

DAYANANDA SAGAR ACADEMY OF TECHNOLOGY & MANAGEMENT



CURRICULUM

Scheme and Syllabus VII to VIII Semester

Outcome Based Education

(Academic Year 2026-2027)

Department of Electronics and Communication Engineering

7th & 8th 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 Electronics and Communication (E&C) undergraduate course offered by our department is as per the syllabus defined by Visvesvaraya Technological University (VTU). The course mainly focusses on the development of student's qualities in these following areas Communications, VLSI, Embedded systems, Computer Networks, Signal Processing, Control & Instrumentation, and Electronics Circuits. Apart from the basic course, the advanced courses are offered as elective by our department to ensure the student's exposure to the advancement in technology for that particular course. With the course, the students are exposed to training, hands on workshops, and lectures to acquire knowledge of a specific field in depth. Along with the course, the students can get engaged with research and development activities carried by out the faculty members in our department.

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):

PEO-1: To ensure graduates with strong foundation in engineering, science and technology for successful career in Electronics and Communication Engineering.

PEO-2: Graduates shall be technically competent with ability to analyze, design, develop, optimize and implement Electronics and Communication systems to meet global needs.

PEO-3: 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)

PSO 1: 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.

PSO 2: Adapt to emerging technologies with innovative idea and solution for novel problems.

PSO 3: Ability to create innovative career path to be an entrepreneur and zest for higher studies.



Dayananda Sagar Academy of Technology & Management

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

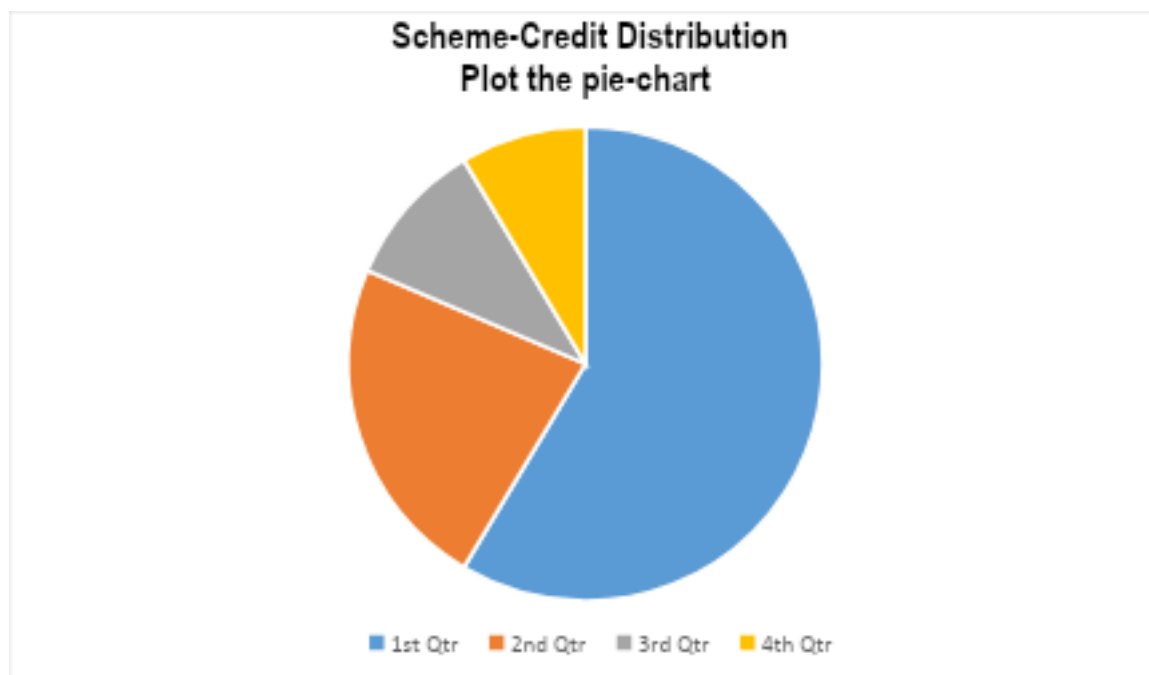
PROPOSED UG CREDIT STRUCTURE IN ALIGNMENT WITH VTU

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

Scheme Distribution

Department of Electronics and Communication Engineering

Course Component	Credits	% of Credits
Basic Science (BS)	11	7
Engineering Science (ES)	15	9
Humanities (HU)	7	4
Program core (PC)	30	19
Program core Integrated (PCI)	44	28
Program core exclusive Lab	0	0
Program elective (PE)	6	4
Open Elective (OE)	6	4
Internship (INT)	13	8
Ability Enhancement course (AEC)	7	4
Project (PR)	15	9
Total	160	100



SEMESTER WISE CREDIT BREAKDOWN FOR B.E. DEGREE CURRICULUM

BATCH 2023-2027

Course Category	Semester								Total Credits
	1 st	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th	
Basic Sciences (BSC)	4	4	3	--	--	--	--	--	11
Engineering Sciences (ESC)	6	6	-	3	--	--	--	--	15
Humanities, Social Sciences and Management (HSMC)	2	2	--	--	3	--	--	--	7
Ability Enhancement Course (AEC)	1	1	1	1	1	2	--	--	7
SCR/Universal Human Values - (UHV)	--	--	1	1	--	--	--	--	2
Professional Core Courses (PCC)	3	3	6	6	3	3	6	--	30
Integrated Professional core Course (IPCC)	4	4	8	8	8	8	4	--	44
Professional Elective Course (PEC)	--	--	--	--	3	3	--	--	6
Institutional Open Elective Courses (IOE)	--	--	--	--	--	3	3	--	6
Internship (INT)	--	--	--	--	--	-	--	12	12
Mini Project / Project Work (PW)	--	--	2	2	2	2	6	--	15
Non-credit Mandatory Courses (NCMC)	--	--	--	--	--	--	--	--	0
Mandatory Courses (Environmental Studies)	--	--	--	--	2	--	--	-	2
Technical seminar	--	--	--	--	--	--	--	2	2
PCCL	--	--	--	--	--	1	1	--	1
Total Credits	20	20	21	21	22	22	20	14	160



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(Autonomous Institute under VTU)

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 (CSE, ISE, ECE, EEE, MECH, CIVIL)

Scheme of Teaching and Examinations – 2024 Outcome Based Education (OBE) and Choice Based Credit System (CBCS) (Effective from 2026-27)

7th SEMESTER: Electronics and 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						
	BEC701	Digital and Wireless Communication	IPCC	ECE	ECE	3	0	1	0	4	4	3	50	50	100
	BEC702	Microwave and Antenna Theory	PCC	ECE	ECE	3	0	0	0	3	3	3	50	50	100
1	BEC703	Professional Elective Course	PEC	ECE	ECE	3	0	0	0	3	3	3	50	50	100
4	BEC704X	Open Elective Course	OEC	ECE	ECE	3	0	0	0	3	3	3	50	50	100
5	BEC706	Capstone Project – Phase-2	PROJ	ECE	ECE	0	0	0	12	12	6	3	100	100	200
6		Indian Knowledge System	NCMC	--	--	--	--	--	--	--	--	--	--	--	--
7		AICTE Activity Points	Details of 80 AICTE Activity Points Earned								--				
Total						12	-	4	12	28	20	18	350	350	700

Professional Elective Course

SI No.	Course Code	Course Title	SI No.	Course Code	Course Title
1	BEC703A	Computer Networks and Internet Protocol	2	BEC703B	Optical Fiber Communication
3	BEC703C	Digital Image Processing	4	BEC703D	Analog and Mixed Signal VLSI Design

Open Elective Course

SI No.	Course Code	Course Title	SI No.	Course Code	Course Title
1	BEC704A	AI for Wireless Communication	2	BEC704B	Drone Technology with AI

8th SEMESTER: Electronics and 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	BECINT801	Internship	PROJ	ECE	ECE	Two contacts hours/week for interaction between faculty and students					12	3	100	100	200
2	BECPS802	Capstone Project – Phase-3	PROJ	ECE	ECE	0	0	0	8	8	4	--	100	--	100
3		AICTE Activity Points	Details of 100 AICTE Activity Points Earned												
Total						0	0	0	8	8	16	3	200	100	300

IPCC: Integrated Professional Core Course,

PEC: Professional Elective Course

OEC: Open Elective Course

PROJ: Project Work,

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

		7 th Semester
1.	List of Existing Elective Courses	-----
2.	List of New Existing Elective Courses	<ol style="list-style-type: none">1. AI for Wireless Communication2. Drone Technology with AI
3.	List of New Industry Aligned Courses	<ol style="list-style-type: none">3. Microwave and Antenna Theory4. Digital and Wireless Communication5. Optical Fiber Communication6. Digital Image Processing7. Analog and Mixed Signal VLSI Design8. Computer network and Internet Protocol

Percentage of Change in the Syllabus

7 th Semester						
Sl.No	Course Code	Course Name	Topics Added	Topics removed	Revised in %	Justification
1	BEC701	Digital and Wireless Communication	<ul style="list-style-type: none"> Access Techniques: Multi-User DSSS systems, Multi-user FHSS systems; Multiuser Systems: Multiuser channels: uplink and downlink, Multiple Access: FDMA, TDMA, CDMA, SDMA, hybrid techniques. 5G Architecture and Fundamental Evolution: 1G, 2G, 3G, 4G and 5G. Network Architecture; Reference Point System Architecture, Service Based System Architecture and Network Functions. 5G Fundamentals Base Station: Base Station Architecture. 	<ul style="list-style-type: none"> Signal design for Band limited Channels: Design of band limited signals for zero ISI-The Nyquist Criterion Effect of De-spreading on a narrowband Interference. <p>Principles of Cellular Communications: Cellular terminology, Cell structure and Cluster, Frequency reuse concept, Cluster size and system capacity, Method of locating cochannel cells, Frequency reuse distance. A Basic Cellular System: A basic cellular system connected to PSTN, Operation of a cellular system</p>	60 % retained the VTU syllabus	<ul style="list-style-type: none"> 40 % changes had been made with respect to the VTU Syllabus <p>[This subject is a combination of Digital Communication and Wireless communication as per VTU Syllabus.]</p>
2	BEC702	Microwave and Theory	<ul style="list-style-type: none"> Gunn Diode Reflex Klystron oscillator – basic construction and working principle. Linear arrays (different cases). 	Mechanism of Oscillations, Modes of Oscillations, Mode Curve. circulators. Antenna Apertures, Effective Height Power Patterns, Power Theorem. Directivity of Circular Loop Antennas	60 % retained the VTU syllabus	30-40 % changes had been made with respect to the VTU Syllabus

			<ul style="list-style-type: none"> • Small loop antenna and basic characteristics, rectangular horn antenna, and applications. • parabolic reflector antenna and their applications in communication systems 			
3	BEC703A	<ul style="list-style-type: none"> • Computer Networks and Internet Protocol 	<ul style="list-style-type: none"> • World Wide Web • Telnet • IEEE 802.11, • Bluetooth 	<ul style="list-style-type: none"> • Application Layer: Application layer services, FTP: Two connections, Control Connection, Data Connection, Quality of Service • Transport Layer: Windows in TCP, Error control, TCP congestion control. 	<ul style="list-style-type: none"> • 60 % retained the VTU syllabus 	<ul style="list-style-type: none"> • 30-40 % changes had been made with respect to the VTU Syllabus
	BEC703B	Optical Fiber Communication	<ul style="list-style-type: none"> • AI-based traffic prediction in optical networks, AI-driven network congestion control, AI in 5G/6G optical backhaul networks, AI-based traffic load balancing. AI-based laser power control systems, AI-controlled semiconductor lasers 	<ul style="list-style-type: none"> • Optical network transmission modes, layers and protocols: Synchronous networks, Asynchronous transfer mode, OSI reference model, Optical transport network, Internet protocol, Wavelength routing networks: Routing and wavelength assignment, Optical switching networks: Optical circuit switched networks, packet switched networks, Multiprotocol Label Switching. 	<ul style="list-style-type: none"> • 60 % retained the VTU syllabus 	<ul style="list-style-type: none"> • 30-40 % changes had been made with respect to the VTU Syllabus

<ul style="list-style-type: none"> ● BEC703C 	<ul style="list-style-type: none"> ● Digital Image Processing 	<ul style="list-style-type: none"> ● Introduction to Feature Extraction for Image Analysis: Boundary representation, regional descriptors, texture-based image features ● Morphological Image Processing: erosion and dilation, opening and closing, boundary extraction, hole filling, connected component extraction, thinning and thickening, and grayscale morphology. ● AI-assisted Image Segmentation - Thresholding, edge-based and region-based segmentation methods for image analysis. ● Principles of computed tomography smoothing and sharpening in colour images and segmentation based on colour Morphological Image Processing. 	<ul style="list-style-type: none"> ● Image Sampling and Quantization ● Some Basic Relationships Between Linear and Nonlinear Operations. ● Two-dimensional DFT. 	<ul style="list-style-type: none"> ● 60 % retained the VTU syllabus 	<ul style="list-style-type: none"> ● 30-40 % changes had been made with respect to the VTU Syllabus.
<ul style="list-style-type: none"> ● BEC703D 	<ul style="list-style-type: none"> ● Analog and Mixed Signal VLSI Design 	<ul style="list-style-type: none"> ● AI Techniques in Mixed-Signal and Data Converter Systems: AI-Based ADC/DAC Calibration ● Techniques, Machine Learning for SNR Enhancement and Noise Reduction, AI-Assisted CMOS Comparator Optimizations. 	<p>Process Flow, Capacitors and Resistors, MOSFET Switch (upto Bidirectional Switches), Delay and adder Elements, Analog Circuits MOSFET Biasing (upto MOSFET Transition Frequency)</p>	<p>60 % retained the VTU syllabus</p>	<p>40 % changes had been made with respect to the VTU Syllabus.</p>

8th Semester

Sl.No	Course Code	Course Name	Topics Added	Topics removed	Revised in %	Justification
1	BECINT801	Internship	--	--	--	--
2	BECTS802	Technical Seminar	--	--	--	--

7th 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

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/progra 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/observ ations/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

								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	:	7 th			
Course Title	:	Digital and Wireless Communication			
Course Code	:	BEC701			
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+12Hrs	SEE	:	3 hrs
Credits	:	4	Duration		

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the concept of Bandpass signals, modulations schemes and wireless communication.
2	Illustrate the concepts of signal propagation over wireless channel, Multiple Access Techniques
3	Compute the Orthogonalization procedure, error probability, CDMA code, PN sequences, OFDM PAPR
4	Interpret the processes of generation and detection of digital modulation techniques, MIMO transmission
5	Simulate various digital modulation techniques, signal detection and channel estimation using AI.

Teaching-Learning Process

Pedagogical Initiatives:

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

1. Adopt different teaching methods to attain the course outcomes.
2. Include videos to demonstrate various concepts in C.
3. Encourage collaborative (Group) Learning to encourage team building.
4. Ask at least three **HOTS (Higher-order Thinking Skills)** module-wise questions to promote critical thinking.
5. 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.
6. Show different ways to solve a problem and encourage the students to come up with creative and optimal solutions.
7. Discuss various case studies to map with real-world scenarios and improve the understanding.



DSATM

Scheme of Teaching and Examinations for BE Programme -2024-25
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2024-25)

COURSE CURRICULUM

Module No.	Topics	Hours
1	Bandpass Signals to Equivalent Lowpass: Hilbert Transform, Pre-envelopes, Complex envelopes of Band-pass Signals, Canonical Representation of Bandpass signals. Signalling over AWGN Channels: Introduction, Geometric representation of signals, Gram- Schmidt Orthogonalization procedure, Optimum receivers using coherent detection: ML Decoding, matched filter receiver. (Text 1: 2.8, 2.9, 2.10, 2.11, 2.12, 7.1, 7.2, 7.3, 7.4)	8
Pedagogy	Chalk and talk method	
2	Digital Modulation Techniques: Phase shift Keying techniques using coherent detection: generation, detection and error probabilities of BPSK and QPSK, M-ary PSK, M-ary QAM, Differential Phase Shift Keying. Frequency shift keying techniques using Coherent detection: BFSK generation, detection and error probability. (Text 1 :7.6, 7.7,7.8,7.9)	8
Pedagogy	Chalk and talk method, Simulation	
3	Principles of Wireless Communications: The Wireless Communication Environment, Modelling of wireless systems, System model for narrowband Signals, Rayleigh fading Wireless Channel, Doppler fading. (Text 2: 3.1, 3.2, 3.3, 3.4, 4.5) Access Techniques: Multi-User DSSS systems, Multi-user FHSS systems; Multiuser Systems: Multiuser channels: uplink and downlink, Multiple Access: FDMA, TDMA, CDMA, SDMA. (Text 3: 13.4,13.5,14.1,14.2)	8
Pedagogy	Chalk & Talk	
4	Code Division for Multiple Access (CDMA): Basic CDMA Mechanism, Fundamentals of CDMA codes, Spreading Codes based on PN sequences, Correlation Properties of Random CDMA Spreading Sequences, Advantages of CDMA. (Text 2: 5.1-5.5, 5.7) Orthogonal Frequency Division Multiplexing (OFDM): Introduction, Motivation and Multicarrier basics, OFDM basics, OFDM Example, MIMO OFDM, OFDM Peak to Average Power ratio, SC-FDMA. (Text 2: 7.1 – 7.3, 7.5, 7.7, 7.8)	8
Pedagogy	Think, Pair, Share	
5	Multiple Input Multiple Output Wireless Communications: Introduction to MIMO Communications, MIMO system Model, MIMO Zero Forcing Receiver, MIMO MMSE Receiver. (Text 2: 6.1 – 6.4) Applications in Communications using AI: Introduction to AI in communication: Machine learning applications for modulation (BPSK, QPSK) AI-based signal detection in noisy environments, AI-based channel estimation in Rayleigh fading channels. (Ref. book 3)	8
Pedagogy	Experiential Learning	
	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 using MATLAB/SCILAB/OCTAVE	COs
1.	Simulation of Hilbert Transform for Bandpass Signals using MATLAB.	CO3, 4, 5
2.	Geometric Representation of Signals in Signal Space using MATLAB.	CO3, 4, 5
3.	Computations of the Probability of Bit Error for Coherent Binary ASK, FSK and PSK for an AWGN Channel and Compare Them	CO3, 4, 5
4.	Digital Modulation Techniques i) DPSK Transmitter and Receiver ii) QPSK Transmitter and Receiver	CO3, 4, 5
5.	Simulation of FDMA, TDMA and CDMA Multiple Access Techniques.	CO3, 4, 5
6.	Simulation of Rayleigh Fading Wireless Channel and Analysis of BER Performance.	CO3, 4, 5
7.	MATLAB Simulation of AI-Assisted Coherent Detection for BPSK Systems.	CO3, 4, 5
8.	Machine Learning Based Channel Estimation in Rayleigh Fading Environment.	CO3, 4, 5
Open ended Programs		
1	Implementation of Gram–Schmidt Orthogonalization for Signal Space Representation.	CO3, 4, 5
2	Machine Learning Based Signal Detection in Additive White Gaussian Noise Environment.	CO3, 4, 5
3	Verification of Correlation Properties of PN Sequences used in CDMA Systems.	CO3, 4, 5
4	AI-Based Doppler Shift Prediction in Wireless Communication Systems.	

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**.

CO1															
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	-	-	3	-	-	-	-	-	-	-	-	-	-	2	-
CO5	-	-	-	-	2	-	-	-	-	2	2	2	2	-	3

Weblinks and Video Lectures (e-Resources)

1	https://nptel.ac.in/courses/117101051
2	https://www.youtube.com/watch?v=8CKZ_icPea0&list=PLuv3GM6-gsE29peRde2uuLvzxh1pztvJ

**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 (PEC)

Professional Core Courses (PCC): A professional core course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering professional electives is 10. However, this condition shall not be applicable to cases where the admission to the program is less than 10.

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 **10 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 **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).

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				
SEE	Total CIE Theory					50	20	Total Marks of IAT and CCA is 50



Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	7 th			
Course Title	:	Microwave and Antenna Theory			
Course Code	:	BEC702			
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	:	3 Hours
Credits	:	3	Duration		

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To impart the basic knowledge of microwave signals, transmission lines and antenna characteristics for communication.
2	To Equip the Students to exercise the different microwave network theory for the RF applications.
3	To Impart the students to identify the different antenna designs using a various strip line for the transmission of signals necessary for building RF system.
4	To provide practical exposure to design the antenna array and RADAR applications.
5	To find the solution for real time applications with the help of antenna concept to enhance the RF system using the current advanced technology.

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.

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



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COURSE CURRICULUM

Module No.	Topics	Hours
1	<p>Microwave Fundamentals and Transmission Lines: Introduction, Microwave frequency range and applications. Introduction to microwave devices and microwave systems. Gunn Diode, Reflex Klystron oscillator – basic construction and working principle.</p> <p>Transmission line fundamentals: Transmission line Equations, Reflection coefficient, transmission coefficient, standing waves, Standing Wave Ratio (SWR). Introduction to Smith chart and basic impedance matching using single stub. TextBook1</p>	8 Hours
Pedagogy	problem solving	
2	<p>Microwave Network Theory: Microwave network concepts. Basic introduction to network parameters: Z-parameters and Y-parameters. Scattering parameters (S-parameters) for multiport networks.</p> <p>Microwave passive components: Coaxial connectors, adapters, attenuators, phase shifters, waveguide tees, magic tee and their applications. [only basic concepts, no numerical]</p>	8 Hours
Pedagogy	seminar	
3	<p>Strip transmission lines: Microstrip lines, parallel strip lines, coplanar strip lines and their applications.</p> <p>Antenna fundamentals: Introduction to antennas, radiation pattern, beamwidth, radiation intensity, efficiency, antenna gain, directivity, Radio Communication Link, antenna field zones. Text book 2. (2.1-2.8,2.11,2.12,2.13)</p>	8 Hours
Pedagogy	simulation	
4	<p>Antenna Arrays: Point sources and radiation patterns, Introduction to antenna arrays, Linear arrays of isotropic point sources (basic concept). Linear arrays (different cases).</p> <p>Electric dipole antennas: Short dipole antenna, radiation pattern of dipole antennas, concept of radiation resistance. Text book 2. (5.2.5.5,5.13,6.1-6.4)</p>	8 Hours
Pedagogy	case studies	
5	<p>Practical Antenna Types: Small loop antenna and basic characteristics, rectangular horn antenna and applications, Helical antenna (basic concept), Yagi-Uda antenna, parabolic reflector antenna. Text book 2. (7.2-7.5,7.20,8.2-8.5,8.8,9.9)</p> <p>Antenna optimization using AI: AI applications in electromagnetics and RF systems. Rectenna optimization using ML. Multi-Band RF Energy Harvesting Using AI.</p>	8 Hours

	<p>Pedagogical Initiatives (Not limited to):</p> <ul style="list-style-type: none"> ▪ 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	Microwave Devices and circuits- Samuel Y Liao, Pearson Education
2	Antennas and Wave Propagation- John D. Krauss, Ronald J Marhefka, Ahmad SKhan, 4th Edition, McGraw Hill Education, 2013

Reference Books

1	Antennas and Wave Propagation- Harish and Sachidananda: Oxford University Press, 2007
2	Microwave Engineering- David M Pozar, John Wiley India Pvt Ltd., 3rd Edn,2008.

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 theoretical principles underlying the semiconductor diodes, microwave devices and their parameters using the transmission lines.	L2	Understand
CO2	Apply the basic network theory using the parameters and different types of passive devices of microwave for transmission of signals.	L3	Apply
CO3	Analyse the various microwave devices and antenna parameters to build a RF system.	L4	Analyze
CO4	Design the antenna array for the real time applications.	L4	Analyze
CO5	Investigate the Antenna model for real time applications using current Technology	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	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	2		-	-	-		1	-	-	-	-	-
CO5	-	-	1	1	1	-	-	-	1	-	-	-	-	-	-

Weblinks and Video Lectures (e-Resources)

1	https://nptel.ac.in/courses/117104118
2	https://nptel.ac.in/courses/101104061
3	https://nptel.ac.in/courses/117105130
4	https://nptel.ac.in/courses/117101119
5	10.23919/EuCAP63536.2025.10999469
6	DOI: 10.1109/TAP.2022.3189963
7	https://doi.org/10.1016/j.engappai.2024.108232

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	20	50	50
Analyse	--	10	--	--
Evaluate	10	10	--	--
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	10	--	--	--	10	10	30	30%
CO2	20	--	10	--	10	10	50	50%
CO3	--	10	--	10	--	--	20	20%
CO4	--	--	--	--	--	--	--	--
CO5	--	--	--	--	--	--	--	--
Total	30	10	10	10	20	20	100	100%

**PROFESSIONAL
ELECTIVE COURSE
(PEC)**



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

Semester	:	7 th			
Course Title	:	Computer Network and Internet Protocols			
Course Code	:	BEC701A			
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	:	40 Hrs		SEE	: 3 Hours
Credits	:	3		Duration	

Course Learning Objectives:

Sl. No	Course Objectives
1	To introduce the fundamental concepts of data communication, computer networks, and layered network architectures including the OSI and TCP/IP models.
2	To develop an understanding of data link layer functions, including framing, error control, flow control, media access protocols, and the operation of networking devices and LAN technologies.
3	To explain the network layer concepts and Internet Protocol mechanisms, including IPv4 and IPv6 addressing, packet switching techniques, routing algorithms, and network services.
4	To provide knowledge of transport layer protocols and mechanisms, including reliable data transmission, flow control, congestion control, and protocols such as TCP and UDP.
5	To familiarize students with application layer protocols and Internet services, including HTTP, FTP, email systems, DNS, and Quality of Service in modern networks.

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	Data communication: Components, Data representation, Data flow, Networks: Network criteria, Physical Structures, Network types: LAN, WAN, Switching, The Internet. Network Models: TCP/IP Protocol Suite: Layered Architecture, Layers in TCP/IP suite, Description of layers, Encapsulation and Decapsulation, Addressing, Multiplexing and Demultiplexing, The OSI Model: OSI Versus TCP/IP. Data-Link Layer: Introduction: Nodes and Links, Services, Link Layer addressing: Types of addresses, ARP TextBook1(1.1,1.2, 1.3.1to 1.3.4,2.2, 2.3 ,9.1, 9.2.1, 9.2.2)	8
Pedagogy	Experiential Learning	
2	Data Link Control (DLC) services: Framing, Flow and Error Control. Data-link Protocols: Simple protocol, Stop and wait Protocol. Media Access Control: Random Access: ALOHA, CSMA, CSMA/CD, CSMA/CA. Wired and Wireless LANs: Ethernet Protocol, Standard Ethernet. Introduction to wireless LAN: Architectural Comparison, IEEE 802.11, Bluetooth TextBook1 (11.1,12.1,13.1,13.2.1 to 13.2.5,15.1,17.1,17.2)	8
Pedagogy	Think Pair Share	
3	Network Layer: Introduction, Network Layer services: Packetizing, Routing and Forwarding, Other services, Packet Switching: Datagram Approach, Virtual Circuit Approach, IPV4 Addresses: Address Space, Classful Addressing, Classless Addressing, DHCP, Network Address Resolution Network Layer Protocols: Internet Protocol (IP): Datagram Format, Fragmentation, Options, Security of IPv4 Datagrams. IPv6 addressing and Protocol. Unicast Routing: Introduction, Routing Algorithms: Distance Vector Routing, Link State Routing, Path vector routing. TextBook1 (18.1(excluding 18.1.3),18.2, 18.4,19.1,20.1, 20.2,22.1 and 22.2)	8
Pedagogy	Mobile Studio	
4	Transport Layer: Introduction: Transport Layer Services, Connectionless and Connection oriented Protocols, Transport Layer Protocols: Simple protocol, Stop and wait protocol, Go-BackN Protocol, Selective repeat protocol, User Datagram Protocol: User Datagram, UDP Services, UDP Applications, Transmission Control Protocol: TCP Services, TCP Features TextBook1 (23.1, 23.2.1, 23.2.2, 23.2.3, 23.2.4, 23.2.5,24.2, 24.3.1, 24.3.2, 24.3.3, 24.3.4, 24.3.6, 24.3.8, 24.3.9)	8
Pedagogy	Demonstration	
5	Application Layer: Introduction: Application- layer paradigms, Standard Client Server Protocols: World Wide Web, Hyper Text Transfer Protocol, Electronic Mail: Architecture, Domain Name system: Name space, DNS in internet, Resolution, DNS Messages, Registrars, DDNS, security of DNS. AI in Web Optimization (HTTP), AI-Based Spam Filtering (Email Systems), AI in DNS Security, AI-driven client-server interaction TextBook1 (25.1, 26.1.2, 26.2, 26.3, 26.6, 30.1, 30.2.)	8
Pedagogy	Case Studies	
	Pedagogical Initiatives (Not limited to):	

	<ul style="list-style-type: none"> ▪ 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
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Text Books	
Sl. No.	Title of the Book/Name of the author/Name of the publisher/Edition and Year
1	Data Communications and Networking, Forouzan, 5th Edition, McGraw Hill, 2022 ISBN: 1-25-906475-3
2	Wireless Communication with Artificial Intelligence, Emerging Trends and Applications, by Anuj Singal, SandeepKumar Sajjan Singh, Ashish Kr. Luhach CRC Press Taylor and Franis Group
Reference Books	
1	A.S Tanenbaum - Computer Networks, 6th Edition, PHI, 2022
2	Computer Networks, James J Kurose, Keith W Ross, Pearson Education, 8 th Edition 2020, ISBN: 0-273-76896-4

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Ability to understand the fundamental concepts of data communication, network architectures, OSI and TCP/IP models, including data representation, network types, addressing mechanisms, and encapsulation processes.	L2	Understand
CO2	Ability to analyze the data link layer mechanisms such as framing, flow control, error control, medium access protocols (ALOHA, CSMA variants), and evaluate the role of networking devices and VLANs in LAN environments.	L3	Analyse
CO3	Ability to apply concepts of the network layer, including IP addressing, subnetting, DHCP, packet switching techniques, and routing algorithms such as distance vector, link state, and path vector routing.	L4	Apply
CO4	Ability to Interpret and compare transport layer protocols including UDP and TCP, and analyze mechanisms such as flow control, congestion control, segmentation, and reliable data transmission protocols.	L4	Design
CO5	Ability to evaluate application layer protocols and services including HTTP, FTP, Email, and DNS, and explain how Internet-based client-server communication supports modern network applications.	L5	Evaluate

Total	30	10	10	10	20	20	100	100
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SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	--
Understand	30
Apply	30
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	10	5	--	--	10	--	25	25%
CO2	10	10	--	10	--	10	40	40%
CO3	5	5	5	--	10	10	35	35%
CO4	--	--	--	--	--	--	--	--
CO5	--	--	--	--	--	--	--	--
Total	20	20	10	10	20	20	100	100



Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	7 th			
Course Title	:	Optical Fiber Communication			
Course Code	:	BEC703B			
Course Type (Theory/ Practical/ Integrated)	:	Theory			
Category	:	PEC			
Stream	:	ECE		CIE	: 50
Teaching hours/ week (L:T:P:S)	:	3:0:0:0		SEE	: 50
Total Hours	:	40hrs		SEE	: 3hrs
Credits	:	3		Duration	

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	To introduce the fundamentals of optical fiber communication, fiber structures, propagation mechanisms, and different types of optical fibers.
2	To study the optical fiber transmission characteristics, losses, dispersion effects, splicing methods, and connector technologies.
3	To familiarize students with optical sources and detectors, including LEDs, laser diodes, and photodetectors used in communication systems.
4	To realize the concepts of Wavelength Division Multiplexing (WDM), optical filters, multiplexers, and optical amplifiers used in high-speed optical networks.
5	To gain knowledge of optical network architectures, switching techniques, transmission fundamentals, and the evolution of modern telecommunication networks.

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

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COURSE CURRICULUM

Module No.	Topics	Hours
1	Historical development: The general system, Advantages of optical fiber communication, Optical fiber wave guides: Ray theory transmission, Modes in planar guide, Phase and group velocity, cylindrical fiber: Modes, Step index fibers, Graded index fibers, Single mode fibers, Cutoff wavelength, Mode field diameter, effective refractive index. Fiber Materials, Photonic crystal fibers. Textbook 1	8
Pedagogy	Experiential Learning	
2	Transmission characteristics of optical fiber: Attenuation, Material absorption losses, Linear scattering losses, Nonlinear scattering losses, Fiber bend loss, Dispersion, Chromatic dispersion, Intermodal dispersion: Multimode step index fiber. Optical Fiber Connectors: Fiber alignment and joint loss, Fiber splices: Fusion Splices, Mechanical splices, Fiber connectors: cylindrical ferrule connectors, Duplex and Multiple fiber connectors, Fiber couplers: three and four port couplers, star couplers, Optical Isolators and Circulators. Textbook 1	8
Pedagogy	Think Pair Share	
3	Optical sources and Detector Light Emitting diodes: LED Structures, Light Source Materials, Quantum Efficiency and LED Power, Modulation, Basics of Laser Diodes. Photodetectors: Physical principles of Photodiodes, The pin Photodetector, Avalanche Photodiodes. AI-based laser power control systems, AI-controlled semiconductor lasers Textbook 3	8
Pedagogy	Role Play	
4	WDM Concepts and Components: Overview of WDM: Operational Principles of WDM, WDM standards, Mach-Zehnder Interferometer Multiplexers. Fiber grating filters, Dielectric Thin-Film Filters, Diffraction Gratings. Optical amplifiers: Basic application and Types. Semiconductor optical amplifiers, Erbium Doped Fiber Amplifiers, Raman Amplifiers, Wideband Optical Amplifiers. Textbook 2	8
Pedagogy	Presentation	
5	Introduction to Optical Networks: Telecommunication network Architecture, services, circuit switching and packet switching, optical Networks, transmission basics, network evolution. AI-based traffic prediction in optical networks, AI-driven network congestion control, AI in 5G/6G optical backhaul networks, AI-based traffic load balancing Textbook 1	8
	Pedagogical Initiatives (Not limited to):	

	<ul style="list-style-type: none"> • 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
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Text Books	
Sl. No.	Title of the Book/Name of the author/Name of the publisher/Edition and Year
1	John M Senior, Optical Fiber Communications, Principles and Practice, 3rd Edition, Pearson Education, 2010, ISBN:978-81-317-3266-3
2	Gerd Keiser, Optical Fiber Communication, 5th Edition, Mc Graw Hill Education (India) Private Limited, 2015. ISBN: I-25-900687-5.
3	Kumar Sivarajan and Rajiv Ramaswamy, Galen Sasaki, 'Optical networks: A practical perspective', 3rd edition, Morgan Kaufmann Publishing, 2010.
Reference Books	
1	Biswajit Mukherjee, 'Optical Communication Networks', TMH, 1998.
2	Joseph CPalais, Fiber Optic Communication, Pearson Education, 2005, ISBN:0130085103.
3	Fiber Optic Communication Systems – Govind P. Agarwal, John Wiley, 3rd Edition, 2004.

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 propagation mechanisms, types, structures, and materials of optical fibers used in optical communication systems.	L1/L2	Understand
CO2	Apply the concepts of attenuation, dispersion, scattering losses, splicing, and connector techniques in analysing optical fiber transmission systems.	L3	Apply
CO3	Analyse the performance and operating characteristics of optical sources and photodetectors such as LEDs, laser diodes, PIN diodes, and avalanche photodiodes.	L4	Analyse
CO4	Evaluate the performance of WDM systems, optical multiplexers, filters, and optical amplifiers for modern optical communication applications.	L5	Evaluate
CO5	Design or develop basic optical communication network models using concepts of optical networking, switching, and transmission architectures.	L5	Create

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	-	2	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	-	-	2	-	-	-	-	-	-	-	-	-	-	2	-
CO5	-	-	-	-	2	-	-	-	-	-	-	-	-	-	2

Weblinks and Video Lectures (e-Resources)

1	https://onlinecourses.nptel.ac.in/e-learning/preview/noc20_ee79
2	http://www.digimat.in/nptel/courses/video/108104113/L01.html
3	https://terna.digimat.in/nptel/courses/video/117104127/L21.html
4	https://onlinecourses.nptel.ac.in/e-learning/preview/noc19_ee67

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	10	10	--	--
Apply	20	20	--	--
Analyse	20	20	--	--
Evaluate	--	--	30	30
Create	--	--	20	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	30	30%
CO2	20	--	10	--	--	--	30	30%
CO3	--	10	--	10	10	10	40	40%
CO4	--	--	--	--	--	--	--	--
CO5	--	--	--	--	--	--	--	--
Total	30	10	10	10	20	20	100	100

SEE- Semester End Examination (50 Marks)

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



Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	VII		
Course Title	:	DIGITAL IMAGE PROCESSING		
Course Code	:	703C		
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	: 3 hrs
Credits	:	3	Duration	

Course Learning Objectives: Students will be able to:

Sl. No	Course Learning Objectives
1	Understand the fundamentals of digital image processing, representation and transforms.
2	Familiarize with image enhancement techniques in spatial and frequency domains for image analysis.
3	Provide knowledge in analyzing image features, segmentation and color image processing techniques.
4	Impart design skills for restoration techniques to improve degraded images.
5	Equip with the usage of modern image processing tools and intelligent image analysis concepts for real-world 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)**.



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	Digital Image Fundamentals: What is Digital Image Processing? Origins of Digital Image Processing, Examples of fields that use DIP, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships Between Pixels. [Text 1: Chapter 1, Chapter 2: Sections 2.1 to 2.5]	8
Pedagogy	Demonstration + Think Pair Share	
2	Image Transforms and Spatial Domain: Introduction, Two-Dimensional Orthogonal and Unitary Transforms, Properties of Unitary Transforms, Two-Dimensional DFT, cosine Transform, Haar Transform. Some Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Introduction to Feature Extraction for Image Analysis: Boundary representation, regional descriptors, texture-based image features (Concepts only). Text 2: Chapter 5: Sections 5.1 to 5.3, 5.5, 5.6, 5.9], [Text 2: Chapter 3: Sections 3.2 to 3.6]	8
Pedagogy	Problem Based Learning	
3	Color Image Processing: color models, pseudo and full-color image processing, smoothing and sharpening in color images and segmentation based on color Morphological Image Processing: erosion and dilation, opening and closing, boundary extraction, hole filling, connected component extraction, thinning and thickening, and grayscale morphology. [Text 1:Chapter 6: Sections 6.1 to 6.5]	8
Pedagogy	Mobile Studio / MATLAB/OpenCV Demo	
4	Frequency Domain: Basics of Filtering in the Frequency Domain, Image Smoothing and Image Sharpening Using Frequency Domain Filters. AI-assisted Image Segmentation - Thresholding, edge-based and region-based segmentation methods for image analysis (Concepts only). [Text 1: Chapter 4: Sections 4.7 to 4.9]	8
Pedagogy	Case Study	
5	Image Restoration and Reconstruction: A model of the Image Degradation/Restoration Process, Noise models, Restoration in the Presence of Noise Only using Spatial Filtering and Frequency Domain Filtering, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Principles of computed tomography. Introduction to Machine Vision Applications: Basics of image classification and recognition for medical imaging and industrial inspection (Concepts only).	8

	[Text 1: Chapter 5: Sections 5.1, to 5.4.3, 5.7, 5.8]	
Pedagogy	Flipped Classroom	
	Pedagogical Initiatives (Not limited to): <ul style="list-style-type: none"> • 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 Image Processing- Rafael C Gonzalez and Richard E Woods, PHI, 3rd Edition 2010.
2	Fundamentals of Digital Image Processing- A K Jain, PHI Learning Private Limited 2014
Reference Books	
1	Digital Image Processing- S Jayaraman, S Esakkirajan, T Veerakumar, Tata McGraw Hill, 2014.
2	Milan Sonka, Vaclav Hlavac, Roger Boyle, <i>Image Processing, Analysis and Machine Vision</i> , Cengage Learning, 4th Edition, 2018.

Course outcomes (Course Skill Set)

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

Sl. No	Course Outcomes	Level
1	Understand the fundamentals of digital image processing, image representation and image transforms.	L2
2	Apply spatial and frequency domain techniques for digital image enhancement and color image processing.	L3
3	Analyse image processing methods including filtering, color image processing and restoration techniques for different applications.	L4
4	Design suitable image enhancement and restoration techniques for improving degraded digital images.	L4

5	Examine intelligent image analysis concepts and modern computational tools for real-world image processing applications.	L4
---	--	----

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2	3											
CO3	2	1	1									
CO4		2	2									
CO5			2	2	3				2	2		2
AVERAGE	2.5	1.5	2.5	2	3				2	2		2

Web links and Video Lectures (e-Resources)

- Image databases, https://imageprocessingplace.com/root_files_V3/image_databases.htm
- Student support materials , https://imageprocessingplace.com/root_files_V3/students/students.htm
- NPTEL Course, Introduction to Digital Image Processing, <https://nptel.ac.in/courses/117105079>
- Computer Vision and Image Processing, <https://nptel.ac.in/courses/108103174>
- Image Processing and Computer Vision – Matlab and Simulink,
- <https://in.mathworks.com/solutions/image-video-processing.html>

Activity Based Learning (Suggested Activities in Class)/ Practical Based Learning

- Verilog /VHDL coding for Image manipulation.
- Simulink models for Image processing.

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	10	10	--	--
Apply	20	20	--	--
Analyse	20	20	--	--

Evaluate	--	--	30	30
Create	--	--	20	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	30	30%
CO2	20	--	10	--	--	--	30	30%
CO3	--	10	--	10	10	10	40	40%
CO4	--	--	--	--	--	--	--	--
CO5	--	--	--	--	--	--	--	--
Total	30	10	10	10	20	20	100	100

SEE- Semester End Examination (50 Marks)

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

**OPEN ELECTIVE COURSE
(OEC)**

OEC – Open Elective Course

Open Elective Courses: Students belonging to a particular stream of Engineering and Technology are not entitled to the open electives offered by their parent Department. However, they can opt for an elective offered by other Departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator / Advisor / Mentor. The minimum numbers of students' strength for offering Open Elective Course is 10. However, this condition shall not be applicable to class where the admission to the program is less than 10. Project Phase – I: Students have to discuss with the mentor / guide and with their help he / she has to complete the literature survey and prepare the report and finally define the problem statement for the project work.

Teaching Hours/Week (L: T:P: S)	3:0:0:0
Total Hours of Pedagogy	40 hours – Theory
Credits:	03
Modules	5
CIE Marks	50
SEE Marks	50
Total Marks	100
Exam Hours	3
Examination nature (SEE)	Theory

3 Credit Course – Open Elective Course (OEC)

Open Elective Courses (OEC): A open elective course (OEC) is a course offered by departments other than a student's parent department. These interdepartmental /interdisciplinary courses allow students to explore disciplines beyond their core area of study. These courses are intended to promote interdisciplinary learning, broad-based education, thereby enhancing a student's overall knowledge, creativity, and employability. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor/Proctor.

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 **10 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 **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).

Open Elective Course (OEC) – 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
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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	:	7 th			
Course Title	:	Artificial Intelligence for Wireless Communication			
Course Code	:	BEC704A			
Course Type (Theory/ Practical/ Integrated)	:	Theory			
Category	:	OEC			
Stream	:	ECE		CIE	: 50
Teaching hours/ week (L:T:P:S)	:	(3:0:0:0)		SEE	: 50
Total Hours	:	40		SEE	: 3 Hours
Credits	:	03		Duration	

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand fundamental of cellular communication concepts, propagation models, and wireless channel behaviour.
2	Explain multiple access techniques and the architecture and operation of cellular systems including GSM networks.
3	Introduce core machine learning techniques and their relevance to engineering problems.
4	Apply machine learning algorithms for solving wireless communication problems such as channel modelling, signal detection, and classification.
5	Analyze the role of AI in modern wireless systems for efficient resource management and future communication technologies.

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 -2026-27
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2026-27)

COURSE CURRICULUM

Module No.	Topics	Hours
1	The Cellular Concept – Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies, Improving Capacity in Cellular Systems (Text-1 Chapter 2) Mobile Radio Propagation -Large Scale Path Loss - Free Space Propagation Model, Relating Power to Electric Field, Three Basic Propagation Mechanisms - Reflection (Ground Reflection) , Diffraction, Scattering, Practical Link Budget	8
Pedagogy	Experiential Learning	
2	Multiple Access Techniques: FDMA, TDMA, CDMA, SDMA, Hybrid Multiple Access Techniques, Multicarrier Multiple Access Schemes. A Basic Cellular System: A basic cellular system connected to PSTN, Parts of basic cellular system, Operation of a cellular system. [Text2: 8.2, 8.3, 8.4.5, 8.5, 8.6, 8.10, 9.2.2, 9.2.3, 9.3]	8
Pedagogy	Chalk and talk	
3	Global System for Mobile (GSM): GSM Network Architecture, GSM signalling protocol architecture, Identifiers used in GSM system, GSM Channels, Frame structure for GSM, GSM Call procedures, GSM hand-off Procedures, GSM Services and features.	8
Pedagogy	Demonstration	
4	Machine Learning: Techniques in AI, Machine Learning Model, Regression Analysis in Machine Learning, Classification Techniques, Clustering Techniques, Naïve Bayes Classification, Neural Network, Support Vector Machine (SVM).	8
Pedagogy	Case Studies	
5	5G Fundamentals Base Station: Base Station Architecture, CU-DU Split Base Station and CP-UP, Standalone Base Station and Non-Standalone Base Station. AI based Channel Model, AI based channel decoding and signal detection, AI-based resource management, Challenges and future direction of AI in wireless communication.	8
	Pedagogical Initiatives (Not limited to): <ul style="list-style-type: none"> ● 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. ● 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	Theodore Rappaport, Wireless Communications: Principles and Practice, 2nd Edition, Prentice Hall Communications Engineering and Emerging Technologies Series, 2002, ISBN 0-13-042232-0.
2	L Singal, Wireless Communications, McGraw Hill Education (India) Private Limited, 2016, ISBN:007-068178-3.
Reference Books	
1	Gary Mullet, Introduction to Wireless Telecommunications Systems and Networks, First Edition, Cengage Learning India Pvt Ltd., 2006, ISBN - 13: 978-81-315-0559-5.
2	Thomas W. Rondeau, Charles W. Bostian, Artificial Intelligence in Wireless Communications, Artech House, 2019.

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

CO	Course Outcomes	RBT Level	RBT Level Indicator
CO1	Understand cellular communication systems, propagation mechanisms, and link budget calculations.	L1, L2	Understand
CO2	Analyze multiple access techniques and GSM network architecture and operations.	L3	Analyze
CO3	Apply basic machine learning algorithms such as regression, classification, clustering, SVM, and neural networks to engineering problems.	L3	Apply
CO4	Implement AI-based techniques for channel estimation, signal detection, and wireless system optimization.	L4	Create
CO5	Evaluate AI-driven approaches for resource management and identify challenges and future directions in AI-enabled wireless communication systems.	L4	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	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	-	2	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	-	-	2	-	-	-	-	-	-	-	-	-	-	2	-
CO5	-	-	-	-	2	-	-	-	-	2	2	2	2	-	2

Weblinks and Video Lectures (e-Resources)

1	https://in.mathworks.com/videos/ai-for-wireless-communication-1663074769420.html
2	http://kcl.digimat.in/nptel/courses/video/108106192/L22.html
3	https://onlinecourses.nptel.ac.in/noc23_ee99/preview
4	https://nptel.ac.in/courses/106106167

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	10	10	--	--
Apply	20	20	--	--
Analyse	20	20	--	--
Evaluate	--	--	30	30
Create	--	--	20	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	30	30%
CO2	20	--	10	--	--	--	30	30%
CO3	--	10	--	10	10	10	40	40%
CO4	--	--	--	--	--	--	--	--
CO5	--	--	--	--	--	--	--	--
Total	30	10	10	10	20	20	100	100

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	--
Understand	30
Apply	30
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	10	5	--	--	10	--	25	25%
CO2	10	10	--	10	--	10	40	40%
CO3	5	5	5	--	10	10	35	35%
CO4	--	--	--	--	--	--	--	--
CO5	--	--	--	--	--	--	--	--
Total	20	20	10	10	20	20	100	100



Dayananda Sagar Academy of Technology & Management

(Autonomous Institute under VTU)

Semester	:	7 th			
Course Title	:	Drone Technology with AI			
Course Code	:	BEC704B			
Course Type (Theory/ Practical/ Integrated)	:	Theory			
Category	:	OEC			
Stream	:	ECE	CIE	:	50
Teaching hours/ week (L:T:P:S)	:	3:0:0:0	SEE	:	50
Total Hours	:	45	SEE	:	3
Credits	:	3	Duration		

Course Learning Objectives: Students will be able to:

Sl. No	Course Objectives
1	Understand the fundamentals, components, and classification of drones.
2	Analyze drone dynamics, control systems, and flight mechanisms.
3	Apply Artificial Intelligence techniques in drone navigation and decision-making.
4	Interpret drone regulations, safety, and security frameworks.
5	Explore real-world applications of drones integrated with AI technologies.

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 -2026-27
Outcome Based Education and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2026-27)

COURSE CURRICULUM

Module No.	Topics	Hours
1	History and evolution of drones, Types of drones (UAV classification), Basic working principle of drones, Forces acting on drones (Lift, Drag, Thrust, Weight), Overview of drone ecosystem, Advantages and limitations T1 Ch1, T2 Ch1	8
Pedagogy	Video demonstrations, case studies on drone applications, group discussions	
2	Drone anatomy and architecture, Frame structure and materials, Propellers and motors (BLDC motors), Electronic Speed Controllers (ESC), Power systems (Battery, Power Distribution Board) Sensors (IMU, GPS, Ultrasonic, Camera modules), Communication modules T1: Ch 2, T2: Ch 2, Ch 3	8
Pedagogy		
3	Flight controller architecture, Working of flight controllers, Transmitter and receiver systems, Radio communication and telemetry, Stabilization techniques (PID control basics), Embedded systems in drones, Introduction to AI in drones, Computer vision basics for drones, Autonomous navigation concepts T1: Ch 3, Ch 8, T2: Ch 4, Ch 5	8
Pedagogy	Think-Pair, Simulation-based	
4	Drone rules and policies in India (DGCA guidelines), Airspace classification and permissions, Safety procedures and risk management, Drone registration and licensing, Cybersecurity in drones, Ethical and privacy issues T1: Ch 6 Web Resource: DGCA Drone Rules (India Gazette)	8
Pedagogy	Case study, Discussion on DGCA policies and real-world regulations	
5	Agriculture (crop monitoring, spraying using AI), Healthcare (medical delivery drones), Smart cities and surveillance, Disaster management and rescue operations, Military and defense applications Industrial inspection and mapping, Drone delivery systems and logistics, AI-enabled real-time applications T1: Ch 7, Ch 9, T2: Ch 6	8
	Pedagogical Initiatives (Not limited to): <ul style="list-style-type: none">● 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	Drone Technology: Future Trends and Practical Applications, Sachi Nandan Mohanty, J.V.R. Ravindra, Scrivener Publishing (Wiley), USA, First Edition, 2023.
2	Make: Getting Started with Drones, Terry Kilby and Belinda Kilby, Maker Media, Inc., USA, First Edition, 2016.
Reference Books	
1	Building Your Own Drones: A Beginner's Guide to Drones, UAVs, and ROVs (Make: Getting Started with Drones), Terry Kilby and Belinda Kilby, Maker Media, Inc., USA, 2016.
2	Make: Drones – Teach an Arduino to Fly, David McGriffy, Maker Media, 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 the fundamentals of drones including classification, working principles, components, subsystems, and hardware architecture	L1/L2	Understand
CO2	Apply concepts of flight control, communication systems, and basic AI techniques for drone operation and navigation	L3	Apply
CO3	Analyze drone system performance, control mechanisms, regulations, safety protocols, and security challenges including ethical concerns	L4	Analyze
CO4	Evaluate the use of drones integrated with AI in various real-world applications such as agriculture, healthcare, and smart systems	L5	Evaluate
CO5	Design and develop innovative drone-based solutions using AI techniques for real-world applications	L6	Create

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	3	-
CO3	-	3	-	-	-	-	-	-	-	-	-	-	3	3	-
CO4	-	-	3	-	-	-	-	-	-	-	-	-	3	3	-
CO5	-	-	-	3	3	-	-	-	-	-	-	-	3	3	-

Weblinks and Video Lectures (e-Resources)

1	https://onlinecourses.nptel.ac.in/noc25_ae30/preview
2	https://www.udemy.com/course/fundamentals-of-drone-design-aerodynamics-and-flight/?utm_campaign=Search_DSA_Beta_Prof_la.EN_cc.India_Sub&utm_source=google&utm_
3	https://eescholars.iitm.ac.in/sites/default/files/eethesis/ee19m004.pdf
4	https://www.instructables.com/How-to-Build-the-Fastest-Quadcopter-in-3-Hours/

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	10	10	-	-
Understand	15	15	-	-
Apply	20	20	-	-
Analyse	5	5	-	-
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	10	20	20	10	20	20	100	100

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	10
Understand	10
Apply	20
Analyse	10
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	10	10					20	20
CO2	5	10	10	10	10	5	50	50
CO3			5	10	5	10	30	30
CO4								
CO5								
Total	15	20	15	20	15	15	100	100

CAPSTONE PROJECT (Phase-1 & 2):

Capstone Project – Guidelines & Implementation Framework (UG Engineering Programs)

1. Introduction

The Capstone Project is a comprehensive, year-long project carried out in **two phases during the 6th and 7th semesters** of the undergraduate engineering/technology program. It integrates knowledge and skills acquired from multiple courses and disciplines to address a **complex, real-world problem**.

This project provides students with an opportunity to apply:

- Scientific principles
- Engineering methodologies
- Technological tools

to **conceive, design, implement, and evaluate an engineering solution**.

The Capstone Project serves as a **culminating academic experience** enabling students to demonstrate attainment of program outcomes including:

- Problem-solving ability
- Teamwork
- Communication skills
- Practical application of engineering principles

Students may undertake the project:

- Individually, OR
- In a group **not exceeding four students**

The group may include:

- Students from the same discipline
- Students drawn from different disciplines

2. Types of Capstone Projects

Capstone projects undertaken during the one-year duration may fall into one or more of the following categories:

a) Research-Oriented Projects

- Focus on investigating new concepts, theories, or technologies.
- Aim to generate new knowledge or contribute to academic research.

b) Experimental / Analytical Projects

- Based on laboratory or field experiments to validate a hypothesis or study a phenomenon.
- Include detailed data collection, analysis, and interpretation.

c) Simulation / Modelling Projects

- Use computational tools to model, simulate, and predict system behaviour.
- Reduce the need for physical prototyping in the initial stages.

d) Industrial / Industry-Sponsored Projects

- Carried out in collaboration with an industry partner.
- Address real-world engineering problems faced by the organization.

e) Interdisciplinary / Multidisciplinary Projects

- Combine knowledge and techniques from multiple engineering domains.
- May also involve other fields such as:
 - Management
 - Medicine
 - Environmental sciences

f) Entrepreneurial / Innovation Projects

- Focus on product or service innovation with potential for commercialization.
- Include:
 - Market analysis
 - Cost estimation
 - Business planning

3. Objectives of the Capstone Project

The objectives of the Project Work are:

1. To encourage independent learning and an innovative attitude among students.

2. To develop interactive attitude, communication skills, organization, time management, and presentation skills.
3. To impart flexibility and adaptability.
4. To inspire teamwork.
5. To expand intellectual capacity, credibility, judgment, and intuition.
6. To ensure adherence to punctuality and meeting deadlines.
7. To instill responsibility towards oneself and others.
8. To train students to present project work confidently in seminars, enhance communication skills, and participate in discussions to exchange ideas.

4. Capstone Project – Phase I Evaluation

Capstone Project Phase-I shall have **Continuous Internal Evaluation (CIE) only**.

4.1 Evaluation Committee – Single Discipline Project

The Departmental Project Review Committee shall consist of:

- One Senior Professor
- Project Guide
- One additional faculty member appointed by the Principal

4.2 Evaluation Committee – Interdisciplinary Project

The Project Review Committee shall consist of:

- One Senior Professor
- Department Project Guide
- Interdepartmental Project Guide(s)
- One faculty member from a related department

All members shall be appointed by the Principal.

4.3 Evaluation Criteria

Phase-I evaluation shall be based on:

- Rubrics designed to measure **NBA Graduate Attributes**

Successful completion of Phase-I allows the student to proceed to **Phase-II**.

5. Capstone Project – Phase II Evaluation

5.1 Continuous Internal Evaluation (CIE)

CIE for Phase-II shall be conducted similarly to Phase-I using the designated committee.

5.2 Semester End Examination (SEE)

The SEE shall be conducted by:

- **University-appointed examiners**

Assessment shall be based on:

- Rubrics designed to measure **NBA Graduate Attributes**

6. Continuous Internal Evaluation (CIE) Procedure

6.1 Single Discipline Project

The CIE marks shall be awarded by a committee consisting of:

- Head of the concerned Department
- Two senior faculty members of the Department
- One of the two faculty members shall be the Project Guide

6.2 Distribution of CIE Marks

The CIE marks for the project work shall be based on:

Component	Weightage
Project Report	50%
Project Presentation Skill	25%
Question & Answer Session	25%

Non-Credit Mandatory Courses (NCMC): are aimed at enhancing students' knowledge, skills, and awareness beyond the core curriculum. Successful completion of the NCMC is compulsory for fulfilling the requirements of the academic program. It shall not be considered for the computation of SGPA, CGPA and vertical progression. Each student shall register for the prescribed NCMC(s) in the prescribed semester. A student who fails to qualify in the prescribed NCMC shall not be eligible for the conferment of the degree.

AICTE Activity Points

Apart from technical knowledge and skills, to be successful as professionals, students should have excellent soft skills, leadership qualities and team spirit. They should have entrepreneurial capabilities and societal commitment. To match these requirements, AICTE has created a unique mechanism of awarding minimum 100 Activity Points for regular students and 75 Activity Points for Lateral Entry students over and above the academic grades.

The activities can be spread over the entire duration of the programme and will be reflected in the Student's VIII Semester Grade Card. It shall not be considered for computation of SGPA/CGPA and for vertical progression. The total duration of the activities for the entire programme is 320 hours for regular students and 240 hours for lateral entry students.

Break-up of CCE marks for activity points:

Evaluation by the Proctor/Coordinator 50 marks

Evaluation by the Dept. Committee

(i) Report 20 marks

(ii) Presentation 20 marks

(iii) Outcome 10 marks

Total 100 marks

1. No SEE for AICTE Activity Points.

2. Students will be awarded either NP or P grade based on marks obtained.

Students will be awarded 'Degree' only on earning P grade in the Activity Points.

8th SEMESTER

Projects

1. Community Project: A community is a social unit or group of people sharing socially-significant characteristics, such as place, set of norms, culture, religion, values, customs or identity. A community project involves addressing issues or needs within such a community or a network of entities working toward a common purpose. These projects may cover a wide range of areas, including welfare, sustainability, technology integration, and social development. Examples include establishing and maintaining an orphanage, implementing solar power generation and its maintenance, or developing environmental improvement solutions, etc. A community project is an experiential learning activity that encourages students to identify, analyse, and address real-life problems of the community using engineering knowledge. It aims to promote social responsibility and civic engagement, interdisciplinary thinking and collaboration and practical application of theoretical concepts, thereby enabling students to contribute meaningfully to community welfare and sustainable development. Students can take up project individually or in a group not exceeding 4 students.

The evaluation shall be done as per the following; CIE: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide. The CIE marks awarded for the project work shall be based on the rubrics. SEE: SEE will be conducted by the two examiners appointed by the University. The SEE marks awarded for the project work shall be based on the rubrics.

2. Environmental Science Project:

The Environmental Science Project is an applied learning component designed to develop students' awareness, understanding, and responsibility toward the environment. It provides an opportunity to study real-world environmental issues and apply scientific and engineering principles to design feasible and sustainable solutions. The topics under environment include, but not limited to, climate change, biodiversity, air and water pollution, land use, excess use of natural resources, earthquakes, rise in the earth's temperature, power generation, soil erosion, environment issues related programme, etc. The project involves problem identification, field surveys, case studies, data collection, environmental audits, analysis, and proposal of remedial or preventive measures aimed at improving biodiversity, air quality, and thermal comfort, etc. Students can take up project individually or in a group not exceeding 4 students. Students can opt for Interdisciplinary Project based on their interest.

The evaluation shall be done as per the following; CIE: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide.

The CIE marks awarded for the project work, shall be based on the rubrics. SEE: SEE will be conducted by the two examiners appointed by the University. The SEE marks awarded for the project work shall be based on the rubrics.

3. Hackathon Based Project (Academic):

The term hackathon is derived from the combination of hack (referring to clever problem-solving, not illegal activity) and marathon, which denotes an arduous (i.e., difficult) intellectual task requiring sustained effort, endurance, and mental resilience. The meaning of a hackathon varies depending on the specific context and intent. In an academic context, a hackathon can be considered to involve several concepts, ranging from resourceful, unconventional approaches to problem-solving. Though a hackathon is an event, typically lasting for a few days to address a specific challenge, for academic purposes, it is conducted as a noncompetitive semester-long activity. The evaluation is done as and when the project is completed, by a panel of industry experts. The hackathons not only help participants develop skills like problem-solving, critical thinking, creativity, teamwork, communication and time management, but also foster indigenous technology development, promote innovation and entrepreneurship, and contribute to non-formal learning and skill enhancement. Students can take up a hackathon project individually or in a group of not exceeding 4 students.

The respective BoS will announce the problem statements in the beginning of the 5th semester. The topic selected can be discipline specific, interdepartmental, industrial, social (refers to immediate human relations, interactions, and individual behaviour within a community), societal (describes larger, general issues, institutions, and structures that define society as a whole), environmental, health, financial, or innovative in nature, leading to development of a working prototype, application, or product. Hackathon projects are aligned with the principles of Outcome-Based Education (OBE) and support the objectives of innovation, skill development, and experiential learning in engineering education. Projects shall be evaluated by industry experts, based on creativity, problem-solving approach, teamwork, and possible implementation, as far as possible, as and when the project is completed. The evaluation shall be done as per the following; CIE: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide. The CIE marks awarded for the project work, shall be based on the rubrics. SEE: SEE will be conducted by the industry experts appointed by the Head of the Institute/University. The SEE marks awarded for the project work shall be based on the rubrics.

4. Capstone Project :

The Capstone project is a comprehensive, year-long project carried out in two phases during 6th and 7th semesters of the undergraduate engineering/technology program. It integrates knowledge and skills acquired from multiple courses and disciplines to address a complex, real-world problem. This project provides students with an opportunity to apply scientific principles, engineering methodologies, and technological tools to conceive, design, implement and evaluate an engineering solution. It serves as a culminating academic experience to demonstrate program outcomes, including problem-solving ability, teamwork, communication skills, and practical application of engineering principles. Students can take up project individually or in a group not exceeding 4 students. The group may have students from the same discipline and drawn from different disciplines.

Types of Capstone Projects: Capstone projects undertaken for one year may fall into one or more of the following categories:

a) Research-Oriented Projects : • Focus on investigating new concepts, theories, or technologies. • Aim to generate new knowledge or contribute to academic research.

b) Experimental/Analytical Projects • Based on laboratory or field experiments to validate a hypothesis or study a phenomenon. • Including detailed data collection, analysis, and interpretation.

c) Simulation/Modelling Projects

- Use computational tools to model, simulate, and predict system behaviour.

- Reduce the need for physical prototyping in the initial stages.

d) Industrial/Industry-Sponsored Projects

- Carried out in collaboration with an industry partner.

- Address real-world engineering problems faced by the organization.

e) Interdisciplinary/Multidisciplinary Projects

- Combine knowledge and techniques from multiple engineering domains or other fields such as management, medicine, or environmental sciences.

f) Entrepreneurial/Innovation Projects

- Focus on product or service innovation with potential for commercialization.

- Include aspects of market analysis, cost estimation, and business planning.

Phase I Evaluation: Capstone Project Phase-I shall have only Continuous Internal Evaluation (CIE). In case disciplinary capstone project, the CIE shall be conducted by the Departmental Project Review Committee, which consists of a Senior Professor, the Project Guide, and one additional faculty member appointed by the principal for projects within the parent discipline. For Interdisciplinary Projects, the Project Review Committee will consist of one Senior Professor, the department and interdepartmental Project Guides and one faculty member from a department related to the interdisciplinary project. The committee members are appointed by the principal of the college.

Phase-I evaluation shall be based on rubrics designed to measure graduate attributes defined by NBA. Successful completion of Phase-I allows the student to proceed to Phase-II.

Phase II Evaluation: CIE of Phase shall be evaluated as indicated with phase -I evaluation. The SEE shall be conducted by university-appointed examiners. The assessment shall be based on rubrics designed to measure graduate attributes defined by NBA.

Note: One Publication indexed in Scopus or Web of Science is Mandatory from Students Projects

Internship

Internship refers to the position of a student as trainee or a temporary (or unconfirmed) employee, who works in an organization, with or without pay, in order to gain work experience or satisfy requirements for a qualification. It is a structured, supervised professional experience in an industry, research organization, or community setting. Students taking up internship may be with or without stipend. Internships play a vital role in bridging the gap between theoretical education and professional practice. In general, engineering internships serve as a crucial component of professional education by providing experiential learning, industry readiness, and holistic skill development, ultimately producing competent engineers or entrepreneurs. Apart from these, it develops professional ethics, work culture awareness and communication skills. Some of the common types of internships are as follows:

- i. **Industry Internship:** Carried out in the engineering industry, companies, manufacturing units, startups, business, IT industry. The topic involved may be technical, managerial, production-related tasks, live projects, or innovative activities.
- ii. **Research Internship:** Carried out at universities, research labs, or R and D departments or organisations. The internship may involve literature review, data analysis, and experimental work leading to publications, prototypes, technical reports or innovations. The research internship may induce students to plan for higher studies or academic careers.
- iii. **Academic or Teaching Internship:** Carried out at educational institutions. The students assist in academic activities, laboratory sessions or content development, and prepare or present report,

presentation and student evaluation. The internship encourages interest in academia and pedagogy, develops new skills, helps to gain a competitive edge on the job market or for post-baccalaureate studies.

- iv. Community or Societal Internship: Carried out with government schemes, or rural development projects, Non-Governmental Organisations (NGOs). The internship focused on social and community development activities promotes social responsibility, sustainable development awareness, encourages civic responsibility and ethical engagement.
- v. Entrepreneurship Internship: Undertaken in association with start-ups, or entrepreneurship cells or launching own idea in Preincubations/Incubation centres. The internship offers exposure to business planning, prototype product development, and promotes innovation, risk-taking, and entrepreneurial mindset.
- vi. Virtual or Remote or Online Internship: Undertaken using online tools and digital collaboration platforms. Such internships are common in content writing, data science, marketing, and software development. It offers flexible learning environments and access to global opportunities, and allows participation in real projects without being physically present, from anywhere and anytime.
- vii. Government Internship: Ministries, public sector units, or civic bodies offer such internships in policy research, administrative tasks, or public service projects. This internship is for students interested in governance or public administration.
- viii. Post-Placement Internship: Refers to the internship offered to students after they receive a confirmed job offer (placement) from a company, but before formally joining as full-time employees. This internship (on-site, virtual, or hybrid) ensures that students are groomed to be professionally ready, technically competent, and culturally aligned with the organization even before official induction.
- ix. Skill Enhancement Internship: Carried out at reputed organisations in offline or online mode. The aim of the internship is to expose to real-world tools, technologies, and professional environments to improve a student's employability by offering hands-on experience, application of theoretical concepts, and skill development aligned with current industry and technical trends. Skill Enhancement Internships, depending on focus area and scope, can be carried out at various organisations such as, Academic and Research Institutions, Industry and Corporate Settings, Government and Public Sector, NGOs and Social Enterprises. For Skill Enhancement Internship topics refer to <https://online.vtu.ac.in/category/courses/Skill-Enhancement-Course>.

Note on Internship for the Attention of Students and Colleges

- Placement training conducted at the college level, whether by third-party agencies, training institutes, or internal faculty, shall not be considered as internship for either a 15 week or a 30-week period.

The official engagement period of 15-week or 30-week for students selected/recruited by the company/ organization only at their premises under the supervision of the company, shall only be considered as an internship.

- The period of training and working of students who have been recruited as employees by organisations at the beginning of the 4th year of the programme, shall also be treated as an internship.
- Students and colleges/institutions shall follow all the guidelines and procedures of the organization and the University's Internship Guidelines, and complete the internship within a period that matches with the VTU Calander and examination timetable.
- The assigned institution faculty mentor/ coordinator/guide should monitor the student's progress, and document offer letters, training reports, attendance, and evaluations for awarding academic credits.
- All students undergoing an internship, should adhere to all the guidelines, reporting protocols, and evaluation procedures prescribed by the University.
- Students must submit the certificate of completion of an internship with the period of internship clearly mentioned, from the respective company/organization.
- Colleges must submit details of students opting for internship during the odd and even semesters, along with a copy of the company selection letter, to the VTU when notified by the University.

Attention: In addition to the internship support provided by the college, students have the option to select internships through the AICTE and VTU Internship Portals. To ensure uniformity, quality, and transparency in the internship process, VTU has developed a dedicated web portal that serves as a single platform where colleges can also register companies offering internships. Every student is required to register on the portal before the commencement of their internship, and their progress will be monitored through the same platform.

As per VTU norms, the CIE shall be conducted based on the students' performance during the training program, assessed through rubrics from the company supervisor. The SEE evaluation shall be conducted by the college as per the examination timetable published by the VTU.

AICTE Activity Points

Apart from technical knowledge and skills, to be successful as professionals, students should have excellent soft skills, leadership qualities and team spirit. They should have entrepreneurial capabilities and societal commitment.

To match these requirements, AICTE has created a unique mechanism of awarding minimum 100 Activity Points for regular students and 75 Activity Points for Lateral Entry students over and above the academic grades.

The activities can be spread over the entire duration of the programme and will be reflected in the Student's VIII Semester Grade Card. It shall not be considered for computation of SGPA/CGPA and for vertical progression. The total duration of the activities for the entire programme is 320 hours for regular students and 240 hours for lateral entry students.

Break-up of CCE marks for activity points:

Evaluation by the Proctor/Coordinator 50 marks

Evaluation by the Dept. Committee

(i) Report 20 marks

(ii) Presentation 20 marks

(iii) Outcome 10 marks

Total 100 marks

1. No SEE for AICTE Activity Points.

2. Students will be awarded either NP or P grade based on marks obtained.

Students will be awarded 'Degree' only on earning P grade in the Activity Points.