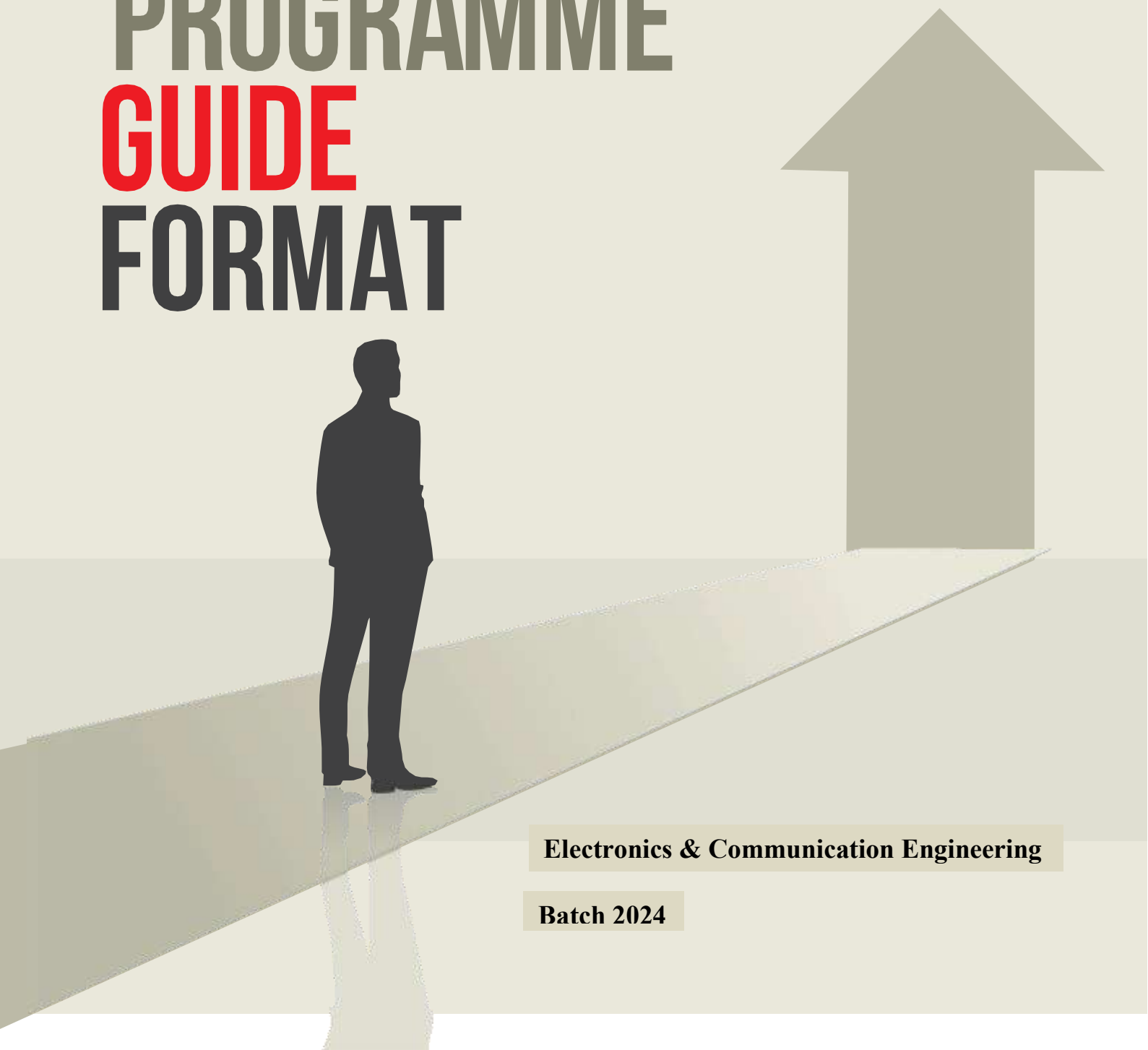
CHITKARA UNIVERSITY

ACADEMIC PROGRAMME GUIDE FORMAT



Electronics & Communication Engineering

Batch 2024

Academic Program Guide

Program: Electronics & Communication Engineering

Batch: 2024

Based on Choice Based Credit System (CBCS) & aligned with NEP 2020 Approved in 26.4 of Academic Council held dated 10.08.2024

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1. General Information

Bachelor of Engineering Program in Electronics & Communication Engineering prepares the students for the ever-expanding field of Electronics & Communication Engineering. The curriculum is directed towards the major applications such as embedded systems and Internet of things (IoT), Robotics, Very large-scale Integration (VLSI) and wireless communications. We believe that many creative opportunities exist at the boundaries of and Electronics and Communication Engineering and Computer Science engineering, so accordingly cross-training schedule for the students across disciplinary boundaries is planned. The normal duration of course is four years. Initially in the curriculum of Electronics & Communication Engineering the focus is on basic building subjects and thereafter, for 3rd and 4th year the Program is structured into different verticals to allow customization by individual students based on their own personal perspectives.

University Vision:

To be a globally recognized organization promoting academic excellence through interdisciplinary applied research and to expand realms of knowledge through innovation.

University Mission:

1. To carry out the academic processes in accordance with global standards through active teacher-student-industry participation.
2. To promote research, innovation and entrepreneurship in collaboration with industry, research laboratories and academic institutions of global repute.
3. To inculcate high moral, ethical and professional values amongst our students, faculty & staff.
4. To contribute in building skillful society.

Institution Vision:

To be a globally recognized institute producing frontiers of sustainable society through innovation, collaboration and multidisciplinary applied research while exhibiting ethical and professional values.

Institution Mission:

1. To produce skillful graduates by upholding academic processes aligned with global standards of education and commitment to life-long learning.
2. To contribute towards building a sustainable society by fostering innovation, collaboration, research and entrepreneurship awareness.
3. To inculcate professional attitude, strong ethical and moral values and leadership qualities.
4. To promote holistic development and to empower students with the required skills to solve complex problems of modern society.

Department Vision:

To be recognized as a centre of excellence in Electronics and Communication Engineering education and research, fostering innovation and advancing sustainable technological progress to address societal needs.

Department Mission:

- **DM1:** To provide globally competitive education in Electronics and Communication

Engineering, fostering creativity, critical thinking, and lifelong learning.

- **DM2:** To cultivate a culture of innovation and research through strategic collaboration with industry and academia, leveraging emerging technologies.
- **DM3:** To instill ethical values, professional integrity, and leadership skills that empower graduates to serve and uplift society.
- **DM4:** To prepare students to solve complex engineering challenges and contribute to sustainable technological advancement.

Program Educational Outcomes (PEO)

PEO1: The graduating students would be able to make choice to go for a professional career in core technical domain or to pursue higher studies in the field of Electronics and Communication Engineering and other related areas and succeed in their academic and research careers.

PEO2: The graduating students would be able to solve socially relevant engineering problems by designing/developing the products with the help of acquired multidisciplinary knowledge.

PEO3: The graduating students would exhibit a good command over interpersonal communication skills, leadership and teamwork, and possess ethical values in their chosen professional careers.

PEO4: The graduating students will be equipped to serve society starting at the national level, gradually expanding their impact to the international stage through the application of technical skills, professional competence, and exposure gained during their engineering education.

2. Program Outcomes (Graduate Attributes)

The department expects undergraduate students to be able to demonstrate the following outcomes. The students are expected to be able to:

PO1: Posses an ability to apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PO2: Posses an ability to identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.

PO3: Posses an ability to design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.

PO4: Posses an ability to conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions.

PO5: Posses an ability to create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems.

PO6: Posses an ability to analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.

PO7: Posses an ability to apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws.

PO8: Posses an ability to function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Posses an ability to communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

PO10: Posses an ability to apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Posses an ability to recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

Program Specific Outcomes (PSO)

PSO1: Demonstrate the ability to apply fundamental and advanced concepts of semiconductor devices, analog/digital electronics, embedded and communication systems to solve real-world engineering problems.

PSO2: Integrate hardware and software co-design methodologies incorporating professional ethics, contemporary, industry-relevant tools to address complex engineering challenges in embedded systems, communication technologies, Internet of Things (IoT), Very-Large-Scale Integration (VLSI) design, and related interdisciplinary areas.

Table 1: PO-Mission-Vision Mapping Matrix

PO No.	PO Statement	Mission Statement	Vision Statement
PO1	Posses an ability to apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.	To promote research, innovation and entrepreneurship in collaboration with industry, research laboratories and academic institutions of global repute.	To be a globally recognized organization promoting academic excellence through interdisciplinary applied research and to expand realms of knowledge through innovation.
PO2	Posses an ability to identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.	To promote research, innovation and entrepreneurship in collaboration with industry, research laboratories and academic institutions of global repute.	

PO3	Posses an ability to design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.	To inculcate high moral, ethical and professional values amongst our students, faculty & staff.
PO4	Posses an ability to conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions.	To carry out the academic processes in accordance with global standards through active teacher-student-industry participation.
PO5	Posses an ability to create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems.	To promote research, innovation and entrepreneurship in collaboration with industry, research laboratories and academic institutions of global repute.
PO6	Posses an ability to analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.	To carry out the academic processes in accordance with global standards through active teacher-student-industry participation.
PO7	Posses an ability to apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws.	To inculcate high moral, ethical and professional values amongst our students, faculty & staff.
PO8	Posses an ability to function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.	To contribute in building skillful society.

PO9	Posses an ability to communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.	To inculcate high moral, ethical and professional values amongst our students, faculty & staff.	
PO10	Posses an ability to apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.	To inculcate high moral, ethical and professional values amongst our students, faculty & staff.	
PO11	Posses an ability to recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.	To carry out the academic processes in accordance with global standards through active teacher-student-industry participation.	

3. Eligibility for Admission, Exit and Migration (MEME)

In consonance with the National Education Policy (NEP) 2020 and the guidelines of the University Grants Commission (UGC), Chitkara University, Punjab has implemented the Multiple Entry and Multiple Exit (MEME) scheme in its undergraduate programmes.

Table 2a: Eligibility for admission and Exit Criteria for Electronics and Communication Engineering Program

Academic Level	Entry Qualification	Exit Qualification and Credits required for the level	National Credit Level (NCrF)
Under-Graduate Degree 1st year	• Class 12th Pass or equivalent state of education. • A minimum aggregate of 60% marks or must have secured 60% in Physics, Chemistry and Mathematics in 12th grade. • Appeared in JEE Mains for that admission year. • The admission is based purely on merit.	• **Under-Graduate Certificate (Electronics and Communication Engineering)** • Minimum credits as per the Scheme (1st and 2nd Semester) given in Table-7 • 4-credit skills enhancement vocational course at the time of exit.	4.5
Under-Graduate Degree 2nd year	Under-Graduate Certificate (Electronics and Communication Engineering)	• **Under-Graduate Diploma (Electronics and Communication Engineering)** • Minimum credits as per the Scheme (1st to 4th Semester) given in Table-7 • 4-credit skills-enhancement vocational course at the time of exit.	5
Under-Graduate 3rd year	Under-Graduate Diploma (Electronics and Communication Engineering)	• **B. Voc (Electronics and Communication Engineering)** • Minimum credits as per the Scheme (1st to 6th Semester) given in Table-7	5.5
Under-Graduate 4th year	B. Voc (Electronics and Communication Engineering) (3-Year)	• **B.E. (Electronics and Communication Engineering)** • Minimum credits as per the Scheme (1st to 8th Semester) given in Table-7	6

Under-Graduate Certificate (Electronics and Communication Engineering): Students who opt to exit after completion of the first year and have secured credits as per scheme (1st and 2nd semester) given in table 6 will be awarded a Under-Graduate Certificate (Electronics and

Communication Engineering) if, in addition, they complete one vocational course of 4 credits during the summer vacation of the first year. These students are allowed to re-enter the degree program within three years and complete the degree program within the stipulated maximum period of seven years.

Under-Graduate Diploma (Electronics and Communication Engineering): Students who opt to exit after completion of the second year and have secured credits as per scheme (1st to 4th semester) given in table 6 will be awarded the Under-Graduate Diploma in Electronics and Communication Engineering if, in addition, they complete one vocational course of 4 credits during the summer vacation of the second year. These students are allowed to re-enter within a period of three years and complete the degree program within the maximum period of seven years.

B. Voc (Electronics and Communication Engineering): Students who wish to undergo a 3-year B. Voc program will be awarded B. Voc. in the Electronics and Communication Engineering after successful completion of three years, securing credits as per scheme (1st to 6th semester) given in table 6 and satisfying the minimum credit requirement as given in table 2.

B.E. (Electronics and Communication Engineering): A four-year BE degree in Electronics and Communication Engineering will be awarded to those who complete a four-year degree program with as per scheme (1 st to 8 th semester) given in table 6 and have satisfied the credit requirements as given in table 2.

To be eligible for award of Under-Graduate Certificate (Electronics and Communication Engineering) after year 1, Under-Graduate Diploma (Electronics and Communication Engineering) after year 2, B. Voc (Electronics and Communication Engineering) after year 3, B.E. (Electronics and Communication Engineering) after year 4, a student must complete all the courses in which he/she has registered with minimum credits at per Table 2 and a minimum CGPA of 4.5.

A student will be declared as "Pass" in a course if he/she obtains the minimum passing marks (40%) in internal components (ST, mid-term evaluation etc. as applicable) and external component (End term examinations).

OR

Any specific criteria followed by the University for any particular course.

Migration/Credit Transfer Criteria:

The following procedures will be followed for credit transfer for a student under migration, studied in other Universities in India and Abroad:

"The credits earned by the student from the other universities in India or abroad shall be transferred as per the mapping of the courses. The Under-Graduate Certificate/ Under-Graduate Diploma/ B. Voc/ B.E shall only be awarded to the candidate subject to the condition that student earned the minimum no. of credit defined by Academic Regulation/APG of the Program run by the Chitkara University."

In case a student undergoes international exchange Program or internship for 1 semester/ 1 year/ 2 years, then the courses, credits and grades earned by the student in abroad during that period should be reflected on the grade card issued by the Chitkara University. The courses will be marked as (*) on the grade card/transcript. The description of the (*) will be "credits and grades as adopted university/institute name during the international exchange Program".

The admission procedure and mapping of the courses for all above mentioned categories will be done through a committee formed by the University/Department. The committee may recommend the student to study additional subjects to fulfil the minimum credits requirements and requirement of mandatory courses.

4. Programme Duration

The duration of the BE program is four years - divided into 8 semesters. Each semester will consist of 15-18 weeks of academic work equivalent to 90 actual teaching days. The odd semester may be scheduled from July to December and even semester from January to June. The maximum duration of completion of the degree is 6 years.

5. Pedagogical Aspects

The structural layout of the program and its courses requires that each course be divided into lecture, tutorial and practical sessions.

Lecture Sessions: Lectures are delivered by traditional chalkboard method, supplemented by modern Information Communication Technology (ICT) methods. The students are encouraged to ask questions and involve in a group discussion to the extent allowed by the teacher.

Tutorial Sessions: The tutorial sessions are small groups of students' interaction with the teacher, solving application oriented analytical problems. The tutorial sessions are very interactive and inculcate problem-solving skills in the students.

Lab/Practical Sessions: During lab/practical sessions, the students work on a prescribed list of experiments and do what they have learnt in the lecture/tutorial sessions.

Projects: The students identify their teammates (maximum 4 students per team) and work on a unique project allotted to them by faculty / group of faculty members. Projects are designed by considering real world challenges. Thus, the project statements are made in such a way that the students while working on these projects apply the concepts learned so far and the deliverables are multi-faceted.

Besides, the pedagogical aspects mentioned above, the curriculum is envisaged towards inclusion of practices that can lead to holistic development of student considering the varied parameters that are defined in the Charter of the University.

To develop students' personality through community services, NSS and NCC activities are offered with the idea of social welfare and to provide service to the society.

6. Apprenticeship/Internship embedded degree programs (AEDP)

B.E. Electronics and Communication Engineering program will have an in-built apprenticeship / internship which shall be undertaken at the premises of the industry so as to get work-based learning in the discipline of Electronics and Communication Engineering. The duration of apprenticeship / internship will be equivalent to that of either one semester (i.e. 8 th semester) under scheme I or one year (i.e. 4 th year) in two modules under scheme II, depending on the quantum of training work. With an integrated industry internship, the B.E. in Electronics and Communication Engineering program offers students a distinctive combination of classroom instruction and practical experience. Working together with industries guarantees that students are exposed to the most recent innovations, procedures, and fashions in the industry. Students can apply the theoretical knowledge they have learned in the classroom to real-world tasks and issues they face in the workplace at reputable companies. This combination sharpens students problem-solving, collaboration, and communication abilities while assisting them in gaining a deeper comprehension of ideas. These internships give students the chance to work on practical projects under the direction

of seasoned experts. Reappearance for failed /uncompleted apprenticeship/internship training is mandatory.

7. Programme Structure

The UG programme will consist of the following categories of courses and the minimum credit requirements for 3-year UG and 4-year UG programmes are given below:

Table 2b: Minimum Credit Requirements to Award Degree under Each Category

S. No	Broad Category of Course	Abbreviation	4-Year UG BE (ECE)
1	Disciplinary/interdisciplinary Major (Core)	DC	80
2	Disciplinary/interdisciplinary Minor Stream	DE	30
3	Multidisciplinary (Interdisciplinary)	OE	9
4	Ability Enhancement Courses	AE	8
5	Skill Enhancement Courses	SE	8
6	Value Added Courses	VA	8
7	Summer Internship	IN	2
8	Internship	IN	15
	Total		**160**
	Generic Course Offered by the University	AC	Max credits to be earned 6*

***Note:** The additional credits (AC) is applicable to the students who opt for generic courses NSS/NCC as per UGC. These credits can be earned with condition to maximum 6 from other activities through NCC, NSS, other Generic courses (GC) etc and will be added as applicable.*

Category	Credits											
	I	II	III	IV	V	VI	VII		VIII		Total	
							Scheme I**	Scheme II**	Scheme I**	Scheme II**	Scheme I**	Scheme II**
DC	8	14	16	19	14	4	5	-	-	-	80	75
DE	4	4	4	-	4	4	10	-	-	-	30	20
OE	-	2	-	-	3	4	-	-	-	-	9	9
AE	-	2	-	-	-	6	-	-	-	-	8	8
SE	5	-	-	-	-	3	-	-	-	-	8	8
VA	2	-	2	2	MNC	2	-	-	-	-	8	8
IN	-	-	-	-	2	-	-	15	15	15	17	32
RP	-	-	-	-	-	-	-	-	-	-	-	-
DT	-	-	-	-	-	-	-	-	-	-	-	-
AC	-	-	-	-	-	-	6**	6**	6**	6**	-	-
Total											160	160

** AC This is applicable to the students who opt for generic courses NSS/NCC as per UGC.

DC	Discipline Core/Major Courses	RP	Research Projects
DE	Discipline Elective/Minor Courses	DT	Dissertation
OE	Open Elective/Multidisciplinary Courses	MNC	Mandatory Non-Credit
AE	Ability Enhancement Courses		
SE	Skill Enhancement Courses		
VA	Value Added Courses		
IN	Internship/ Training		

The various courses prescribed for a Program are categorized in terms of their functional objectives as follows:

Disciplinary/interdisciplinary Major (Core) (DC): Core courses are the foundation courses that cater to develop the breadth of Electronics & Communication Engineering stream and include Physics, Mathematics, Engineering Science and Electronics core courses. Core courses are compulsory and can be offered in any semester during the program tenure provided it meets the pre-requisite requirement.

Disciplinary/interdisciplinary Minor Stream (DE): The technical courses apart from core courses are offered as minors and skill-based courses to the students. These are the professional courses that are offered to students to cover the depth in a specific area of Electronics & Communication for their employment, research, or higher education. It also includes courses from other departments and/or streams. The students may also choose a specialization track to enhance their skills in a particular area and to gain industry exposure.

Multidisciplinary (Interdisciplinary) (OE): Courses under this category will facilitate the students to use and apply tools and techniques in their major and minor disciplines. The course may include training in programming software like C, C++, Python and courses on artificial intelligence and machine learning. Basic courses under this category will be helpful for data analysis and interpretation for qualitative and quantitative analytics.

Ability Enhancement Courses (AE): The courses aim at enabling the students to acquire and demonstrate the core linguistic skills, including critical reading and expository and academic writing skills, that help students articulate their arguments and present their thinking clearly and coherently and recognize the importance of language as a mediator of knowledge and identity. The courses will also emphasize the development and enhancement of skills such as communication, and the ability to participate/conduct discussion and debate.

Skill Enhancement Courses (SE): The course curriculum of the ECE program allows the students to enhance their soft skills and reasoning abilities through various courses. These courses are aimed at imparting practical skills, hands-on training, soft skills, etc., to enhance the employability of students.

Value Added Courses (VA): Students are given opportunity to have various value-added courses to promote holistic and 360-degree growth in various semesters.

Summer Internship (IN): These are hands-on trainings to apply the knowledge gained through core/elective courses. This is *Industry Oriented Hands-on Training (IOHT)* of 3-4 weeks after the completion of 2nd year.

Internship/ Research Project (IN/RP): This is *Industry Oriented Hands-on Experience (IOHE)* with minimum duration of one semester. Students can undergo internships in a firm, industry, or organization or Training in labs with faculty and researchers in their own or other HEIs/research institutions.

Vocational Courses: Vocational course can be related to the major or minor discipline or choice of the student. These courses will be useful to find a job for those students who exit before completing the programme.

Other Activities: This component will include participation in activities related to National Service Scheme (NCC), National Cadet Corps (NCC), adult education/literacy initiatives, mentoring school students, and other similar activities. Additional Credits (AC) through NCC ,NSS, other generic courses will be added to the total credits earned by the student with condition to maximum 6.

Besides the above types of courses, all students are provided with opportunities to explore their potential through MOOC courses, courses delivered by professors from universities across the globe and international collaborations. The students at Chitkara University are given opportunity to enhance their knowledge and skill sets through the following programs under International Collaborations:

1. Articulation Program
2. Semester Exchange
3. Semester Abroad

8. Rules for Attendance

Students are expected to be regular in attending the classes. 75% attendance (of all held sessions – lectures, tutorials, lab) is compulsory in a course to be eligible for appearing in end term comprehensive examination. 10% concession in this mandatory requirement is possible only in extreme circumstances and at the sole discretion of the Vice Chancellor. 5% concession is possible only in case of extreme circumstances and at the sole discretion of the Head of the Department. Students are encouraged for participating in co-curricular activities conducted by prestigious institutions at national/International level. Such students would be eligible for grant of special Duty Leaves (limited by a cap decided by the Vice Chancellor) to make up for the attendance in case any class work is missed during this period. This privilege extended to the students will not be termed as right and is limited to just the attendance benefit. There is no weightage for attendance in evaluation criteria.

9. Grading System

The list of Letter Grades is given below:

Table 3: Grade and grade points

% Marks Range oftotal	Grade	Grade Point	Qualitative Meaning
80- 100	O	10	Outstanding
70-79	A+	9	Excellent
60-69	A	8	Very Good
55-59	B+	7	Good
50-54	B	6	Above Average
45-49	C	5	Average
40-44	P	4	Pass
0-39	F	0	Fail
	I	0	Incomplete / Absent

9.1 Computation of SGPA and CGPA

The UGC recommends the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

i. The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses under- gone by a student, i.e SGPA (Si) = Σ (Ci x Gi) / ΣCi where Ci is the number of credits of the ith course and Gi is the grade point scored by the student in the ith course.

ii. The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme,

I.e. CGPA = Σ (Ci x Si) / Σ Ci where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.

iii. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

9.2 Illustration of Computation of SGPA and CGPA and Format for Transcripts

i. Computation of SGPA and CGPA

ii. Transcript: Based on the above criteria, the university may issue the transcript for each semester and a consolidated transcript indicating the performance in all semesters.

Table 4: Illustration for SGPA

Semester	**Course**	**Credit**	**Letter Grade**	**Grade point**	**Credit Point** (Credit x Grade)
I	Course 1	3	A	8	3 X 8 = 24
I	Course 2	4	B+	7	4 X 7 = 28
I	Course 3	3	B	6	3 X 6 = 18
I	Course 4	3	O	10	3 X 10 = 30
I	Course 5	3	C	5	3 X 5 = 15
I	Course 6	4	B	6	4 X 6 = 24
		20			139
			SGPA		139/20=**6.95**

Thus, SGPA =139/20 =6.95

Table 5: Illustration for CGPA

Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6
Credit: 21 SGPA:6.9	Credit: 22 SGPA:7.8	Credit:25 SGPA:5.6	Credit: 26 SGPA:6.0	Credit: 26 SGPA: 6.3	Credit 25 SGPA 8.0
CGPA= **6.73** (21 x 6.9 + 22 x 7.8 + 25 x 5.6 + 26 x 6.0 + 26 x 6.3 + 25 x 8.0)/145					

The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

10. Promotion and Registration

Any bonafied student, who appears for the examination con- ducted by the University, shall be promoted to the next higher semester and shall carry forward all course(s) in which he/she is declared fail. The student shall have to pass all papers within the stipulated maximum duration as prescribed by the University to qualify for the award of the degree.
All students are eligible to register for next semester irrespective of the number of backlogs.
A student is not permitted to register in a term if:

a) He/She has dues outstanding to the University, hostel, or any recognized authority or body of the University, or
b) His/Her grade sheet in his/her immediately preceding term is withheld, or
c) He/She has been specifically debarred or asked to stay away from that term.

Late registration may be granted in case a student fails to register on the date. Students failing to register on the specified day of registration will be allowed to register only after permission from Dean of Department and after paying the late fee. Any student who has not registered will not be allowed to attend classes.
The registration of the student may be cancelled, if at the later stage, it is found that the student is not eligible for registration due to the following reasons:
If the registration of a student in a course is not found to be as per the regulations, his/her registration in that course will be cancelled and the grade obtained, if any, will be rejected.
The registration of a student in a course or complete set of courses in a term can be cancelled by the concerned authority when he is found guilty in case of unfair means, breach of discipline, etc. or when he/she persistently and deliberately does not pay his dues.
Absence for a period of four or more weeks at a stretch during a term shall result in automatic cancellation of the registration of a student from all the courses in that term.
A student who is duly registered in a term is on the rolls of the university. After registration, if he/she withdraws from the term, or has been given prior permission to temporarily withdraw from the University for the term or has been asked to stay away by an appropriate authority of the University will be considered to be on the rolls of the University for that term. While such a student retains the nominal advantage of being on the rolls of the University the loss of time from studies and its consequences cannot be helped by the University.
If for any valid reason a student is unable to register in a term, he/she must seek prior permission of Dean of Department to drop the term. If such permission has not been requested

or after a request, the permission has been denied, his/her name would be struck off the rolls of the University and he would no longer be a student of the University. His/her case will be automatically processed, and the file will be closed. However, if such a student, after his/her name has been struck off the rolls of the University, is permitted to come back, his/her case can be considered at the sole discretion of the competent authority of the University with the provision that all his/ her previous records as a former student are revived un- der the current academic and administrative structure, regulations and schedule of fees.

11. Program Overview

The Program consists of subjects under the following categories:

Table 6: Program Scheme: Electronics & Communication Engineering, Batch 2024

Year 1 Sem 1												
S. No.	CourseName	Course Code	Level	Category (Type of Course)	Credits (Course wise)	Hour sper Week			Marks Distribution			Total Credits (Semester wise)
						L	T	P	I	E	TL	
1	Calculus and Statistical Analysis	24APS1101	100-199	DC	4	4	0	0	40	60	100	19
2	Semiconductor Physics & devices	24ECE1100	100-199	DC	4	3	0	2	50	50	100	
3	Introduction to Programming for Problem Solving	24ECE1101	100-199	DE	4	2	0	4	60	40	100	
4	Integrated Design Engineering	24ECE1102	100-199	SE	4	2	0	4	60	40	100	
5	Mini Course	24*******	100-199	SE	1	0	0	2	70	30	100	
6	Foundational Course in Indian Knowledge System	24UNI0107	100-199	VA	2	2	0	0	100	0	100	
Year 1 Sem 2												
S. No.	CourseName	CourseCode	Level	Category (Type of Course)	Credits (Course wise)	Hours per Week			Marks Distribution			Total Credits (Semester wise)
						L	T	P	I	E	TL	
1	Differential Equations and Transformations	24APS2101	100-199	DC	4	4	0	0	40	60	100	22
2	Electronic Circuits	24ECE2100	100-199	DC	4	3	0	2	50	50	100	
3	Object Oriented Programming	24ECE2101	100-199	DE	4	2	0	4	60	40	100	
4	Digital Electronics	24ECE2102	100-199	DC	4	3	0	2	50	50	100	

5	Electrical Engineering Fundamentals	24ECE2103	100-199	DC	1	0	0	2	60	40	100	
6	Prototyping Fundamentals	24ECE2104	100-199	DC	1	0	0	2	80	20	100	
7	Foundation Workshop	24MEC0105	100-199	multidisciplinary	2	0	0	4	60	40	100	
8	Universal Human Values	24UNI0104	100-199	AE	2	2	0	0	40	60	100	

Year 2 Sem 3

S. No.	CourseName	CourseCode	Level	Category (Type of Course)	Credits (Course wise)	Hours per Week			Marks Distribution			Total Credits (Semester wise)
						L	T	P	I	E	TL	
1	Linear Integrated Circuits	24ECE3200	200-299	DC	4	3	0	2	50	50	100	22
2	Microcontroller	24ECE3201	200-299	DC	4	2	0	4	50	50	100	
3	Signals & Systems	24ECE3202	200-299	DC	3	2	0	2	50	50	100	
4	Network Analysis & Synthesis	24ECE3203	200-299	DC	3	3	0	0	40	60	100	
5	Capstone Project-1	25ECE3200	200-299	DC	2	0	0	4	60	40	100	
6	Data handling using Artificial Intelligence	24ECE3205	200-299	DE	3	1	0	4	50	50	100	
7	MOOC (Massive Open Online Course)	25MOC020*	200-299	DE	1	1	0	0	70	30	100	
8	Mathematics in India: from Vedic period to modern times	24UNI0123	100-199	VA	2	2	0	0	100	0	100	

Year 2 Sem 4

S. No.	CourseName	CourseCode	Level	Category (Type of Course)	Credits (Course wise)	Hours per Week			Marks Distribution			Total Credits (Semester wise)
						L	T	P	I	E	TL	
1	Microelectronic Circuits	24ECE4200	200-299	DC	4	3	0	2	50	50	100	21
2	Digital Signal Processing	24ECE4201	200-299	DC	4	3	0	2	50	50	100	
3	Electromagnetic Waves and Antenna	24ECE4202	200-299	DC	3	3	0	0	40	60	100	
4	Linear Control System	24ECE4203	200-299	DC	3	3	0	0	40	60	100	
5	RTOS Development	24ECE4204	200-299	DC	4	2	0	4	70	30	100	
6	Measurement & Virtual	24ECE4205	200-299	DC	1	0	0	2	60	40	100	

	Instrumentation Lab											
7	Environmental Studies	24UNI0106	100-199	VA	2	2	0	0	40	60	100	

Year 3 Sem 5

S. No.	CourseName	CourseCode	Level	Category (Type of Course)	Credits (Course wise)	Hours per Week			Marks Distribution			Total Credits (Semester wise)
						L	T	P	I	E	TL	23
1	Analog and Digital Communication	24ECE5300	300-399	DC	4	3	0	2	50	50	100	
2	Digital VLSI Design	24ECE5301	300-399	DC	4	3	0	2	50	50	100	
3	Program Elective 1	24ECE530*	300-399	DE	4	2	0	4	50	50	100	
4	Computer Networks and communication	24ECE5302	300-399	DC	3	1	0	4	50	50	100	
5	IOHT*	24ECE5400	400-499	IN	2	4 weeks			60	40	100	
6	AI and Machine Learning	24CAI0301	300-399	multidisciplinary	3	3	0	0	40	60	100	
7	Research Tools & Engineering Writing	24ECE5303	300-399	DC	3	3	0	0	70	30	100	
8	Cyber security	24UNI0124	100-199	VA	MNC	0	0	2	40	60	100	
9	Disaster Management	24UNI0125	100-199	VA	MNC	0	0	2	40	60	100	

Year 3 Sem 6

S. No.	CourseName	CourseCode	Level	Category (Type of Course)	Credits (Course wise)	Hours per Week			Marks Distribution			Total Credits (Semester wise)
						L	T	P	I	E	TL	23
1	Open Elective 1	2********	300-399	OE	4	2	0	4	50	50	100	
2	Program Elective 2	24ECE630*	300-399	DE	4	2	0	4	50	50	100	
3	Communication Skills	24UNI0101	100-199	AE	2	2	0	0	40	60	100	
4	Professional Skills	24UNI0102	100-199	AE	2	2	0	0	40	60	100	
5	Leadership and Management Skills	24UNI0103	100-199	AE	2	2	0	0	40	60	100	
6	Numerical Ability and logical Reasoning	24UNI0151	300-399	SE	3	3	0	0	40	60	100	
7	Capstone Project-2	25ECE6400	400-499	DC	4	0	0	8	80	20	100	

8	Human Values and Professional Ethics	24UNI0105	100-199	VA	2	2	0	0	40	60	100	

Year 4 Sem 7

Scheme 1

S. No.	CourseName	CourseCode	Level	Category (Type of Course)	Credits (Course wise)	Hours per Week			Marks Distribution			Total Credits (Semester wise)
						L	T	P	I	E	TL	15
1	Wireless & Mobile Communication	24ECE7300	300-399	DC	3	3	0	0	40	60	100	
2	Department Elective 1	24ECE730*	300-399	DE	3	3	0	0	40	60	100	
3	Program Elective 3	24ECE73**	300-399	DE	4	2	0	4	50	50	100	
4	Program Elective 4	24ECE****	300-399	DE	3	1	0	4	50	50	100	
5	Research Project	24ECE7400	400-499	DC	2	0	0	4	60	40	100	
6	Generic Course Offered by the University			AC	Max credits to be earned 6**							

Year 4 Sem 8

S. No.	CourseName	CourseCode	Level	Category (Type of Course)	Credits (Course wise)	Hours per Week			Marks Distribution			Total Credits (Semester wise)
						L	T	P	I	E	TL	15
1	Industry Oriented Hands-on Experience	24ECE8400	400-499	IN	15	6 Months						
2	Generic Course Offered by the University			AC	Max credits to be earned 6**							

Scheme 2

Year 4 Sem 7

S. No.	CourseName	CourseCode	Level	Category (Type of Course)	Credits (Course wise)	Hours per Week			Marks Distribution			Total Credits (Semester wise)
						L	T	P	I	E	TL	
1	Co-oP Project at Industry (Module-1)	24ECE7401	400-499	IN	15	6 Months			60	40	100	15
2	Generic Course Offered by the University			AC	Max credits to be earned 6**							

Year 4 Sem 8

S. No.	CourseName	CourseCode	Level	Category (Type of Course)	Credits (Course wise)	Hours per Week			Marks Distribution			Total Credits (Semester wise)
						L	T	P	I	E	TL	

1	Co-oP Project at Industry (Module-2)	24ECE8401	400-499	IN	15	6 Months	60	40	100	15
2	Generic Course Offered by the University			AC	Max credits to be earned 6**					
***Entrepreneurial Skill development / Start-up Activity										
1	CEED Acceleration Program (CAP) Cohort-II-Module I				24ECE7402					2

* IOHT is executed after 4th semester in month of May to July depending upon academic schedule and evaluation is done in semester 5.
** AC This is applicable to the students who opt for generic courses NSS/NCC as per UGC.
***The student has a choice to opt for Research project or to choose entrepreneurial skill development /startup activity in semester 7 under scheme 1.

Mini Course List

Course Code	Course Name	Option	Credits
24ECE1103	Community Projects using Design Thinking	Student will select one subject from this bucket	1
24ECE1104	Artificial Intelligence for All		
24ECE1105	Introduction to Entrepreneurial Thinking		
24ECE1106	Introduction to Prompt Engineering		
24ECE1107	Social Emotional Learning		
24ECE1108	Clean and Green Campus		
24ECE1109	Leadership and Sustainability		
24MOC0101	Introduction to Architecting Smart IoT Devices		
24MOC0102	Introduction to solar cells		
24MOC0103	Working for a sustainable future: concepts and approaches		
24MOC0104	Innovation and emerging technology: Be disruptive		
24MOC0105	5G for Everyone		
24MOC0106	Introduction to Digital Transformation		
24MOC0107	AI for GOOD		
24MOC0108	Prompt Engineering for ChatGPT		
24MOC0109	Creative Thinking: Techniques and Tools for Success		
24MOC0110	Wireless Communications for Everybody		

MOOC (Massive Open Online Course) *

Course Code	Course Name	Credits
25MOC0201	Patent Drafting for Beginners	1
25MOC0202	Fundamentals of electronic device fabrication	
25MOC0203	C Programming and Assembly Language	
25MOC0109	Business and Sustainable Development	
25MOC0110	Design Thinking and Innovation	

Program Electives List

Category	Course Code	Course Name	Credits
Program Elective 1			
Program Elective 1	24ECE5304	Mixed Signal Circuit Design	4
Program Elective 1	24ECE5305	Embedded Artificial Intelligence	
Program Elective 1	24ECE5308	Sensor and Communication Protocol	
Program Elective 1	24ECE5306	Digital Image Processing	
Program Elective 1	24ECE5307	Machine Learning	
Program Elective 1	24ECE5309	Robotics System Modeling and Control	
Program Elective 2			
Program Elective 2	24ECE6304	Analog Layout Design	4
Program Elective 2	24ECE6305	IoT Application Development	
Program Elective 2	25ECE6303	Microwave and Satellite Communication	
Program Elective 2	24ECE6308	Digital System Design	
Program Elective 2	24ECE6306	Introduction to Robotic Sensors	
Program Elective 2	24ECE6307	Aerial and Mobile Robotics	
Program Elective 3			
Program Elective 3	24ECE7306	IC Fabrication & Technology/	4
Program Elective 3	24ECE7307	VLSI Design and Verification	
Program Elective 3	24ECE7308	Embedded Linux	
Program Elective 3	24ECE7320	Advance Wireless Communication	
Program Elective 3	24ECE7317	Machine Vision	

Program Elective 3	24ECE7316	Embedded System Design	
Program Elective 4			
Program Elective 4	24ECE7313	High Speed and Low Power VLSI Circuit Design	**3**
Program Elective 4	24ECE7314	Cloud Computing	
Program Elective 4	24ECE7303	Optical Communication System	
Program Elective 4	24ECE6309	Cloud Computing & Virtualization	
Program Elective 4	24ECE7312	Biomedical Robotics	
Program Elective 4	24ECE7315	IoT and Industrial Application	
Program Elective 4	24ECE7318	Information Theory and Coding	
Program Elective 4	24ECE7319	Introduction to Mobile Technology	
Program Elective 4	24ECE7321	Wearable Technology and Reality	

Departmental Electives List

Subject Code	Course Name	Credits
Departmental Elective 1		
24ECE7301	Power electronics	4
25ECE7300	Programming Concepts using Java	
24ECE7304	Wireless Sensor Network	

Open Electives List

Course Code	Course Name	Credits
Open Elective 1		
24CSE0201	Data Structures	4
24CSE0202	Operating Systems	
24CSE0203	Programming Paradigms	
25ECE6300	Applied Programming in Engineering	
25ECE6301	Applied IoT and Embedded System Design	
25ECE6302	Applied VLSI Design: Principles and Practices	

COURSE OUTLINE

The detailed course structure, examination pattern, evaluation components, pedagogy, mode of lecture delivery, question paper format as per Bloom's taxonomy, CO-PO mapping and other details are given in the Course Handout of the respective subjects.

24APS1101-Calculus and Statistical Analysis

Matrices for mathematical problems related to real life and find their solutions, analyse functions of two or more variables and compute their derivatives for finding extreme values of surfaces. Techniques of evaluating double and triple integral to solve various engineering problems, various hypothesis testing techniques for small and large sample data and calculate coefficient of correlation, line of regression to describe relation between independent variable and dependent variable.

24ECE1100 - Semiconductor Physics & devices

Fundamentals of semiconductor physics such as band and bond theory, fermi dirac statistics, intrinsic/extrinsic semiconductor, EK diagram PN junction diode, energy bands analysis, breakdowns, bipolar junction transistors, different configurations, BJT as switch and amplifier, MOS field effect transistors, MOSFET, industrial semiconductor devices viz. LED, solar cell, photodiode.

24ECE1101- Introduction to Programming for Problem Solving

The course provides Introduction to Problem Solving through Programs and Algorithms, emphasizes on the Problem-Solving Aspect, Problem definition phase, and General Problem-solving strategies.

24ECE1102- Integrated Design Engineering

Concept Sketches: Pin / Mood / Inspiration board: Mind Map. Information Sketch- Information drawing of the entire product including each individual part and assembly. Introduction to 3D CAD Modelling software Story Board. 3D generated Models-3D CAD Models 3D. 2D technical drawings-- 2D drawings that meet minimum engineering standards. Info-graphic- Presents the product and its main features quickly and links highly relevant data to the reader. CAD skills test. Introduction to PCB design, installation/setup of PCB design tool, creating a component library, schematic design, PCB design, generating Gerber files. Introduction to microcontrollers (Arduino), setting up IDE, basic programming structure, interfacing of sensor and actuators.

Mini MOOC Elective

Mini MOOC Elective provide an affordable and flexible way to learn new skills, advance career and deliver quality educational experiences at scale. It helps to learn a variety of courses such as career development, supplement learning, lifelong learning, corporate eLearning & training. It also helps to gain knowledge in all sorts of areas. It can be used to develop career skills, prepare for other education, or explore a new interest.

24UNI0107-Foundational Course in Indian Knowledge System

Bharatavarsha—A Land of Rare Natural Endowments, Foundational Literature of Indian Civilisation, Indian Astronomy, Indian Health Sciences, Classical Literature in Sanskrit and Other Indian Languages, Indian Education, The Purpose of Knowledge in India, Methodology of Indian Knowledge System, Indian Architecture and Town Planning, Indian Fine Arts, Indian Agriculture, Indian Textiles, Indian Metallurgy, Indian Polity and Economy, The Outreach of Indian Knowledge System.

24UNI0123- Mathematics in India: from vedic period to modern times

Introductory Overview, Mathematics in the Vedas and Śulva Sūtras, Pāṇini's Aṣṭādhyāyī, Piṅgala's Chandaḥśāstra, Mathematics in the Jaina Texts, Development of Place Value System, Āryabhaṭīya of Āryabhaṭa, Brāhmasphuṭasiddhānta of Brahmagupta, Guidelines for Incorporating Indian Knowledge in Higher Education Curricula, Bakṣālī Manuscript, Gaṇitasārasaṅgraha of Mahāvīra, Development of Combinatorics, Līlāvatī of Bhāskarācārya, Bījagaṇita of Bhāskarācārya, Gaṇitakaumudī of Nārāyaṇa Paṇḍita, Magic Squares, Kerala School of Astronomy and Development of Calculus, Trigonometry and Spherical Trigonometry, Proofs in Indian Mathematics, Mathematics in Modern India.

24APS2101-Differential Equations and Transformations

Fourier Series and Transforms, Fourier Cosine and Sine transforms and properties: Laplace Transform and Inverse transforms with properties, Partial differential equations and to find the solutions of equations of first order, Classification of PDE of second order, Solution by separation of variables, Solution of one-dimensional wave equation, Solution of two-dimensional Laplace equation using Fourier series. Functions of Complex Variable, Analytic Function, Cauchy-Riemann equations, Harmonic functions, conformal mapping, Complex Integration, Cauchy's theorem, Cauchy Integral Formula, Taylors and Laurent's Expansion.

24ECE2100 - Electronic Circuits

Diode circuits, transistor configuration and biasing: BJT and MOSFET Operation Configurations, Transistor Amplifier Circuits: Important Parameters: Zi, Zo, Av, Ai. The Hybrid Equivalent Model, Cascaded systems, two stage RC coupled multistage amplifier. MOSFET as an amplifier and switch, Frequency response and power amplifiers.

24ECE2102- Digital Electronics

Boolean Algebra and Simplification, Logic Gates, Truth Table, Theorems of Boolean Algebra, SOP, POS, K-Maps, Quine-Mccluskey method. Design implementation using MSI Logic: Multiplexer, Encoder and Decoder; 2-Bit Half Adder, 2/4 Bit parallel Adder, Classification of sequential circuits,1 bit memory cell, Latches, Gated Latches, Concept of clock and triggering, Flip Flops, State Machine, Mealy and Moore Model, State Diagram: concepts and reduction techniques, Counters and Register, Synthesis of synchronous sequential circuits, FSM, machine minimization, Simplification of incompletely specified machines

24ECE2101- Object Oriented Programming

Introduction to basic concepts and characteristics of object-oriented programming, Comparison between procedural programming paradigm and object-oriented programming paradigm, Problem solving strategies. Basics of objects and classes, Access Control Modifiers, method overloading, constructors, constructor overloading, Inheritance basics & types, method overriding, Virtual Functions and Polymorphism, Exception handling fundamentals and types, Templates and Generic Programming, I/O Streams, input/ Output using Overloaded operators and Member functions of I/O stream classes. Data Files management, File streams, Error handling, Reading/Writing of files, Accessing records randomly.

24ECE2104 – Prototyping Fundamentals

Introduction to design thinking, platform-based learning, sensor and actuator interfacing, design mechanism, circuit designing and testing, prototype development using Agile approach, project report writing.

24ECE2103- Electrical Engineering Fundamentals

Analysis of AC circuits, to study construction, working of transformer and to perform open- circuit and short circuit tests on a single-phase transformer. To study construction, working of DC Motor and types of DC Motors. To study the construction, working of 1- phase and 3-phase induction motor. Measurement of specific gravity and internal resistance of a battery. To measure the step angle, half stepping, full stepping, and speed control of a stepper motor. To study speed control of a servo motor.

24MEC0105- Foundation Workshop

Bench Work and Fitting, Smithy and Forging, Welding and Cutting. Hot Working Processes, Sheet Metal Work, Wood and Wood Working (Carpentry), Introduction to Machine Tools, Introduction to CNC machines, Basic Plumbing Shop.

24UNI0104-Universal Human Values

Love and Compassion (Prem and Karuna), Truth (Satya), Non-Violence (Ahimsa), Righteousness (Dharma), Peace (Shanti), Service (Seva), Renunciation (Sacrifice) Tyaga, Constitutional Values, Justice, and Human Rights.

24ECE3205- Data handling using Artificial Intelligence

Introduction to Data Handling and AI, Overview of Data Handling, Importance of Data in AI Types of Data: Structured vs. Unstructured, Introduction to AI and its applications, Python for AI-Identifiers, reserved words, Essential Python Libraries, Python variable types, assigning values to variables, global/ local variables, Data types, Python basic operators, Basics of Bitwise operator, Python decision making, Python functions-Types of functions, Function declaration, Calling a function, Python date & time Python Files I/O and Directories- Input function, Directories in python Data Capturing-Introduction to Arduino, Need for sensing, Connecting sensors to Arduino board, Data logging, data logger shield, saving data to SD card, csv file, Analysing sensor data, relation of sensor output with ground truth, confusion matrix. Data Preparation-Need for data preparation, importing python libraries-Pandas, NumPy, Data Cleaning Techniques Data Visualization- Need for data visualization, Python libraries for data visualization, data visualization methods.

24ECE3200- Linear Integrated Circuits

Fundamentals of Op-Amp, Op-Amp ideal circuits, negative feedback in amplifiers, applications: voltage follower, Current to voltage converter, non-idealities and frequency response: Circuit stability and slew rate: Causes of slew rate, slew rate equation, Active filters and Oscillators, Nonlinear circuits, VCO and Phase Locked Loops.

24ECE3201- Microcontroller

Introduction: RISC and CISC Architecture, Microprocessor to Microcontroller, STM32 Microcontroller Overview, ARM Cortex M4 Core, STM32CUBE IDE. External Interrupt Controller, Interrupt Programming. Analog Peripherals: Configuration and Programming of ADC, DAC, Op-amp and Comparator peripherals. Timer Peripherals, Types of communication peripherals, USART, SPI, I2C, USB and CAN peripherals.

24ECE3202 -Signals & Systems

Continuous Time signals, Classification of Continuous Time Signals, Mathematical Operations on CT, Mathematical Equation and block diagram governing CT system, Classification of Continuous Time Systems. Standard Discrete Time Signals, Classification of Discrete Time Signals, Mathematical Operations on DT system, classification of Discrete Time System, Convolution, Cross correlation,

Autocorrelation of DT signals. Basic Fourier series and Fourier transform analysis, Z transform, pole zero analysis of discrete time systems.

24ECE3203- Network Analysis & Synthesis

Circuit Elements and Kirchhoff's laws, tree, Co-tree, Tie set matrix, Cut set, Circuit Analysis Methods, State Equation for networks, theorems for DC, and AC circuits, series circuits, parallel circuits, complex powers, Steady state and Transient response of RLC circuit, Laplace transform Two port Network, Classification of filters, filter Networks

24UNI0106- Environmental Studies

Humans and the Environment, Natural Resources and Sustainable Development, Environmental Issues: Local, Regional and Global Conservation of Biodiversity and Ecosystems, Environmental Pollution and Health Climate Change: Impacts, Adaptation and Mitigation, Environmental Management, Environmental Treaties and Legislation, Case Studies and Field Work.

25ECE3200- Capstone Project-1

Projects are undertaken individually or in small groups that introduce the dimension of identifying and solving an engineering problem. To facilitate effective workload management and iterative development of the working prototype, students are encouraged to utilize a project management tool for project planning and development. The projects undertaken span a diverse range of topics, including theoretical, simulation and experimental studies. Assessments are conducted through presentations and a public demonstration of work.

24ECE4200- Microelectronic Circuits

Introduction to Mosfet, Characteristics, Threshold Voltage, Substrate bias effect and short channel effects, Mos Capacitances, Inverter, Digital dynamic circuits, related issues and solutions, Memory, SRAM, DRAM, read write and power dissipation, Introduction to fabrication process, design rules, small signal model for the MOS Transistor, Common source, Common drain and Common Gate Amplifiers. Current Mirrors.

24ECE4201- Digital Signal Processing

DFT, Circular Convolution, Fast Fourier Transform, Frequency response of digital filters, Design Techniques for digital filters, Quantization effects in analog to digital conversion of signals, realizing structures for digital filters, multirate DSP, Overview of TMS320 Family DSP Processors, Applications of DSP in Biomedical Signal Processing, image and speech processing

24ECE4202- Electromagnetic Waves and Antennas

Fundamentals of Electromagnetic field theory and its applications such as Vector Calculus and Co-ordinates Systems, Maxwell's equations and apply to solve practical electromagnetic fields problems, analyse the behaviour of EM Wave through different medium such as transmission Lines and Waveguides, basic parameters & properties of Antennas, Antenna Types, and Antenna Arrays for Antenna Gain and Directivity Enhancement.

24ECE4203 –Linear Control System

Introduction and Mathematical Modeling. The control System, transfer function of Mechanical, electrical system, State variable approach, Classification of time responses, system time response, analysis of steady state error, Routh-Hurwitz criterion, Root locus, Polar plots, Bode plots, Nyquist stability criterion, controllers, Proportional controller, Integral controller, PI, PD, PID controller.

24ECE4204- RTOS Development

RTOS introduction, IDE installation, creating Free RTOS based projects, Free RTOS task creation, trace tool integration, IDLE task, and timer service, Free RTOS scheduler, context switching, SEGGER system view, task states, Free RTOS task delay API and notification, memory management, interrupt safe API's, Free RTOS Hook functions, Queue management, semaphore for synchronization.

24ECE4205- Measurement & Virtual Instrumentation lab

Introduction to virtual Instrumentation, LabVIEW basics, Familiarization to soft front panel (SFP), Stability analysis using Bode plot, Nyquist plot, Root locus plot, PID control system. Analyzing input-output characteristics of a potentiometer, synchro set , d-c positional servo system and a.c position servo-system.

24ECE5300- Analog and Digital Communication

Electromagnetic Frequency Spectrum; Elements of Electronic Communications System. Modulation - Need and Types. AM/FM Radio Transmitters, AM/FM Superheterodyne Receiver; Digital versus Analog Transmissions, Sampling Theorem, Practical Aspects of Sampling, Pulse Amplitude Modulation, PCM System Block Diagram, Delta Modulation, Line Encoding Techniques, Types of Digital Modulation.

24ECE5301- Digital VLSI Design

Historical Perspectives, Flow of circuit design procedure, VLSI Design Flow, VLSI Design Styles, Design Quality, Introduction to Verilog, verilog data types, system tasks, compiler directives, Gate-Level Modeling, Rise, fall, turn-off delays, Min, Max, and typical delays. Dataflow Modeling, Behavioural Modelling, Structured Procedures, Timing controls, Conditional Statements, Procedural Assignments, Moore and Mealy Machine, Design of FSM in Verilog, Setup/Hold concept, Static timing analysis, Fault Types and Models, Ad Hoc Testable Design Techniques, Scan-Based Techniques, Built-In Self-Test (BIST) Techniques.

24ECE5302- Computer Networks and communication

Introduction to computer networks: Network hardware and software address schemes, Network Models: OSI and TCP/IP, Introduction to Wireshart and Cisco Packet Tracer, Physical Layer, Packet capture and analysis using Wireshark, Network layer: IPv4, IPv6, subnetting Network Layer, router configuration with cisco packet tracer, Transport Layer: TCP and UDP, Application Layer: HTTP, SMTP, DNS, DHCP and FTP, building small networks, routing concepts, access control lists, contextual unit, NAT.

24ECE5304 -Mixed Signal Circuit Design

Study of mixed signal (analog and digital), submicron CMOS circuits and to understand the various CMOS based amplifiers and topologies. Differential amplifiers, their characteristics and performance parameters, Operation amplifiers, comparators, analog to digital conversion, PLLs, MOSFET as a switch and switching characteristics, Static/dynamic characteristics, pipelining and architecture of ADCs.

24ECE6304-Analog Layout Design

Introduction to CMOS physical design, Processes involved in IC fabrication. Fabrication steps of CMOS inverter, layout tool, layout design rules, Live demo of virtuoso layout XL, DRC categories,

DRC flow using the tool, LVS flow using the tool, Stick diagrams, Digital standard cell layouts, Introduction to standard cells, Parasitics associated with layout design, Layout optimization for minimum parasitics and area, Live demo of a NAND/NOR gate layout, decoder layout, multiplexer layout. Universal gates with LVS and DRC clean, Introduction to basic components, resistors & its parameters, BJTs and its parameters, capacitors & its parameters, MOSFETs parameters and matching, Analog layout concepts, Need & Techniques for Matching, WPE and STI effect, Comparator layout using matching technique, OTA layout using matching technique, layout related issues.

24ECE6305- IoT Application Development

Introduction to IoT and its use cases, IoT enabled embedded devices, sensors & actuators, IoT network protocols, IoT communication protocols, Front-end technologies, backend technologies, project management and deployment.

24ECE5400- Integrated Hands-on Training

IOHT course is a short-term skill-oriented training which is generally offered either in association with an industry or in a specialized domain. The main aim is to train the students in a specific skill / platform/ tool/ technology which is state-of-the-art. It fills the gap between present curricula and the specific industry/domain needs as per individual student.

24ECE5303- Research Tools & Engineering Writing

This course provides the opportunity to the students to enhance their knowledge through a diverse range of topics, including theoretical, simulation and experimental studies. The students develop the ability to review, prepare and present technological developments happening in the electronics industry and prepare to face placement interviews.

24ECE7314 -Cloud Computing

Cloud Computing, Deployment and Service Models, Enabling Technologies to Cloud Computing: Virtualization, Resource Management, Load Balancing and techniques, Migration of virtual Machines and techniques, Security: Application-level, Data level, Virtual Machine level, Intrusion detection service, identity Management, Access Controls Techniques, Typical hardware/software server stack.

24ECE7308- Embedded Linux

Fundamentals Linux kernel module and syntax. Character device driver theory and code implementation, Platform bus, Platform device, and platform driver concepts, Platform driver implementation, Device tree from scratch, Accessing device tree nodes from drivers, Device instantiation through device tree nodes, Device tree properties and node syntax, Device tree overlays, Overlays testing via u-boot Kernel synchronization services (Mutex, Spinlocks), Linux device model and sysfs, Linux GPIO subsystem, Linux pinctrl subsystem.

24ECE5305 - Embedded Artificial Intelligence

Introduction to machine learning, introduction to neural networks, audio classification and keyword spotting, image classification, convolutional neural networks, object detection.

24ECE5306 - Digital Image Processing

Fundamental steps and components of digital image processing, Image formation model, basic relationship between pixels, basics of spatial filtering, basics of filtering in frequency domain,

Correspondence Between Filtering in Spatial and Frequency Domain, Smoothing Frequency Domain Filters, Sharpening Frequency Domain Filters, Homomorphic Filtering, Basic Morphological Operations, morphological Algorithms, Introduction to Image Segmentation, Edge and Line Detection, Thresholding, Model of Restoration Process, Filtering – Mean, median, max and min filters, Periodic Noise Reduction by Frequency Domain Filtering.

24ECE5307- Machine Learning

Introduction to machine learning, Basic Concepts of Machine Learning, Supervised Learning, Non-parametric Methods: k-Nearest Neighbours (kNN) and Decision Tree, Discriminative Learning models: Support Vector Machine (SVM), Unsupervised Learning: k-means and hierarchical clustering, Supervised learning after clustering, Introduction to regression: linear and logistic regression, Reinforcement Learning, Evaluation Metrics.

24ECE5308 - Sensor and Communication Protocol

Sensor and communication protocols are essential components in the realm of sensor networks and the Internet of Things (IoT). These protocols establish the rules and standards for communication between sensors and other devices within a network. They facilitate the seamless exchange of data, ensuring efficient and reliable transmission. Sensor protocols define how sensors collect and transmit data, while communication protocols govern how data is packaged, transmitted, and interpreted by devices. Well-designed protocols enable interoperability, scalability, and security in sensor networks, enabling the integration of diverse sensors and facilitating the development of innovative IoT applications. They play a vital role in optimizing data transmission, minimizing energy consumption, and ensuring the overall performance and reliability of sensor networks.

24ECE5309 - Robotics system modeling and control

Mathematic Modelling of Robots, Classification of Robotic Manipulators Modelling of Electrical networks, Translation and Rotational Mechanical systems, Hydraulic, Pneumatic and Thermal System, DC Servo Motors, Two phase AC Servo Motor. Compensation of Control Systems: Set-Point Tracking, Hybrid Impedance Control. Vision-based Control: Different approached, Camera motion and interaction matrix, Image-based Control Laws, Relationship between end effector and camera motions. Robotics Lab-1: Lab experiments, mini projects and case studies

24ECE6306 - Introduction to Robotic Sensors

Sensors and Transducers: Classification of sensors based on transduction principle - Primary and secondary, Analog and digital, Active and passive. Primary input physical parameters - Mechanical, electrical, optical, thermal, magnetic, chemical and biological sensors. Characteristics of sensors. Calibration of sensors. Displacement and velocity Sensors: Variable resistance - Linear and angular motion potentiometers, Strain gauges. Variable inductance Electromagnetic and electrodynamic, Variable reluctance and LVDT. Digital transducer - Encoders (Absolute, incremental and tachometer). Force, Pressure, Torque, Sound, Temperature, Touch, Light Sensors and Transducers

24ECE7307 - Aerial and Mobile Robotics

Introduction to Aerial Robotics, energetics and System Design, Geometry and Mechanics Quadrotor Kinematics: Quadrotor dynamics, Planning and Control, Advanced Topics, Mobile Robotics, Robotics Lab-2: Hands-on activities and development of related project(s).

24ECE6308 - Digital System Design
Hardware Digital Design using Combinational logic, Design implementation using MSI Logic: Multiplexer, Encoder and Decoder, Sequential Logic Circuits, Latches, Gated Latches, Flipflops, Shift Registers, Data movement in a register, modes of operation of a shift register, Counters – State diagram of a counter, Classification and design of counters, Finite State Machines, Models for synchronous sequential circuits, Moore circuit, Mealy circuit, State table, State reduction and assignments, Capabilities, minimization, and transformation of sequential machines, the finite-state model.

24ECE6309 - Cloud Computing & Virtualization
Cloud Computing, Technologies to Cloud Computing, Migration and Fault Tolerance, Security: Application-level, Data level, Virtual Machine level, Infrastructure, Multi-tenancy Issues, Trust and identity Management, Access Controls Techniques, Traditional IT infrastructure, physical Infrastructures, hardware/software server stack, hypervisors, Virtualization: types, implementation, benefits.

24ECE7312 -Biomedical Robotics

The Biomedical Robotics focuses on research and development of human-centered robotic technologies that can directly impact the health and well-being of people. The activities of the Biomedical Robotics are devoted to study and to design intelligent interfaces and mechanisms for real applications, especially related to disease diagnosis and surgery, assisted communications, teleoperation, biomanipulation, and general healthcare.

24ECE7315- IOT and Industrial Application
Industrial Internet: Key IIoT Technologies, Key Opportunities, Benefits, Reference Architecture, Framework (IIAF), Viewpoints, Different domains: Architectural Topology, Key System Characteristics, IIoT concept, Network Protocols, Low-Power Technologies, Designing networks Protocols: Low Power Wi-Fi, LTE Category-M, Securing the Industrial Internet: PLCs and DCS, Securing the OT, Network Level and system level : Potential Security Issues, IAM, Industry 4.0.

24ECE7316 Embedded System Design
This course provides an introduction to the tools and technologies used for embedded systems design. Special focus is given to processor architectures, use of interrupts and handling shared data problems. This is followed by introduction to different software architectures used to design software for embedded systems. Fundamentals of application development using a RTOS are also discussed with use of RTOS services to develop fast executing embedded code. The serial, parallel and network protocols are also discussed to enable their use to fulfill the communication requirements of embedded systems.

24ECE7317 - Machine Vision
Basic Components – Elements of visual perception, Lenses: Pinhole cameras, Gaussian Optics – Cameras – Camera-Computer interfaces. Fundamental Data Structures: Images, Regions, Sub-pixel Precise Contours – Image Enhancement: Gray value transformations, image smoothing, Fourier Transform – Geometric Transformation - Image segmentation – Segmentation of contours, lines, circles and ellipses – Camera calibration – Stereo Reconstruction. Object recognition, Approaches to Object Recognition, Recognition by combination of views – objects with sharp edges, using two views only, using a single view, use of dept values.

24ECE7318 -Information Theory and Coding

Information Theory-Introduction; Discrete and Continuous Messages – Message Sources, Amount of Information; Average Information and Entropy; Characteristics of a Discrete Memoryless Channel;

Mutual Information; Shannon's Channel-Coding Theorem; Channel Capacity. Source Coding-Introduction; Basics of Source Encoding - Classification of Source Codes, Kraft-McMillan Inequality, Source-Coding Theorem; Source Coding Techniques – Shannon-Fano Source Code, Huffman Source Code, Lempel-Ziv Code. Error-Control Channel Coding-Types of Errors and Error-Control Codes; Hamming Codes; Cyclic Codes; BCH Codes; Hadamard Codes; LDPC Codes; Convolution Coding and Decoding; Burst-Error Correction Techniques – Interleaving, RS Codes, Turbo Codes. Spread-Spectrum Communications-Introduction, Principles of Spread-Spectrum.

24ECE7319 - Introduction to Mobile Technology

Mobile IP – Terminology, Operational, Location and Mobility Management, Mobile IPv6, Modified TCP for mobile applications, Mobile Ad-hoc Networks (MANETs) – Topology, Operational Characteristics, Routing Protocols, Hidden-node and Exposed-node problem. Wireless Internet: A Reality, Wi-Fi Technology - WLAN Infrastructure and Ad-hoc Mode Configuration, Bluetooth Technology - Piconet and Scatternet, WiMAX - Broadband versus Baseband Transmission, WiMAX Deployment Scenario and Base Station Equipment, WiMAX potential applications - Voice and Internet Services.

24ECE7320 -Advance Wireless Communication

Evolution of Cellular Technologies, UMTS Technology - Network Architecture, Air Interface Specifications and Logical Channels, W-CDMA Air Interface, TD-SCMA Technology, 4G LTE and LTE-A. Features and Standards, Spectrum Sensing and Concept of Cognitive Radio and Software Defined Radio, Hardware and System Design Considerations, Cognitive Radio Network Paradigms - Underlay, Overlay and Interweave, Spectrum Sensing Techniques - Cyclostationary, Energy Detection and Matched Filter, TCP Protocol Stack and Security Aspects in Cognitive Radio, Cognitive Radio in 5G Mobile Networks, 5G Radio Access Architecture, Vision of Next-Generation Wireless Networks, Challenges for Research in Wireless Communications.

24ECE7321 -Wearable technology and reality

Opportunities, Wearable Haptics, Categories of Wearable Haptic and Tactile Display. Wearable Electronics Sensors: Wearable Bio and Chemical Sensors, Wearable Inertial Sensors, Optical Heart Rate Monitoring, Body Worn Heat Flow Sensors, Body Sensor Networks (BSN). Knitted Electronic Textiles, Non-Invasive Sweat Monitoring, Smart Fabrics and Interactive Textile RFID Technology. Wireless Body Area Network, Wearable Radios, wearable sensor inside and outside of the human body.

24ECE7304 - Wireless Sensor Network

This course provides an introduction to the field of wireless sensor networks and its applications. Hardware architecture of a sensor node, networking technologies, physical layer and MAC layer protocols, routing techniques used for data transmission, time synchronization and localization of the sensor nodes, network topologies for WSN and use of operating system based sensor nodes for advanced network deployments.

24ECE7300- Wireless & Mobile Communication

Basic Propagation Mechanism, Ground, Space and Sky wave Propagation, Free Space and Two Ray Propagation Models, Cellular Terminology, Frequency Reuse Concept, Design of Omni-directional and Directional Antenna Cellular Systems, Cell coverage and capacity, Cell Splitting. Multiple Access Techniques, GSM Network Architecture, Frame Structure, Call Procedures, 2.5G TDMA evolution path, GPRS and EDGE Technology, 3G Cellular network, The IMT-2000 Global Standards.

24ECE7400 -Research Project

This course provides the opportunity to the students to enhance their knowledge through a diverse range of topics, including theoretical, simulation and experimental studies. The students develop the ability to review, prepare and present technological developments happening in the electronics industry and prepare to face placement interviews.

24UNI0105- Human Values and Professional Ethics

Human Values: Love and Compassion (Prema and Karuna), Peace (Shanti), Truth (Satya), Non-violence (Ahimsa), Righteousness (Dharma), Renunciation (Tyaga), Service (Seva). Professional Ethics, Constitutional Values and Global Citizenship.

24ECE8400 – Industry Oriented Hands-on Experience

This course has been designed to fulfil the need of industrial exposure among the students, where they get an experience of industrial environment in their relevant fields. During the tenure of training, students are exposed with the actual organizational structure and culture of an environment and also with industrial live projects. The Co-op Training Modules (Module 1 and Module 2) differ from the Industry-Oriented Hands-on Experience in fact that Co-op modules are typically stipend-based and support the "earn while you learn" model, offering extended, full-time professional engagement that aligns closely with the student's academic curriculum. In contrast, the Industry-Oriented Hands-on Experience is generally a short-term, part-time training or internship opportunity, aimed at providing students with practical exposure in a specific domain. While internships under this category may be paid or unpaid, they are often utilized to fulfill academic credit requirements and are more limited in duration and scope compared to the Co-op training modules.

24ECE7401 - Co-oP Project at Industry: Module 1

24ECE8401 - Co-oP Project at Industry: Module 2

The course is implemented with the aim to develop different types of skills leading to achieve following competencies, such as performing many activities/skills and get information pertaining to electronics industry in areas of process, processing equipment, materials, testing and instruments. The Department of Electronics and Communication offers a co-op training module with industry of one year duration, which has two modules: Co-op Project at Industry (Module-1)-24ECE7401 in semester 7 and (Module-2)-24ECE8401 in semester 8. This training module is a structured and formal component of the Electronics and Communication Engineering (ECE) program, designed to provide students with compensated, industry-relevant work experience closely aligned with their academic specialization. Implemented typically during the final year, this module serves to bridge the gap between theoretical instruction and practical industry application. It enables students to undertake hands-on professional assignments in areas such as VLSI, IoT, embedded systems, telecommunications, and related domains. Through this integration of academic learning with industry-based exposure, students develop essential technical competencies, problem-solving skills, and workplace readiness. The immersive nature of the Co-op experience enhances their understanding of real-world engineering practices and better equips them for successful transition into professional careers.

24CSE0201-Data Structures

Elementary Data Organization, Data Structures and Operations, Algorithm, Complexity, Array, Searching, Sorting, Linked List, Operations on single, double and circular linked list. Array and Linked representation of Stacks, Applications, Array and Linked representation of Queue and it's types, Sorting Techniques & their complexity, Binary trees, Tree Traversal, Binary Search Trees, Balanced binary Trees, AVL trees, Red Black Tree, Heaps, Heap sort. Graphs, operations on Graph, DFS, BFS. Hashing Techniques, Collision and its resolving.

24CAI0301- AI and Machine Learning
Origin of AI, Turing Test, Understanding Knowledge Base, AI search Algorithms, Breadth First, Depth First, A* and AO* Algorithms. Introduction to Machine Learning: Basic Terminology, Types of Machine Learning, Supervised, Unsupervised, and Semi-Supervised Learning. Python, Numpy, Pandas, Matplotlib(Pre-requisite. Linear Regression - Linear Regression Ideal, Best Fit Line. Linear Regression - Loss functions, Loss function minimize, Square Function, MSE/RMSE, Assumptions of Linear Regression. Introduction to Gradient Descent, Stochastic Gradient Descent, Mini Batch Gradient Descent.

25ECE6303 - Microwave and Satellite Communication
Introduction to microwave, Klystrons, Reflex Klystrons, Magnetrons and TWT, Classification of solid-state microwave devices, Analysis of MW components using s-parameters, ferrite devices (isolator, circulator, gyrator), cavity resonator, matched termination, radar communication, Origin of Satellite Communication, Communication Satellite Link Design, interference effects on complete link design, earth station parameters.

24ECE7303 –Optical communication system
Introduction to optical communication system, optical ray theory, Light propagation in optical fiber, optical fibers structures. Fiber characteristics, attenuation, absorption, losses, Dispersion. Light emitting diode, Lasers. Semiconductor optical amplifier (SOA), traveling wave amplifier (TWA), ERBIUM-Doped Fiber Amplifier (EDFA's). Requirements of photo detector, semiconductor photodetectors. Wavelength division multiplexing.

24ECE7306 -IC fabrication & Technology
Semiconductor Materials, Carrier Concentrations, Continuity Equation, Crystal growth. Vapour phase and molecular beam epitaxy. Oxidation techniques, lithography methods. Deposition process and methods. Ion implantation and metallization. diffusion, oxidation, epitaxy, lithography, etching and deposition. IC fabrication. Analytical and assembly techniques. Packaging of VLSI devices.

24ECE7307 - VLSI Design and Verification
Semiconductor Materials, Crystal Structure, Energy Bands, Carrier Concentrations, Carrier Transport Phenomena, Continuity Equation, Thermionic Emission Process, Tunneling Process, High Field Effects. Electron grade silicon. Crystal growth. Wafer preparation. Vapour phase and molecular beam epitaxy. SOI. Epitaxial evaluation. Oxidation techniques, systems and properties. Oxidation defects. Optical, electron, X-ray and ion lithography methods. Plasma properties, size, control, etch mechanism, etch techniques and equipments. Deposition process and methods. Diffusion in solids. Diffusion equation and diffusion mechanisms. Ion implantation and metallization. Process simulation of ion implementation, diffusion, oxidation, epitaxy, lithography, etching and deposition. NMOS, CMOS, MOS memory and bipolar IC technologies. IC fabrication. Analytical and assembly techniques. Packaging of VLSI devices.

24ECE7313 -High Speed and Low Power VLSI Circuit Design
Introduction and need of Low-Power and High-Speed VLSI Circuits Design, Physics and sources of power dissipation and delay in Logic Gates, Impact of technology scaling, technology and device innovation, transistor sizing and gate oxide thickness. Static and dynamic consumption in circuits and related various approaches such as multithreshold voltage, Transistor stacking, logic level, Gate reorganization, signal gating, logic encoding, state machine encoding, pre-computation logic, Low Power Static RAM Architecture: Architecture of SRAM array, Ideal and non-ideal interconnect issues, Delay in Multi-stage logic networks, choosing the best number of stages, Model of a logic, defining various characteristics relating to access time. Clocked Logic style, Clock Jitter, Clock Skew, Clock Generation, Clock Distribution, and Asynchronous Clocking Techniques.

25ECE6400-Capstone Project-2

Projects are undertaken individually or in small groups that introduce the dimension of work load management into the program to enable completion of a large, relatively unstructured assignment over the course of the semester. To facilitate effective workload management and iterative development, students are encouraged to utilize a project management tool and apply a Scrum-based development approach for project planning and development. The projects undertaken span a diverse range of topics, including theoretical, simulation and experimental studies. Assessments are through seminars, presentations, thesis, and a public demonstration of work.

24UNI0101-Communication Skills

Listening, Speaking, Reading, Writing and Different Modes of Writing, Digital Literacy and Social Media, Digital Ethics and Cyber Security, Nonverbal Communication.

24UNI0102-Professional Skills

Résumé Skills, Interview Skills, Group Discussion Skills, Exploring Career Opportunities.

24UNI0103-Leadership and Management Skills

Leadership Skills, Managerial Skills, Entrepreneurial Skills, Innovative Leadership and Design Thinking, Ethics and Integrity, Managing Personal Finance

24UNI0151- Numerical Ability and logical reasoning

VEDIC MODULE: Square and Square + Introduction with aptitude , Cube and cube root, Division, Addition and Subtraction + Basic Trick, ,Rec. Numbers + Approximation, Number System Module: Number System – 1, Number System – 2,H.C.F & L.C.M – 1,H.C.F & L.C.M – 2,Average (Basic), Average(Tricks), Ratio Module: Problem on Ages (Basic + Questions), Partnership (Basic + Questions), Allegations Part -1 (Basic Formula), Allegation (Type of Questions).

24CSE0202 - Operating Systems

Introduction to Operating System (OS) and its types, OS services and system calls, case study on UNIX and Windows OS, processes and context-switching threads, types of schedulers, inter-process communication, semaphores, deadlocks, memory management, paging, basics of virtual memory, I/O hardware management, concept of a file, disk management.

24ECE6312 –Project Management

Examining Professional Project Management-, Develop a Work Breakdown Structure, Developing Project Schedules-Planning Project Quality, Staffing, and Communications- Analyzing Risks and Planning Risk Responses- Develop a Risk Response Plan, Planning Project Procurement-Executing Project Work-Closing the Project, Close Project Procurements, Close the Project or Phase Administratively.

24ECE6313 -Data Analytics

Data Science fundamentals, R and R Studio, Version Control and GitHub, Programming with R, Profiling, finding data and reading different file types, data storage systems, data extraction from web or databases, organizing, merging and managing the data, text and date manipulation in R, basics of analytic graphics, graphing systems available in R, statistical methods for exploratory analysis, clustering and dimension reduction techniques, EDA tools.

24ECE7402 – CEED Acceleration Program (CAP) Cohort-II-Module I 2

Course Introduction: Self Discovery Finding Your Flow, Effectuation – I and II, Identifying Problems Worth Solving – I and II, Design Thinking, Look for Solutions, Present the Problem You Love – I and II. Customers and Markets, Identify Your Customer Segment and Niche, Identify Jobs, Pains, and Gains, and Early Adopters, Master Class: Craft Your Value Proposition – I and II, Outcome-Driven Innovation (ODI), Present Your Value Proposition Canvas (VPC), Basics of Business Model and Lean Approach, Sketch the Lean Canvas – I and II Class Presentation - Pitch Your Business Model.

24ECE7301 Power Electronics

This course introduces the basic concepts of switched-mode converter circuits for controlling and converting electrical power with high efficiency.

24UNI0124- Cyber Security

Introduction to Security, Basics of Cryptography, Cryptographic mechanisms, Classical Encryption Techniques Symmetric and Asymmetric cryptography (basics) Introduction to cybercrime, cybercrime and information security, Classifications of cybercrimes Cybercrime and the Indian ITA 2000, Cyber offenses: Introduction, how criminals plan the attacks? Botnets- The fuel for cybercrime. Phishing, Password cracking, key loggers and sql injection, attacks on wireless networks.

24UNI0125- Disaster Management

Introduction to Disasters, Impacts, Classification of hazards /disasters and causes. Approaches to Disaster Risk reduction: Disaster cycle, Phases, prevent, Components of Disaster Relief, Hazard Profile (India), Disaster Risk Management in India, DM Act and Policy, Disaster and Development: Inter-relationship between Disasters and Development Waste Management.

24CSE0203- Programming Paradigms

Classes and Object-Oriented Programming, Properties of Object –Oriented Programming, Concept of Public, protected and Private, Concept of Constructors, types of constructor, Destructor, Friend Functions, Friend Classes, Constant Objects and constant Member Functions, Arrays of Objects of Class, The Size of a Class Object, Static member. Pointers and References to Class Objects, Pointers as Data Members and class variables, access specifiers in class, new and delete, this pointer. Overloading the Assignment Operators, unary and binary Operators, Type Conversions, Overloading Operators new and delete, Inheritance, type of inheritance, Changing the Access Specification of Inherited Members, Multiple Inheritance, Multilevel inheritance, Inherited Member Ambiguity, Virtual Base Classes. Introduction to Class Templates and application of class template. Bubble Sort, quick sort, linear Search, Binary Search, insertion sort , selection sort, merge sort, Linked List, Doubly Linked List, Circular Linked List , Stack, Queue, circular queue, priority queue. Tree, Binary Tree, applications of trees, binary search tree. Understanding type of Exceptions, Use of exception handling,Stream Classes, File Streams, different method of file data reading and writing.

25ECE6300- Applied Programming in Engineering

Introduction to programming structure, compilation, linking, execution, code documentation, and version control using Git. Data handling including variables, constants, data types, type casting, and expressions with emphasis on type conversion. Control flow and software logic using conditional statements (if, switch, conditional operators) and looping structures (while, do-while, for). Functions and code reusability through user-defined functions, recursion, and modular programming with a focus on real-world applications like API integration. Data structures such as arrays (1D, 2D, multidimensional), strings, sparse matrices, and dynamic memory allocation with real-world use cases. Object-oriented programming (OOP) concepts including classes, objects, inheritance, polymorphism, and encapsulation for scalable software design. Advanced memory management, including pointers, references, dynamic memory operations, and memory optimization techniques. File handling and data

persistence through text and binary file operations, large dataset management, and serialization. Industry coding practices covering error handling, exception management, writing maintainable code, code reviews, unit testing, and debugging. Mini-projects for collaborative real-world software modules.

25ECE6301- Applied IoT and Embedded System Design

Bare-metal embedded systems include microcontroller architectures such as ARM Cortex-M and RISC-V, register-level programming involving GPIO, timers, ADC, and PWM, as well as the use of interrupts and Direct Memory Access (DMA). It also covers memory management using Flash, SRAM, and EEPROM, along with debugging techniques using JTAG/SWD and logic analyzers. IoT application development focuses on the complete IoT stack from sensors to edge to cloud, covering wireless protocols like Wi-Fi, BLE, LoRa, and Zigbee, and IoT protocols such as MQTT, CoAP, and HTTP/HTTPS. It also involves working with cloud platforms like AWS IoT, ThingsBoard, and Ubidots, and emphasizes power optimization for battery-operated devices. Automotive embedded systems explore automotive standards like AUTOSAR and ISO 26262, communication protocols including CAN bus, LIN, FlexRay, and Automotive Ethernet, and topics such as OTA updates, secure diagnostics with UDS protocol, and basics of ECU (Electronic Control Unit) design, along with real-time operating systems like FreeRTOS and QNX. AI and advanced communication protocols focus on TinyML with TensorFlow Lite for Microcontrollers, Time-Sensitive Networking (TSN) for Industry 4.0, 5G/LTE-M for industrial IoT, secure firmware updates using TUF and Uptane, and edge AI use cases like predictive maintenance and vision.

25ECE6302 Applied VLSI Design: Principles and Practices

CMOS fundamentals and circuit design cover MOSFET operation including short-channel effects and leakage, combinational and sequential logic design, the CMOS fabrication process such as FinFET and PDKs, and low-power techniques like clock gating and power gating. RTL design and synthesis focus on Verilog/VHDL coding best practices, finite state machines (FSMs) and pipelining, logic synthesis involving constraints and optimization, and the basics of static timing analysis (STA). Physical design and PPA optimization include floor planning, placement, and routing, clock tree synthesis (CTS), signal integrity concerns like crosstalk and IR drop, and PPA trade-off analysis. Verification and testing encompass System Verilog and UVM methodology, built-in self-test (BIST), scan chains and ATPG, along with post-silicon validation.

25ECE7300 Programming Concepts using Java

This course introduces programming basics, Java history, JVM, JDK, and IDE setup. It covers Java syntax, data types, operators, control flow, methods, arrays, and strings. Students learn object-oriented principles like classes, inheritance, encapsulation, and polymorphism. Exception handling, file operations, and error management are also explored in depth. GUI development using Swing components and event handling is introduced for simple applications. Finally, students apply their skills by building a mini-project integrating OOP, GUI, and file handling.

Mini Course

Mini course is a concise and focused course designed to help students maximize their learning experience from online courses available on Coursera. This mini course provides practical strategies, tips, and tools to effectively navigate, engage with the course while exploring emerging technologies. The learners can become lifelong learners using efficient learning techniques to manage their time and leverage additional resources and community support.

Integration of Swayam

Swayam and MOOCs offer a diverse range of online courses across various disciplines, providing

students with access to high-quality educational content from esteemed institutions and instructors worldwide. Integrating these courses into our curriculum presents a valuable opportunity to enhance the learning experience of our students, broaden their academic horizons, and equip them with relevant skills for their future endeavors. Students can choose the courses from online platforms like NPTEL/SWAYAM.

12. Assessments

In Electronics and Communication Engineering B.E. program assessments play a vital role in ensuring the comprehensive development of students' knowledge, skills, and competencies. The program incorporates a diverse range of assessment methods designed to evaluate various aspects of student learning and performance.

1. Exams (Sessional Tests, End term examination)-

a. Subjective Assessments for Knowledge Verification: Ensures understanding of fundamental concepts and theories. Involves objective/ short-answer/problem solving questions that test students understanding and ability to articulate complex ideas.

b. Numerical-Based Assessments: Focuses on solving mathematical problems and applying theoretical knowledge in subjects like circuit analysis and signal processing etc.

2. Formative Assessments: Ongoing evaluations such as quizzes, assignments, and class discussions that provide continuous feedback and help identify areas for improvement
Students also have an option of choosing the courses from online platforms like MOOC (NPTEL/SWAYAM)

3. Lab-Based Assessments and viva voce:

a. Skill Development: Enhances practical skills through hands-on activities and projects.

b. Critical Thinking and Problem-Solving: Develops the ability to tackle complex engineering challenges. Practical exams and experiments conducted in laboratory settings to assess technical skills and hands-on experience.

4. Project assessments and evaluations:

a. Problem-Based Learning (PBL): Engages students with real-world problems to develop critical thinking, problem-solving, and teamwork skills.

b. Individual Projects: Assignments where students design, implement, and test individual projects, such as a simple electronic circuit or a communication system.

c. Group Projects: Collaborative projects that may involve designing complex systems or solving real-world problems, encouraging teamwork and practical application of theoretical knowledge.

5. Continuous Assessment

a. Class Participation: Regular assessment of student engagement and participation in class discussions, activities, weekly tasks given to students.

b. Formative Assessment: Ongoing assessments that provide immediate feedback to students, helping them improve continuously.

6. Presentations

a. Oral Presentations: Students present on a specific topic, project, or research finding to develop their communication skills.

By integrating these diverse assessment methods, the B.E. Electronics and Communication Engineering program ensures that students are well-equipped with the theoretical knowledge, practical skills, and professional competencies needed to excel in the dynamic field of electronics and communication engineering.

13. Examples of few questions statements pertaining to different levels of Bloom's Taxonomy

Remember

A lot of emphasis is laid on, so as to make sure that all assessment components are conducted while following different levels of Bloom's Taxonomy as mentioned in figure.

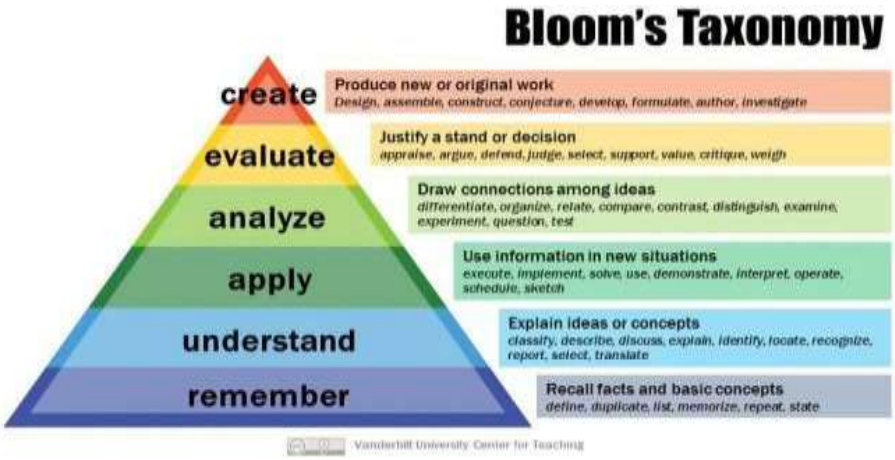

Figure 1. Bloom's Taxonomy [7]

Further a focused effort if also made to align every single Further a focused effort if also made to align every single test item in assessment components with one or the other course learning outcome.
Retrieving, recognizing, and recalling relevant knowledge from long-term memory.

Sample Questions
1. State Ohm's law
2. List the physical and chemical properties of silicon

Understand

Constructing meaning from oral, written and graphic messages through interpreting,exemplifying, classifying, summarizing, inferring, comparing and explaining.

Sample Questions
1. Explain the importance of sustainability in Engineering design
2. How does a PN junction diode behaves under different bias conditions

Applying

Carrying out or using a procedure through executing or implementing.

Sample Questions
1. One of the resource persons needs to address a huge crowd (nearly 400 members) in the auditorium. A system is to be designed in such a way that everybody attending the session should be able to hear properly and clearly without any disturbance. Identify the suitable circuit to boost the voice signal and explain its functionality in brief.

2. Model and realize the following behaviors using diodes with minimum number of digital inputs. (i) Turning on of a burglar alarm only during night time when the locker door is opened. (ii) Providing access to an account if either date of birth or registered mobile number or both are correct. (iii) Updating the parking slot empty light in the basement of a shopping mall.

Analyzing

Breaking material into constituent parts, determining how the parts relate to one another andto an overall structure or purpose through differentiating, organizing and attributing

Sample Questions

1. Dave is working on a Campus Management Software but is unable to identify the maximum number of students per course. He decided to implement the same using arrays but discovered that there is memory wastage due to over-provisioning. Which method of memory storage should be used by Dave and help Dave to implemented same following any programming language?
2. Return statement can only be used to return a single value. Can multiple values be returned from a function? Justify your answer.

Creating & Evaluating

Putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure through generating, planning or producing. Making judgments based on criteria and standards through checking and critiquing

Sample Questions

1. Design a system to assist the driver by using cameras to detect lane markers and pedestrians while the vehicle is in motion.

14. Course Handout

The course handout prepared by the faculty, at the start of the semester, is a comprehensive guide detailing all aspects of the course. It includes clear objectives and expected course outcomes, providing students with an understanding of what they will achieve by the end of the term. It maps the course objectives and outcomes to the overall program outcomes. The handout includes essential reading materials, relevant websites, and recommended tools and platforms. The handout outlines the complete course coverage plan, ensuring a structured learning journey. Additionally, it specifies the evaluation scheme and components, so students are aware of the assessment criteria. The syllabus is also included, offering an in-depth look at the topics to be covered, ensuring both students and faculty are aligned on the course content and expectations. This document serves as a crucial guide for both students and faculty, ensuring a clear understanding of the course structure and expectations. This document typically has various components like -

- Title of the course
- Course code
- Names of all the Faculty members teaching that course in a typical semester
- Objective of the course
- Course learning outcomes
- Alignment of every single CLO with Program outcomes along with mapping
- Recommended books along with other reading / relevant websites
- Detailed delivery plan
- Assessment methodologies etc.

Faculty members are expected to religiously follow the contents of the course handout in complete letter and spirit.

15. Program level Course-PO matrix of all courses

Table 7: CO-PO Matrix

S.NO.	Course Name	Course Code	CO#	COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1.1	Calculus and Statistical Analysis	24APS1101	CO1	To introduce and form matrices to present mathematical solutions in a concise and informative manner. Use matrices to solve the problems of system of linear equations and solve various live problems using matrices.	3.00	3.00		3.00								3.00	
			CO2	To find local extreme values of functions of several variables, test for saddle points, examine the conditions for the existence of absolute extreme values. solve constraint problems using Lagrange multipliers and solve related application problems.	3.00	3.00										2.00	2.00
			CO3	To apply the principles of integral calculus to solve a variety of practical problems in engineering and applied science.	3.00		2.00								3.00	2.00	2.00
			CO4	To interpret statistical inference tasks with the help of probability & distributions and hypothesis testing for mean, variance and proportion of large as well as small data and employ appropriate regression models in determining statistical relationships.	3.00	3.00									2.00	1.00	
					3.00	3.00	2.00	3.00	-	-	-	-	-	-	2.50	2.00	2.00
1.2	Semiconductor Physics & Devices	24ECE1100	CO1	Understand and analyze the fundamental properties of semiconductors, carrier dynamics, and quantum	3.00											3.00	

				mechanical concepts relevant to electronic devices.													
			CO2	Analyze the electrical behavior of various diodes under different biasing conditions and understand their industrial applications.		3.00			2.00							3.00	
			CO3	Evaluate the operation and characteristics of BJTs in different configurations and apply models for circuit analysis.			2.00	2.00								3.00	
			CO4	Understand and analyze the working principles and characteristics of FETs, including MOSFETs, JFETs, and UJTs.	3.00												2.00
			CO5	Develop practical skills in constructing and characterizing semiconductor device circuits, validating models through experimental measurements			3.00		3.00								3.00
					3.00	3.00	2.50	2.00	2.50	-	-	-	-	-	-	3.00	2.50
1.3	Introduction to Programming for Problem Solving	24ECE1101	CO1	Understand and apply fundamental problem-solving strategies and programming constructs in C++ to design basic computational solutions.	3.00	2.00	2.00									3.00	
			CO2	Apply control structures, functions, and recursion to develop modular programs in C++.		2.00	3.00		2.00							3.00	
			CO3	Implement programs using pointers, dynamic memory allocation, arrays, and strings to handle structured data efficiently.		2.00	2.00		2.00								3.00
			CO4	Understand and implement user-defined data types and basic object-oriented concepts such as	2.00		2.00		2.00							2.00	

				classes, objects, and enumerated types to develop simple structured programs.													
			CO5	Demonstrate the ability to build, test, and debug C++ programs through hands-on assignments, reflecting effective use of programming tools and sound development practices		2.00			3.00			1.00	2.00		2.00		3.00
					2.50	2.00	2.25	-	2.25	-	-	1.00	2.00	-	2.00	2.67	3.00
1.4	Integrated Design Engineering	24ECE1102	CO1	Apply design thinking principles to conceptualize and visualize product ideas using sketches, mind maps, and CAD tools.			3.00		2.00								2.00
			CO2	Demonstrate proficiency in schematic creation, PCB layout design, Gerber file generation, and PCB fabrication using industry-standard tools and techniques.			3.00		3.00							3.00	
			CO3	Develop and test hardware applications using Arduino by interfacing sensors, actuators, and displays for real-world problem-solving.	3.00			3.00								3.00	
			CO4	Develop communication, teamwork, and technical adaptability through hands-on engineering projects with modern tools								3.00	2.00				
					3.00	-	3.00	3.00	2.50	-	-	3.00	2.00	-	-	3.00	2.00
1.5a	Introduction to Architecting Smart IoT Devices	24MOC0101	CO1	Identify and navigate various MOOC platforms (e.g., NPTEL, Coursera, edX etc) and utilize digital tools for self-paced learning.					3.00						3.00		

			CO2	Demonstrate the ability to plan, manage, and complete an online course independently, applying self-discipline and time management skills.								2.00		3.00	3.00		
			CO3	Apply acquired knowledge from the MOOC course to real-world or academic contexts and reflect on the learning experience through reports or presentations.	2.00			2.00								**2.00**	
					2.00	-	-	2.00	3.00	-	-	2.00	-	3.00	3.00	2.00	-
1.5b	Introduction to solar cells	24MOC0102	CO1	Identify and navigate various MOOC platforms (e.g., NPTEL, Coursera, edX etc) and utilize digital tools for self-paced learning.					3.00						3.00		
			CO2	Demonstrate the ability to plan, manage, and complete an online course independently, applying self-discipline and time management skills.								2.00		3.00	3.00		
			CO3	Apply acquired knowledge from the MOOC course to real-world or academic contexts and reflect on the learning experience through reports or presentations.	2.00			2.00								**2.00**	
					2.00	-	-	2.00	3.00	-	-	2.00	-	3.00	3.00	2.00	-
1.5c	Working for a sustainable future: concepts and approaches	24MOC0103	CO1	Identify and navigate various MOOC platforms (e.g., NPTEL, Coursera, edX etc) and utilize digital tools for self-paced learning.					3.00						3.00		
			CO2	Demonstrate the ability to plan, manage, and complete an online course independently, applying self-discipline and time management skills.								2.00		3.00	3.00		

			CO3	Apply acquired knowledge from the MOOC course to real-world or academic contexts and reflect on the learning experience through reports or presentations.	2.00			2.00								**2.00**	
					2.00	-	-	2.00	3.00	-	-	2.00	-	3.00	3.00	2.00	-
1.5d	Innovation and emerging technology: Be disruptive	24MOC0104	CO1	Identify and navigate various MOOC platforms (e.g., NPTEL, Coursera, edX etc) and utilize digital tools for self-paced learning.					3.00						3.00		
			CO2	Demonstrate the ability to plan, manage, and complete an online course independently, applying self-discipline and time management skills.								2.00		3.00	3.00		
			CO3	Apply acquired knowledge from the MOOC course to real-world or academic contexts and reflect on the learning experience through reports or presentations.	2.00			2.00								**2.00**	
					2.00	-	-	2.00	3.00	-	-	2.00	-	3.00	3.00	2.00	-
1.5e	5G for Everyone	24MOC0105	CO1	Identify and navigate various MOOC platforms (e.g., NPTEL, Coursera, edX etc) and utilize digital tools for self-paced learning.					3.00						3.00		
			CO2	Demonstrate the ability to plan, manage, and complete an online course independently, applying self-discipline and time management skills.								2.00		3.00	3.00		
			CO3	Apply acquired knowledge from the MOOC course to real-world or academic contexts and reflect on the learning experience through reports or presentations.	2.00			2.00								**2.00**	

					2.00	-	-	2.00	3.00	-	-	2.00	-	3.00	3.00	2.00	-
1.5f	Introduction to Digital Transformation	24MOC0106	CO1	Identify and navigate various MOOC platforms (e.g., NPTEL, Coursera, edX etc) and utilize digital tools for self-paced learning.					3.00						3.00		
			CO2	Demonstrate the ability to plan, manage, and complete an online course independently, applying self-discipline and time management skills.								2.00		3.00	3.00		
			CO3	Apply acquired knowledge from the MOOC course to real-world or academic contexts and reflect on the learning experience through reports or presentations.	2.00			2.00								**2.00**	
					2.00	-	-	2.00	3.00	-	-	2.00	-	3.00	3.00	2.00	-
1.5g	AI for GOOD	24MOC0107	CO1	Identify and navigate various MOOC platforms (e.g., NPTEL, Coursera, edX etc) and utilize digital tools for self-paced learning.					3.00						3.00		
			CO2	Demonstrate the ability to plan, manage, and complete an online course independently, applying self-discipline and time management skills.								2.00		3.00	3.00		
			CO3	Apply acquired knowledge from the MOOC course to real-world or academic contexts and reflect on the learning experience through reports or presentations.	2.00			2.00								**2.00**	
					2.00	-	-	2.00	3.00	-	-	2.00	-	3.00	3.00	2.00	-
1.5h	Prompt Engineering for ChatGPT	24MOC0108	CO1	Identify and navigate various MOOC platforms (e.g., NPTEL, Coursera, edX etc) and utilize					3.00						3.00		

				digital tools for self-paced learning.													
			CO2	Demonstrate the ability to plan, manage, and complete an online course independently, applying self-discipline and time management skills.							2.00		3.00	3.00		
			CO3	Apply acquired knowledge from the MOOC course to real-world or academic contexts and reflect on the learning experience through reports or presentations.	2.00			2.00							**2.00**	
					2.00	-	-	2.00	3.00	-	-	2.00	-	3.00	3.00	2.00	-
1.5i	Creative Thinking: Techniques and Tools for Success	24MOC0109	CO1	Identify and navigate various MOOC platforms (e.g., NPTEL, Coursera, edX etc) and utilize digital tools for self-paced learning.					3.00						3.00		
			CO2	Demonstrate the ability to plan, manage, and complete an online course independently, applying self-discipline and time management skills.								2.00		3.00	3.00		
			CO3	Apply acquired knowledge from the MOOC course to real-world or academic contexts and reflect on the learning experience through reports or presentations.	2.00			2.00							**2.00**		
					2.00	-	-	2.00	3.00	-	-	2.00	-	3.00	3.00	2.00	-
1.5j	Wireless Communications for Everybody	24MOC0110	CO1	Identify and navigate various MOOC platforms (e.g., NPTEL, Coursera, edX etc) and utilize digital tools for self-paced learning.					3.00						3.00		
			CO2	Demonstrate the ability to plan, manage, and complete an online course independently, applying								2.00		3.00	3.00		

				self-discipline and time management skills.													
			CO3	Apply acquired knowledge from the MOOC course to real-world or academic contexts and reflect on the learning experience through reports or presentations.	2.00			2.00								**2.00**	
					2.00	-	-	2.00	3.00	-	-	2.00	-	3.00	3.00	2.00	-
1.5k	Community Projects using Design Thinking	24ECE1103	CO1	Identify and navigate various MOOC platforms (e.g., NPTEL, Coursera, edX etc) and utilize digital tools for self-paced learning.					3.00						3.00		
			CO2	Demonstrate the ability to plan, manage, and complete an online course independently, applying self-discipline and time management skills.								2.00		3.00	3.00		
			CO3	Apply acquired knowledge from the MOOC course to real-world or academic contexts and reflect on the learning experience through reports or presentations.	2.00			2.00		2.00						**2.00**	
					2.00	-	-	2.00	3.00	2.00	-	2.00	-	3.00	3.00	2.00	-
1.5l	Artificial Intelligence for All	24ECE1104	CO1	Identify and navigate various MOOC platforms (e.g., NPTEL, Coursera, edX etc) and utilize digital tools for self-paced learning.								2.00		3.00	3.00		
			CO2	Demonstrate the ability to plan, manage, and complete an online course independently, applying self-discipline and time management skills.	2.00			2.00								**2.00**	
			CO3	Apply acquired knowledge from the MOOC course to real-world or academic contexts and reflect						2.00				1.00	3.00		

				on the learning experience through reports or presentations.													
					2.00	-	-	2.00	-	2.00	-	2.00	-	2.00	3.00	2.00	-
1.5m	Introduction to Entrepreneurial Thinking	24ECE1105	CO1	Identify and navigate various MOOC platforms (e.g., NPTEL, Coursera, edX etc) and utilize digital tools for self-paced learning.					3.00						3.00		
			CO2	Demonstrate the ability to plan, manage, and complete an online course independently, applying self-discipline and time management skills.								2.00		3.00	3.00		
			CO3	Apply acquired knowledge from the MOOC course to real-world or academic contexts and reflect on the learning experience through reports or presentations.	2.00			2.00		2.00						**2.00**	
					2.00	-	-	2.00	3.00	2.00	-	2.00	-	3.00	3.00	2.00	-
1.5n	Introduction to Prompt Engineering	24ECE1106	CO1	Identify and navigate various MOOC platforms (e.g., NPTEL, Coursera, edX etc) and utilize digital tools for self-paced learning.					3.00						3.00		
			CO2	Demonstrate the ability to plan, manage, and complete an online course independently, applying self-discipline and time management skills.								2.00		3.00	3.00		
			CO3	Apply acquired knowledge from the MOOC course to real-world or academic contexts and reflect on the learning experience through reports or presentations.	2.00			2.00		2.00						**2.00**	
					2.00	-	-	2.00	3.00	2.00	-	2.00	-	3.00	3.00	2.00	-

1.5o	Social Emotional Learning	24ECE1107	CO1	Identify and navigate various MOOC platforms (e.g., NPTEL, Coursera, edX etc) and utilize digital tools for self-paced learning.					3.00						3.00			
			CO2	Demonstrate the ability to plan, manage, and complete an online course independently, applying self-discipline and time management skills.								2.00		3.00	3.00			
			CO3	Apply acquired knowledge from the MOOC course to real-world or academic contexts and reflect on the learning experience through reports or presentations.	2.00			2.00		2.00						**2.00**		
					2.00	-	-	2.00	3.00	2.00	-	2.00	-	3.00	3.00	2.00	-	
1.5p	Clean and Green Campus	24ECE1108	CO1	Identify and navigate various MOOC platforms (e.g., NPTEL, Coursera, edX etc) and utilize digital tools for self-paced learning.					3.00						3.00			
			CO2	Demonstrate the ability to plan, manage, and complete an online course independently, applying self-discipline and time management skills.								2.00		3.00	3.00			
			CO3	Apply acquired knowledge from the MOOC course to real-world or academic contexts and reflect on the learning experience through reports or presentations.	2.00			2.00		2.00						**2.00**		
					2.00	-	-	2.00	3.00	2.00	-	2.00	-	3.00	3.00	2.00	-	
1.5q	Leadership and Sustainability	24ECE1109	CO1	Identify and navigate various MOOC platforms (e.g., NPTEL, Coursera, edX etc) and utilize digital tools for self-paced learning.					3.00						3.00			

			CO2	Demonstrate the ability to plan, manage, and complete an online course independently, applying self-discipline and time management skills.							2.00		3.00	3.00		
			CO3	Apply acquired knowledge from the MOOC course to real-world or academic contexts and reflect on the learning experience through reports or presentations.	2.00			2.00		2.00						**2.00**	
					2.00	-	-	2.00	3.00	2.00	-	2.00	-	3.00	3.00	2.00	-
1.6	Foundational Course in Indian Knowledge System	24UNI0107		Explain key concepts and principles from Indian knowledge systems (astronomy, health sciences, fine arts) through foundational texts and literature.	2.00										2.00		
				Analyze the interdisciplinary connections within Indian knowledge systems and their holistic approaches to problem-solving		3.00											2.00
				Evaluate Indian knowledge systems using historical and contemporary frameworks, assessing their relevance and applications.		3.00											
				Interpret ancient Indian mathematical concepts and foundational texts, demonstrating their logical and structural significance.	3.00	2.00											
				Develop strategies to systematically integrate Indian traditional knowledge systems into modern educational curricula and scientific research.			3.00						2.00		2.00		2.00
					2.50	2.67	3.00	-	-	-	-	-	2.00	-	2.00	-	2.00

Sem 2																	
2.1	Differential Equations and Transformations	24APS2101	CO1	To analyze and correlate many real-life problems mathematically and thus find the appropriate solutions using Fourier series and Fourier transforms.	3.00	3.00								3.00		3.00	2.00
			CO2	To solve various practical problems in Science and Engineering using ordinary differential equations.	3.00	3.00		2.00								2.00	2.00
			CO3	To model and solve engineering problems using Laplace transforms and their properties, including applications to ordinary differential equations.	3.00	3.00										2.00	2.00
			CO4	To recognize and find families of solutions for most real physical processes such as heat transfer, elasticity, quantum mechanics, water flow and other practical problems in Science and Engineering, which are governed by ordinary and partial differential equations.	3.00	3.00								3.00			
			CO5	To analyze functions of complex variables, techniques of complex integrals and compute integrals over complex surfaces.	3.00	3.00		3.00								3.00	2.00
					3.00	3.00	-	2.50	-	-	-	-	-	3.00	-	2.50	2.00
2.2	Electronic Circuits	24ECE2100	CO1	Perform DC analysis of transistor circuits and evaluate its significance for stable amplifier operation.	3.00	2.00										3.00	1.00
			CO2	Analyze and experimentally verify the input/output impedance, voltage gain, and current gain of various transistor amplifier configurations.	3.00	3.00										3.00	2.00

			CO3	Investigate the frequency response of BJT amplifiers, identify dominant-pole cutoff frequencies, and analyze the effects of parasitic capacitance on bandwidth		3.00										3.00	2.00
			CO4	Design and implement power amplifier circuits with industrial relevance, quantifying efficiency and nonlinear distortion metrics in practical scenarios.							1.00	2.00	2.00			3.00	3.00
			CO5	Develop, test, and troubleshoot electronic hardware using laboratory instruments such as multimeter, function generators, and oscilloscopes to validate theoretical predictions.		2.00	2.00	3.00	2.00			2.00	2.00	1.00	1.00	3.00	3.00
					3.00	2.50	2.00	3.00	2.00	-	1.00	2.00	2.00	1.00	1.00	3.00	2.20
2.3	Object Oriented Programming	24ECE2101	CO1	Demonstrate understanding of object-oriented programming concepts such as classes, objects, and encapsulation, and differentiate them from procedural approaches.	3.00	2.00						2.00					3.00
			CO2	Apply constructors, destructors, and operator overloading in C++ to build modular and efficient object-oriented code components.		2.00	2.00		2.00							2.00	
			CO3	Construct and test class hierarchies using inheritance, polymorphism, and exception handling to enhance reusability and robustness in software design.			3.00								2.00		2.00
			CO4	Utilize file handling, streams, and templates in C++ to create generic, data-centric applications with persistent storage capabilities.	2.00	3.00	2.00										2.00

			CO5	Develop and evaluate real-world applications using object-oriented techniques that incorporate user interaction, data abstraction, and file operations for embedded or communication-based systems.		3.00	3.00		2.00			2.00			3.00		3.00
					2.50	2.50	2.50	-	2.00	-	-	2.00	-	-	2.50	2.00	2.50
2.4	Digital Electronics	24ECE2102	CO1	Apply Boolean algebra and logic simplification to design and implement combinational circuits using logic gates, MSI components, and arithmetic circuits.	3.00	2.00	3.00		3.00							3.00	2.00
			CO2	Apply logic gates to implement and analyze basic latches and flip-flops using waveform interpretation for sequential circuit design.	3.00	2.00	3.00	2.00	3.00							3.00	2.00
			CO3	Explain the concepts of shift registers, their modes of operation, and data movement principles in sequential circuits.	2.00	1.00			2.00								
			CO4	Design and analyze counters and finite-state machines to implement synchronous sequential circuits, considering classification, state behavior, and propagation effects.	3.00	3.00		3.00	3.00							3.00	2.00
			CO5	Design and implement combinational and sequential digital circuits using hardware components like breadboards, ICs, and digital kits, as well as simulation software, to validate functionality.	3.00	2.00	3.00	3.00	3.00			2.00	2.00			3.00	3.00
					2.80	2.00	3.00	2.67	2.80	-	-	2.00	2.00	-	-	3.00	2.25
2.5	Electrical Engineering Fundamentals	24ECE2103	CO1	Accurately measure electrical quantities using standard instruments and verify	3.00	3.00			2.00							3.00	

				fundamental laws such as Kirchhoff's laws and inductance in DC and AC circuits.													
			CO2	Operate and control DC and AC machines, including speed and direction control, and interpret their performance characteristics for practical applications.	3.00	3.00			2.00							3.00	
			CO3	Produce structured laboratory reports that present experimental observations, analytical conclusions, and conceptual understanding in a clear and professional manner.		2.00	3.00					1.00	3.00		2.00		2.00
					3.00	2.67	3.00	-	2.00	-	-	1.00	3.00	-	2.00	3.00	2.00
2.6	Prototyping Fundamentals	24ECE2104	CO1	Apply systematic design methodologies to model conceptual frameworks and critically assess system functionality representations	3.00	2.00	3.00	2.00	2.00							2.00	2.00
			CO2	Configure the Arduino IDE for STM32 and implement basic programs to control digital outputs and interface sensors and actuators.			2.00	1.00	3.00			3.00				3.00	3.00
			CO3	Interface peripheral devices using I2C, SPI, and USART protocols to enable data communication, storage, and wireless control in embedded systems.		2.00	3.00	2.00	3.00			3.00				3.00	3.00
			CO4	Design, implement, and demonstrate a functional prototype using STM32, and document the development process through structured reporting and presentation.	3.00	3.00	3.00	3.00	3.00	3.00		3.00	2.00		2.00	3.00	3.00
					3.00	2.33	2.75	2.00	2.75	3.00	-	3.00	2.00	-	2.00	2.75	2.75

2.7	Foundation Workshop	24MEC105	CO1	To distinguish the applications of various trades in industry.	3.00		3.00			3.00	2.00	3.00		2.00	2.00		
			CO2	To identify the hand tools and equipment's of various trades.	3.00		3.00			3.00	2.00	3.00		2.00	2.00		
			CO3	To apply the knowledge of measuring instruments and measuring skills used in industry.	3.00		3.00			3.00	2.00	3.00		2.00	2.00	1.00	1.00
			CO4	To describe the knowledge of different materials and manufacturing process in various shops.	3.00		3.00			3.00	2.00	3.00		2.00	2.00		
			CO5	To apply the knowledge of safety precautions, safety equipment and first aid.			3.00			3.00	2.00	3.00		2.00	2.00		
					3.00	-	3.00	-	-	3.00	2.00	3.00	-	2.00	2.00	1.00	1.00
2.8	Universal Human Values	24UNI0104	CO1	Comprehend the principles of right understanding, harmonious relationships, and physical well-being as essential components of holistic human development and fulfilment of basic aspirations.						3.00	3.00				2.00		
			CO2	Analyse the interplay of harmony within the self, family, society, and nature by integrating ethical conduct, trust, respect, and interconnectedness in human relationships.						3.00	3.00	3.00	3.00		3.00		
			CO3	Apply universal human values and professional ethics to foster sustainable development, holistic decision-making, and a value-based approach to life and profession.						3.00	3.00	3.00			2.00	1.00	1.00
					-	-	-	-	-	3.00	3.00	3.00	3.00	-	2.33	1.00	1.00
Sem 3																	
3.1	Linear Integrated Circuits	24ECE3200	CO1	Explain the functional characteristics and parameters of operational amplifiers and	3.00	2.00									2.00	2.00	1.00

				analyze basic op-amp configurations using datasheet specifications													
			CO2	Analyze ideal op-amp feedback configurations and implement linear applications such as summing, scaling, integration, and differentiation circuits	3.00		3.00						1.00			3.00	
			CO3	Analyze the frequency response, stability, and slew rate of op-amp-based circuits such as active filters, oscillators, and waveform generators.	3.00	2.00		3.00	2.00	1.00						2.00	
			CO4	Evaluate nonlinear op-amp applications including comparators and Schmitt triggers, and explain the working principles of voltage regulators and phase-locked loops in linear power supplies.		2.00			2.00								2.00
			CO5	Design, analyze, and experimentally validate op-amp-based linear/nonlinear circuits	3.00		3.00					1.00	1.00			3.00	2.00
					3.00	2.00	3.00	3.00	2.00	1.00	-	1.00	1.00	-	2.00	2.50	1.67
3.2	Microcontroller	24ECE3201	CO1	Compare RISC/CISC architectures and analyze the STM32 microcontroller's ARM Cortex-M4 core.	3.00											3.00	
			CO2	Configure and program GPIO, ADC, DAC, and interrupts (NVIC) on STM32, applying the Cortex-M4 exception model for embedded systems.		2.00			3.00								
			CO3	Implement timer peripherals (general-purpose, RTC, watchdog) with interrupt handling, optimizing low-power modes for real-time applications		3.00	3.00										
			CO4	Design and prototype embedded communication systems using USART, I2C, SPI, USB, and			3.00	3.00									

				CAN interfaces on STM32 platforms.													
			CO5	Develop, debug, and validate STM32-based embedded systems (GPIO, timers, communication protocols) using STM32Cube IDE, documenting results through technical reports.					3.00			2.00	3.00				3.00
					3.00	2.50	3.00	3.00	3.00	-	-	2.00	3.00	-	-	3.00	3.00
3.3	Signals & Systems	24ECE3202	CO1	Analyze continuous-time signals and systems mathematically, classify their characteristics, and evaluate responses using convolution and step-response methods.	3.00	2.00		3.00								2.00	
			CO2	Implement sampling theory for CT-to-DT conversion and execute discrete-time operations (convolution, correlation).		2.00			3.00							3.00	
			CO3	Assess LTI system stability and frequency characteristics using Laplace (pole-zero) and Fourier transforms with MATLAB verification.		2.00		3.00	3.00							2.00	2.00
			CO4	Evaluate discrete-time LTI systems via Z-transforms, derive transfer functions, and determine stability through ROC analysis.	3.00	2.00	2.00		2.00						2.00	2.00	2.00
			CO5	Implement signal processing operations - including convolution, transforms, and system analyses - through MATLAB/Python programming for continuous and discrete-time systems	2.00		2.00	3.00	3.00			2.00			2.00		3.00
					2.67	2.00	2.00	3.00	2.75	-	-	2.00	-	-	2.00	2.25	2.33
3.4	Network Analysis & Synthesis	24ECE3203	CO1	Analyze electrical circuits using Kirchhoff's laws, matrix methods, and network topology concepts	3.00	2.00		2.00								2.00	

			CO2	Apply network theorems (Thevenin, Norton, Superposition) and transformation techniques to solve DC and AC circuits.	3.00	3.00			2.00							3.00	1.00
			CO3	Evaluate the behavior of RLC circuits in AC systems using phasor analysis and compute power parameters.	3.00	2.00		3.00	2.00							3.00	1.00
			CO4	Determine transient and steady-state responses of RLC circuits using time-domain and Laplace transform methods.	3.00	3.00	1.00	2.00							2.00	2.00	2.00
			CO5	Design and characterize two-port networks and passive filters using impedance parameters and frequency response analysis.	2.00		3.00	2.00							2.00	2.00	2.00
					2.80	2.50	2.00	2.25	2.00	-	-	-	-	-	2.00	2.40	1.50
3.5	OE-I (Data handling using Artificial Intelligence)	24ECE3205	CO1	Explain the basic concepts of data types and data handling, and describe the significance of data in Artificial Intelligence.	3.00	2.00									2.00	2.00	
			CO2	Apply fundamental Python programming constructs and libraries for basic data processing tasks in AI applications.	3.00	2.00									2.00		3.00
			CO3	Develop Python programs using functions, file handling, and graphical user interfaces for user-driven data applications.	3.00		2.00		3.00								3.00
			CO4	Demonstrate data acquisition, preparation, and visualization techniques for AI-related datasets using Python tools.	3.00	2.00		2.00	3.00						2.00	2.00	3.00
			CO5	Implement AI-oriented data handling tasks through Python programming, sensor interfacing, and visualization in a practical setup.	3.00		2.00	3.00	3.00			2.00				3.00	3.00

					3.00	2.00	2.00	2.50	3.00	-	-	2.00	-	-	2.00	2.33	3.00
3.6	Capstone Project-1	25ECE3200	CO1	Identify real-world engineering problems, analyze their importance, and develop a project proposal with specific objectives.	2.00	3.00				3.00						2.00	
			CO2	Design and develop a functional prototype by applying engineering design principles, selecting appropriate tools/materials, and validating through iterative testing.	2.00		3.00	3.00	3.00							3.00	2.00
			CO3	Implement the project plan collaboratively, demonstrating effective task allocation, timeline management.								3.00		2.00			
			CO4	Develop professional-quality technical reports and presentations that demonstrate adherence to both technical standards and ethical guidelines in engineering practice.			1.00				2.00		3.00				
					2.00	3.00	2.00	3.00	3.00	3.00	3.00	3.00	3.00	2.00	-	2.50	2.00
3.7	Global Week/ MOOC (Mass Open Online Course)																
3.7a	Patent Drafting for Beginners	25MOC0201	CO1	Identify and navigate various MOOC platforms (e.g., NPTEL, Coursera, edX etc) and utilize digital tools for self-paced learning.					3.00						3.00		
			CO2	Demonstrate the ability to plan, manage, and complete an online course independently, applying self-discipline and time management skills.								2.00		3.00	3.00		

			CO3	Apply acquired knowledge from the MOOC course to real-world or academic contexts and reflect on the learning experience through reports or presentations.	2.00			2.00								**2.00**	
					2.00	-	-	2.00	3.00	-	-	2.00	-	3.00	3.00	2.00	-
3.7b	Fundamentals of electronic device fabrication	25MOC0202	CO1	Identify and navigate various MOOC platforms (e.g., NPTEL, Coursera, edX etc) and utilize digital tools for self-paced learning.					3.00						3.00		
			CO2	Demonstrate the ability to plan, manage, and complete an online course independently, applying self-discipline and time management skills.								2.00		3.00	3.00		
			CO3	Apply acquired knowledge from the MOOC course to real-world or academic contexts and reflect on the learning experience through reports or presentations.	2.00			2.00								**2.00**	
					2.00	-	-	2.00	3.00	-	-	2.00	-	3.00	3.00	2.00	-
3.7c	C Programming and Assembly Language	25MOC0203	CO1	Identify and navigate various MOOC platforms (e.g., NPTEL, Coursera, edX etc) and utilize digital tools for self-paced learning.					3.00						3.00		
			CO2	Demonstrate the ability to plan, manage, and complete an online course independently, applying self-discipline and time management skills.								2.00		3.00	3.00		
			CO3	Apply acquired knowledge from the MOOC course to real-world or academic contexts and reflect on the learning experience through reports or presentations.	2.00			2.00								**2.00**	
					2.00	-	-	2.00	3.00	-	-	2.00	-	3.00	3.00	2.00	-

3.8	Mathematics in India: from Vedic period to modern times	24UNI0123	CO1	Explain the foundational contributions of ancient Indian mathematicians and the evolution of Vedic Mathematics.	3.00	2.00		2.00					2.00				
			CO2	Apply Vedic Mathematics sutras to perform addition and subtraction operations efficiently	3.00	2.00			2.00								
			CO3	Demonstrate speed and accuracy in multiplication using various Vedic strategies such as Vertically-Crosswise and Base Method.	3.00	3.00	2.00		2.00							2.00	
			CO4	*Solve mathematical problems involving squares, cubes, tables, equations, and division using Vedic and traditional methods.*	3.00	3.00	2.00		2.00							2.00	
			CO5	Utilize Vedic methods to compute roots, simplify fractions, solve algebraic products, and find determinants of matrices.	3.00	3.00	2.00		2.00							2.00	
					3.00	2.60	2.00	2.00	2.00	-	-	-	2.00	-	-	2.00	-
Sem 4																	
4.1	Microelectronic Circuits	24ECE4200	CO1	Apply the physical model and operation of MOS transistors to analyze its electrical characteristics and evaluate the role MOSFET in CMOS Inverter design and operation.	3.00	3.00			2.00				2.00			3.00	
			CO2	Design and analyze static CMOS and dynamic CMOS logic circuits including flip-flops and memory cells using MOSFETs, pass transistor logic and transmission gates.	2.00	2.00	3.00		2.00				2.00			3.00	3.00

			CO3	Explain the fabrication process of nMOS transistors, describe layout design rules, and summarize the principles of silicon-on-insulator (SOI) technology.	2.00					1.00	1.00					3.00	
			CO4	Describe the small-signal model of MOS transistors, the operation of MOS amplifiers and current mirror circuits.	3.00	2.00			2.00							3.00	
			CO5	Design, simulate, and analyze CMOS-based digital and analog circuits using Cadence tools, evaluating their electrical characteristics, power efficiency, and timing performance.	3.00	3.00	3.00	2.00	3.00				2.00			3.00	3.00
					2.60	2.50	3.00	2.00	2.25	1.00	1.00	-	2.00	-	-	3.00	3.00
4.2	Digital Signal Processing	24ECE4201	CO1	Implement Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT) algorithms to analyze discrete-time signals and systems.		2		3	3							3	
			CO2	Design linear-phase Finite Impulse Response (FIR) filters using windowing techniques and analyze their frequency responses.	3	2	3		2							3	
			CO3	Design IIR filters using impulse invariant and bilinear transformation methods, and analyze the impact of coefficient quantization on stability and frequency response.	3		3	3	3						2	2	2
			CO4	Evaluate applications of DSP in multi-rate systems, biomedical signals, and speech/image processing, emphasizing real-world constraints.	2	3		3		2					2	2	
			CO5	Design, simulate, and experimentally validate FIR/IIR filters using computational tools			2		3			2	2		2		2

				(MATLAB/Python), and analyze their performance metrics for real-world signal processing applications.													
					2.67	2.33	2.67	3.00	2.75	2.00	-	2.00	2.00	-	2.00	2.50	2.00
4.3	Electromagnetic Waves and Antenna	24ECE4202	CO1	Apply vector calculus operations in different coordinate systems to analyze electromagnetic field distributions and verify fundamental theorems through mathematical derivations	3.00			2.00								2.00	
			CO2	Formulate and interpret Maxwell's equations in both integral and differential forms to establish the theoretical foundations of electromagnetic phenomena.		3.00										3.00	
			CO3	Analyze electromagnetic wave propagation in various media, compute power transfer using Poynting vector, and evaluate reflection characteristics at boundaries			1.00			1.00							
			CO4	Design impedance matching networks using transmission line theory and Smith charts, and characterize performance through S-parameter measurements		2.00			3.00								
			CO5	Compare waveguide propagation modes, assess antenna radiation patterns, and design basic antenna arrays for targeted radiation characteristics			3.00										2.00
					3.00	2.50	2.00	2.00	3.00	1.00	-	-	-	-	-	2.50	2.00
4.4	Linear Control System	24ECE4203	CO1	Develop mathematical models of control systems using transfer functions, block diagrams, and state-space representations.	3.00	2.00		3.00	2.00							3.00	
			CO2	Evaluate time response, steady-state errors, and stability of first and second-order systems.	3.00	2.00		3.00								3.00	2.00

			CO3	Construct root locus plots and analyze their impact on system stability.	2.00		3.00		3.00							2.00	
			CO4	Apply frequency response techniques (Bode, Nyquist) to assess system performance.	3.00			3.00									
			CO5	Design compensators and PID controllers to enhance system stability and performance.			3.00			2.00					2.00	3.00	2.00
					2.75	2.00	3.00	3.00	2.50	2.00	-	-	-	-	2.00	2.75	2.00
4.5	RTOS Development	24ECE4204	CO1	Identify timing requirements of real-time systems and compare RTOS with general-purpose OS.	2.00	2.00										2.00	
			CO2	Convert super-loop programs into RTOS tasks, using interrupts to make the system faster and more reliable.	3.00		2.00		3.00							3.00	2.00
			CO3	Implement inter-task communication and synchronization using queues, semaphores, and mutexes, while resolving priority inversion through priority inheritance mechanisms	3.00	2.00			3.00							3.00	3.00
			CO4	Apply real-time scheduling techniques, such as Rate Monotonic and Earliest Deadline First, to manage task execution.		2.00			2.00								3.00
			CO5	Demonstrate embedded RTOS development skills through practical implementation of task management, synchronization, communication, and hardware interfacing using FreeRTOS.			2.00		3.00						2.00	3.00	3.00
					2.67	2.00	2.00	-	2.75	-	-	-	-	-	2.00	2.75	2.75
4.6	Measurement & Virtual Instrumentation Lab	24ECE4205		Design and implement LabVIEW-based simulations of physical systems using basic math operations, loops, and formula nodes.	3.00				3.00								3.00

				Develop and implement control systems using LabVIEW and transfer functions			3.00	3.00									
				Analyze system stability using Bode plots and root locus techniques					3.00			2.00	2.00		2.00	3.00	3.00
				Investigate electromechanical systems by designing error detectors, testing synchronous systems, and examining servo motor responses.	2.00	2.00									2.00	2.00	
					2.50	2.00	3.00	3.00	3.00	-	-	2.00	2.00	-	2.00	2.50	3.00
4.7	Environmental Studies	24UNI0106		Analyze the interrelationships between natural resources, ecosystems, biodiversity, and anthropogenic systems including energy production, pollution, and waste management.	3.00	3.00				3.00						1.00	1.00
				Evaluate environmental challenges through comparative analysis of natural disasters (e.g., floods, earthquakes) and anthropogenic impacts (e.g., industrial pollution, climate change).				3.00	2.00	3.00							1.00
				Assess energy systems' socio-environmental impacts and propose sustainable alternatives to address global energy demands.			3.00			3.00	3.00					1.00	1.00
					3.00	3.00	3.00	3.00	2.00	3.00	3.00	-	-	-	-	1.00	1.00
Sem 5																	
5.1	Analog and Digital Communication	24ECE5300	CO1	Analyze the principles of amplitude modulation, compare DSBSC/SSB/VSB techniques, and evaluate their power efficiency and applications in communication systems.	3.00	2.00										3.00	
			CO2	Explain the principles of frequency and phase modulation, analyze FM/PM spectra, and	3.00		2.00									3.00	

				design FM transmitter/receiver subsystems with noise mitigation techniques.													
			CO3	Design analog/digital transmission systems, including AM/FM superheterodyne receivers and PCM/DM encoders.			3.00		2.00							3.00	
			CO4	Apply line coding and multiplexing techniques (TDM/FDM) in telecommunication networks and evaluate the performance of digital modulation schemes.		3.00	3.00										
			CO5	Implement and test analog/digital modulation techniques (AM, FM, PCM, PSK) using software/hardware tools, analyze system performance, and interpret results to validate theoretical concepts.				3.00	3.00			2.00	2.00				3.00
					3.00	2.50	2.67	3.00	2.50	-	-	2.00	2.00	-	-	3.00	3.00
5.2	Digital VLSI Design	24ECE5301	CO1	Analyze VLSI design flow, styles, and quality parameters to assess circuit design strategies.	3.00	3.00	2.00		2.00	1.00						3.00	2.00
			CO2	Implement gate-level and dataflow modeling in Verilog using appropriate data types, delays, and compiler directives.	3.00	3.00				2.00		2.00				3.00	3.00
			CO3	Develop behavioral models and finite state machines (FSM) in Verilog, optimizing timing constraints.	3.00	3.00	2.00		2.00				2.00			3.00	3.00
			CO4	Explain testability techniques such as scan-based testing and built-in self-test (BIST) to enhance fault detection in VLSI circuits.	3.00			3.00	2.00	1.00					1.00		3.00
			CO5	Design, simulate, and verify combinational and sequential digital circuits in Verilog HDL	3.00		3.00		3.00	1.00			1.00		1.00	3.00	3.00

				using Xilinx ISE/ Vivado tools, applying techniques for logic implementation, error detection and different modelling styles.													
					3.00	3.00	2.33	3.00	2.25	1.25	-	2.00	1.50	-	1.00	3.00	2.80
5.3.1	PE-I Mixed Signal Circuit Design	24ECE5304	CO1	Understand semiconductor fabrication and MOS transistor operation to analyze and model device characteristics.	3.00	3.00			2.00	1.00						3.00	
			CO2	Analyze and design CMOS circuits for frequency response, stability, and other performance metrics	3.00	3.00	2.00		2.00	1.00						3.00	3.00
			CO3	Identify biasing techniques and memory circuit approaches to develop efficient analog and digital subsystems.	3.00	3.00		2.00	2.00							3.00	3.00
			CO4	Understand how electronic circuits convert signals between digital and analog forms.	3.00		3.00		2.00							3.00	3.00
			CO5	Design and test analog circuits using Cadence Virtuoso to understand their working.	3.00		3.00		3.00	1.00		2.00	1.00		1.00	3.00	3.00
					3.00	3.00	2.67	2.00	2.20	1.00	-	2.00	1.00	-	1.00	3.00	3.00
5.3.2	PE-I Embedded Artificial Intelligence	24ECE5305	CO1	Explain the fundamentals of Embedded AI, its significance, challenges, and applications in IoT-based systems.	2.00	1.00			1.00							2.00	2.00
			CO2	Apply supervised and unsupervised machine learning techniques to solve real-world problems.	3.00	2.00	2.00	2.00	3.00	1.00						2.00	3.00
			CO3	Analyze the role of Edge Computing in AI deployment, evaluate its advantages, and implement AI models using embedded computing platforms.	3.00	3.00	3.00	2.00	3.00	2.00					2.00	3.00	2.00
			CO4	Understand different deep learning models (ANN, CNN) for resource-constrained embedded systems.	3.00		3.00	2.00	3.00	1.00					2.00	3.00	3.00

			CO5	Develop and deploy AI models on embedded hardware using frameworks like TensorFlow Lite and evaluate their real-time performance.	3.00	2.00	3.00		3.00	1.00		2.00	2.00		3.00	3.00	3.00
					2.80	2.00	2.75	2.00	2.60	1.25	-	2.00	2.00	-	2.33	2.60	2.60
5.3.3	PE-1 Digital Image Processing	24ECE5306	CO1	Understand the fundamental concepts of digital images and implement basic mathematical operations on images	3.00											2.00	
			CO2	Apply and evaluate various spatial and frequency domain image enhancement techniques	3.00	2.00	2.00	2.00	3.00	1.00						2.00	3.00
			CO3	Implement the fundamentals of color image processing and analyze image restoration techniques to address image degradation			3.00	2.00	3.00	2.00					2.00	3.00	2.00
			CO4	Understand the principles of image compression and implement basic compression techniques			3.00	2.00	3.00	1.00					2.00	3.00	3.00
			CO5	Design and implement practical image processing solutions for real-world problems		3.00	3.00		3.00	1.00		2.00	2.00		3.00	3.00	3.00
					3.00	2.50	2.75	2.00	3.00	1.25	-	2.00	2.00	-	2.33	2.60	2.75
5.3.4	PE-1 Machine learning	24ECE5307	CO1	Understand basic concepts and techniques of Machine Learning, including supervised and unsupervised learning.	3.00	2.00	2.00		2.00							3.00	3.00
			CO2	Use methods like k-Nearest Neighbours, Decision Trees, and Support Vector Machines for classification.	3.00		2.00	3.00	3.00								3.00
			CO3	Apply clustering methods like k-means and hierarchical clustering, and combine them with supervised learning for better analysis.	3.00	2.00	2.00	3.00									3.00
			CO4	Use regression methods (linear and logistic), reinforcement learning, and evaluation metrics to assess model performance.	3.00		2.00	3.00	2.00							3.00	3.00

			CO5	Implement and test machine learning algorithms to strengthen understanding and solve problems.	3.00	2.00	2.00	3.00	3.00			2.00			2.00	2.00	3.00
					3.00	2.00	2.00	3.00	2.50	-	-	2.00	-	-	2.00	2.67	3.00
5.3.5	PE-1 Sensor and Communication Protocol	24ECE5308	CO1	To acquire, process and visualize sensor data for meaningful interpretation and ethical concerns.	3.00	3.00		2.00	3.00	1.00		2.00					3.00
			CO2	Configure and operate various network devices to establish effective communication systems.			2.00		2.00							3.00	3.00
			CO3	To understand the routing and switching techniques used in modern networks	3.00	3.00	3.00		2.00							3.00	
			CO4	Integrate sensors, actuators, and network configurations into a functional capstone project, demonstrating practical implementation skills	3.00	3.00	3.00		2.00	1.00			1.00		1.00	3.00	3.00
					3.00	3.00	2.67	2.00	2.25	1.00	-	2.00	1.00	-	1.00	3.00	3.00
5.3.6	PE-1 Robotics system modeling and control	24ECE5309	CO1	Explain and apply basic modelling methods and classification of robotic manipulators.	2.00	3.00			2.00	1.00						3.00	
			CO2	Model and analyse electrical, mechanical, and fluid-based actuation systems, including servo motors.		3.00	2.00		2.00							3.00	3.00
			CO3	Apply control techniques like set-point tracking and impedance control to improve robot performance.	3.00	3.00		2.00	2.00							3.00	3.00
			CO4	Design vision-based control strategies using camera models and image-based control laws.	3.00		3.00		2.00			2.00				3.00	3.00
			CO5	Demonstrate the ability to work effectively in teams to analyse real-world case studies, and integrate modelling, actuation, control, and vision concepts in robotics.	1.00		3.00		3.00	1.00			1.00		1.00	3.00	3.00

					2.25	3.00	2.67	2.00	2.20	1.00	-	2.00	1.00	-	1.00	3.00	3.00
5.4	Computer Networks and Communication	24ECE5302	CO1	Explain the OSI and TCP/IP reference models, configure basic network devices, and analyze network traffic using tools like Wireshark and Packet Tracer.	3.00	2.00	1.00		3.00						2.00	2.00	3.00
			CO2	Design subnetting schemes for IPv4/IPv6 networks, analyze data link layer protocols (Ethernet, ARP), and configure routers/switches for basic routing.	3.00	3.00	2.00		3.00						2.00	3.00	3.00
			CO3	Compare TCP/UDP protocols, implement application-layer services (DNS, DHCP), and troubleshoot network performance issues.	2.00	3.00	2.00		3.00	2.00						3.00	2.00
			CO4	Configure dynamic routing protocols (OSPF, EIGRP), implement ACLs for network security, and deploy NAT for IP address translation.	2.00	3.00	2.00		3.00	2.00						3.00	3.00
			CO5	Simulate and troubleshoot network topologies using Cisco Packet Tracer/Wireshark, configure routers/switches for routing and security (ACLs, NAT), and analyze protocol behavior (TCP/UDP, DNS, DHCP).	2.00	3.00	3.00		3.00	2.00		2.00	2.00		3.00	3.00	3.00
					2.40	2.80	2.00	-	3.00	2.00	-	2.00	2.00	-	2.33	2.80	2.80
5.5	IOHT	24ECE5400	CO1	Demonstrate application of fundamental concepts of electronics and communication engineering principles in designing practical solutions for embedded systems, IoT applications, VLSI circuits, and communication systems.	3.00	1.00		3.00	2.00	3.00					3.00	2.00	3.00
			CO2	Utilize industry-standard tools and methodologies to develop,	3.00	1.00		3.00	2.00	3.00					3.00	2.00	3.00

				simulate, and validate hardware/software systems across various domains including embedded programming, VLSI design, and communication.													
			CO3	Evaluate problems considered as case studies using experimental methods, troubleshooting techniques, and optimization strategies.	3.00	1.00		3.00	2.00	3.00		3.00			3.00	2.00	1.00
			CO4	Exhibit professional competencies including collaborative presentations, technical documentation, and adherence to ethical practices in engineering development.		1.00		3.00	2.00	3.00	2.00		3.00		3.00	2.00	1.00
					3.00	1.00	-	3.00	2.00	3.00	2.00	3.00	3.00	-	3.00	2.00	2.00
5.6	AI and Machine Learning	24CAI0301	CO1	CO1: Understand the fundamental concepts and principles of machine learning, including the types of problems it can solve and the tools and techniques used to implement ML algorithms.	3	2	1	2	1	2	1			2	2	2	
			CO2	CO2: Develop the skills of pre-process and clean the data for ML tasks, including handling missing valuesor corrupted data, selecting relevant features, and scaling and normalizing the data.	3	1	2	2	3	3	1		3	2	2		2
			CO3	CO3: Become proficient in using popular ML libraries and frameworks such as sklearn to build ML models.	3	1	1	2	3	3	1	2	3	2	2	1	
			CO4	CO4: Understand how to evaluate the performance of ML models, including common metrics and methods for model selection and hyper-parameter tuning.	3	2	2	2	3	3	1	2	3	2	2	2	3
			CO5	CO5: Understand the ethical and societal implications of ML,	3	3	2	2	2	3	3	2		2	3		3

				including issues of bias, privacy, and transparency.													
					3.00	1.75	1.75	2.00	2.75	3.00	1.50	2.00	3.00	2.00	2.25	1.50	2.67
5.7	Research Tools & Engineering Writing	24ECE5303		CO1: Demonstrate a comprehensive understanding of research methodology in engineering disciplines, including the process of formulating research questions, selecting appropriate research designs, and identifying suitable data collection methods.	3.00											3.00	
				CO2: Utilize various research tools, software, and databases commonly employed in engineering research to gather, analyze, and interpret data effectively.			3.00		2.00						3.00		3.00
				CO3: Critically evaluate research papers and academic literature related to engineering, demonstrating the ability to assess the credibility, validity, and relevance of research findings.		3.00											3.00
				CO4: Apply effective writing and presentation techniques to organize and present research findings in a clear, concise, and professional manner, adhering to academic conventions and formatting guidelines.				3.00				3.00	3.00			3.00	
				CO5: Identify ethical considerations and demonstrate a commitment to academic integrity when conducting and reporting research in engineering disciplines.							3.00						3.00
					3.00	3.00	3.00	3.00	2.00	-	3.00	3.00	3.00	-	3.00	3.00	3.00
5.8	Cyber Security	24UNI0124		CO1: Understand information and risk models, including confidentiality, integrity, and	3.00											3.00	

				availability, along with core security principles, common threats, and fundamentals of cryptography.													
				CO2: Identify and analyze cybercrime types to develop prevention strategies, including botnets, phishing, password cracking, SQL injection, and wireless breaches..					2.00						3.00	
				CO3: Understand knowledge of legal issues, threats, and attacks to identify and address vulnerabilities in professional practice.					2.00					3.00		
				CO4:Acquire knowledge of cyber security architecture, forensics, and ethical, legal, and psychological aspects of cybercrime to handle threats effectively.				3.00						3.00		2.00
					3.00	-	-	3.00	-	2.00	-	-	-	-	3.00	3.00	2.00
5.9	Disaster Management	24UNI0125		CO1: Understand different types of disasters, their causes, public health consequences, and strategies for preparedness, response, and rehabilitation						3.00						2.00	
				CO2: Acquire knowledge of biological, technological, and human-made disasters and their mitigation measures.						3.00	2.00						2.00
				CO3: Understand emerging disaster risks and the effects of climate change and urbanization on vulnerability.						3.00							
				CO4: Acquire knowledge of post-disaster recovery processes, disaster management policies, and the roles of key agencies in India and globally.						3.00	2.00						

				CO5:Understand the applications of science and technology, including GIS, remote sensing, and early warning systems, in disaster management.						3.00	2.00					1.00	2.00
					-	-	-	-	-	3.00	2.00	-	-	-	-	1.50	2.00
Sem 6																		
6.1.1	OE-1: Data Structures	24CSE0201		Explain fundamental concepts of data structures and algorithmic complexity, and analyze the efficiency of algorithms using asymptotic notations	3.00	2.00	2.00		3.00						2.00	2.00	3.00
				Implement and manipulate linear data structures such as arrays and linked lists to solve basic computational problems involving storage and retrieval	3.00	2.00		2.00	2.00							2.00	
				Apply tree and graph data structures to model hierarchical and networked data, and implement traversal algorithms for efficient data access			3.00	2.00	3.00						2.00	2.00	3.00
				Utilize stacks and queues for structured data processing, including expression evaluation and scheduling tasks, using both array and linked representations.		3.00	3.00	2.00	3.00						2.00	2.00	2.00
				Design and implement efficient sorting and hashing algorithms to optimize data organization and retrieval in large-scale applications.	3.00	3.00	3.00	2.00				2.00	2.00		3.00	2.00	3.00
					3.00	2.50	2.75	2.00	2.75	-	-	2.00	2.00	-	2.25	2.00	2.75
6.1.2	OE-1: Operating Systems	24CSE0202		CO1: Describe the fundamentals, types, and services of operating systems.	2.00												
				CO2:Apply process management concepts, CPU scheduling techniques, inter-process communication methods, and	3.00	2.00	3.00	2.00	3.00			2.00			2.00	2.00	3.00

				apply mechanisms to handle synchronization and deadlocks.													
				CO3: Apply memory management techniques, including paging and virtual memory, and evaluate their performance in different scenarios.	3.00	2.00	2.00	2.00	3.00						2.00		3.00
				CO4: Explain the principles of I/O management, file systems, and disk management, and assess their role in efficient data storage and retrieval.	2.00	3.00		2.00	2.00	2.00	3.00	2.00			2.00	2.00	
				CO5: Implement operating system functionalities such as process scheduling, memory allocation, and file handling using suitable programming tools or simulators.	3.00	2.00	2.00	2.00	3.00		2.00		2.00	2.00	2.00	2.00	
					2.60	2.25	2.33	2.00	2.75	2.00	2.50	2.00	2.00	2.00	2.00	2.00	3.00
6.1.3	OE-1: Programming Paradigms	24CSE0203	CO1	Understand and explain core Object-Oriented Programming concepts such as classes, objects, constructors, destructors, access specifiers, and pointers to class objects.	2.00	3.00	2.00	3.00	2.00						2.00	1.00	2.00
			CO2	Analyze and apply operator overloading, type conversions, and various inheritance types to design flexible and reusable software components.	3.00	2.00	3.00	2.00	3.00						2.00		
			CO3	Demonstrate knowledge of class templates and implement fundamental sorting and searching algorithms to solve computational problems efficiently.	3.00	3.00	2.00	1.00	2.00						2.00	1.00	2.00
			CO4	Understand and apply advanced data structures including linked lists, stacks, queues, and trees, along with exception handling											2.00		

				and file stream operations for effective program design.													
			CO5	Develop the ability to implement, test, and debug programs covering object-oriented programming, data structures, and algorithms for solving real-world problems.											2.00	2.00	3.00
					2.67	2.67	2.33	2.00	2.33	-	-	-	-	-	2.00	1.33	2.33
6.1.4	Applied Programming in Engineering	25ECE6300	CO1	Apply structured and object-oriented programming techniques to solve electronics and communication engineering problems.	3.00	2.00	2.00	-	2.00			1.00			2.00	3.00	2.00
			CO2	Develop and implement algorithms for signal processing, data acquisition, and control systems using appropriate programming tools.	3.00	3.00	3.00	2.00	3.00	2.00					3.00	3.00	3.00
			CO3	Interface software with hardware components such as sensors, microcontrollers, or communication modules for real-time applications.	2.00	2.00	3.00	1.00	3.00	2.00					3.00	3.00	3.00
			CO4	Demonstrate proficiency in debugging, testing, and documenting code for embedded and simulation-based engineering solutions.	2.00	2.00	2.00		3.00		1.00	1.00	2.00		2.00	2.00	3.00
					2.50	2.25	2.50	1.50	2.75	2.00	1.00	1.00	2.00	-	2.50	2.75	2.75
6.1.5	Applied IoT and Embedded System Design	25ECE6301	CO1	Apply embedded system design principles to develop microcontroller-based solutions for real-world engineering problems.	3.00	2.00	3.00	2.00	3.00			1.00			2.00	3.00	3.00
			CO2	Design and implement IoT-enabled systems using sensors, actuators, and communication protocols.	3.00	3.00	3.00	2.00	3.00	2.00					3.00	3.00	3.00
			CO3	Integrate hardware and software components for real-time data	2.00	2.00	3.00	2.00	3.00	2.00		1.00			3.00	3.00	3.00

				acquisition, processing, and control.													
			CO4	Demonstrate proficiency in using modern tools for simulation, debugging, and deployment of embedded and IoT systems.	2.00	2.00	2.00		3.00		1.00	1.00	2.00		2.00	2.00	3.00
					2.50	2.25	2.75	2.00	3.00	2.00	1.00	1.00	2.00	-	2.50	2.75	3.00
6.1.6	Applied VLSI Design: Principles and Practices	25ECE6302	CO1	Apply CMOS design principles to analyze and implement combinational and sequential logic circuits	3.00	2.00	3.00	2.00	3.00						2.00	3.00	2.00
			CO2	Design and simulate digital subsystems using HDL (Hardware Description Languages) and industry-standard EDA tools.	3.00	2.00	3.00	2.00	3.00			1.00	2.00		3.00	3.00	3.00
			CO3	Evaluate performance metrics such as area, power, and delay in VLSI circuits and optimize for real-world constraints.	3.00	3.00	3.00	2.00	3.00	2.00					3.00	3.00	3.00
			CO4	Demonstrate the ability to integrate VLSI design methodologies in mini-projects, adhering to ethical and sustainable engineering practices.	2.00	2.00	3.00		3.00	2.00	2.00	2.00	2.00	2.00	3.00	2.00	3.00
					2.75	2.25	3.00	2.00	3.00	2.00	2.00	1.50	2.00	2.00	2.75	2.75	2.75
6.2.1	PE-2: Analog Layout Design	24ECE6304	CO1	Describe CMOS fabrication processes and analyze the steps involved in manufacturing a CMOS inverter.	3.00	3.00			2.00							3.00	
			CO2	Design and optimize CMOS layouts using standard tools, ensuring compliance with layout rules and parasitic minimization.	3.00		3.00	3.00	2.00							3.00	3.00
			CO3	Implement analog layout techniques, including component matching and circuit optimization for improved performance.	3.00		3.00		2.00							3.00	3.00
			CO4	Apply advanced layout methodologies to mitigate issues	3.00		2.00		2.00	2.00							3.00

				like coupling, electromigration, and ESD protection in IC design.													
			CO5	Design and optimize layouts for basic logic gates, standard cells design, and analog circuits such as operational amplifiers using Cadence EDA tools, applying industry-standard techniques to minimize parasitic effects and enhance circuit performance.	3.00		3.00	3.00	3.00	2.00					2.00	3.00	3.00
					3.00	3.00	2.75	3.00	2.20	2.00	-	-	-	-	2.00	3.00	3.00
6.2.2	PE-2: IoT application development	24ECE6305	CO1	Select appropriate architectural design components to implement an IoT enabled application based on societal problem	3		3		3			2				3	2
			CO2	Capture data from real-life environment by using various sensor modules integrated with IoT enabled hardware platforms.	2	3			3	2			2		2	2	3
			CO3	Choose appropriate network and communication protocols to transfer data captured from real-life environment to the cloud.			2								2		
			CO4	Use various cloud computing services to process data and extract the required information.		2		3	3								
			CO5	Demonstrate the interface various input/output devices and sensors with STM32 microcontrollers for embedded system applications	2	2	2						2		2		3
					2.33	2.33	2.33	3.00	3.00	2.00	-	2.00	2.00	-	2.00	2.50	2.67
6.2.3	PE-2 Introduction to Robotic sensors	24ECE6306	CO1	Explain the working principles, classifications, and applications of various transducers and sensors used in measurement and control systems.			3										3
			CO2	Analyze the characteristics and performance parameters of sensors, and select appropriate		2		2									

				types for specific industrial, robotic, and measurement applications.													
			CO3	Integrate sensors, transducers, and actuators for measurement of physical parameters and data acquisition and transmission.												1	
			CO4	Evaluate and apply smart sensors and motor systems for automation, robotics, and modern engineering applications.					2								
			CO5	Demonstrate to interface a variety of sensors and transducers for measurement, control, and robotic applications.	3	2			3	3	1				2	3	2
					3.00	2.00	3.00	2.00	2.50	3.00	1.00	-	-	-	2.00	2.00	2.50
6.2.4	PE-2 Aerial and Mobile Robotics	24ECE6307	CO1	Explain the fundamentals of aerial robotics and apply system design concepts considering energetics.	3.00		2.00		2.00							2.00	
			CO2	Interpret and apply geometry, mechanics, and kinematic modelling of quadrotor systems.	2.00	2.00											
			CO3	Analyse quadrotor dynamics and implement planning and control strategies for stable flight.	2.00											2.00	
			CO4	Apply advanced aerial robotics concepts and basic mobile robotics principles to real-world scenarios.	3.00			2.00	2.00								2.00
			CO5	Demonstrate the ability to work individually and collaboratively in teams to create and develop projects combining key concepts of aerial and mobile robotics.		2.00	3.00	2.00		3.00					2.00	2.00	2.00
					2.50	2.00	2.50	2.00	2.00	3.00	-	-	-	-	2.00	2.00	2.00
6.2.5	PE-2 Digital system Design	24ECE6308	CO1	Understand the System-on-Chip (SoC) design flow and the role of EDA tools and open-source platforms in modern chip development.	3.00	3.00	2.00									2.00	

			CO2	Design and implement digital systems using Verilog HDL, including sequential logic and FSMs, to model hardware behavior at the RTL level.	3.00	3.00	2.00		2.00	2.00							2.00
			CO3	Apply IP integration strategies and verification methodologies to ensure functional correctness and interoperability in SoC designs.	3.00	3.00	2.00										3.00
			CO4	Utilize automation scripts using TCL and Perl to streamline chip design workflows and enhance productivity in SoC development..	3.00	3.00	2.00							3.00		3.00	3.00
			CO5	Design and verify basic System-on-Chip (SoC) components using Verilog, EDA tools, scripting, and FPGA prototyping through hands-on lab sessions and project work	3.00	3.00	2.00		2.00	2.00				3.00			
					3.00	3.00	2.00	-	2.00	2.00	-	-	-	3.00	-	2.50	2.67
6.2.6	PE-2 Cloud Computing & Virtualization	24ECE6309	CO1	Understand the core concepts, models, and architecture of cloud computing and virtualization	3.00										3.00		2.00
			CO2	Apply virtualization technologies and evaluate cloud migration and fault tolerance strategies		2.00	1.00		3.00	3.00						2.00	3.00
			CO3	Analyze cloud security threats and implement techniques at various infrastructure levels	2.00				2.00								
			CO4	Implement identity, trust, and access control mechanisms in a secure cloud environment.	3.00	2.00											
			CO5	Deploy and manage cloud-based resources for web applications.		3.00	2.00		2.00				2.00			2.00	2.00
					2.67	2.33	1.50	-	2.33	3.00	-	-	2.00	-	3.00	2.00	2.33
6.3	Communication Skills	24UNI0101		Students will learn time management and stress management techniques while demonstrating decision-making skills through risk-taking								3.00	3.00	2.00			3.00

				Students will be able identify personal and professional strengths, weaknesses, opportunities, and threats to create a growth action plan								3.00	3.00				3.00
				Students will create a professional resume, both written and video, that highlights their skills, experiences, and achievements effectively									3.00	3.00	2.00		3.00
				Students will learn to plan and deliver engaging presentations using visual aids and techniques									3.00	3.00			3.00
				Students will learn how to engage in group discussions effectively. They will demonstrate leadership and practice active listening when working in teams								3.00	3.00	3.00			3.00
				Students will learn how to effectively answer common behavioral interview questions. They will also exhibit better etiquette, body language, and confidence during interviews									3.00	3.00	2.00		3.00
					-	-	-	-	-	-	-	3.00	3.00	2.80	2.00	-	3.00
6.4	Professional Skills	24UNI0102		Understand the skills required to prepare and effective resume and for appearing in an interview.									3.00		3.00		
				Apply the technique of group discussions and exploration of career opportunities.								3.00	3.00	1.00			
				Assess the importance of cognitive, non-cognitive Skills and presentation skills in any profession.							1.00		3.00				
				Evaluate the various aspects of teamwork and internal communication.								3.00	3.00			2.00	2.00
					-	-	-	-	-	-	1.00	3.00	3.00	1.00	3.00	2.00	2.00
6.5	Leadership and Management Skills	24UNI0103		Students will be able to create a professional and tailored written									3.00	3.00	2.00		3.00

				and Video resume that effectively showcases their skills, experiences, and achievements													
				Students will be able to structure and deliver effective presentations, incorporating visual aids and engaging delivery techniques									3.00	3.00			3.00
				Students will develop skills for effective participation and leadership in group discussions.								3.00	3.00	3.00			3.00
				Students will be proficient in responding to common and behavioural interview questions. They will exhibit improved interview etiquette, body language, and overall confidence in interview settings.									3.00	3.00	2.00		3.00
					-	-	-	-	-	-	-	3.00	3.00	3.00	2.00	-	3.00
6.6	Numerical Ability and Logical Reasoning	24UNI0151		CO1: Apply and understand the basic concepts of QUANTITATIVE ABILITY and understand the basic concepts of LOGICAL REASONING Skills	1.00	2.00				3.00	3.00				3.00		
				CO2: Acquire satisfactory competency in use of VERBAL REASONING		2.00		1.00	2.00	3.00	3.00		2.00				
				CO3: Solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning and Verbal Ability		3.00	2.00			3.00	3.00			3.00	2.00	2.00	2.00
				CO4: Construct a logically sound and well-reasoned argument		2.00	2.00			3.00	3.00						
					1.00	2.25	2.00	1.00	2.00	3.00	3.00	-	2.00	3.00	2.50	2.00	2.00
6.7	Capstone Project - 2	25ECE6400	CO1	Identify real-world engineering problems, analyze their importance, and develop a project proposal with specific objectives.	2.00	3.00				3.00						2.00	
			CO2	Design and develop a functional prototype by applying	2.00		3.00	3.00	3.00							3.00	2.00

				engineering design principles, selecting appropriate tools/materials, and validating through iterative testing.													
			CO3	Implement the project plan collaboratively, demonstrating effective task allocation, timeline management.								3.00		2.00	2.00		
			CO4	Develop professional-quality technical reports and presentations that demonstrate adherence to both technical standards and ethical guidelines in engineering practice.			1.00				3.00		3.00				
					2.00	3.00	2.00	3.00	3.00	3.00	3.00	3.00	3.00	2.00	2.00	2.50	2.00
6.8	Human Values & Professional Ethics	24UNI0105	CO1	Recall the concept, aim, and evolution of human values and value-oriented education.						3.00			3.00		2.00		
			CO2	Practice respect, equality, and sensitivity towards individuals and the environment.						3.00		3.00	3.00		2.00		3.00
			CO3	Apply values such as truthfulness, trust, and respect to maintain harmony within self, family, society, and nature.						3.00		3.00.	3.00		1.00		
			CO4	Explain professional duties, rights, and ethical practices related to workplace situations.						3.00		3.00					3.00
			CO5	Describe professional values, global ethical challenges, and basic human rights with focus on women and children.						3.00			3.00		1.00		3.00
					-	-	-	-	-	3.00	-	3.00	3.00	-	1.50	-	3.00
Sem 7	(Scheme 1 and Scheme 3)	**SEMESTER 7**															
7.1	Wireless and Mobile Communication	24ECE7300	CO1	Analyse how radio waves travel through different paths and the	3.00	3.00			2.00	1.00						3.00	

				effects of the ionosphere on communication.													
			CO2	Apply cellular communication principles to design efficient networks, optimize frequency reuse, and enhance coverage using directional antennas and cell splitting techniques.	3.00		3.00		2.00	1.00		2.00				3.00	3.00
			CO3	Compare different methods of sharing frequency and time in communication systems.		3.00	3.00		2.00	1.00						2.00	3.00
			CO4	Evaluate GSM network architecture, channel structures, and call procedures to understand mobile communication operations.	3.00	3.00			2.00			2.00	1.00			3.00	3.00
			CO5	Analyze the evolution of cellular technology from 2.5G to 3G, exploring advancements like GPRS, EDGE, and IMT-2000 standards for improved network performance.	3.00	3.00	2.00		2.00	1.00					1.00	3.00	3.00
					3.00	3.00	2.67	-	2.00	1.00	-	2.00	1.00	-	1.00	2.80	3.00
7.2.1	DE -1: Power electronics	24ECE7301		CO1: Identify and explain the static (V–I) and dynamic (switching, latching, holding current) characteristics of power semiconductors.	3.00	2.00	2.00									2.00	
				CO2: Analyze snubber circuits, SCR protection (dv/dt, di/dt), and compare various thyristor-based devices	3.00	2.00											3.00
				CO3: Analyze various thyristor commutation techniques, including load, resonant pulse, impulse, and line commutation, to select appropriate methods for efficient and reliable SCR operation in power electronic circuits	3.00	2.00	2.00									2.00	
				CO4: Evaluate the operation of rectifiers, AC voltage	3.00	2.00		3.00	2.00								3.00

				controllers, and chopper types in both circulating and non-circulating current modes..														
				CO5: Examine cycloconverters and inverters (single/three-phase, PWM, series) including their control and steady-state behavior.	3.00	2.00	2.00									2.00	
					3.00	2.00	2.00	3.00	2.00	-	-	-	-	-	-	2.00	3.00
7.2.2	DE -2 Microwave and Satellite Communication	25ECE6303		CO1: Students will gain complete knowledge about the significance, types and characteristics of various microwave solid state devices.	3.00	3.00	2.00		2.00							3.00	
				CO2: Analyze mathematically the operation and working of various tubes or sources for the transmission of the microwave frequencies.	3.00	3.00	2.00					2.00					2.00
				CO3: Students will gain the basic understanding about the principles and woking of RADAR.	3.00					1.00					2.00	2.00	
				CO4:Students will aquire basic understanding of satellite communcation and various design links in satellite communication	3.00			2.00	2.00	1.00					2.00		2.00
				CO5: Students will apply the knowledge of S-parameter analysis to evaluate the performance of microwave components and ferrite devices	3.00	3.00	3.00	2.00	2.00							2.00	
					3.00	3.00	2.00	2.00	2.00	1.00	-	2.00	-	-	2.00	2.50	2.00
7.2.3	DE-3 Optical communication system	24ECE7303		CO1: Explain the fundamental principles and components of optical communication systems.			3.00									3.00	
				CO2: Analyze light propagation in optical fibers and the factors affecting transmission performance.	2.00			3.00								1.00	2.00

				CO3: Evaluate the characteristics and performance of optical sources, amplifiers, and detectors in communication systems.						2.00							2.00
				CO4: Interpret the effects of attenuation, dispersion, and other impairments on signal quality in optical links.	3.00	2.00	3.00				2.00				2.00	2.00	
				CO5: Assess advanced optical communication techniques such as wavelength division multiplexing for system enhancement.			3.00	3.00			2.00						
					2.50	2.00	3.00	3.00	-	2.00	2.00	-	-	-	2.00	2.00	2.00
7.2.4	DE-4 Wireless Sensor Network	24ECE7304		CO1: Explain the architecture, components, and applications of Wireless Sensor Networks and compare them with Ad Hoc Networks.	3.00	3.00			1.00	2.00		2.00	2.00		2.00	2.00	2.00
				CO2: Analyze physical, MAC, and network layer protocols, and evaluate routing techniques for efficient data transmission in WSNs.	3.00	3.00	3.00							1.00			
				CO3: Apply time synchronization and localization algorithms to improve accuracy and reliability in WSN operations.	3.00	3.00		2.00		2.00		2.00		1.00		2.00	
				CO4: Evaluate the impact of network topologies and operating systems on WSN performance, energy efficiency, and scalability.	3.00	3.00	3.00		1.00	2.00				1.00	2.00		2.00
				CO5: Assess applications, challenges, and future trends in WSNs, and propose solutions integrating emerging technologies like IoT and AI.		3.00	3.00	2.00		2.00		2.00	2.00	1.00	2.00	2.00	
					3.00	3.00	3.00	2.00	1.00	2.00	-	2.00	2.00	1.00	2.00	2.00	2.00

7.2.5	Programming Concepts using Java	25ECE7300	CO1	Apply object-oriented programming principles and core Java syntax to develop modular, reusable, and maintainable applications.	3.00	2.00	3.00	2.00	3.00		1.00	1.00	2.00			2.00	2.00
			CO2	Implement exception handling, multithreading, and file I/O operations to develop robust and efficient Java programs.	3.00	2.00		2.00	3.00		1.00	1.00	2.00		2.00	2.00	2.00
			CO3	Design and develop interactive GUI-based applications using Java libraries and event-driven programming techniques.	2.00		3.00	2.00	3.00		1.00	1.00	2.00		2.00	2.00	2.00
			CO4	Demonstrate the ability to use modern IDEs and debugging tools for developing, testing, and documenting Java-based solutions		2.00	2.00	2.00	3.00		1.00	1.00	2.00		2.00	2.00	2.00
			CO5	Analyze real-world problems and design optimal Java solutions by applying structured programming logic and algorithmic design patterns	2.00	3.00	3.00	2.00	3.00		1.00	1.00	2.00		3.00	2.00	2.00
					2.50	2.25	2.75	2.00	3.00	-	1.00	1.00	2.00	-	2.25	2.00	2.00
7.3.1.1	PE-3 IC Fabrication & Technology	24ECE7306	CO1	Comprehensive knowledge of foundational principles, evolution, and technological advancements in semiconductor manufacturing.	3.00	3.00			1.00					1.00		3.00	3.00
			CO2	Apply the principles of photolithography, etching, deposition, and material-equipment interactions to understand critical operations in semiconductor fabrication.		3.00		2.00	1.00	2.00							3.00
			CO3	Design integrated process flows and scaling strategies for advanced semiconductor devices, addressing modern manufacturing challenges through case-based learning.	3.00		2.00		1.00	2.00		2.00		1.00			3.00

			CO4	Evaluate the reliability and performance of semiconductor manufacturing processes through quality testing and project-based design exploration.		3.00		2.00	1.00	2.00		2.00	2.00	1.00	2.00	3.00	3.00
			CO5	Apply advanced semiconductor manufacturing concepts through simulation, analysis, and design-based exercises to develop industry-aligned fabrication competencies.	3.00	3.00	3.00		1.00				2.00		2.00	3.00	3.00
					3.00	3.00	2.50	2.00	1.00	2.00	-	2.00	2.00	1.00	2.00	3.00	3.00
7.3.1.2	PE-3 VLSI Design and Verification	24ECE7307	CO1	Demonstrate the ability to utilize various SystemVerilog data types and procedural constructs to efficiently model digital circuits.	3.00	3.00			2.00							3.00	3.00
			CO2	Apply SystemVerilog assertion techniques to validate design functionality and ensure correct behavior in simulation.		3.00		3.00	2.00								3.00
			CO3	Implement object-oriented programming principles in SystemVerilog to create modular, reusable, and scalable verification components	3.00		3.00		2.00			2.00					3.00
			CO4	Develop SystemVerilog-based randomized testbenches to generate constrained stimulus and enhance functional verification coverage.		3.00		3.00	3.00			2.00					3.00
			CO5	Implement SystemVerilog commands, procedural constructs, and object-oriented principles using Xilinx Vivado/ EDAPlayground to design, simulate, and verify combinational and sequential digital circuits	3.00	3.00	3.00		3.00							3.00	3.00
					3.00	3.00	3.00	3.00	2.40	-	-	2.00	-	-	-	3.00	3.00
7.3.2	PE-3 Embedded Linux	24ECE7308	CO1	Describe the fundamental architecture of Linux and	3.00	3.00			2.00							3.00	3.00

				Embedded Linux systems, covering key components such as the kernel, shell, boot process, and development frameworks.													
			CO2	Examine the essential elements of an embedded Linux system, including cross-compilation, bootloaders, device trees, and root file systems.	3.00	2.00			2.00	1.00					2.00	3.00	
			CO3	Compare various embedded devices (e.g., Raspberry Pi, BeagleBone, and NVIDIA Jetson Nano) and assess their applications in practical embedded systems.	3.00		3.00									3.00	
			CO4	Design and implement embedded Linux applications, incorporating kernel modules, device drivers, and custom Linux distributions using Yocto.		3.00	3.00		3.00	1.00						3.00	3.00
			CO5	Apply embedded Linux development tools and techniques to configure, program, and debug embedded systems, demonstrating proficiency in cross-compilation, kernel module development, and deployment on target hardware platforms.	3.00	2.00	3.00		3.00						2.00	3.00	3.00
					3.00	2.50	3.00	-	2.50	1.00	-	-	-	-	2.00	3.00	3.00
7.3.3	PE-3 Biomedical Robotics	24ECE7312		CO1: Students will identify the problem, design and optimize integrated solutions for adopting new directions.	3.00	3.00	3.00		2.00	1.00						3.00	3.00
				CO2: Students will identify different types of medical robots and implement the knowledge in kinematics, dynamics, and control	3.00				3.00	3.00							
				CO3: Students will develop the analytical and experimental skills necessary to design and										3.00			

				implement robotic assistance for both minimally invasive surgery and image-guided interventions													
				CO4: Students will understand the real-world effects of medical robots, including ethical issues, cost, and patient safety, and be able to discuss these challenges.						3.00						3.00	
				CO5: Students will be able to create a plan for a new medical robot, showing they can use everything they've learned from start to finish.			3.00	2.00	3.00				2.00		3.00		
					3.00	3.00	3.00	-	2.50	2.33	-	-	-	3.00	-	3.00	3.00
7.3.4	PE-3 IOT and Industrial Application	24ECE7315	CO1	Explain the key Industrial IoT technologies and industrial internet architecture framework .	3.00	3.00											
			CO2	Analyze different Industrial IoT domains and architectural topologies by identifying key system characteristics, network protocols, and low-power communication technologies.	3.00							2.00					
			CO3	Design Industrial IoT network protocols using low-power technologies for efficient and scalable industrial applications.			2.00										
			CO4	Evaluate and implement security measures for Industrial Internet systems, including system-level security issues with Identity and Access Management.						2.00							
			CO5	Apply IoT technologies to design and implement practical solutions for industrial applications through hands-on experiments in sensing, communication, data processing, and automation			3.00		2.00						2.00	3.00	2.00
					3.00	3.00	2.50	-	2.00	2.00	-	2.00	-	-	2.00	3.00	2.00
7.3.5	PE-3 Embedded system design	24ECE7316		Explain embedded system concepts, processor	2.00				2.00						1.00		

				architectures, and apply interrupt handling methods to manage shared data.													
				Analyse and apply suitable software architectures for embedded system applications.	3.00		2.00								2.00		
				Develop real-time embedded applications using RTOS features and services for efficient execution.		2.00			2.00						2.00	3.00	3.00
				Identify and implement appropriate communication protocols to meet embedded system requirements	2.00		2.00							1.00			
				Design, implement, and test embedded system solutions with processor control, software architecture, RTOS, and communication protocols while working in team.		2.00		3.00	2.00					1.00	2.00	3.00	
					2.33	2.00	2.00	3.00	2.00	-	-	-	-	1.00	1.75	3.00	3.00
7.3.6	PE-3 Machine Vision	24ECE7317	CO1	Understand the fundamental concepts of visual perception, camera optics, and camera interfacing with computing systems.	3.00	2.00		2.00	3.00						2.00	2.00	2.00
			CO2	Explain and apply basic image data structures and common image enhancement techniques for improving image quality.	3.00	3.00		3.00	3.00						2.00	2.00	2.00
			CO3	Describe and utilize geometric transformations, image segmentation methods, and camera calibration for image analysis.	3.00		3.00		3.00						2.00	2.00	2.00
			CO4	Understand various object recognition techniques using single and multiple views, including the use of depth information.	3.00		3.00		3.00						2.00	2.00	2.00
			CO5	Apply core image processing and computer vision concepts to	3.00	2.00	3.00	2.00	3.00						2.00	2.00	2.00

				solve practical problems in a variety of applications.													
					3.00	2.33	3.00	2.33	3.00	-	-	-	-	-	2.00	2.00	2.00
7.4.1	PE-4 High Speed and Low Power VLSI Circuit Design	24ECE7313	CO1	Understand various sources of power dissipation in VLSI circuits and explain the need for low-power design.	3.00	3.00	2.00		2.00	1.00						3.00	3.00
			CO2	Identify low-power design techniques such as voltage scaling to reduce power consumption in digital circuits.	2.00	2.00				1.00					1.00		
			CO3	Estimate capacitance delay and power in CMOS circuits using RC delay models				3.00		1.00					1.00		3.00
			CO4	Design and optimize logic paths and memory circuits for low power and delay					2.00						1.00		
			CO5	Design digital circuits using low-power and delay reduction techniques	3.00		3.00	3.00									
					2.67	2.50	2.50	3.00	2.00	1.00	-	-	-	-	1.00	3.00	3.00
7.4.2	PE-4 Cloud computing	24ECE7314		CO1:Understand the fundamental concepts, characteristics, deployment models, and service models of cloud computing along with real-world applications and services.	3.00												
				CO2: Explain the underlying cloud technologies including virtualization, scalability, load balancing, identity management, and service level agreements for efficient cloud resource management.		3.00											
				CO3: Analyze and compare various cloud services, storage and database solutions to design cloud-based applications with appropriate architecture				2.00		2.00							
				CO4:Demonstrate knowledge of cloud security architecture and security at different levels.					2.00								

				CO5: Apply foundational knowledge of Amazon Web Services (AWS) to deploy cloud-based solutions by utilizing different services for real-world applications						2.00	2.00					3.00	3.00
					3.00	3.00	-	2.00	2.00	2.00	2.00	-	-	-	-	3.00	3.00
7.4.3	PE-4 Information Theory and Coding	24ECE7318	CO1	To explain the fundamentals of information theory, including discrete/continuous messages, message sources, amount of information, average information, and entropy.	3.00											3.00	
			CO2	To analyze discrete memoryless channels, compute mutual information and channel capacity, and apply Shannon's channel-coding theorem	3.00	3.00										3.00	
			CO3	To apply source coding principles, including Shannon–Fano, Huffman, and Lempel–Ziv coding, and verify source codes using Kraft–McMillan inequality and the source-coding theorem.	3.00	3.00		3.00	2.00							3.00	3.00
			CO4	To implement error-control coding schemes such as Hamming, cyclic, BCH, Hadamard, LDPC, convolution, and burst-error correction techniques (interleaving, Reed–Solomon, Turbo codes).	3.00	3.00	3.00	3.00	2.00						1.00	3.00	3.00
			CO5	To explain the principles of spread spectrum communication and differentiate between various spread-spectrum techniques based on application and performance.	3.00	3.00	3.00		2.00	2.00						3.00	3.00
					3.00	3.00	3.00	3.00	2.00	2.00	-	-	-	-	1.00	3.00	3.00
7.4.4	PE-4 Introduction to mobile technology	24ECE7319	CO1	CO1: To describe the evolution of mobile technologies from 1G to 5G, explain the core principles of cellular communication, and	2.00	3.00	2.00			2.00	2.00				2.00	3.00	2.00

				analyze key concepts like spectrum allocation and handoff strategies													
			CO2	CO2:to compare and contrast the architectural features and operational principles of different mobile network generations, including GSM, UMTS, and LTE, and explain their core technologies.	3.00								3.00				
			CO3	CO3:to identify and explain the function of various cell site components, differentiate between different wireless access technologies like FWA and small cells, and apply these concepts to network design principles.	3.00												
			CO4	CO4: To evaluate the role of Operational Support Systems (OSS) and Business Support Systems (BSS) in network management and describe the key services and security protocols that enable mobile communication.													
			CO5	CO5:To practically demonstrate the use of APIs and web services to create a basic mobile application that interacts with a server, and analyze mobile network traffic to identify key communication flows and security protocols.													
					2.67	3.00	2.00	-	-	2.00	2.00	-	3.00	-	2.00	3.00	2.00
7.4.5	PE-4 Advance Wireless Communication	24ECE7320	CO1	CO1: To analyze the evolution of mobile technologies from 1G to 5G, and explain the fundamental principles of cellular communication, including air interface specifications, spectrum	3.00					2.00	2.00	2.00			1.00	3.00	3.00

				allocation, and handoff strategies.													
			CO2	CO2: To evaluate the key features and standards of 4G LTE and LTE-Advanced, and assess their technical advancements compared to earlier generations.						2.00			3.00	1.00	2.00		
			CO3	CO3:To investigate the concepts of Cognitive Radio (CR) and Software Defined Radio (SDR) by explaining spectrum sensing techniques like energy detection and cyclostationary methods, and comparing different CR network paradigms													
			CO4	CO4:To evaluate the architecture of 5G Radio Access Networks (RANs) and identify the technical challenges and research opportunities for future wireless communications.													
			CO5	CO5:To practically demonstrate spectrum sensing techniques and analyze the TCP protocol stack and security aspects of a cognitive radio network		2.00	3.00	3.00	1.00	2.00		2.00	3.00		1.00		
					3.00	2.00	3.00	3.00	1.00	2.00	2.00	2.00	3.00	1.00	1.33	3.00	3.00
7.4.6	PE-4 Wearable technology and reality	24ECE7321	CO1	CO1: Understand the fundamentals, scope and ethical aspects of biomedical robotics and wearable haptic technologies.	3.00	1.00						2.00				3.00	
			CO2	CO2: Explain the design and applications of robotic systems in diagnosis, imaging and surgery.		2.00	2.00	3.00		2.00							
			CO3	CO3: Analyze assistive, wearable and rehabilitation robotic technologies for patient support and recovery.				3.00			2.00		3.00		2.00	3.00	3.00

			CO4	CO4: Describe teleoperation, biomanipulation and AI-integrated healthcare robotic systems.	3.00		1.00			2.00							3.00
			CO5	CO5: Design, simulate or implement a biomedical robotic solution integrating sensing, control and healthcare applications.	3.00		3.00	3.00		2.00			3.00		2.00	3.00	3.00
					3.00	1.50	2.00	3.00	-	2.00	2.00	2.00	3.00	-	2.00	3.00	3.00
7.5	Research Project	24ECE7400	CO1	CO1: To apply multidisciplinary approach in solving complex engineering problems.	3.00						3.00	3.00	3.00			3.00	3.00
			CO2	CO2: Demonstrate the ability to identify, formulate, and solve engineering problems using structured and analytical approach						3.00			3.00	3.00		3.00	3.00
			CO3	CO3: Design prototype models for the problems solved through engineering design process.		2.00		3.00	3.00						3.00		
			CO4	CO4: Evaluate the performance of engineering solution with respect to sustainability and feasibility						3.00	3.00						
			CO5	CO5:To prepare well-structured technical reports, presentations, and demonstrations that effectively communicate project findings, following professional, ethical, and academic standards with the complete team.								3.00	3.00	3.00	3.00		
					3.00	2.00	-	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Sem 8	(Scheme 1)																
8.1	Industry Oriented Hands on Experience (Six Month Industrial Training) – **Scheme I**	24ECE8400	CO1	Demonstrate awareness of sustainability and cost-efficiency principles in the design and development of engineering solutions	3.00	2.00	3.00			3.00	3.00			3.00			3.00

			CO2	Identify, formulate, and model engineering problems using a systematic approach to derive feasible solutions.	3.00	3.00	2.00	2.00	3.00							3.00	3.00
			CO3	Exhibit commitment to continuous self-improvement through lifelong learning and professional development.	3.00						3.00				3.00	2.00	
			CO4	Communicate technical ideas effectively through written, oral, and visual means in engineering contexts.	3.00							3.00	3.00				
					3.00	2.50	2.50	2.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.50	3.00
Sem 7	(Scheme 2)	**SEMESTER 7**															
7.1	Co-op Project at Industry: Module I	24ECE7401	CO1	CO1: Apply theoretical and practical knowledge from core electronics and communication subjects to solve real-world engineering problems in an industrial setting.	3.00	2.00	3.00	2.00		3.00	3.00			3.00			3.00
			CO2	CO2: Identify, model, and solve engineering problems using industry-standard tools, technologies and methods in VLSI, IoT, embedded systems, and telecommunications.	3.00	3.00	2.00		3.00							3.00	3.00
			CO3	CO3: Exhibit professional behaviour, including effective communication, teamwork, and time management in a full-time work environment.	3.00						3.00				3.00	2.00	
			CO4	CO4: Reflect on the learning experience to identify areas for personal and professional growth, fostering self-improvement through continuous professional development and lifelong learning.	3.00							3.00	3.00				
					3.00	2.50	2.50	2.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.50	3.00

Sem 8	(Scheme 2)																
8.1	Co-op Project at Industry: Module II - **Scheme II**	24ECE8401	CO1	Independently manage and execute complex engineering tasks or sub-projects within the industrial framework.	3.00	2.00	3.00	2.00		3.00	3.00			3.00			3.00
			CO2	Utilize feedback from mentors and supervisors to refine project outcomes and technical deliverables while identifying, modelling, and solving engineering problems.	3.00	3.00	2.00		3.00							3.00	3.00
			CO3	Prepare and present comprehensive technical reports and presentations that meet professional standards.	3.00						3.00				3.00	2.00	
			CO4	Identify growth opportunities, driving self-improvement through continuous professional development and lifelong learning.	3.00							3.00	3.00				
					3.00	2.50	2.50	2.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.50	3.00

Sem 8	(Scheme 3)																
8.1	Research Project at research organisation/university -**Scheme III**	24ECE8402	CO1	CO1: Demonstrate the ability to conduct independent research by formulating research questions, designing experiments or studies, collecting and analyzing data, and drawing valid conclusions based on research findings.	2.00	3.00	3.00	3.00								3.00	3.00
			CO2	CO2: Develop advanced research skills, including literature review, critical analysis	3.00	3.00	2.00		2.00			3.00	3.00				

				of existing research, and synthesis of knowledge to contribute new insights or solutions to a specific research problem or area of study.														
			CO3	CO3: Communicate research findings effectively through written reports, presentations, and discussions, demonstrating the ability to disseminate research outcomes to academic and professional audiences and engage in scholarly dialogue.						3.00	3.00			2.00	3.00		
					2.50	3.00	2.50	3.00	2.00	3.00	3.00	3.00	3.00	2.00	3.00	3.00	3.00

16. Flexibilities

The Department of electronics and communication engineering offers significant academic flexibility to its students. Beyond traditional coursework, students are offered integrated industry and research-oriented experiences within the curriculum through three distinct schemes. Students are given a lot of choice to make a selection on how they want to pursue their final leg of degree program. Various flexibilities available with student are –

i. Scheme I - Industry Oriented Hands-on Experience module

This is the mandatory internship module for all students of B.E ECE. The students who are not in the Co-Op module have to complete this mandatory internship during the eighth semester. The evaluation is a combination of university exam and industry feedback. Students may also be given opportunity to complete this module through in-house training provided by the university. In the scheme I, students complete courses provided in scheme within university and pursue Industry Oriented Hands-on Experience at industry in the 8th semester.

ii. Scheme II- Co Op project at Industry

Under this category, students are allowed to undergo industry internship during their final year.

This is divided into two modules:

- Co-Op Project at Industry (Module-1): During seventh semester
- Co-Op Project at Industry (Module-2): During eighth semester

Through these modules, students get more exposure to apply their learning skills in real life applications. The evaluation is a combination of university exam and industry feedback.

17. Opportunities for international exposure

Chitkara University boasts of having very strong collaboration with more than 200 international university partners. Students are encouraged to draw the maximum benefit from the same by being in regular touch with #Go Global office at university and participating in various opportunities like short term mobility, internships modules etc. Credits earned by student through these opportunities at international university partners are suitably mapped to eventually get those reflected in the student's grade card.