: A Brief History, Architecture Versions. *Text Book 2: Chapter 12 (12.2 only), 14 (14.1 only), 17 (selected topics)* *Text Book 3: Chapter 1 (1.2.1 and 1.2.2 only)*	
Pedagogy	**Flipped Classroom**	
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

List of Programs:

Sl. No.	Experiments/Programs	COs
	Part A – Software Programs	
1	Write an assembly language program to transfer n=10 bytes of data from location 8035h to location 8041h (with and without overlap)	**CO3, CO4, CO5**
2	Write an assembly language program to transfer n=10 bytes of data from location 40h to location 50h (with and without overlap) *Using internal memory.	**CO3, CO4, CO5**
3	Write an assembly language program to exchange n=5 bytes of data at location 0027h and at location 0041h	**CO3, CO4, CO5**
4	Write an assembly language program to sort an array of 10 bytes of data in ascending and descending order.	**CO3, CO4, CO5**
5	Five bytes of data are stored in external memory location at 8000H, Write an ALP to find the largest/smallest of those five bytes and store the result in memory location 8050H.	**CO3, CO4, CO5**
6	Write an ALP to add two 16-bit numbers stored in location 10,11,12,13H and store the result in 14,15,16H.	**CO3, CO4, CO5**
7	Write an ALP to perform multiplication or division for two 8-bit numbers stored in memory internal memory location 10H & 11H. Check the contents of R1, if R1 =1, then perform multiplication else perform division and store the result in 12H & 13H.	**CO3, CO4, CO5**
8	To implement a 2-digit decimal up / down counter and display the states watch window	**CO3, CO4, CO5**
	Part B - Interfacing Programs	
9	To generate a Triangular & Sine wave waveform using DAC interface to 8051.	**CO3, CO4, CO5**
10	To interface stepper motor to 8051 micro-controller to rotate clockwise and anticlockwise continuously. Modify the program to rotate the motor clockwise/anticlockwise for a given angle or number of steps.	**CO3, CO4, CO5**

Open ended Programs		
1	To interface LCD display with 8051 controller and display any message.	**CO2,CO3, CO4, CO5**
2	To interface DC motor with 8051 controller to control its speed and direction.	**CO2,CO3, CO4, CO5**
3	To interface Hex Keypad with 8051 controller to display the hexadecimal numbers.	**CO2,CO3, CO4, CO5**
4	To interface 7 segment display with 8051 controller to up/down count the hexadecimal numbers.	**CO2,CO3, CO4, CO5**

CIE for Principles of Programming Using C (Integrated Professional Core Course (IPCC)):

This Course refers to professional theory core course integrated with practical. Credit for this course can be 03 and its Teaching Learning hours (L : T : P: S) can be considered as (2 : 0 : 2 : 0).

15 marks for the conduction of practical experiment and preparation of the Laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.

On completion of every program in the laboratory, the student shall be evaluated including viva-voce and marks shall be awarded on the same day.

Each program report can be evaluated for **15 marks** (Write-up – 3 marks, Execution – 8 marks .and Viva – 4 marks)

The Laboratory test (duration 2 hours / 3 hours) after completion of all the programs shall be conducted for 50 marks and scaled down to **10 marks.**

The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. This course is common to all branches of first year B.E/B.Tech. 2023-24 regulation.

Note: L- Theory Lecture, T- Tutorial, P-Practical, S-Project, IPCC: Integrated Professional Core Course, CIE: Continuous Internal Evaluation, SEE: Semester End Examination.

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	"The 8051 Microcontroller", Kenneth J. Ayala, 3rd Edition, Thomson/Cengage Learning.
2	"The 8051 Microcontroller and Embedded Systems – using assembly and C", Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; 2nd Edition, 2014 / Pearson, 2014.
3	"The Definitive Guide to the ARM CORTEX - M3", Joseph Yiu, Second Edition, 2010.
Reference Books	
1	"The 8051 Microcontroller Based Embedded Systems", Manish K Patel, McGraw Hill, 2014, ISBN: 978-93-329-0125-4.
2	"Microcontrollers: Architecture, Programming, Interfacing and System Design", Raj Kamal, Pearson Education, 2005.

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Understand the fundamental knowledge of 8051 architectures, its instruction sets, addressing modes and basics of ARM Architecture.	L2	Understand
CO2	Apply the logic to write the assembly code and Embedded C code to interface on chip peripherals and External devices.	L3	Apply
CO3	Analyse assembly program and embedded C program for on chip peripherals: UART, timers/counters and external devices such as DAC and stepper motor.	L4	Analyse
CO4	Evaluate assembly program and embedded C program for timers/counters and external devices such as DAC, etc with various test cases.	L5	Evaluate
CO5	Implement solution to the real time problems with 8051 microcontroller using EDA tools or online simulators.	L3	Design

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2	3												3	2	
CO3		3											2	2	
CO4			3										2	2	
CO5				3	2				2	2			2	2	

Weblinks and Video Lectures (e-Resources)	
1	https://nptel.ac.in/courses/108105102
2	https://github.com/gmostofabd/8051-Assembly-Programming-and-Proteus-Simulation/blob/main/README.md

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember				
Understand	20	20		
Apply	20	20		
Analyse	10	10		10
Evaluate			25	20
Create			25	20

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	10	10			10	10	40	40%
CO2		10	10	10	10		40	40%
CO3	10					10	20	20%
CO4								
CO5								
Total	20	20	10	10	20	20	100	

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	10%
Understand	40%
Apply	30%
Analyse	20%
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module 3	Module-4	Module-5		
CO1	6	8	10	6	10	40	40%
CO2	7	7	10	8	10	42	42%
CO3	7	5		6		18	18%
CO4							
CO5							
Total	20	20	20	20	20	100	

PROFESSIONAL CORE COURSE (PCC)

PCC Course - Professional Core Course

Teaching Hours/Week (L: T:P: S)	3:0:0:0
Total Hours of Pedagogy	40 hours
Credits:	03
Each Module	8 Hrs
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Theory

3 Credit Course – Professional Core Course (PCC)

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Internal Assessment Test (IAT):

- For the Internal Assessment Test component of CIE, there are 25 marks and for Assignment component of the CIE, there are 25 marks. Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 25 marks
  - The first test will be administered after 40-50% of the syllabus has been covered, and
  - The second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

- Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Blooms RBT Levels. Emphasis to be given for higher order RBT levels

Semester-End Examination:

Theory SEE will be conducted as per the scheduled timetable (duration 03 hours).

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be CCA1+CCA2 and scaled down to **25 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The evaluation includes either through quiz or rubrics
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **25 Marks** after and review 2 of **25 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **25 Marks**

Total Marks scored for theory component of CIE (IAT+ CCA) is **50 Marks**

Possible Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom,
- The assessment of these techniques shall be in rubrics.
- The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

Professional Core Course (PCC) – 3 Credit course – Theory

Assessment Method	Component	Type of Assessments	Syllabus Coverage	Maximum Marks	Average	Reduced Marks	Minimum Passing Marks	Evaluation Details
Total CIE Theory + Practical				**50**	----	----	**20**	
	Theory	Internal Assessment Test (IAT) - II	Module – 1 to 2.5	50	(50+50) / 2	**25**	10	Average of Two Internal test each of 50 Marks scale down the marks to 25 Marks
		Internal Assessment Test (IAT) - II	Module – 2.5 to 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives / Activity Based learning	Considering all the Modules	50	(50+50) / 2	**25**	10	Two CCA methods as per VTU Clause 22OB4.2 of regulations to be adopted. If CCA chosen is Project Based Learning, then one assessment method may be adopted
		CCA-2- Pedagogical Initiatives / Activity Based learning		50				
	Total CIE Theory					**50**	20	Total Marks of IAT and CCA is 50

SEE		Theory exam	Entire theory syllabus including questions from lab Component in respective Modules	100	----	50	20	SEE Exam is theory Exam conducted for 100 Marks, scored Marks are scaled down to 50 Marks
			CIE + SEE	100	----	----	40	

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**5th Semester**				
Course Title	**:**	**Engineering Electromagnetics**				
Course Code	**:**	**BEC504**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Theory**				
Category	**:**	**PCC**				
Stream	**:**	**ECE**		**CIE**	**:**	**50 Marks**
Teaching hours/ week (L:T:P:S)	**:**	**4:0:0:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**40**		**SEE Duration**	**:**	**03 hours**
Credits	**:**	**03**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Learn the concepts of Coulombs law, Gauss's law to different charge distributions, the effect of magnetic forces, materials and inductance and Maxwell's equation
2	Examine Laplace and Poisson's equation to solve problems on capacitance for different charge distributions.
3	Survey the physical significance of Biot-savart law, ampere's law and stokes theorem, for different current distributions and behaviour of uniform plane waves in different medium
4	Assess problems on electrostatic law, magnetic laws and uniform place waves
5	Visualise and interpret the field behavior from simulation results of electromagnetic field theory.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

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Scheme of Teaching and Examinations for BE Programme -2025-26
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Coulomb's Law, Electric Field Intensity and Flux density**: Experimental law of Coulomb, Electric field intensity, Field due to continuous volume charge distribution, Field of a line charge, Field due to Sheet of charge, Electric flux density, Numerical Problems. **(Text: Chapter 2.1 to 2.5, 3.1)** **Gauss's Law and Divergence**: Gauss 'law, Application of Gauss' law to Point Charge, line charge, Surface charge and Volume Charge, Point (differential) form of Gauss law, Divergence. Maxwell's First Equation (Electrostatics), Vector Operator ▼ and divergence theorem, Numerical Problems. (**Text: Chapter 3.2 to 3.7)**	8
Pedagogy	**Problem Solving**	
2	**Energy and Potential:** Energy expended or work done in moving a point charge in an Electric field, The line integral, definition of potential difference and potential, the potential field of a point charge , potential gradient, Numerical Problems **(Text: Chapter 4.1 to 4.4 and 4.6)** Conductors and Dielectrics: Current and Current density, Continuity of current. **(Text: Chapter 5.1, 5.2)** **Poisson's and Laplace's Equations**: Derivation of Poisson's and Laplace's Equations, Examples of the solution of Laplace's equation, Numerical problems on Laplace's equation **(Text: Chapters 6.6 and 6.7)**	8
Pedagogy	**Fliped Class**	
3	**Steady Magnetic Field**: Biot-Savart Law, Ampere's circuital law, Curl, Stokes' theorem, Magnetic flux and flux density,, the scalar and vector magnetic potentials (**Text: Chapters 7.1 to 7.6)** **Magnetic Forces**: Force on a moving charge, differential current element and Force between differential current elements, Numerical problems. **(Text: Chapter 8.1 to 8.3)**	8
Pedagogy	**Poster Presentation:**	
4	**Magnetic Materials**: Magnetization and permeability, Magnetic boundary conditions, the magnetic circuit, potential energy and forces on magnetic materials, inductance and mutual inductance, problems **(Text: Chapter 8.6 to 8.10)** **Time Varying fields and Maxwell's equation:** Faraday's law, displacement current, Maxwell's equations in Integral form and Point form, Numerical problems. **(Text: Chapter 9.1 to9.4)**	8
Pedagogy	**Quiz**	
5	**The Uniform Plane Wave**: Wave propagation in free space, Uniform plane wave derivation from Maxwell's equations, Poynting's Theorem, Depth of penetration, Numerical problems. **(Text: Chapter 11.1, 11.3, 11.4.2)** **Plane Wave Reflection and Dispersion:** Reflection of Uniform Plane Waves at Normal Incidence, Standing Wave Ratio, Plane Wave Propagation in general directions, Numerical Problems **(Text: Chapter 12.1, 12.2, 12.4)**	8
Pedagogy	**Case studies**	

	Pedagogical Initiatives (Not limited to): **Problem Solving:** encourages cognitive thinking and enables creative problem solving **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. **Case studies:** maps different domains in real time applications **Demonstration:** exhibits the implementation process

3 Credit Course – Professional Core Course (PCC)

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	W.H. Hayt and J.A. Buck, ―Engineering Electromagnetics, 9th Edition, Tata McGraw- Hill, 2018.

Reference Books	
1	Elements of Electromagnetics – Matthew N.O., Sadiku, Oxford University press, 4th Edn.
2	Electromagnetic Waves and Radiating systems – E. C. Jordan and K.G. Balman, PHI, 2ndEdn.
3	Electromagnetics- Joseph Edminister, Schaum Outline Series, McGraw Hill.
4	N. Narayana Rao, ―Fundamentals of Electromagnetics for Engineering, Pearson

Course Outcomes:

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Understand the concepts of Coulombs law, Gauss's law to different charge distributions, the effect of magnetic forces, materials and inductance and Maxwell's equation	L1	Understand
CO2	Apply Laplace and Poisson's equation to solve problems on capacitance for different charge distributions.	L2	Apply
CO3	Analyse the physical significance of Biot-savart law, ampere's law and stokes theorem, for different current distributions and behaviour of uniform plane waves in different medium	L3	Analyse
CO4	Evaluate problems on electrostatic law, magnetic laws and uniform place waves	L4	Evaluate
CO5	Illustrate the concepts of electromagnetic field theory using modern tools to simulate ,visualise and solve problem for different charge distributions	L5	Simulate

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2		1											
CO2	3	2		2											
CO3	3	2		1											
CO4	3	2		2											
CO5					2										

Weblinks and Video Lectures (e-Resources)	
1	https://nptel.ac.in/courses/115101005
2	https://nptel.ac.in/courses/115104088

Professional Electives

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**5th Semester**				
Course Title	:	**Introduction to Machine Learning**				
Course Code	:	**BEC505A**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**PCC**				
Stream	:	**ECE**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**(3:0:0:0)**		**SEE**	:	**50**
Total Hours	:	**40**		**SEE Duration**	:	**3 hours**
Credits	:	**03**				

Course Learning Objectives: Students will be able:

Sl. No	Course Objectives
1	**To Study** machine learning concepts, principles, algorithms, and techniques for building a strong foundational understanding.
2	**To Impart the Knowledge** of implementing and applying machine learning algorithms for tasks like classification, regression, clustering, and recommendation.
3	**To Solve Problems** by applying machine learning methods to real-world datasets through data preprocessing, feature engineering, and model deployment.
4	**To Know** how to evaluate, optimize, and fine-tune machine learning models using performance metrics, cross-validation, and hyperparameter tuning.
5	**To Equip** students to explore and work with advanced machine learning topics, including deep learning, natural language processing, and reinforcement learning.

Teaching-Learning Process Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in Control Systems.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.

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Course Curriculam

Module No.	Topics	Hours
1	**Overview of Artificial Intelligence and Machine Learning**: Need for Machine Learning, Machine Learning and Artificial Intelligence, Machine Learning and Statistics, Types of Machine Learning, Supervised Learning, Unsupervised Learning Semi-supervised Learning, Reinforcement Learning, Challenges of Machine Learning Machine Learning Process, Machine Learning Applications. **Text-1 [1.1-1.7]**	**8 Hours**
Pedagogy		
2	**Introduction to Regression:** Introduction to Regression, Introduction to Linearity, Correlation, and Causation , validation of Regression Methods, Multiple Linear Regression, Polynomial Regression Logistic Regression Ridge, Lasso, and Elastic Net Regression, Ridge Regularization LASSO, Elastic Net **Text-1[5.1-5.8]**	**8 Hours**
Pedagogy	**Think Pair Share**	
3	**Support Vector Machines (SVM),** K-Nearest Neighbors (KNN), Classification Using Bayes Models, Ensemble Methods and Model Evaluation Metrics. **Text-1[11.1-11.2, 8.4, 8.3.1-8.3.4]**	**8 Hours**
Pedagogy	**Mobile Studio**	
4	**Unsupervised Learning Clustering Algorithms:** K-Means, Hierarchical Clustering, Dimensionality Reduction Techniques, Principal Component Analysis (PCA), Association Rule Mining, Anomaly Detection, Evaluation of Unsupervised Models	**8 Hours**
Pedagogy	**Demonstration**	
5	**Case Studies:** To read data from CSV, with pandas library, Split into Features and Target with iloc, Visual Linear Regression with Matplotlib, Visual Linear Regression with Matplotlib, Model: Build, Train, Predict and Evaluate. ML based application in wireless communication and analog circuits.	**8 Hours**
Pedagogy	**Poster Presentation**	

Pedagogical Initiatives (Not limited to):

- **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another
- **Problem Solving**: encourages cognitive thinking and enables creative problem solving
- **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily.
- **Case studies:** maps different domains in real time applications
- **Demonstration:** exhibits the implementation process

CIE for Control Systems (Professional Core Course (PCC)):

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Internal Assessment Test (IAT):

- For the Internal Assessment Test component of CIE, there are 25 marks and for the Assignment component of the CIE, there are 25 marks. Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 25 marks
- The first test will be administered after 40-50% of the syllabus has been covered, and
- The second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.
- Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Blooms RBT Levels. Emphasis to be given for higher order RBT levels

Semester-End Examination:

Theory SEE will be conducted as per the scheduled timetable (duration 03 hours).

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for

50 Marks. Total Marks scored will be CCA1+CCA2 and scaled down to **25 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The evaluation includes either through quiz or rubrics
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **25 Marks** after and review 2 of **25 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **25 Marks**

Total Marks scored for theory component of CIE (IAT+ CCA) is **50 Marks Possible**

Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair- Share, Flipped classroom.
- The assessment of these techniques shall be in rubrics.

The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC)..

Note: L- Theory Lecture, T- Tutorial, P-Practical, S-Project, IPCC: Integrated Professional Core Course, CIE: Continuous Internal Evaluation, SEE: Semester End Examination.

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	MACHINE LEARNING Paperback – 1 June 2021 S Sridhar (Author), M Vijayalakshmi (Author) Oxford University Press; 1st edition (1 June 2021); Oxford University Press
2	Machine Learning by S.Sridhar & M.Vijayalakshmi
Reference Books	
1	Pattern Recognition and Machine Learning" by Christopher M. Bishop
2	Machine Learning: A Probabilistic Perspective" by Kevin P. Murphy
e- Resources & other digital material	
1	https://onlinecourses.nptel.ac.in/noc23 ee87/preview https://onlinecourses.nptel.ac.in/noc23_cs18/preview

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	**Understand** the foundational concepts, algorithms, and methodologies of machine learning to build strong theoretical knowledge.	L2	Understand
CO2	**Apply** a variety of machine learning algorithms to solve classification, regression, clustering, and recommendation problems.	L3	Apply
CO3	**Analyze** model performance using evaluation metrics, cross-validation, and hyperparameter tuning for data-driven decision-making.	L4	Analyze
CO4	**Evaluate** and solve real-world problems by preprocessing data, engineering features, deploying models, and assessing outcomes.	L4	Design & Demonstrate
CO5	**Compare** to explore and implement advanced machine learning topics such as deep learning, natural language processing, and reinforcement learning.	L5	Design & Demonstrate

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1															
CO2	3														
CO3		3													
CO4			3		2				2						
CO5				3		2		2		2		2	2	2	2

Web links and Video Lectures (e-Resources)	
1	https://onlinecourses.nptel.ac.in/noc21_cs35/course

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember				
Understand	20	20		
Apply	20	20		
Analyze	10	10		
Evaluate			50	
Create				50

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	10	10		10			30	30%
CO2	10		10		10	10	40	40%
CO3		10			10	10	30	30%
CO4								
CO5								
Total	20	20	10	10	20	20	100	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	-
Understand	40
Apply	40
Analyze	20
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module 3	Module-4	Module-5		
CO1	10	10	10			30	30%
CO2	10		10	10	10	40	40%
CO3		10		10	10	30	30%
CO4							
CO5							
Total	20	20	20	20	20	100	100%

Dayananda Sagar Academy of Technology & Management
(Autonomous Institute under VTU)

Semester	:	**5th Semester**		
Course Title	:	**Data Structures Using C++**		
Course Code	:	**BEC505B**		
Course Type (Theory/Practical/Integrated)	:	**Theory**		
Category	:	**PEC**		
Stream	:	**ECE**	**CIE**	**50 Marks**
Teaching hours/ week (L: T:P:S)	:	**3:0:0:0**	**SEE**	**50 Marks**
Total Hours	:	**40Hrs**	**SEE Duration**	**3 Hours**
Credits	:	**03**		

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the principles of Object-Oriented Programming and C++ foundations.
2	Learn the use of classes, objects, inheritance, polymorphism, and templates.
3	Explore and implement fundamental data structures such as arrays, stacks, queues.
4	Apply linear and non-linear data structures like linked lists, trees, graphs.
5	Develop and analyze C++ programs using dynamic memory, STL, and hashing.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

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COURSE CURRICULUM

Module No.	Topics	Hours
1	**C++ Programming Foundations:** C++ and its features, Data types, Variables, Operators, Expressions, Control structures, Functions and parameters, Function overloading, Recursion. **OOP Essentials:** Classes and Objects, Constructors, Destructors and Operator overloading, Inheritance, Polymorphism, Programming examples. **Textbook 2:** 2.1–2.4, 3.1–3.5, 4.1–4.4, 5.1–5.3, 6.2, 7.1, 8.1–8.4, 9.1	8
Pedagogy	**Think–Pair–Share**	
2	**Arrays and Matrices:** Arrays, Matrices, Special matrices, Sparse matrices. **Pointers & Linear Lists:** Pointers, Dynamic memory allocation, Data objects and structures, Introduction to Linear and Non-Linear data structures, Linear list data structures, Array Representation, Vector Representation, Singly Linked Lists and Chains. **Textbook 1:** 1.1–1.6, 2.1–2.4, 3.1–3.5 **Textbook 2:** 11.1–11.5	8
Pedagogy	**Problem Solving**	
3	**Stacks:** The abstract data types, Array Representation, Linked Representation, Applications – Parsing and Evaluation of arithmetic expressions, Parenthesis Matching & Towers of Hanoi. **Queues:** The abstract data type – Array, Linked, Circular Queues, Priority Queues, Deques. Applications – Railroad Car Arrangement, Job Scheduling. **Textbook 1:** 4.1–4.6, 5.1–5.7	8
Pedagogy	**Case Study**	
4	**Hashing:** Dictionaries, Hash table representation, Collision resolution techniques – Linear Probing, Quadratic Probing, Chaining. **STL (Standard Template Library):** Templates – Introduction to Vectors, Lists, Queues, Stacks, Maps. Usage of Iterators, Usage of built-in container classes for data structures. **Textbook 1: 6.1–6.4** **Textbook 2: 14.1–14.5**	8
Pedagogy	**Simulation**	
5	**Trees & Heaps:** Binary Trees – Properties and Representations, Common Binary Tree Operations, Tree Traversals – Inorder, Preorder, Postorder, Binary Search Tree – Operations and Implementation. Heaps: Binary Heap, Min-Heap and Max-Heap, Applications – Heap Sort, Priority Queues.	8

	Graphs: Graph Representations – Adjacency Matrix and Adjacency List, Traversal Algorithms – Depth First Search (DFS), Breadth First Search (BFS). **Textbook 1:** 7.1–7.6, 8.1–8.5, 9.1–9.4	
Pedagogy	**Demonstration & Poster Presentation**	
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Internal Assessment Test (IAT):

- For the Internal Assessment Test component of CIE, there are 25 marks and for Assignment component of the CIE, there are 25 marks. Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 25 marks.
    - The first test will be administered after 40-50% of the syllabus has been covered, and
    - The second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.

For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

- Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Blooms RBT Levels. Emphasis to be given for higher order RBT levels.

Semester-End Examination:

Theory SEE will be conducted as per the scheduled timetable (duration 03 hours).

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be CCA1+CCA2 and scaled down to **25 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The evaluation includes either through quiz or rubrics
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **25 Marks** after and review 2 of **25 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **25 Marks**

Total Marks scored for theory component of CIE (IAT+ CCA) is **50 Marks**

Possible Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom,
- The assessment of these techniques shall be in rubrics.

The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

TEXTBOOKS					
SINO	**Unit**	**Textbook Title**	**Author(s)**	**Publisher(s)**	**Edition/Year of Publication**
1.	T1	Data structures, Algorithms, and applications in C++	Sartaj Sahni	Universities Press	2nd Edition, 2005
2	T2	Object Oriented Programming with C++	E.Balaguruswamy	TMH	6th Edition, 2013
REFERENCE BOOKS					
1	R1	Data structures, Algorithms, and applications in C++	Sartaj Sahni	Mc. Graw Hill	2000
3	R2	Data Structures and Algorithm Analysis in C++	Mark Allen Weiss	Pearson Education	4th Edition, 2013

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level
CO1	**Understand** C++ features, class design, memory management and object-oriented principles.	**L2**
CO2	**Apply** concepts of recursion, dynamic memory, and class-based design to solve problems.	**L3**
CO3	**Analyze** various linear data structures such as arrays, linked lists, stacks, and queues for problem-solving.	**L4**
CO4	**Evaluate** binary trees, heaps, and graph traversal algorithms efficiently.	**L5**
CO5	**Create** well-structured, reusable, and efficient code using C++ features in real-world scenarios.	**L6**

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	-		
CO2	**3**	-	-	-	-	-	-	-	-	-	-	-	**3**	
CO3		**3**											**3**	
CO4			**3**										**3**	
CO5				**3**	**3**				**2**	**2**			**3**	

Weblinks and Video Lectures (e-Resources)		
1	NPTEL: Data Structures and Algorithms – 12-week course by Prof. Naveen Garg (IIT Delhi)	https://archive.nptel.ac.in/courses/106/105/106102064/
2	GeeksforGeeks – Data Structures in C++)	https://www.geeksforgeeks.org/data-structures/
3	MIT OCW – Practical Programming in C (includes DS concepts)	https://ocw.mit.edu/courses/6-087-practical-programming-in-c-january-iap-2010/
4	w3schools – C++ Tutorial	https://www.w3schools.com/cpp/
5	Sanfoundry – C++ Programming Examples and DS Problems	https://www.sanfoundry.com/cplusplus-programming-examples-data-structure/
6	Princeton University – Algorithms and DS (Java focus, concepts applicable)	https://algs4.cs.princeton.edu/
7	YouTube – Jenny's Lectures C++ STL and Data Structures	https://www.youtube.com/playlist?list=PLdo5W4Nhv31bZSiqiOL5ta39vSnBxpOPT
8	Coursera – Data Structures by UC San Diego & NIIT (C++ focus)	https://www.coursera.org/learn/data-structures
9	Javatpoint – C++ and DS tutorials	https://www.javatpoint.com/cpp-tutorial
10	C++ Reference – STL and Containers	https://en.cppreference.com/w/cpp

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**5th Semester**				
Course Title	:	**Fundamentals of Computer Vision**				
Course Code	:	**BEC505C**				
Course Type **(Theory/ Practical/ Integrated)**	:	**Theory**				
Category	:	**PCC**				
Stream	:	**ECE**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50**
Total Hours	:	**40**		**SEE Duration**	:	**3Hrs**
Credits	:	**3**				

Course Learning Objectives: Students will be able :

Sl. No	Course Objectives
1	**To Study** the fundamental concepts of computer vision, including image formation, edge and corner detection, pattern recognition, object detection, and video analysis.
2	**To Impart** the Knowledge of real-world computer vision applications across domains like healthcare, transportation, security, and entertainment, and to introduce students to practical tools and methods used in the field.
3	**To Solve Problems** related to image and video understanding, such as feature extraction, classification, object detection, motion analysis, and tracking using basic algorithms and techniques.
4	**To Know** digital images are processed by computers, how features are extracted and matched, and how recognition systems are built and evaluated.

5	**To Equip** with the skills to implement simple computer vision tasks, including feature detection, classification, video frame processing, motion detection, and object tracking using conceptual and hands-on approaches.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- *Adopt different teaching methods to attain the course outcomes.*
- *Include videos to demonstrate various concepts in Network Analysis.*
- *Encourage collaborative (Group) Learning to encourage team building.*
- *Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.*
- *Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.*
- *Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.*
- *Discuss various case studies to map with real-world scenarios and improve the understanding.*
- *Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.*

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Scheme of Teaching and Examinations for BE Programme -2025-26

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**INTRODUCTION TO COMPUTER VISION:** Simple definition and examples**,** Difference between human vision and computer vision, Basic computer vision pipeline: Common applications everyone can relate to: Phone cameras and filters**,** Google Photos face detection code scanners Social media photo tagging. **Real-World Applications**: Transportation: Self-driving cars, traffic monitoring, Healthcare: X-ray analysis, skin cancer detection. Basic Image Understanding: Quick review of digital images, Color vs. grayscale images. Image size and resolution concepts Basic image operations (brightening, contrast)	**8 Hours**
Pedagogy	**Flipped Classroom**	
2	**EDGE AND CORNER DETECTION :** **Edge Detection - Finding Boundaries:** Simple edge detection methods, Canny edge detection, Applications: Object outline detection, document scanning. Corner Detection: Harris corner detector, Applications: Image matching, object tracking. **Basic Feature Matching: F**eature matching, Match features between two images, Simple distance measures, Applications: Photo stitching, object recognition. Practical Exercise**:** Match features between image pairs.	**8 Hours**
Pedagogy	**Think Pair Share**	
3	**BASIC PATTERN RECOGNITION:** Pattern Recognition Basics, Training vs. testing concept, Simple classification examples**.** Measuring performance: accuracy, errors**.** Practical Exercise: Classify simple shapes**,** **k**-Nearest Neighbours (k-NN) - easy to understand**.** Decision trees - visual and intuitive, Basic concept of Support Vector Machines. Practical **Exercise:** Implement k-NN classifier, Feature Selection and Reduction, Principal Component Analysis (PCA) - basic concept, selecting important features, **Practical Exercise**: Apply PCA to reduce image dimensions	**8 Hours**
Pedagogy	**Mobile Studio**	

4	**OBJECT DETECTION AND RECOGNITION:** Template Matching, to find objects using templates, Limitations and challenges**,** Applications: Logo detection, part inspection, Practical **Exercise:** Find objects using templates Simple Object Detection, Sliding window approach, Face detection basics (Haar features concept), Object vs. background separation. Practical Exercise: Detect faces in images, Basic Recognition Systems. Bag-of-words model (simplified), Building a simple recognition system, Training and testing process	**8 Hours**
Pedagogy	**Demonstration**	
5	**WORKING WITH VIDEOS:** Video as sequence of images**,** Frame rate and video formats Extracting frames from videos. **Practical Exercise:** Extract and display video frames, Motion Detection, Background subtraction method, Finding moving objects, Applications: Security cameras, traffic monitoring Practical Exercise: Detect motion in videos, Simple Object Tracking ,Template-based tracking, Challenges in tracking.	**8 Hours**
Pedagogy	**Poster Presentation**	
	Text Books	
1.	"Computer Vision: Algorithms and Applications" by Richard Szeliski	
2.	"Learning OpenCV 4" by Adrian Kaehler and Gary Bradski	

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	**Understand** the fundamental concepts of computer vision, including digital images, image features, and real-world applications across domains.	L2	Understand
CO2	**Apply** basic techniques such as edge detection, corner detection, feature matching, and classification methods to solve simple computer vision problems.	L3	Apply
CO3	**Analyze** image properties, object boundaries, and video frames to identify patterns and extract meaningful features for recognition.	L4	Analyze
CO4	**Evaluate** the performance of different vision algorithms such as k-NN, PCA, and template matching in object detection and tracking tasks.	L4	Design & Demonstrate
CO5	**Develop** the simple end-to-end computer vision systems for tasks such as face detection, motion tracking, and object recognition using image and video data.	L5	Design & Demonstrate

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2	3														
CO3		3													
CO4			3		2				2						
CO5				3		2		2		2		2	2	2	2

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember				
Understand	20	20		
Apply	20	20		
Analyse	10	10		
Evaluate			50	
Create				50

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	10	10		10			30	30%
CO2	10		10		10	10	40	40%
CO3		10			10	10	30	30%
CO4								
CO5								
Total	20	20	10	10	20	20	100	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	-
Understand	40
Apply	40
Analyse	20
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module 3	Module-4	Module-5		
CO1	10	10	10			30	30%
CO2	10		10	10	10	40	40%
CO3		10		10	10	30	30%
CO4							
CO5							
Total	20	20	20	20	20	100	100%

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**5th Semester**				
Course Title	**:**	**Micro-Electro-Mechanical Systems**				
Course Code	**:**	**BEC505D**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Theory**				
Category	**:**	**PCC**				
Stream	**:**	**ECE**		**CIE**	**:**	**50**
Teaching hours/ week (L:T:P:S)	**:**	**3:0:0:0**		**SEE**	**:**	**50**
Total Hours	**:**	**40**		**SEE Duration**	**:**	**3Hrs**
Credits	**:**	**3**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Introduce students to MEMS and Microsystems, their applications and markets.
2	Explore the working principles of sensors, actuators, and the science behind microdevice behavior.
3	Understand mechanical modeling and analysis for micro-scale systems.
4	Explain scaling laws and their impact on device miniaturization.
5	Familiarize students with micromanufacturing techniques and processes.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in Network Analysis.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal.

Scheme of Teaching and Examinations for BE Programme -2025-26
Outcome Based Education and Choice Based Credit System (CBCS)
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COURSE CURRICULUM

Module No.	Topics	Hours
1	**Overview of MEMS and Microsystems: ch 1** MEMS and Microsystem, Typical MEMS and Microsystems Products, Evolution of Microfabrication, Microsystems and Microelectronics, Multidisciplinary Nature of Microsystems, Miniaturization. Applications and Markets.	8
Pedagogy	**Inquiry-Based Learning**	
2	**Working Principles of Microsystems: ch 2** Introduction, Microsensors, Micro actuation, MEMS with Micro actuators, Micro accelerometers, Microfluidics. Engineering Science for Microsystems Design and Fabrication: Introduction, Molecular Theory of Matter and Inter-molecular Forces, Plasma Physics, Electrochemistry.	8
Pedagogy	**Flipped Classroom**	
3	**Engineering Mechanics for Microsystems Design: Ch 4& 5** Introduction, Static Bending of Thin Plates, Mechanical Vibration, Thermo mechanics, Fracture Mechanics, Thin Film Mechanics, Overview on Finite Element Stress Analysis. Basics of fluid mechanics, laminar fluid flow, CFD.	8
Pedagogy	**Blended Learning**	
4	**Scaling Laws in Miniaturization: Ch 6 & 7** Introduction, Scaling in Geometry, Scaling in Rigid-Body Dynamics, Scaling in Electrostatic Forces, electromagnetic forces, electricity, Scaling in Fluid Mechanics, Scaling in Heat Transfer. Material for MEMS – introduction, substrate and wafers, silicon, gallium arsenide, polymers.	8
Pedagogy	**Problem Solving**	
5	**Overview of Micromanufacturing: Ch 9 & 10** Introduction, Bulk Micromanufacturing, Surface Micromachining, The LIGA Process, Summary on Micromanufacturing, Micro systems design, Design considerations, process design, mechanical design, design of a silicon die for a micro pressure sensor	8
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Tai-Ran Hsu, MEMS and Micro systems: Design, Manufacture and Nanoscale Engineering, 2nd Ed, Wiley.
Reference Books	
1	Hans H. Gatzen, Volker Saile, JurgL euthold, Micro and Nano Fabrication: Tools and Processes, Springer, 2015.
2	Dilip Kumar Bhattacharya, Brajesh Kumar Kaushik, Microelectromechanical Systems (MEMS), Cengage Learning.
3	Fundamentals of Microelectromechanical Systems (MEMS), 1st Edition, Eun Sok Kim, 2021

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	**Understand** the principles and materials used in MEMS	**L2**	**Understand**
CO2	**Apply** the concepts of microfabrication and micromachining processes	**L3**	**Apply**
CO3	**Analyze** MEMS devices such as sensors and actuators	**L3**	**Analyze**
CO4	**Evaluate** performance characteristics of MEMS structures	**L4**	**Evaluate**
CO5	**Design** and simulate simple MEMS-based systems	**L5**	**Design**

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**												**2**		
CO2	**3**	**2**											**2**		
CO3	**3**	**2**	**2**										**3**		
CO4	**2**		**2**										**2**		
CO5	**2**												**2**		

Weblinks and Video Lectures (e-Resources)	
1	https://nptel.ac.in/courses/117105082
2	https://archive.nptel.ac.in/courses/108/108/108108113/
3	https://www.youtube.com/watch?v=2Q_1hwG7VQc&list=PLmTI1qSExyyzoe1blSCW8I04ukFszaSw2
4	https://www.coursera.org/learn/micro-electromechanical-systems

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember				
Understand	05	05		
Apply	20	25	25	20
Analyse	25	20	25	25
Evaluate				05
Create				

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	5	5			5	5	20	20%
CO2	10	10		10	10		40	40%
CO3		10	10		10	10	40	40%
CO4								
CO5								
Total	15	25	10	10	25	15	100	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	-
Understand	20
Apply	40
Analyse	40
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	5	5			5	5	20	20%
CO2	10	10		10	10		40	40%
CO3		10	10		10	10	40	40%
CO4								
CO5								
Total	15	25	10	10	25	15	100	100%

ABILITY ENHANCEMENT COURSE (AEC)

AEC Course – Ability Enhancement Course

Teaching Hours/Week (L: T:P: S)	0:0:2:0
Total Hours of Pedagogy	24 hours Practical
Credits:	01
Programs / Experiments	12
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Practical (Internal Examiners only)

1 Credit Course – Practical

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.

The minimum passing mark for the CIE is 40% of the maximum Marks (20 Marks out of 50).

The minimum passing mark for the SEE is 35% of the maximum Marks (18 Marks out of 50).

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the Semester-End Examination (SEE), and a minimum of 40% (40 Marks out of 100) in the total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are 50 Marks. The split-up of CIE marks for record/ journal and test are in the ratio 60:40.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the

syllabus.

- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to 20 marks (40% of the maximum marks). The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

SEE marks for the practical course are 50 Marks.

- SEE shall be conducted jointly by the two examiners of the same institute; examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University. All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered by the examiners or based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
- General rubrics suggested for SEE are mentioned here,
    - Writeup-20%,
    - Conduction procedure and result in -60%,
    - Viva-voce 20% of maximum marks.

  SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)
- Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.
- The minimum duration of SEE is 02 hours.

Dayananda Sagar Academy of Technology & Management

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Semester	:	**5th Semester**				
Course Title	:	**Research Methodology and Intellectual Property Right (RMIPR)**				
Course Code	:	**BRM507x**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**AEC**				
Stream	:	**Common to all branches**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**1:0:0:0**		**SEE**	:	**50**
Total Hours	:	**15 Hours**		**SEE Duration**	:	**1 hours**
Credits	:	**01**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the knowledge on basics of research and its types.
2	Learn the concept of Literature Review, Technical Reading, Attributions and Citations.
3	Learn Ethics in Engineering Research.
4	Discuss the concepts of Intellectual Property Rights in engineering

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

DSATM

Scheme of Teaching and Examinations for BE Programme -2025-26
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2025-26)

COURSE CURRICULUM		
Module No.	**Topics**	**Hours**
1	**Introduction**: Objectives of Engineering Research, and Motivation in Engineering Research, Types of Engineering Research, Finding and Solving a Worthwhile Problem. Ethics in Engineering Research, Ethics in Engineering Research Practice, Types of Research Misconduct, Ethical Issues Related to Authorship. **Tools:** Undermind, Litmaps, Bohrium, Perplexity.	**3**
	Textbook1: Chapter1	
Pedagogy	**Think-Pair-Share**	
2	**Literature Review and Technical Reading**, New and Existing Knowledge, Analysis and Synthesis of Prior Art Bibliographic Databases, Web of Science, Google and Google Scholar, Effective Search: The Way Forward Introduction to Technical Reading Conceptualizing Research, Critical and Creative Reading. **Tools:** Google Scholar, IEEE Xplore, ACM Digital Library, PubMed, Scopus, Web of Science, arXiv, bioRxiv, Semantic Scholar, Connected Papers / Research Rabbit	**3**
	Textbook 1: Chapter2	
Pedagogy	**Literature Review Paper Writing and Demo of the same**	
3	**Paper Writing:** Identification of research problem, Paper writing as per IEEE format, Introduction to LaTeX, Plagiarism Checking **Attributions and Citations**: Giving Credit Wherever Due, Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge Flow through Citation, Citing Datasets, Styles for Citations. **Tools:** Grammarly, QuillBot,LaTeX , Jenni.AI, Turnitin , Mendeley , Zotero, Scite.ai, PubMed, ResearchRabbit, Scispace, Speechify.	**3**
	Text Book1: Chapter 3.	
Pedagogy	**Case study, Patent Proposal Writing**	
4	**Introduction to Intellectual Property:** IP as a Global Indicator of Innovation, Origin of IP History of IP in India. Major Amendments in IP Laws and Acts in India. **Patents:** Rights Associated with Patents, Enforcement of Patent Rights, Inventions Eligible for Patenting, Non-Patentable Matters, Patent Infringements, Avoid Public Disclosure of an Invention before Patenting. Process of Patenting, Prior Art Search. Choice of Application to be Filed. Patent Application Forms, Jurisdiction of Filing Patent Application, Publication, Pre-grant Opposition, Examination. Grant of a Patent, Validity of Patent Protection, Post-grant Opposition, Commercialization of a Patent, Need for a Patent Attorney/Agent.	**3**

	Tools: PatentPal, WIPO Lex/GPT-based querying, Google Patents, IPfolio/TurboPatent,WIPO, TrademarkNow Advisor, DesignSearch.ai, DesignShelf, Legal Robot	
	Text Book1: Chapter 4,5,6	
5	**Copyrights and Related Rights**: Classes of Copyrights. Criteria for Copyright. Ownership of Copyright. Copyrights of the Author. Copyright Infringements. Copyright Infringement **Trademarks**: Designation of Trademark Symbols. Classification of Trademarks. Registration of a Trademark is Not Compulsory. Validity of Trademark. Types of Trademark Registered in India, Process for Trademarks Registration, Case Study: Coca-Cola Company vs. Bisleri International Pvt. Ltd. **Tools:** WIPO Lex, Google Scholar (Case Law), HeinOnline, LexisNexis / Westlaw, SCOPUS / Web of Science, Plagscan / Turnitin, WIPO Copyright Registration Tools, Scholarcy, Elicit	**3**
	Text Book1: Chapter 7,8	
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1.	Research Methodology and Intellectual Property Rights , Dr. Santosh M Nejakar, Dr. Harish Bendigeri, ISBN 978-93-5987-928-4, Edition: 2023-24.
Reference Books	
1.	Research Methods for Engineers, David V. Thiel , Cambridge University Press, 978-1-107-03488-4
2.	Intellectual Property Rights, N.K.Acharya Asia Law House 6th Edition. ISBN: 978-93-81849-30-9
3.	Research Methodology – Methods and Techniques., C. R Kothari, Gourav Garg, New Age International Publishers.

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Acquire the knowledge of research and conduct a literature review.	Understand	L2
CO2	Apply the knowledge of research design, Citations, and the concepts of research methodology to a problem.	Apply	L3
CO3	Write an effective research paper for a given problem statement and Analyze data collection methods.	Analyze	L4
CO4	Choose Indian patent applications, Patent laws, Gain the requirements about registration and infringements related to trademarks, & copyrights.	Evaluate	L5

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	2	-	-	3	-	3	-	3	2	-	-
CO2	-	-	-	2	2	-	-	3	-	3	-	3	-	-	-
CO3	-	-	-	2	3	-	-	3	-	2	-	3	-	-	-
CO4	-	-	-	-	2	-	-	3	-	3	-	3	-	2	2

Weblinks and Video Lectures (e-Resources)	
1	https://onlinecourses.nptel.ac.in/noc24_ge21/preview
2	https://archive.nptel.ac.in/content/syllabus_pdf/121106007.pdf
3	https://onlinecourses.nptel.ac.in/noc21_hs08/preview

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember	-	-	-	-
Understand	20	-	10	-
Apply	20	10	20	20
Analyse	10	20	10	20
Evaluate	-	20	5	5
Create	-		5	5

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1(50)			Test-2(50)				
	Module -1	Module -2	Module 2 to 2.5	Module -2.5 to 3	Module -4	Module -5		
CO1	10	10	-	-	-	-	20	50 Marks
CO2	5	5	10	-	-	0	20	
CO3	5	5	-	10	10		30	
CO4	-	-	-	-	10	5	15	
CO5	-	-	-	-	-	15	15	
Total	20	20	10	10	20	20	100	

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks
	(90% Theory+10% Practical Questions)
Remember	-
Understand	20
Understand	20
Understand	30
Understand	15
Understand	15

SEE Course Plan

CO's	Marks Distribution						Total Marks	Weightage
	Module -1	Module -2	Modul e 2 to 2.5	Module -2.5 to 3	Module -4	Module -5		
CO1	5	5	5	0	**0**	0	15	50 Marks
CO2	5	5	5	0	**5**	0	20	
CO3	5	5	0	5	**5**	5	25	
CO4	5	5	0	5	5	5	25	
CO5	**0**	0	0	0	5	10	15	
Tota l	20	20	10	10	20	20	100	

COs Mapped with POs and PSOs:

CO	PO	PSO
CO1	-	-
CO2	PO1,PO2,PO5	PSO1
CO3	PO1,PO2,PO5	-
CO4	PO1,PO3	PSO2
CO5	PO1,PO2,PO3,PO5,PO12	PSO1

6th SEMESTER

INTEGRATED PROFESSIONAL CORE COURSE (IPCC)

IPCC Course – Integrated Professional Core Course

Teaching Hours/Week (L: T:P: S)	3:0:2:0
Total Hours of Pedagogy	40 hours Theory + 20 Hours of Practical Classes
Credits:	04
Theory - Each Module	8 Hrs
Practical's	8-10 Programs / Experiments
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Theory

- The theory part of the IPCC shall be evaluated both by CIE and SEE.
- The practical part shall be evaluated by only CIE (no SEE).
- However, questions from the practical part of IPCC shall be included in the SEE question paper.

Integrated Professional Core Course (IPCC) - 4 Credit Course

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE) for the Theory component of the IPCC (Maximum marks 50)

Internal Assessment Test (IAT):

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are 25 marks and that for the practical component is 25 marks.
- 25 marks for the theory component are split into 15 marks for two Internal Assessment Tests (Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 15 marks) and 10 marks for Two Continuous Comprehensive Assessment(CCA) methods.

- The first Internal test at the end of 40-50% coverage of the syllabus
- The second Internal test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for 25 marks).
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Revised Blooms Taxonomy (RBT) Levels. Emphasis to be given for Higher order Thinking Skills(HOTS).

Continuous Internal Evaluation (CIE) for the practical component of the IPCC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and Marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report, **05 Marks** are for conducting the experiment, **05 Marks for** preparation of the laboratory record, **5 Marks** for conducting Open Ended Experiments Each experiment. Marks of all experiments' write-ups are added to 15 marks.
- The Practical laboratory test **(duration 03 hours)** at the end of the 15th week of the semester/after completion of all the experiments (whichever is early) shall be conducted for **50 Marks** and scaled down to **5 Marks.**
- The open-ended experiment after completion of all the experiments shall be conducted for 20 marks with a split-up for 5 Marks for writeup, 10 Marks for Execution, and 5 Marks for Viva-Voce.
  Marks for writeup, Execution and Viva-Voce is added and scaled down to 05 marks.
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for 25 marks.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

Semester End Examination (SEE) for IPCC Theory

SEE will be conducted as per the scheduled timetable, with common question papers for the course (duration 03 hours)

- The question paper will have ten questions. Each question is set for 20 marks.

- The question paper shall be set for 100 Marks. The medium of the question paper shall be English. **The duration of SEE is 03 hours.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module. The two questions shall be of same course outcome, program outcome and Blooms RBT level. Emphasis to be given for higher order RBT levels.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored by the student shall be proportionally scaled down to 50 Marks.
- The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only.
- Questions mentioned in the SEE paper may include questions from the practical component.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be (CCA1+CCA2)/2 and scaled down to **10 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The Assessment will be through rubrics.
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **20 Marks** after and review 2 of **30 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **10 Marks**

Total Marks scored for theory component of CIE (IAT+ CCA) is **25 Marks**

Possible Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom,
- The assessment of these techniques shall be in rubrics.
- The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

4 Credits Courses – Integrated Professional Core Course (IPCC)

Assessment Method	Component	Type of Assessments	Syllabus Coverage	Maximum Marks	Average	Reduced Marks	Minimum Passing Marks	Evaluation Details
Total CIE Theory + Practical				**50**	----	----	**20**	
CIE	**Theory**	Internal Assessment Test (IAT) - I	Module – 1 to 2.5	50	(50+50) / 2	**15**	6	Average of Two Internal test each of 50 Marks scale down the marks to 15 Marks
		Internal Assessment Test (IAT) - II	Module – 2.5 to 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives / Activity based learning	Considering all the Modules	50	(50+50) / 2	**10**	4	Two CCA methods as per VTU Clause 22OB4.2 of regulations to be adopted. If CCA chosen is Project Based Learning, then one assessment method may be adopted
		CCA-2- Pedagogical Initiatives/ Activity based learning		50				
	Total CIE Theory					**25**	10	Scale down Marks of IAT and CCA to 25

CIE	**Practical**	Conduction of Experiments	Performance-Continuous Evaluation of each experiment	05	15	Average of all Experiments	15	4	Performance of the Experiment (On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. 20 marks are for conducting the experiment and calculations/observations/output)
			Record	05					
			Observation book	05					
		Practical Test	Write up	15	50	----	05	4	One Internal Practical Test after conduction of all Experiments for 50 Marks
			Execution	25					
			Viva-voce	10					
		Open Ended Experiment	Write up	05	20	----	05	2	One experiment for 20 marks. 20 marks reduced to 05 marks
			Execution	10					
			Viva-voce	05					
					Total CIE Practical		**25**	**10**	Scale down Marks of Experiments, Record, Observation, Practical Test and Open-Ended Experiment

SEE		Theory exam	Entire theory syllabus including questions from lab Component in respective Modules	100	----	50	20	SEE Exam is theory Exam conducted for 100 Marks, scored Marks are scaled down to 50 Marks
CIE + SEE				100	----	----	40	

- The Minimum Marks to be secured in CIE to appear for SEE shall be 10 (40% of Maximum Marks – 25) in the Theory Component and 10 (40% of Maximum Marks – 25) in the Practical component.
- The Laboratory Component for the IPCC shall be for CIE only.
- However, in SEE, the Questions from the Laboratory Component shall be included in the respective Modules only.

Note: If few of the 3 Credit Courses are Integrated course type, for such courses the method suggested for 4 Credit IPCC Course shall be followed

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**6th Semester**				
Course Title	**:**	**Embedded System Design**				
Course Code	**:**	**BEC601**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Integrated**				
Category	**:**	**IPCC**				
Stream	**:**	**ECE**		**CIE**	**:**	**50**
Teaching hours/ week (L:T:P:S)	**:**	**3:0:2:0**		**SEE**	**:**	**50**
Total Hours	**:**	**40+20**		**SEE Duration**	**:**	**03 hours**
Credits	**:**	**04**				

Course Learning Objectives:

Sl. No	Course Objectives
1	Comprehend the architecture and features of ARM Cortex-M microcontrollers and their relevance in embedded systems.
2	Provide knowledge of simple and complex peripherals used in the design of embedded systems
3	Enhance the assembly/embedded C programming skills to write programs for simple and complex embedded system applications
4	Familiarize to interpret the design with various test cases.
5	Train on EDA tools used in simulating and debugging the embedded programs either as an individual or a team

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

DSATM

Scheme of Teaching and Examinations for BE Programme -2025-26
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Introduction to Embedded System:** Embedded systems Vs General computing systems, History of Embedded Systems, Classification of Embedded systems, Major Application areas of Embedded Systems. Purpose of Embedded Systems, The Typical Embedded System, Microprocessor Vs Microcontroller, Differences between RISC and CISC, Harvard V/s Von Neumann Processor/Controller Architecture, Big-endian V/s Little-endian processors, Memory (ROM and RAM types), Sensors & Actuators, The I/O Subsystem – I/O Devices, Light Emitting Diode (LED), 7Segment LED Display, Optocoupler, Relay, Piezo buzzer, Push button switch, Communication Interfaces, On-board Communication Interface, External Communication Interface, Embedded Firmware, Other System Components *Text Book 1: Chapter 1 & 2 (Except 2.3.3.4, 2.3.3.8, 2.3.3.9 & 2.7)*	8
Pedagogy	**Flipped Classroom**	
2	**ARM Instruction Set Architecture:** ARM Cortex-M organization. Arithmetic and Logic Instructions, Load and Store Instructions, Branch and Conditional Execution. *Text Book 2: Chapter 3 (3.2 only), 4, 5 & 6*	8
Pedagogy	**Problem Solving**	
3	**Structured Programming (Embedded C Programing Only):** Basic Control Structures, Examples of Factorial Numbers, Counting ones in a word, Finding the Maximum of an array, Counting Digits, Parity Bit, Perfect Numbers, Armstrong Numbers, Palindrome String, Converting String to Integer, Binary Search and Bubble Sort. *Text Book 2: Chapter 7*	8
Pedagogy	**Think-Pair-Share**	
4	**Subroutines:** Calling a subroutine, stack, Implementation of stack via STM and LDM, Example of Greatest Common Divisor, Concatenating two strings, Comparing two strings, Inserting an integer into a sorted array, Converting integer to string, Finding unique numbers in an array. Recursive functions and examples. *Text Book 2: Chapter 8 (Except 8.4, 8.5.1, 8.5.2, 8.5.3, 8.5.4 and 8.6)*	8
Pedagogy	**Case Study**	
5	**RTOS and IDE for Embedded System Design: Operating** System basics, Types of operating systems, Task, process and threads (Only POSIX Threads with an example program), Thread preemption, Non Preemptive and Preemptive Task scheduling techniques, Task synchronization issues – Racing and Deadlock. How to choose an RTOS. *Different Optimization Techniques in Embedded Systems (Self Study).* *Text Book 1: Ch-10 (Sections 10.1, 10.2, 10.3, 10.5.1, 10.5.2, 10.8.1.1, 10.8.1.2, 10.10 only)*	8

Pedagogy	**Flipped Classroom**	
	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process	

List of Programs:

Sl. No.	Experiments/Programs	COs
Instruction: Simulate the program with the test cases, debug and evaluate result using Keil Uvision (LPC1768) /STM32 Cube IDE **Write embedded C program for:**		
1	**LED Blinking using GPIO Port Programming** • Configure GPIO pins • Toggle LEDs with software delay	**CO3, CO4, CO5**
2	Switch Interfacing and Debouncing • Read input from push-button • Control output based on switch input	**CO3, CO4, CO5**
3	Timer-based LED Blinking • Generate periodic delays using hardware timer • Implement time-based control logic	**CO3, CO4, CO5**
4	External Interrupt Handling • Configure an interrupt on button press • Use NVIC for ISR handling	**CO3, CO4, CO5**
5	UART Communication with PC • Send/receive data using serial terminal • Display sensor data on terminal	**CO3, CO4, CO5**
6	I2C Sensor Interfacing • Interface temperature or accelerometer sensor • Display values on serial monitor or LCD	**CO3, CO4, CO5**
7	16x2 LCD Display Interface • Display static and dynamic data from microcontroller	**CO3, CO4, CO5**
8	Keypad Interfacing • Detect key press and map to ASCII or numerical values	**CO3, CO4, CO5**
9	Interfacing • Stepper Motor • DC Motor	**CO3, CO4, CO5**

10	Interfacing DAC to generate • Triangle wave • Sine wave	**CO3, CO4, CO5**
Open ended Programs		
1	Smart Temperature Logger using I2C sensor + UART	**CO2,CO3, CO4, CO5**
2	Home automation prototype using RTOS + GPIOs	**CO2,CO3, CO4, CO5**
3	**Creating Tasks using FreeRTOS** • Blink two LEDs with separate FreeRTOS tasks • Observe time slicing behavior	**CO2,CO3, CO4, CO5**
4	**Semaphore-based LED Control** • Control a shared resource (e.g., LED or serial port) using semaphores	**CO2,CO3, CO4, CO5**

CIE for Principles of Programming Using C (Integrated Professional Core Course (IPCC)):

This Course refers to professional theory core course integrated with practical. Credit for this course can be 03 and its Teaching Learning hours (L : T : P: S) can be considered as (2 : 0 : 2 : 0).

15 marks for the conduction of practical experiment and preparation of the Laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.

On completion of every program in the laboratory, the student shall be evaluated including viva-voce and marks shall be awarded on the same day.

Each program report can be evaluated for **15 marks** (Write-up – 3 marks, Execution – 8 marks .and Viva – 4 marks)

The Laboratory test (duration 2 hours / 3 hours) after completion of all the programs shall be conducted for 50 marks and scaled down to **10 marks.**

The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. This course is common to all branches of first year B.E/B.Tech. 2023-24 regulation.

Note: L- Theory Lecture, T- Tutorial, P-Practical, S-Project, IPCC: Integrated Professional Core Course, CIE: Continuous Internal Evaluation, SEE: Semester End Examination.

Text Books

Sl. No.	Title of the Book/Name of the author/Name of the publisher/Edition and Year
1	Shibu K V, "Introduction to Embedded Systems", Tata McGraw Hill Education.
2	Embedded Systems with ARM Cortex-M Microcontrollers in Assembly Language and C, Yifeng Zhu, 3rd edition 2017.

Reference Books	
1	The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors, Joseph Yiu, Elsevier, 2013
2	Mastering the FreeRTOS Real Time Kernel – A Hands-On Tutorial Guide, Richard Barry, 10th Edition 2016

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Explain fundamentals of embedded system design, architecture, peripherals of ARM Cortex-M3 and real time operating systems for embedded applications	L2	Understand
CO2	Apply basics of ARM Cortex M3 and RTOS to write embedded C program for GPIOs, timers, interrupts on ARM, and communication protocols	L3	Apply
CO3	Solve the scheduling problems in RTOS and write embedded C program for simple and complex applications	L3	Design
CO4	Analyze and optimize the program for simple and complex embedded application including the communication protocols and scheduling algorithms.	L4	Analyze
CO5	Compare the performance parameters of various scheduling algorithms for a given real time embedded application	L5	Evaluate

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2	3												3		
CO3		3											3		
CO4			3										3		
CO5				3	3				2	2			3		

Weblinks and Video Lectures (e-Resources)	
1	FreeRTOS.org – FreeRTOS tutorials and documentation
2	ARM Developer – Cortex-M architecture reference
3	STMicroelectronics and NXP – Datasheets, IDEs, and peripheral libraries

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**6th Semester**				
Course Title	:	**Digital Signal Processing**				
Course Code	:	**BEC602**				
Course Type (Theory/ Practical/ Integrated)	:	**Integrated**				
Category	:	**IPCC**				
Stream	:	**ECE**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**3:0:2:0**		**SEE**	:	**50**
Total Hours	:	**40Hrs Theory + 20 hours of practical classes**		**SEE Duration**	:	**03 hours**
Credits	:	**04**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To understand discrete Fourier transform, its properties
2	To introduce FFT and its applications
3	To provide sufficient understanding of analog filter design
4	To familiarize digital IIR design and realization
5	To learn FIR filter design and realization

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

DSATM

Scheme of Teaching and Examinations for BE Programme -2025-26

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Introduction to Analog Signal Processing**: Basic Introduction to Analog Signal Processing. **Discrete Fourier Transform (DFT):** Frequency domain sampling and reconstruction of discrete signals, DFT as a linear transformation, its relationship with other transforms, properties of DFT. (with Numerical) *Textbook 1: Chapter 5 (5.1 & 5.2 only)*	8
Pedagogy	**Blended Learning**	
2	**Fast Fourier Transform (FFT) Algorithms:** Direct computation of DFT, need for FFT, Radix-2 FFT algorithm for computation of DFT and IDFT, decimation-in-time and decimation-in-frequency algorithms. Use of DFT in linear filtering, overlap-save and overlap-add methods. (with Numerical) *Textbook 1: Chapter 5 (5.3 only) Chapter 6 (6.1, 6.2 only)*	8
Pedagogy	**Flipped Classroom**	
3	**Analog filter design:** Characteristics of commonly used analog filter: Butterworth and Chebyshev, Analog to Analog frequency transformations, Design of Butterworth and Chebyshev filters. (with Numerical) *Textbook 1: Chapter 8 (8.3 only)*	8
Pedagogy	**Collaborative Learning**	
4	**IIR Filter Design:** Approximation of derivative: bilinear transformation and impulse invariance method (Only Basic Numerical - Design not included), verification for stability and linearity during mapping. Realization of IIR filters: direct form I and form II. (with Numerical) *Textbook 1: Chapter 7 (7.2 and 7.3 only) Chapter 8 (8.3 only)*	8
Pedagogy	**Collaborative Learning**	
5	**Design of FIR filters:** Introduction to FIR filters, design of FIR filters using window functions: Rectangular, Hamming, Bartlett and Hanning, Linear phase FIR filter design using frequency sampling, Realization of FIR filters: Direct form and Cascade Realizations. (with Numerical) **Digital Signal Processors:** DSP Architecture, Fixed point format, Floating point Format, Fixed point digital signal processors, Floating point processors. *Textbook 1: Chapter 8 (8.2 only) Textbook 2: Chapter 2*	8

	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Digital Signal Processing: Principles, Algorithms and Applications, Proakis and Manolakis Pearson Education, 4th Edition / 2007
2	"Digital Signal Processors", B Venkataramani and M Bhaskar, TMH, 2nd, 2010.
Reference Books	
1	Fundamentals of Digital Signal Processing, L C Ludeman, John Wiley and Sons, PHI, 1986
2	Digital Signal Processing, S K Mitra, TMH, 4th Edition/2008
3	Digital Signal Processing, Oppenheim and Schaffer, PHI, 2nd Edition/2003

List of Programs:

Sl. No.	**Experiments/Programs**	**COs**
Instruction: Simulate the program with the test cases, debug and evaluate result using MATLAB		
1	Write a MATLAB Code for Verification of sampling theorem	**CO1, CO2**
2	Write a MATLAB Code to find the Linear convolution of two given sequences	**CO1, CO2**
3	Write a MATLAB Code to find the Circular convolution of two given sequences	**CO1, CO2**
4	Write a MATLAB Code to prove Commutative, distributive and associative property of convolution.	**CO1, CO2**
5	Write a MATLAB Code to Compute N point DFT of a given sequence and to plot magnitude and phase spectrum	**CO1, CO2**
6	Write a MATLAB Code to Verify DFT properties (Linearity and Parseval's theorem)	**CO1, CO2**

7	Design and implementation of digital low pass FIR filter using a window to meet the given specifications	**C03, C04**
8	Design and implementation of digital IIR Butterworth low pass filter to meet the given specifications.	**C03, C04**
Part B - DSP Experiments using DSP processor		
9	Obtain the Linear convolution of two sequences using DSP processor	**CO1, CO2**
10	Compute the N-point DFT of a given sequence using DSP processor	**C03, C04**
Open ended Programs		
1	Design and implementation of Low pass and High pass FIR filter to meet the desired specifications (using different window techniques) and test the filter with an audio file. Plot the spectrum audio signal before and after filtering.	**CO3, C04, C05**
2	Design and implementation of a digital IIR filter (Low pass and High pass) to meet given specifications and test with an audio file. Plot the spectrum of audio signal before and after filtering.	**CO3, C04, C05**

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE) for the Theory component of the IPCC (Maximum marks 50)
Internal Assessment Test (IAT):

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are 25 marks and that for the practical component is 25 marks.
- 25 marks for the theory component are split into 15 marks for two Internal Assessment Tests
  (Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 15 marks) and 10 marks for Two Continuous Comprehensive Assessment (CCA) methods.
- The first Internal test at the end of 40-50% coverage of the syllabus
- The second Internal test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for 25 marks).
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and

the Revised Blooms Taxonomy (RBT) Levels. Emphasis to be given for Higher order Thinking Skills (HOTS).

Continuous Internal Evaluation (CIE) for the practical component of the IPCC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and Marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report, **05 Marks** are for conducting the experiment, **05 Marks for** preparation of the laboratory record, **5 Marks** for conducting Open Ended Experiments Each experiment. Marks of all experiments' write-ups are added to 15 marks.
- The Practical laboratory test **(duration 03 hours)** at the end of the 15th week of the semester/after completion of all the experiments (whichever is early) shall be conducted for **50 Marks** and scaled down to **5 Marks.**
- The open-ended experiment after completion of all the experiments shall be conducted for 20 marks with a split-up for 5 Marks for writeup, 10 Marks for Execution, and 5 Marks for Viva-Voce.
  Marks for writeup, Execution and Viva-Voce is added and scaled down to 05 marks.
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for 25 marks.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

Semester End Examination (SEE) for IPCC Theory

SEE will be conducted as per the scheduled timetable, with common question papers for the course (duration 03 hours)

- The question paper will have ten questions. Each question is set for 20 marks.
- The question paper shall be set for 100 Marks. The medium of the question paper shall be English. **The duration of SEE is 03 hours.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module. The two questions shall be of same course outcome, program outcome and Blooms RBT level. Emphasis to be given for higher order RBT levels.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored by the student shall be proportionally scaled down to 50 Marks.
- The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only.
- Questions mentioned in the SEE paper may include questions from the practical component.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be (CCA1+CCA2)/2 and scaled down to **10 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The Assessment will be through rubrics.
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **20 Marks** after and review 2 of **30 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **10 Marks**

Total Marks scored for theory component of CIE (IAT+ CCA) is **25 Marks**

Possible Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom,
- The assessment of these techniques shall be in rubrics.

The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	**Understand** the fundamentals of LTI systems using time domain and DFT techniques.	L2	Understand
CO2	**Apply** the concept of FFT algorithms and linear filtering approach to solve DFT.	L3	Apply
CO3	**Analyze** the Analog FIR and IIR filter realizations.	L3	Analyze
CO4	**Design** the digital FIR and IIR filters using different transformation methods and windowing techniques.	L4	Design
CO5	**Demonstrate** minor projects using Discrete Fourier Transforms and Filtering techniques.	L5	Evaluate

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1													3		
CO2	3												3		
CO3		3											3		
CO4			3										3		
CO5				3	3				2	2			3		

PROFESSIONAL CORE COURSE (PCC)

PCC Course - Professional Core Course

Teaching Hours/Week (L: T:P: S)	3:0:0:0
Total Hours of Pedagogy	40 hours
Credits:	03
Each Module	8 Hrs
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Theory

3 Credit Course – Professional Core Course (PCC)

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Internal Assessment Test (IAT):

- For the Internal Assessment Test component of CIE, there are 25 marks and for Assignment component of the CIE, there are 25 marks. Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 25 marks
  - The first test will be administered after 40-50% of the syllabus has been covered, and
  - The second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

- Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Blooms RBT Levels. Emphasis to be given for higher order RBT levels

Semester-End Examination:

Theory SEE will be conducted as per the scheduled timetable (duration 03 hours).

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for **50 Marks**. Total Marks scored will be CCA1+CCA2 and scaled down to **25 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The evaluation includes either through quiz or rubrics
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **25 Marks** after and review 2 of **25 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **25 Marks**

Total Marks scored for theory component of CIE (IAT+ CCA) is **50 Marks**

Possible Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom,
- The assessment of these techniques shall be in rubrics.
- The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC).

Professional Core Course (PCC) – 3 Credit course – Theory

Assessment Method	Component	Type of Assessments	Syllabus Coverage	Maximum Marks	Average	Reduced Marks	Minimum Passing Marks	Evaluation Details
Total CIE Theory + Practical				**50**	----	----	**20**	
	Theory	Internal Assessment Test (IAT) - II	Module – 1 to 2.5	50	(50+50) / 2	**25**	10	Average of Two Internal test each of 50 Marks scale down the marks to 25
		Internal Assessment Test (IAT) - II	Module – 2.5 to 5	50				
	Continuous Comprehensive Assessment (CCA)	CCA-1- Pedagogical Initiatives / Activity Based learning	Considering all the Modules	50	(50+50) / 2	**25**	10	Two CCA methods as per VTU Clause 22OB4.2 of regulations to be adopted. If CCA chosen is Project Based Learning, then one assessment method may be adopted
		CCA-2- Pedagogical Initiatives / Activity Based learning		50				
	Total CIE Theory					**50**	20	Total Marks of IAT and CCA is 50

SEE		Theory exam	Entire theory syllabus including questions from lab Component in respective Modules	100	---	50	20	SEE Exam is theory Exam conducted for 100 Marks, scored Marks are scaled down to 50 Marks
CIE + SEE				100	----	----	40	

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**6th Semester**				
Course Title	:	**Fundamentals of CMOS VLSI**				
Course Code	:	**BEC603**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**PCC**				
Stream	:	**ECE**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**(3:0:0:0)**		**SEE**	:	**50**
Total Hours	:	**40**		**SEE Duration**	:	**3 hours**
Credits	:	**03**				

Course Learning Objectives: Students will be able :

Sl. No	Course Objectives
1	**To Study** the fundamentals of MOS transistor theory, CMOS fabrication flow, and the effects of technology scaling on VLSI systems.
2	**To Impart the Knowledge** of physical design techniques including stick diagrams, layout diagrams, and the principles of VLSI circuit design.
3	**To Solve** Problems related to the design and implementation of combinational, sequential, and dynamic logic circuits according to design specifications.
4	**To Know** the architecture and timing requirements of memory elements and the critical aspects affecting their performance in VLSI designs.
5	**To Equip** students with the ability to analyze, detect, and improve testing and testability issues in VLSI systems through collaborative and innovative approaches.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in Control Systems.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.

Scheme of Teaching and Examinations for BE Programme -2025-26
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Introduction:** MOS Transistors, Inverter, NAND Gate, NOR Gate, Compound Gates, Pass Transistors and Transmission Gates, Tristates , Multiplexers, Sequential Circuits (1.1 to 1.4 of TEXT2) **MOS Transistor Theory:** Introduction, Long-channel I-V Characteristics, Non-ideal I-V Effects(Mobility Degradation and Velocity Saturation, Channel Length Modulation, Threshold Voltage Effects, Leakage, Temperature Dependence), DC Transfer Characteristics (Static CMOS Inverter DC Characteristics, Beta Ratio Effects, Noise Margin, Pass Transistor)(2.1, 2.2, 2.4 and 2.5 of TEXT2).	**8 Hours**
Pedagogy	**Experiential Learning**	
2	**Fabrication:** CMOS Fabrication and Layout (Inverter Cross-Section, Fabrication Process, Layout Design Rules, Gate Layouts, Stick Diagrams), VLSI Design Flow, Introduction, CMOS Technologies (Wafer Formation, Photolithography, Well and Channel Formation, Silicon Dioxide (SiO2), Isolation, Gate Oxide, Gate and Source/Drain Formations, Contacts and Metallization, Passivation, Metrology), Layout Design Rules, (1.5 and 3.1 to 3.3 of TEXT2). MOSFET Scaling and Small-Geometry Effects, MOSFET Capacitances (3.5 to 3.6 of TEXT1).	**8 Hours**
Pedagogy	**Think Pair Share**	
3	**Delay:** Introduction, Transient Response, RC Delay Model (Effective Resistance, Gate and Diffusion Capacitance, Equivalent RC Circuits, Transient Response, Elmore Delay, Layout Dependence of Capacitance, Determining Effective Resistance), Linear Delay Model (Logical Effort, Parasitic Delay, Delay in a Logic Gate, Drive), Logical Effort of Paths (Delay in Multistage Logic Networks, Choosing the Best Number of Stages, Example) (4.1 to 4.5 of TEXT2, except sub-sections 4.3.7, 4.4.5, 4.4.6, 4.5.5 and 4.5.6). **Combinational Circuit Design:** Introduction, Circuit families (9.1to 9.2 of TEXT2, except subsection 9.2.4).	**8 Hours**
Pedagogy	**Mobile Studio**	
4	**Sequential Circuit Design:** Introduction, Circuit Design for Latches and Flip- Flops (10.1 and 10.3.1 to 10.3.4 of TEXT2). **Dynamic Logic Circuits:** Introduction, Basic Principles of Pass Transistor Circuits, Synchronous Dynamic Circuit Techniques, Dynamic CMOS Circuit Techniques (9.1, 9.2, 9.4 to 9.5 of TEXT1).	**8 Hours**
Pedagogy	**Demonstration**	
5	**Semiconductor Memories:** Introduction, Dynamic Random Access Memory (DRAM) and Static Random Access Memory (SRAM), (10.1 to 10.3 of TEXT1). **Testing and Verification:** Introduction, Logic Verification Principles, Manufacturing Test Principles, Design for testability (15.1, 15.3, 15.5, 15.6.1to 15.6.3 of TEXT 2).	**8 Hours**

Pedagogy	Poster Presentation

Pedagogical Initiatives (Not limited to):

- **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another
- **Problem Solving**: encourages cognitive thinking and enables creative problem solving
- **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily.
- **Case studies:** maps different domains in real time applications
- **Demonstration:** exhibits the implementation process

CIE for Control Systems (Professional Core Course (PCC)):

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Internal Assessment Test (IAT):

- For the Internal Assessment Test component of CIE, there are 25 marks and for Assignment component of the CIE, there are 25 marks. Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 25 marks
- The first test will be administered after 40-50% of the syllabus has been covered, and
- The second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.
- Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Blooms RBT Levels. Emphasis to be given for higher order RBT levels

Semester-End Examination:

Theory SEE will be conducted as per the scheduled timetable (duration 03 hours).

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for

50 Marks. Total Marks scored will be CCA1+CCA2 and scaled down to **25 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The evaluation includes either through quiz or rubrics
- CCA as project-based learning,
    - CCA is evaluated for 50 Marks with review 1 of 25 Marks after and review 2 of 25 Marks includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is 25 Marks

Total Marks scored for theory component of CIE (IAT+ CCA) is 50 Marks Possible

Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair- Share, Flipped classroom.
- The assessment of these techniques shall be in rubrics.

The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC)..

Note: L- Theory Lecture, T- Tutorial, P-Practical, S-Project, IPCC: Integrated Professional Core Course, CIE: Continuous Internal Evaluation, SEE: Semester End Examination.

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	"CMOS Digital Integrated Circuits: Analysis and Design" - Sung Mo Kang & Yosuf Leblebici, Third Edition, Tata McGraw-Hill
2	" CMOS VLSI Design- A Circuits and Systems Perspective"- Neil H. E. Weste and David Money Harris, 4th Edition, Pearson Education.
Reference Books	
1	Adel Sedra and K. C. Smith, "Microelectronics Circuits Theory and Applications", 6th or 7th Edition, Oxford University Press, International Version, 2009.
2	Douglas A Pucknell & Kamran Eshragian, "Basic VLSIDesign", PHI 3rd Edition, (original Edition- 1994).
3	BehzadRazavi, "Design of Analog CMOS Integrated Circuits", TMH, 2007.
e- Resources & other digital material	
1	https://onlinecourses.nptel.ac.in/noc23 ee87/preview
2	https://onlinecourses.nptel.ac.in/noc23_cs18/preview

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	**Understand** MOS transistor theory, CMOS fabrication processes, and the impact of technology scaling on VLSI design.	L2	Understand
CO2	**Apply** physical design principles to create stick diagrams and layout diagrams for basic logic gates.	L3	Apply
CO3	**Analyze and design** combinational, sequential, and dynamic logic circuits based on given specifications.	L4	Analyze
CO4	**Evaluate** memory elements, focusing on design trade-offs and timing considerations in VLSI systems.	L4	Design & Demonstrate
CO5	**Design and Compare** testing and testability issues in VLSI technology.	L5	Design & Demonstrate

Mapping of Course Outcomes to Program Outcomes:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2	3														
CO3		3													
CO4			3		2				2						
CO5				3						2		2	2	2	2

Web links and Video Lectures (e-Resources)	
1	https://nptel.ac.in/courses/117106092

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember				
Understand	20	20		
Apply	20	20		
Analyze	10	10		
Evaluate			50	
Create				50

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	10	10		10			30	30%
CO2	10		10		10	10	40	40%
CO3		10			10	10	30	30%
CO4								
CO5								
Total	20	20	10	10	20	20	100	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	-
Understand	40
Apply	40
Analyze	20
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module 3	Module-4	Module-5		
CO1	10	10	10			30	30%
CO2	10		10	10	10	40	40%
CO3		10		10	10	30	30%
CO4							
CO5							
Total	20	20	20	20	20	100	100%

Professional Electives

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**6th Semester**				
Course Title	:	**Satellite Communication**				
Course Code	:	**BEC604A**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**Elective**				
Stream	:	**ECE**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**(3:0:0:0)**		**SEE**	:	**50**
Total Hours	:	**40**		**SEE Duration**	:	**3 hours**
Credits	:	**03**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Impart the knowledge of fundamental concepts, principles, functions, multiple access techniques and applications of satellite communication and systems.
2	Familiarize in applying satellite communication theories to solve link budget problems, calculate orbital parameters, and usage of various multiple access techniques in practical scenarios.
3	Provide the knowledge in analyzing the types of satellite orbits, examine the effects of noise, attenuation and compare the performance of various satellite communication systems and technologies.
4	Impart the knowledge to Evaluate different satellite access technologies, modulation schemes, and system designs for various applications
5	Equip with the usage of modern tools to simulate satellite scenarios.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in Satellite Communication.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

Scheme of Teaching and Examinations for BE Programme -2025-26
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Satellite Orbits and Trajectories:** Definition, Basic Principles, Orbital parameters, Injection velocity and satellite trajectory, Types of Satellite orbits, Orbital perturbations, Satellite stabilization, Orbital effects on satellite's performance, Eclipses, Look angles: Azimuth angle, Elevation angle. **Text 1: 2.1,2.2,2.3,2.4,2.5,3.3,3.4,3.5,3.6,3.7**	**8 Hours**
Pedagogy	**Problem Solving**	
2	**Satellite subsystem:** Power supply subsystem, Attitude and Orbit control, Tracking, Telemetry and command subsystem, Payload. **Earth Station:** Types of earth station, Architecture, Design considerations, Testing, Earth station Hardware, Satellite tracking. **Text 1: 4.1,4.5,4.6,4.7,4.8, 8.1,8.2,8.3,8.4,8.5,8.6,8.7**	**8 Hours**
Pedagogy	**Seminar**	
3	**Multiple Access Techniques**: Introduction, FDMA (No derivation), SCPC Systems, MCPC Systems, TDMA, CDMA, SDMA. **Satellite Link Design Fundamentals**: Transmission Equation, Satellite Link Parameters, Propagation considerations. **Text 1: 6.1,6.2,6.3,6.4,6.5,6.6,6.13,6.14,7.1,7.2,7.4**	**8 Hours**
Pedagogy	**Simulation**	
4	**Communication Satellites:** Introduction, Related Applications, Frequency Bands, Payloads, Satellite Vs. Terrestrial Networks, Satellite Telephony, Satellite Television, Satellite radio, Regional satellite Systems, National Satellite Systems. **Text 1: 9.1,9.2,9.3,9.4,9.5,9.6,9.7,9.8,9.10**	**8 Hours**
Pedagogy	**Case Studies**	
5	**Remote Sensing Satellites:** Classification of remote sensing systems, orbits, Payloads, Types of images: Image Classification, Interpretation, Applications. **Weather Forecasting Satellites:** Fundamentals, Images, Orbits, Payloads, Applications. **Navigation Satellites:** Development of Satellite Navigation Systems, GPS system. Applications. **Text 1: 10.1,10.2,10.3,10.4,10.7,10.8,10.9,11.1,11.2,11.3,11.4,11.5, 11.7, 12.1,12.2,12.3,12.8**	**8 Hours**
Pedagogy	**Flipped Class Room**	

	Pedagogical Initiatives (Not limited to): • **Think Pair and Share (Blended Learning):** provides an opportunity for students to learn from one another • **Problem Solving**: encourages cognitive thinking and enables creative problem solving • **Poster Presentation:** allows students to represent the concepts visually in order to understand the topics easily. • **Case studies:** maps different domains in real time applications • **Demonstration:** exhibits the implementation process

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Anil K. Maini, Varsha Agrawal, Satellite Communications, Wiley India Pvt Ltd, 2015, ISBN: 978-81-265-2071-8.
Reference Books	
1	Dennis Roddy, Satellite Communications, 4th Edition, McGraw- Hill International edition, 2006
2	Timothy Pratt, Charles Bostian, JeremyAllnutt, SatelliteCmnmunications, 2nd Edition, Wiley India Pvt. Ltd, 2017, ISBN: 978-81-265-0833-4

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Understand the fundamental concepts, principles, functions, multiple access techniques and applications of satellite communication and systems	L2	Understand
CO2	Apply the theoretical concepts of satellite communication to solve link budget problems, calculate orbital parameters, and usage of various multiple access techniques in practical scenarios	L3	Apply
CO3	Analyze the types of satellite orbits, examine the effects of noise, attenuation and compare the performance of various satellite communication systems and technologies	L4	Analyze
CO4	Evaluate different Multiple access techniques and system designs for various applications.	L4	Analyze
CO5	Simulate various Orbital Parameters using modern tools.	L5	Demonstrate

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2	3														
CO3		3											2	2	
CO4			2	2					2	2					
CO5					3				2	2					

Weblinks and Video Lectures (e-Resources)	
1	https://archive.nptel.ac.in/courses/117/105/117105131/
2	https://www.youtube.com/watch?v=eMP4KskZbQc&list=PLMpCSwrw7iRHLTWOGywJ0jZ6boAQIQ9R7

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**6th**				
Course Title	:	**Automotive Electronics**				
Course Code	:	**BEC604B**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Course Category	:	**Elective**				
Stream	:	**ECE**		**CIE**	:	**50 Marks**
Teaching hr/week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50 Marks**
Total Hours	:	**40 Hrs**		**SEE Duration**	:	**3 Hours**
Credits	:	**3**				

Course Learning Objectives: Students will be able

Sl. No	Course Objectives
1	To learn basics of automobile systems and design electronics.
2	To impart the concept of sensors, microcontroller, and actuators into electronic subsystem.
3	To know the connect of networking of various modules in automotive systems.
4	To learn the electronics that attribute the reliability, safety, and smartness to the automobiles.
5	To explore and exhibit the Electric Vehicle.

Teaching-Learning Process Pedagogy (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
3. Encourage collaborative (Group) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
9. Individual teachers can device innovative pedagogy to improve teaching-learning.

DSATM

Scheme of Teaching and Examinations for BE Programme -2025-26
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2025-26)

COURSE SYLLABUS

Module No.	Contents of the Module	Hours
1	**Automotive Fundamentals Overview** – Evolution of Automotive Electronics, Automobile Physical Configuration, The Engine – Engine Block, Cylinder Head, Four Stroke Cycle, Engine Control, Ignition System - Spark plug, Spark pulse generation, Diesel Engine, Drive Train - Transmission, Drive Shaft, Differential, Suspension, Brakes, Steering System, Starter Battery, Battery parameters, Types of battery–Operating principle. **(TextBook1-Chapter 1 and TextBook2-Pg. 407-410)**	8
Pedagogy	Experiential Learning	
2	**Automotive Sensors and its Principles** –Airflow rate sensor, Strain Gauge MAP sensor, Engine Crankshaft Angular Position Sensor, Magnetic Reluctance Position Sensor, Hall effect Position Sensor, Optical Crankshaft Position Sensor, Engine Coolant Temperature (ECT) Sensor, Exhaust Gas Oxygen (O2/EGO) Piezoelectric Knock Sensor. Automotive Engine Control Actuators – Solenoid, Fuel Injector, EGR Actuator, Ignition System. **(TextBook1-Chapter 6)**	8
Pedagogy	Think Pair Share	
3	**Digital Engine Control Systems** – Digital Engine control features, Control modes for fuel Control (Seven Modes), EGR Control, Electronic Ignition Control - Closed loop Ignition timing, Spark Advance Correction Scheme, Integrated Engine Control System - Secondary Air Management, Automatic System Adjustment, System Diagnostics. **(TextBook1-Chapter 7)**	8
Pedagogy	Mobile Studio	
4	**Automotive Networking** –Ethernet, A2B, CAN Bus, LIN Bus, MOST Bus, Bluetooth, Flex Ray, Diagnostic Interfaces. Vehicle Motion Control – Typical Cruise Control System, Digital Cruise Control System, Digital Speed Sensor, Throttle Actuator, Digital Cruise Control configuration, Antilock Brake System (ABS). **(TextBook1-Chapter 8 and TextBook2-Pg. 92-151)**	8
Pedagogy	Demonstration	
5	**Automotive Diagnostics**–Timing Light, Engine Analyzer, On-board diagnostics, Off-board diagnostics, Accelerometer based Air Bag systems. Future Automotive Electronic System, Electric and Hybrid vehicles, Configuration and Performance of Electric Vehicles, Low tire pressure warning system, Heads Up display, Navigation – Radio Navigation, Signpost navigation, dead reckoning navigation, Voice Recognition, Advanced Cruise Control, Advanced Driver-Assistance System (ADAS). **(TextBook1-Chapter 10 and 11)**	8
Pedagogy	Case Studies	

Text Books
1.William B. Ribbens, "Understanding Automotive Electronics", 6th Edition, Elsevier Publishing.
2.Robert Bosch GmbH (Ed.) Bosch Automotive Electrics and Automotive Electronics Systems and Components, Networking and Hybrid Drive, 5th edition, John Wiley & Sons Inc., 2007.
Reference Books
1.Automotive Electronics Handbook 2nd Edition, McGraw-Hill Professional by Ronald K. Jurgen
2.Automotive Electronics EMC Controlling" by Fayu Wan, Scholars' Press 2014

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level
CO1	Ability to **understand** the overview of automotive components, subsystems, and basics of Electronic Engine Control in today's automotive industry.	L2
CO2	Ability to **apply** the concepts of automotive sensors and actuators while interfacing with microcontrollers / microprocessors during automotive system design.	L3
CO3	Ability to **analyze** the networking of various modules in automotive systems, communication protocols and diagnostics of the sub systems.	L4
CO4	Ability to **design** and implement the electronics that attribute the reliability, safety, and smartness to the automobiles, providing add-on comforts and get fair idea on future Automotive Electronic Systems.	L4
CO5	Ability to **investigate** and demonstrate the Electric Vehicle.	L5

Mapping of Course Outcomes to Program Outcomes:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-	2	2	-
CO3		2	-	-	-	-	-	-	-	-	-	-	2	2	-
CO4	-	-	2	-	-	-	-	-	-	-	-	-	2	2	-
CO5	-	-	-	2	-	-	2	-	-	-	-	-	2	2	-

Weblinks and Video Lectures (e-Resources)	
1	https://nptel.ac.in/courses/122106025
2	https://nptel.ac.in/courses/108105132
3	https://nptel.ac.in/courses/117104072

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**6th Semester**				
Course Title	:	**Deep Learning**				
Course Code	:	**BEC604C**				
Course Type (Theory/ Practical/ Integrated)	:	**Theory**				
Category	:	**PCC**				
Stream	:	**ECE**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**(3:0:0:0)**		**SEE**	:	**50**
Total Hours	:	**40**		**SEE Duration**	:	**3 hours**
Credits	:	**03**				

Course Learning Objectives: Students will be able :

Sl. No	Course Objectives
1	**To study** the foundations and evolution of deep learning models and algorithms.
2	**To impart the knowledge** of optimization techniques, regularization methods, and neural network architect
3	**To solve** problems related to training, visualizing, and improving deep learning models
4	T**o know** advanced concepts like PCA, autoencoders, and recurrent networks with BPTT.
5	**To equip** students with practical skills for designing and applying deep learning solutions.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in Control Systems.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.

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Module No.	Topics	Hours
1	**History of Deep Learning:** Deep Learning Success Stories, McCulloch Pitts Neuron, Thresholding Logic, Perceptron, Perceptron Learning Algorithm Multilayer Perceptrons (MLPs), Representation Power of MLPs, Sigmoid Neurons, Gradient Descent, Feedforward, Neural Networks, Representation Power of Feedforward Neural Networks	**8 Hours**
Pedagogy	**Experiential Learning**	
2	**Feed Forward Neural Networks**: Backpropagation Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, Ada Grad, RMS Prop, Adam, Eigenvalues and eigenvectors, Eigenvalue Decomposition	**8 Hours**
Pedagogy	**Think Pair Share**	
3	**Principal Component Analysis:** PCA and its interpretations, Singular Value Decomposition, Auto encoders and relation to PCA. **Regularization:** in auto-encoders, Denoising auto encoders, Sparse auto encoders, Contractive auto-encoders.	**8 Hours**
Pedagogy	**Mobile Studio**	
4	**Regularization(Continuation):** Bias Variance Trade-off, L2 regularization, Early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods, Dropout, Greedy Layer Wise Pre-training, Better activation functions, Better weight initialization methods, Batch Normalization Learning Vectorial Visualizing Convolutional Neural Networks,	**8 Hours**
Pedagogy	**Demonstration**	
5	**Guided Backpropagation**, Deep Dream, Deep Art, Fooling Convolutional Neural Networks, Recurrent Neural Networks, Backpropagation through time (BPTT), Vanishing and Exploding Gradients, LSTMs Encoder Decoder Models. DL based Application in wireless sensor networks, IoT communications and analog circuits.	**8 Hours**
Pedagogy	**Presentation**	

Pedagogical Initiatives (Not limited to):

- Think Pair and Share (Blended Learning): provides an opportunity for students to learn from one another
- Problem Solving: encourages cognitive thinking and enables creative problem solving
- Poster Presentation: allows students to represent the concepts visually in order to understand the topics easily.
- Case studies: maps different domains in real time applications

- Demonstration: exhibits the implementation process

CIE for Control Systems (Professional Core Course (PCC)):

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Internal Assessment Test (IAT):

- For the Internal Assessment Test component of CIE, there are 25 marks and for Assignment component of the CIE, there are 25 marks. Two Tests, each of 50 Marks with 01-hour 30 minutes' duration, are to be conducted and average of two tests to be reduced to 25 marks
- The first test will be administered after 40-50% of the syllabus has been covered, and
- The second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.
- Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The IA test questions are to be framed to map the Course Outcomes (COs), Program Outcomes (POs) and the Blooms RBT Levels. Emphasis to be given for higher order RBT levels

Semester-End Examination:

Theory SEE will be conducted as per the scheduled timetable (duration 03 hours).

- The question paper will have ten questions. Each question is set for 20 marks.

- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks.

Continuous and Comprehensive Assessment (CCA):

Two of continuous and comprehensive assessment (CCA) to be conducted to attain COs and POs, evaluated each for

50 Marks. Total Marks scored will be CCA1+CCA2 and scaled down to **25 Marks**.

- CCA1 after 4th week and CCA2 after 9th week. The evaluation includes either through quiz or rubrics
- CCA as project-based learning,
    - CCA is evaluated for **50 Marks** with review 1 of **25 Marks** after and review 2 of **25 Marks** includes project demonstration/competition and report submission.
    - The evaluation of review 1 after 6th weeks of semester and review 2 after 12th week of semester with project demonstration and submission of the report

Total score for CCA is **25 Marks**

Total Marks scored for theory component of CIE (IAT+ CCA) is **50**

Marks Possible Continuous and Comprehensive Assessment (CCA):

- Project based, Problem Based, Building Models, Lab-to-Land, Mobile Studio, Design and Programming Contest, Certification, Concept Map (Collage presentation/poster presentation), Case studies, Think-Pair-Share, Flipped classroom.
- The assessment of these techniques shall be in rubrics.

The faculty can adopt any other CCA method of implementation and its assessment with prior approval of Program Assessment Committee (PAC)..

Note: L- Theory Lecture, T- Tutorial, P-Practical, S-Project, IPCC: Integrated Professional Core Course, CIE: Continuous Internal Evaluation, SEE: Semester End Examination.

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016. 2.
2	Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.

Reference Books	
1	Cosma Rohilla Shalizi, Advanced Data Analysis from an Elementary Point of View, 2015.
2	Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.
e- Resources & other digital material	
1	https://onlinecourses.nptel.ac.in/noc21_cs35/course

Course Outcomes: At the end of the course, the student will be able :

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	**Understand** the fundamentals and architecture of deep neural networks.	L2	Understand
CO2	**Apply** appropriate metrics and validation techniques to evaluate the performance of deep learning models.	L3	Apply
CO3	**Analyze** the different components and functioning of deep neural networks.	L4	Analyze
CO4	**Evaluate** deep learning algorithms for natural language processing tasks.	L4	Design & Demonstrate
CO5	**Develop, and optimize** deep learning solutions for real-time applications	L5	Design & Demonstrate

Mapping of Course Outcomes to Program Outcomes:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2	3														
CO3		3													
CO4			3		2				2						
CO5				3		2		2		2		2	2	2	2

Web links and Video Lectures (e-Resources)	
1	https://onlinecourses.nptel.ac.in/noc21_cs35/course

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember				
Understand	20	20		
Apply	20	20		
Analyze	10	10		
Evaluate			50	
Create				50

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	10	10		10			30	30%
CO2	10		10		10	10	40	40%
CO3		10			10	10	30	30%

CO4								
CO5								
Total	20	20	10	10	20	20	100	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	-
Understand	40
Apply	40
Analyze	20
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module 3	Module-4	Module-5		
CO1	10	10	10			30	30%
CO2	10		10	10	10	40	40%
CO3		10		10	10	30	30%
CO4							
CO5							
Total	20	20	20	20	20	100	100%

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	**6th Semester**				
Course Title	:	**Analog Integrated Circuits Design**				
Course Code	:	**BEC604D**				
Course Type **(Theory/ Practical/ Integrated)**	:	**Theory**				
Category	:	**PCC**				
Stream	:	**ECE**		**CIE**	:	**50**
Teaching hours/ week (L:T:P:S)	:	**3:0:0:0**		**SEE**	:	**50**
Total Hours	:	**40**		**SEE Duration**	:	**3Hrs**
Credits	:	**3**				

Course Learning Objectives: Students will be able :

Sl. No	Course Objectives
1	**To Study** basic amplifiers and differential amplifiers using MOSFETs.
2	**To Impart** the knowledge of different opamp topologies for a given specification.
3	**To Solve Problems** stability of OPAMPs and apply the appropriate compensation technique.

4	**To Know** analysis of filters and oscillators
5	**To equip** skills to implement OPAMPs and real time analog integrated systems.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- *Adopt different teaching methods to attain the course outcomes.*
- *Include videos to demonstrate various concepts in Network Analysis.*
- *Encourage collaborative (Group) Learning to encourage team building.*
- *Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.*
- *Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.*
- *Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.*
- *Discuss various case studies to map with real-world scenarios and improve the understanding.*
- *Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.*

DSATM

Scheme of Teaching and Examinations for BE Programme -2025-26

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Introduction to Analog Integrated Design:** Models for analog design, body transconductance. Single-stage Amplifiers – CS stage, diode connected load, current source load and source degeneration, review of CD and CG stages (all amplifier analysis with body effect), Cascode stage & folded cascode concepts. Design of amplifier from specifications.	**8 Hours**
Pedagogy	**Flipped Classroom**	
2	**Differential Amplifiers –** MOS differential pair, Small signal operation - half circuit analysis, common mode response, differential amplifier with active load, common mode gain and CMRR, frequency response of the differential amplifier	**8 Hours**
Pedagogy	**Think Pair Share**	
3	**Operational Amplifiers:** General considerations – performance parameters, One-Stage Op amps –cascode opamps, telescopic opamps, folded cascode opamps, Two-Stage Op amps, Gain Boosting, Comparison of performance of various opamp topologies. Design of opamps from specifications.	**8 Hours**
Pedagogy	**Mobile Studio**	

4	**Noise:** MOSFET noise models, types of noise – thermal, flicker, Representation of noise in circuits, Noise in single stage amplifiers (Common source only). **Integrated Oscillators :** Ring oscillators, LC oscillators – Cross coupled oscillators, VCO	**8 Hours**
Pedagogy	**Demonstration**	
5	**Analog Filters** : Classification of filters, transfer function of filters, Second order filters, active filters– sallen and key filters, KHN biquad. **Bandgap reference:** Temperature independent references - Bipolar CTAT, PTAT, Band gap references (BGR)	**8 Hours**
Pedagogy	**Poster Presentation**	
Text Books		
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**	
1	Design of Analog CMOS Integrated Circuits, Behzad Razavi, 2002, Mc GrawHill Edition, ISBN: 0-07-238032-2	
2	CMOS Circuit Design, Layout and Simulation, R. Jacob Baker, Harry W. Li and David E. Boyce, 2002, IEEE Press, ISBN: 81-203-1682-7	
Reference Books		
3	CMOS Mixed-signal Circuit Design, R. Jacob Baker, 2009, IEEE Press, ISBN: 978-81-265-1657-5	
4	Analysis and Design of Analog Integrated Circuits, Paul R. Gray, Paul J. Hurst, Stephen H. Lewis, Robert G. Meyer, "", 4 th edition, 2008, Wiley India Private Limited, ISBN:978-8126515691	
5	Fundamentals of Microelectronics, Behzad Razavi, 2nd Edition, 2013, Wiley, ISBN-10: 5-1118156323	

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	**Understand** the fundamental of analog integrated circuits	L2	Understand

CO2	**Apply** the knowledge of MOSFET based discrete amplifiers to investigate various design trends in analog IC design	L3	Apply
CO3	**Analyze** the functionality of opamp based analog circuits & systems	L4	Analyze
CO4	**Design** and implement integrated oscillators, analog filters and other analog integrated circuits	L4	Design & Demonstrate
CO5	**Evaluate** the different performance parameters of analog integrated circuits	L5	Design & Demonstrate

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2	3														
CO3		3													
CO4			3		2				2						
CO5				3		2		2		2		2	2	2	2

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Theory			
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)	
	IAT-1	IAT-2	CCA-1	CCA-2
	50 Marks	50 Marks	50 Marks	50 Marks
Remember				
Understand	20	20		
Apply	20	20		
Analyse	10	10		
Evaluate			50	
Create				50

CIE Course Assessment Plan

CO's	Marks Distribution						Total Marks	Weightage
	Test-1			Test-2				
	Module-1	Module-2	Module 2 to 2.5	Module-2.5 to 3	Module-4	Module-5		
CO1	10	10		10			30	30%
CO2	10		10		10	10	40	40%
CO3		10			10	10	30	30%
CO4								
CO5								
Total	20	20	10	10	20	20	100	100%

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	-
Understand	40
Apply	40
Analyse	20
Evaluate	-
Create	-

SEE Course Plan

CO's	Marks Distribution					Total Marks	Weightage
	Module-1	Module-2	Module 3	Module-4	Module-5		
CO1	10	10	10			30	30%
CO2	10		10	10	10	40	40%
CO3		10		10	10	30	30%
CO4							
CO5							
Total	20	20	20	20	20	100	100%

ABILITY ENHANCEMENT COURSE (AEC)

AEC Course – Ability Enhancement Course

Teaching Hours/Week (L: T:P: S)	0:0:2:0
Total Hours of Pedagogy	24 hours Practical
Credits:	01
Programs / Experiments	12
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Practical (Internal Examiners only)

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**06**				
Course Title	**:**	**Introduction to Robotics**				
Course Code	**:**	**BEC607A**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Practical**				
Category	**:**	**AEC**				
Stream	**:**			**CIE**	**:**	**50**
Teaching hours/ week (L:T:P:S)	**:**	**0:0:2:0**		**SEE**	**:**	**50**
Total Hours	**:**			**SEE Duration**	**:**	**03**
Credits	**:**	**02**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the basic components, configurations, and applications of robots.
2	Demonstrate the working of sensors, actuators, and microcontrollers in robotic systems.
3	Develop basic robotic functionalities such as line following, obstacle avoidance, and pick-and-place.
4	Gain hands-on experience with robot programming using Arduino or equivalent.
5	Design simple robotic prototypes for real-world problems.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Use multimedia to explain concepts of robotic motion, sensors, and actuators..
- Encourage collaborative learning through team-based robot building projects.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.

Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.**Scheme of Teaching and**

1 Credit Course – Practical

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
The minimum passing mark for the CIE is 40% of the maximum Marks (20 Marks out of 50).
The minimum passing mark for the SEE is 35% of the maximum Marks (18 Marks out of 50).
A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the Semester-End Examination (SEE), and a minimum of 40% (40 Marks out of 100) in the total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are 50 Marks. The split-up of CIE marks for record/ journal and test are in the ratio 60:40.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to 20 marks (40% of the maximum marks). The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

SEE marks for the practical course are 50 Marks.

- SEE shall be conducted jointly by the two examiners of the same institute; examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University. All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered by the examiners or based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
- General rubrics suggested for SEE are mentioned here,
    - Writeup-20%,
    - Conduction procedure and result in -60%,
    - Viva-voce 20% of maximum marks.

  SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)
- Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.
- The minimum duration of SEE is 02 hours.

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the fundamental components and types of robotic systems (mobile and industrial).
2	Learn to model robotic components and systems using CAD software such as SolidWorks.
3	Analyze the structural and mechanical aspects of robotic systems including torque, RPM, and load calculations.
4	Select appropriate actuators, sensors, and drivetrain components for robotic applications.
5	Simulate, validate, and evaluate robot performance using software tools and hands-on assembly.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- *Adopt different teaching methods to attain the course outcomes.*
- *Include videos to demonstrate various concepts in Network Analysis.*
- *Encourage collaborative (Group) Learning to encourage team building.*
- *Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.*
- *Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.*
- *Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.*
- *Discuss various case studies to map with real-world scenarios and improve the understanding.*
- *Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.*

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Scheme of Teaching and Examinations for BE Programme -2025-26

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

Module No.	Topics	Hours
1	**Overview of Robot modeling using 3D modeling Software:** Introduction of 3d Modeling first and third angle projections, different planes - SolidWorks - Sketch – Part modelling – Extrude, Revolve, Swept, Lofted boss, fillet and chamfer, Assembly	4
Pedagogy	**Inquiry-Based Learning**	
2	**Overview of Robotics:** Introduction of Robotics-Laws of robotics- Robot Anatomy- Configuration of Robot- Work Volume- Robot Drive Systems - Control System - Robot Application.	4
Pedagogy	**Flipped Classroom**	
3	**Robot end effectors:** Robot end effectors-Types of end effectors-Mechanical Grippers-Types of gripper mechanisms-Tools as end effectors-Considerations in gripper selection and design, Motor selection DC, Stepper and Servo.	4
Pedagogy	**Blended Learning**	

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Tai-Ran Hsu, MEMS and Micro systems: Design, Manufacture and Nanoscale Engineering, 2nd Ed, Wiley.
Reference Books	
1	Hans H. Gatzen, Volker Saile, JurgL euthold, Micro and Nano Fabrication: Tools and Processes, Springer, 2015.
2	Dilip Kumar Bhattacharya, Brajesh Kumar Kaushik, Microelectromechanical Systems (MEMS), Cengage Learning.
3	Fundamentals of Microelectromechanical Systems (MEMS), 1st Edition, Eun Sok Kim, 2021

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Examinations for BE Programme -2025-26

Outcome Based Education and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

List of Programs:

Sl. No.	Experiments/Programs	COs
1	Study, Identification, and Disassembly of Robot Parts (Motors, Wheels, Chassis, Sensors)	CO1 to CO5
2	Introduction to SolidWorks for Robot Modeling	CO1 to CO5
3	Design of Gears and Wheels in SolidWorks	CO1 to CO5
4	Design of Chassis and Gripper in SolidWorks	CO1 to CO5
5	Design and Modeling of a 2-DOF Robotic Arm	CO1 to CO5
6	Assembly of Robot Components in SolidWorks (Arm, Chassis, Wheels)	CO1 to CO5
7	Complete Mobile Robot Assembly in SolidWorks	CO1 to CO5
8	Load and Structural Analysis of Robotic Arm (SolidWorks Simulation)	CO1 to CO5
9	Torque and Speed Analysis for Robotic Wheel Selection	CO1 to CO5
10	Design and Demonstration of Pick-and-Place Robot Simulation (Robot Studio / V-REP / Gazebo/ RoboDK)	CO1 to CO5
Open ended Programs		
1	3D Printing of a Designed Robotic Part (e.g., Gripper, Chassis Component, Wheel Hub)	CO1 to CO5
2	Mini-Project: Design and Demonstration of a Real-World Task-Oriented Robot System	CO1 to CO5

CIE for Principles of Programming Using C (Integrated Professional Core Course (IPCC)):

This Course refers to professional theory core course integrated with practical. Credit for this course can be 03 and its Teaching Learning hours (L : T : P: S) can be considered as (2 : 0 : 2 : 0).

15 marks for the conduction of practical experiment and preparation of the Laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.

On completion of every program in the laboratory, the student shall be evaluated including viva-voce and marks shall be awarded on the same day.

Each program report can be evaluated for **15 marks** (Write-up – 3 marks, Execution – 8 marks .and Viva – 4 marks)

The Laboratory test (duration 2 hours / 3 hours) after completion of all the programs shall be conducted for 50 marks and scaled down to **10 marks.**

The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. This course is common to all branches of first year B.E/B.Tech. 2023-24 regulation.

Note: L- Theory Lecture, T- Tutorial, P-Practical, S-Project, IPCC: Integrated Professional Core Course, CIE: Continuous Internal Evaluation, SEE: Semester End Examination.

Text Books	
Sl. No.	**Title of the Book/Name of the author/Name of the publisher/Edition and Year**
1	Industrial Robotics Technology, Programming, and Applications, M. P. Groover, McGrawHill, 2017
Reference Books	
1	SOLIDWORKS 2024 for Designers – Prof. Sham Tickoo & CADCIM
2	Robotics: Modelling, Planning and Control – Bruno Siciliano et al, 2009
3	Arduino Robotics – John-David Warren et al. (Wiley), 2011

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Identify and explain different robot types, components, and working principles.	**L2**	**Understand**
CO2	Apply design thinking to model individual robot components using CAD tools.	**L3**	**Interpret**
CO3	Analyze mechanical properties such as load, torque, and structural integrity of designed robot parts.	**L3**	**Apply**
CO4	Select suitable motors, sensors, and drivetrains based on the application requirements.	**L4**	**Analyze**
CO5	Design and simulate a complete robot system to perform real-world tasks using open-source tools.	**L5**	**Evaluate**

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	2	-	-	-	2	-	-	3	-	-
CO2	-	3	2	-	-	3	-	-	-	2	-	-	3	-	-
CO3	-	-	3	2	-	3	-	-	-	2	-	-	3	-	-
CO4	-	-	3	3	-	2	-	-	-	2	-	-	3	-	-
CO5	-	-	2	3	-	3	-	-	-	2	-	-	3	-	-

Weblinks and Video Lectures (e-Resources)	
1	https://www.youtube.com/@Sw-tcNet/playlists
2	https://www.youtube.com/watch?v=Ulttc_2p4DY&list=PLrOFa8sDv6jcp8E3ayUFZ4iNI8uuPjXHe
3	https://www.youtube.com/watch?v=Iz693FlqZAY&list=PLv2ZxY8SkeQU7nPLXhYpH-TA5I4ILylug
4	https://www.coursera.org/specializations/solidworks-xdesign-for-education#courses
5	https://my.solidworks.com/solidworks/guide/SOLIDWORKS_Introduction_EN.pdf

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Practical		
	Continuous Assessment Tests (IAT)		Continuous Comprehensive Assessment (CCA)
	IAT1 Programs 1-6	IAT2 Programs 7-10	Open ended
	50 Marks	50 Marks	50 Marks
Remember			
Understand	10	10	**10**
Apply	15	15	**10**
Analyse	15	15	20
Evaluate	10	10	10
Create			

CIE Course Assessment Plan

CO's	Marks Distribution		Total Marks	Weightage
	IAT1 Programs 1-6	IAT2 Programs 7-10		
CO1	10	--	10	10%
CO2	15	20	35	35%
CO3	10	20	30	30%
CO4	10	10	20	20%
CO5	05	05	10	20%
Total	50	50	100	100

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks
Remember	
Understand	**10**
Apply	15
Analyse	15
Evaluate	10
Create	

SEE Course Plan

CO's	Marks Distribution	Total Marks	Weightage
	Programs 1 to12		
CO1	**10**	**10**	**20%**
CO2	**15**	**15**	**30%**
CO3	**10**	**10**	**20%**
CO4	**10**	**10**	**20%**
CO5	**05**	**05**	**10%**
Total	**50**	**50**	**100**

Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	**:**	**6th Semester**				
Course Title	**:**	**Design For Testability**				
Course Code	**:**	**BEC607B**				
Course Type (Theory/ Practical/ Integrated)	**:**	**Practical**				
Category	**:**	**Ability Enhancement Course**				
Stream	**:**	**ECE**		**CIE**	**:**	**50**
Teaching hours/ week (L:T:P:S)	**:**	**(0:0:2:0)**		**SEE**	**:**	**50**
Total Hours	**:**	**24**		**SEE Duration**	**:**	**3 hours**
Credits	**:**	**01**				

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Familiarize with Atalanta Tool and its libraries for testing and testability
2	Learn the basics of VLSI and designing of analog and digital circuits in Circuit verse
3	Gain the knowledge of different applications of VLSI design and verification using LT Spice tool.
4	Build mini-projects based on real time applications.

Teaching-Learning Process

Pedagogical Initiatives:

Some sample strategies to accelerate the attainment of various course outcomes are listed below:

- Adopt different teaching methods to attain the course outcomes.
- Include videos to demonstrate various concepts in C.
- Encourage collaborative (Group) Learning to encourage team building.
- Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
- Adopt **Problem-Based Learning (PBL),** which fosters students' analytical skills, and develops thinking skills such as evaluating, generalizing, and analyzing information rather than simply recalling it.
- Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
- Discuss various case studies to map with real-world scenarios and improve the understanding.
- Devise innovative pedagogy to improve **Teaching-Learning Process (TLP)**.

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Scheme of Teaching and Examinations for BE Programme -2025-26
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2025-26)

COURSE CURRICULUM

List of Programs:

Sl. No.	Experiments/Programs
1	Design of a Full adder circuit with and without fault.
2	Design of a Half subtractor with and without fault.
3	Design of a 2:4 Decoder with and without fault.
4	Design of a 8:1 Multiplexer with and without fault.
5	Design of a8:3 Encoder with and without fault.
6	Design of a 4 bit adder using combinational logic
7	Design of a decade counter using sequential logic.
8	Design of D-Algorithm using fault modeling
9	Design of Inverter using LT SPICE tool and to analyze transient and DC analysis.
10	Design of NAND Gate using LTSPICE tool and to analyze transient and DC analysis.
Open Ended Experiments	
1	A New User-Friendly ATPG Platform for Digital Circuits
2	Diagnostic Test Pattern Generation and Fault Simulation for Stuck-at and Transition Faults
3	Enhanced Soft Error Rate Estimation Technique for Aerospace Electronics Safety Design via Emulation Fault Injection

Course Outcomes: At the end of the course, the student will be able to:

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Understand the VLSI Design Fundamentals	L1/L2	Understand
CO2	Apply the concepts of testing and testability in analog and digital circuits.	L3	Apply
CO3	Analyze testability in D Algorithm and PODEM	L4	Analyze
CO4	Design different circuit applications using Atalanta, LT Spice and Circuit verse tools	L5	Evaluate

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2	3												2		
CO3		3							2					2	
CO4			3		2					2					1
CO5				3					2						2

Weblinks and Video Lectures (e-Resources)	
1	S. M. Metev and V. P. Veiko, Laser Assisted Microtechnology, 2nd ed., R. M. Osgood, Jr., Ed. Berlin, Germany: Springer-Verlag, 1998.
2	G. Naveen Balaji, S. Chenthur Pandian, D. Rajesh. "A survey on effective Automatic Test Pattern Generator for self-checking Scan - BIST VLSI circuits." International Research Journal of Engineering and Technology 3.5 (May 2016):

1 Credit Course – Practical

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
The minimum passing mark for the CIE is 40% of the maximum Marks (20 Marks out of 50).
The minimum passing mark for the SEE is 35% of the maximum Marks (18 Marks out of 50).
A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the Semester-End Examination (SEE), and a minimum of 40% (40 Marks out of 100) in the total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are 50 Marks. The split-up of CIE marks for record/ journal and test are in the ratio 60:40.

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- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to 20 marks (40% of the maximum marks). The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

SEE marks for the practical course are 50 Marks.

- SEE shall be conducted jointly by the two examiners of the same institute; examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University. All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered by the examiners or based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
- General rubrics suggested for SEE are mentioned here,
    - Writeup-20%,
    - Conduction procedure and result in -60%,
    - Viva-voce 20% of maximum marks.

  SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)
- Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.
- The minimum duration of SEE is 02 hours.