CHITKARA UNIVERSITY

ACADEMIC PROGRAM GUIDE

Bachelor of Engineering
(Electronics & Communication Engineering)

Batch 2023

Based on Choice Based Credit System (CBCS)

Approved by 24th Academic Council
vide agenda item no. 24.4A
Date: 1-09-2023

INDEX

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.

The Program Educational Objectives (PEOs) and Program Outcomes of Electronics and Communication Engineering are summarized as below:

1.1 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.

1.2 Program Outcomes (PO)

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 the knowledge of mathematics science, engineering fundamentals, and engineering specialization to the solution of complex engineering problems.

PO2: Posses an ability to identify, formulate, review research literature, and analyze complex engineering problems using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Posses an ability to design solutions for complex engineering problems and design system components or processes to meet the specific needs with appropriate consideration of the public health and safety, the cultural, societal, and environmental sustainability.

PO4: Posses an ability to Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Posses an ability to create, elect, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: Posses an ability to apply reasoning informed by the contextual knowledge of societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practices.

PO7: Posses an ability understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge and need for sustainable development.

PO8: Posses an ability to apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Posses an ability to function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.

PO10: Posses an ability to communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Posses an ability to demonstrate knowledge and understanding of the engineering, management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Posses an ability to recognize the need and have ability to engage in independent and lifelong learning 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.

2. Eligibility for Admission

The student seeking admission in B.E. program should have a minimum aggregate of 60% marks or must have secured 60% in Physics, Chemistry and Mathematics in 12th grade. He / She should have appeared in JEE Mains for that admission year. The admission is based purely on merit.

3. Program 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.

4. 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. In some courses where case study-based methodology is adopted, the lectures are supplemented by discussions on case studies.

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.

Variety of extra-curricular activities such as "Explore", "Rangrez" are being organised every year to enrich student's interpersonal skills. The Department has well established functional techno-cultural Club **"EbuZZ"** being managed by students of the department under the supervision of a faculty coordinator that organizes activities very frequently for students overall grooming.

In an endeavour to provide career counselling and guidance on career progression, holistic development and 360

growth, the Program organizes industrial visits, technology focused workshops, expert talks, technical quizzes, hackathons and project displays via dedicated established units in the university/department like those from reputed international societies like IEI, IETE, E-Buzz, IEEE, IIC, Debsoc and Electronique design centre.

Students also participate in sports activities which emphasize good health and their well-being. These activities have been designed taking into account various Program Objectives like PO3, PO6, PO7, PO8, PO9 and PO10, and have been in accordance with the Program Educational Objectives (PEO). The Program B.E Electronics & Communication Engineering is designed to build Innovators, entrepreneurs, leaders, and responsible citizens with the above-mentioned skills and knowledge that will help them to achieve the UN 2030 agenda for sustainable development.

5. Program Structure

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

(i) Core Courses: Core courses are the foundation courses that cater to develop the breadth of Electronics & Communication Engineering stream and include Humanities, Social Science, Management, Mathematics, Basic Science and Engineering Science courses. Core courses are compulsory and can be offered in any semester during the program tenure provided it meets the pre-requisite requirement. It is divided into these four categories:

a) Basic Science Course (BSC)

b) Engineering Science Course (ESC)

c) Program Core Course (PCC)

(ii) Elective Courses: The technical courses apart from core courses are offered as electives 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. It includes:

a) Professional Elective Course (PEC)

b) Open Elective Course (OEC)

c) Department Elective Course (DEC)

(iii) Project Work (PW): The students identify their team-mates and work on a unique project. The projects can be suggested by faculty or by students after getting due approval from faculty-in-charge. The projects are allotted to them at the start of the semester. 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.

(iv) Special Courses (SC): Besides the above two types of courses, all students are provided with opportunities to explore their potential through industry internship, MOOC courses, courses delivered by professors from universities across the globe and international collaborations as detailed below.

a) Industry Oriented Hands-on Training (IOHT): These are hands-on trainings to apply the knowledge gained through core/elective courses.

b) Engineering Exploration Courses: Students are given a choice of technical and industry-oriented courses to get the knowledge of new technologies/skills. Students also have an option of choosing the courses from online platforms like MOOC (NPTEL/SWAYAM) or Nanodegree courses.

c) Courses for Global Exposure: To provide global exposure to students, the short duration courses are offered by professors from universities across the globe during global week (GW). The students may choose or may be offered these courses to earn additional credits. These courses are decided for each batch as per the expertise of the teaching faculty and will be informed to the students before offering in a

semester.

d) Courses for Skill Enhancement: The course curriculum of the B.E program allows the students to enhance their soft skills and reasoning abilities through various courses.

e) Opportunity for Students to avail benefits of International Collaborations.

f) Students are given opportunity to have various value-added courses (VAC) o promote holistic and 360 growth in various semesters.

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

6. 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.

7. Grading System

The list of Letter Grades is given below:

Table 1: Grade and grade points

% Marks Range of total	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

7.1 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 undergone by a student, i.e

SGPA (Si) = $\Sigma(C_i \times G_i) / \Sigma C_i$

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 Program, i.e.

CGPA = $\Sigma(C_i \times S_i) / \Sigma C_i$

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.

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

i. Computation of SGPA and CGPA

Table 2: Illustration for SGPA

Course	Credit	Grade	Grade	Credit Point
Course 1	3	A	8	3 X 8 = 24
Course 2	4	B+	7	4 X 7 = 28
Course 3	3	B	6	3 X 6 = 18
Course 4	3	O	10	3 X 10 = 30
Course 5	3	C	5	3 X 5 = 15
Course 6	4	B	6	4 X 6 = 24
	20			**139**

Thus, **SGPA =139/20 =6.95**

Table 3: Illustration for CGPA

Semester 1	Semester 2	Semester 3	Semester 4
Credit: 20 SGPA: 6.9	Credit: 22 SGPA: 7.8	Credit: 25 SGPA: 5.6	Credit: 26 SGPA: 6.0
Semester 5	**Semester 6**		
Credit: 26 SGPA: 6.3	Credit: 25 SGPA: 8.0		

$$\text{Thus, CGPA} = \frac{20 \times 6.9 + 22 \times 7.8 + 25 \times 5.6 + 26 \times 6.0 + 26 \times 6.3 + 25 \times 8.0}{144} = 6.73$$

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.

8. Promotion and Registration

Any bonafied student, who appears for the examination conducted 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.

(a) 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.

(b) 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.

9. Migration/Credit Transfer/Lateral Entry

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 Degree 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.

In case of availability of seats, a student can apply for branch change. The student shall have to pass all papers of the first year and possess minimum CGPA criteria. Preference will be given to high CGPA.

The admission procedure and mapping of the courses for all categories (migration, credit transfer and lateral entry) 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.

10. Eligibility to Award the Degree

To be eligible for award of B.E. degree in Electronics & Communication Engineering, a student must complete all the courses in which he/she has registered with minimum 161 credits 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.

11. Program Overview

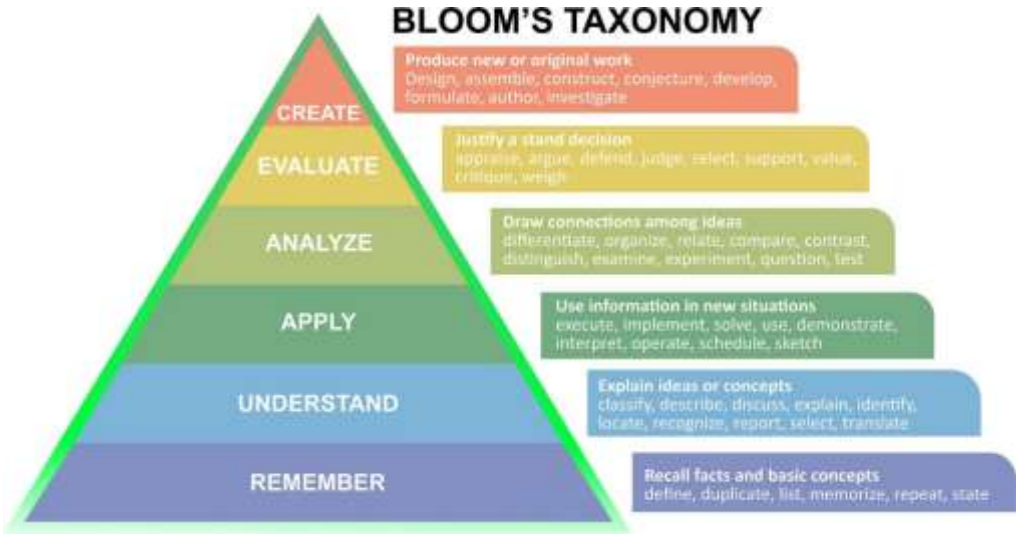
The B.E ECE Program consists of subjects under the following categories:

BSC: Basic Science Courses
ESC: Engineering Science Courses
PCC: Program Core Course
PEC: Program Elective Course
OEC: Open Elective Course
DEC: Department Elective Course
PW: Project Work
VAC: Value added course
SC: Special Course
AC: Additional Credits through NCC and NSS

- Student must take environmental science, cyber security, disaster management, human values & professional ethics.
- The number of courses may vary in a semester based on the choice of electives/specialization courses.
- Student may earn credits of the seventh and eighth semester by taking Co-op training /Research project at research organization/University.
- Student can choose additional electives instead of Co-op training in the final year.

12. Assessments

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.



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.

13. Examples of few questions statements pertaining to different levels of Blooms Taxonomy

a. Remember

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

b. 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

c. 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.

d. Analysing

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

Sample Questions

2. 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?
3. Return statement can only be used to return a single value. Can multiple values be returned from a function? Justify your answer.

e. 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 judgements 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

An elaborate document named as 'Course Handout' providing details about every single course is shared with students at the beginning of every semester. This document typically has various components like -

1. Title of the course
2. Course code
3. Names of all the Faculty members teaching that course in a typical semester
4. Scope and objective of the course
5. Course learning outcomes
6. Alignment of every single CLO with Program outcomes
7. Detailed delivery plan
8. Information about reliable and authenticated web 8. resources
9. Assessment methodologies etc.

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

15. Flexibilities

Students are given a lot of choice to make a selection on how they want to pursue their final leg of degree program. Various choices available with student are -

- 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:

i. Co-op Project at Industry (Module-1): During seventh semester

ii. 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.

iii. 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.

16. 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.

Program scheme BE(ECE), 2023 on the basis of Choice Based Credits System as per UGC notification dated 10th August, 2016.

Year 1									
Semester - 1					Semester - 2				
S. No.	**Code**	**Course Name**	**Category**	**Credits**	**S. No.**	**Code**	**Course Name**	**Category**	**Credits**
1	22AS001	Calculus and Statistical Analysis	BSC	3	1	22AS002	Differential Equations and Transformations	BSC	3
2	23EC028	Semiconductor Physics & devices	BSC	4	2	23EC029	Electronic Circuits	PCC	4
3	22EC003	Introduction to Programming for Problem Solving	ESC	4	3	22EC005	Object Oriented Programming	ESC	3
4	22ME004	Design Thinking	ESC	2	4	23EC033	Digital Electronics	PCC	4
5	22EC002	Engineering Infusion for skill development	ESC	3	5	23EC357	Electrical Engineering Fundamentals	PCC	1
6		Mini MOOC Elective	SC	1	6	22EC006	Prototyping Fundamentals	ESC	2
7		Value Addition Course 1	VAC	1	7	22ME005	Foundation Workshop	ESC	1
8		Value Addition Course 2	VAC	1					
	Total			19		Total			18
Year 2									
Semester - 3					**Semester – 4**				
S. No.	**Code**	**Course Name**	**Category**	**Credits**	**S. No.**	**Code**	**Course Name**	**Category**	**Credits**
1	22EC007	Linear Integrated Circuits	PCC	4	1	22EC012	Microelectronic Circuits	PCC	4
2	22EC008	Microcontroller	PCC	4	2	22EC014	Digital Signal Processing	PCC	4
3	23EC031	Signals & Systems	PCC	3	3	22EC020	Electromagnetic Waves and Antenna	PCC	3
4	22EC010	Network Analysis & Synthesis	PCC	3	4	22EC015	Linear Control System	PCC	3
5	24EC030	Data handling using Artificial Intelligence	ESC	3	5	23EC361	RTOS Development	PCC	4
6	22GE002	Environmental Sciences	VAC	2	6	22EC013	Measurement & Virtual Instrumentation Lab	PCC	2
7	23EC507	Integrated Project-1	PW	1					
8		Global Week/ MOOC (Mass Open Online Course)	SC	1					
9		Value Addition Course 3	VAC	1					

	Total		22		Total			21
Year 3								
Semester - 5					**Semester -6**			
S. No.	**Code**	**Course Name**	**Category**	**Credits**	**S. No.**	**Code**	**Course Name**	**Category**	**Credits**
1	22EC018	Analog and Digital Communication	PCC	4	1	22EC343	Data Structures	PCC	3
2	22EC019	Digital VLSI Design	PCC	4	2		Department Elective-1	DEC	4
3		PE1 PE1 Lab	PEC	4	3		PE-2 PE-2 lab	PEC	4
4	23EC032	Computer Networks and communication	PCC	4	4		Open Elective-1	OEC	3
5	23EC506	IOHT***	SC	2	5		Open Elective-2	OEC	3
6	22GE004	Cyber Security	VAC	2	6 `	22EC022	Major Project	PW	3
7	22EC024	Research Tools & Engineering Writing	PW	1					
	Total			21		Total			20
Year 4									
Scheme-1									
Semester-7					**Semester- 8**				
S. No.	**Code**	**Course Name**	**Category**	**Credits**	**S. No.**	**Code**	**Course Name**	**Category**	**Credits**
1	22EC023	Wireless & Mobile Communication	PCC	3	1	22EC501	Industry Oriented Hands-on Experience	PW	20
2		Department Elective -2	DEC	4	2	Generic Course Offered by the University		AC	Max credits to be earned 6*
3		PE-3 PE-3 lab	PEC	4					
4		PE-4	PEC	4					
5	23EC508	Research Project	PW	3					
6	22GE001	Human Values & Professional Ethics	VAC	1					
7	22GE003	Disaster Management	VAC	1					
8	Generic Course Offered by the University		AC	Max credits to be earned 6*					
	Total			20		Total			20
Scheme-2									
Semester-7					**Semester- 8**				
S. No.	**Code**	**Course Name**	**Category**	**Credits**	**S. No.**	**Code**	**Course Name**	**Category**	**Credits**
1	22EC502	Co-oP Project at Industry (Module-1)	PW	20	1	22EC503	Co-oP Project at Industry (Module-2)	PW	20

2	22GE001	Human Values & Professional Ethics	VAC	1					
3	22GE003	Disaster Management	VAC	1					
4	Generic Course Offered by the University		AC	Max credits to be earned 6*	2	Generic Course Offered by the University	AC	Max credits to be earned 6*	
	Total			22					

**Entrepreneurial Skill development / Start-up Activity				
S.NO.	**Code**	**Course Name**	**Category**	**Credits**
1	22EC504	CEED Acceleration Program (CAP) Cohort-II-Module I	PW	3

* 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.
*** IOHT is executed after 4th semester in month of May to July depending upon academic schedule and evaluation is done in semester 5.

Annexure-I (Mini MOOC Elective)

Subject Code	Subject Name	Option	Credits
23GE018	Introduction to Architecting Smart IoT Devices	Student can opt any one course	1
23GE019	Introduction to solar cells		
23GE020	Working for a sustainable future: concepts and		
23GE021	Innovation and emerging technology: Be disruptive		
23GE022	5G for Everyone		
23GE023	Introduction to Digital Transformation		

Annexure-II (Value addition course)

Subject Code	Subject Name	Credits
23GE012	Fundamentals of computational thinking with graphical	1
23GE014	Electronic Circuit Design using TinkerCAD	1
23GE013	Incredible India	1
24GE030	FASHIONEXT : Integration of Electronics in Fashion	1
24GE031	Responsible Consumption	1
24GE032	Green Campus	1
24GE033	Art and Aesthetic Value of Electronic Home Gadgets	1

* Student can choose value addition course 1 and 2 in semester 1 and value addition course 3 in semester 3 from above list.

Annexure-III (Mooc Courses)

Subject Code	Subject Name	Option	Credits
22GE005	Community Projects using Design Thinking	Student can opt any one course	1
22GE017	Artificial Intelligence for All		
22GE015	Introduction to Entrepreneurial Thinking		
24GE024	Electrical Measurement and Electronic Instruments		
24GE025	Electronic Systems Design: Hands-on Circuits and PCB Design with CAD Software		
24GE026	Sensor Technologies: Physics, Fabrication, and Circuits		
24GE027	Mobile Virtual Reality and Artificial Intelligence		
24GE028	Soft Skill Development		
24GE029	Innovation, Business Models and Entrepreneurship		
22GE016	Introduction to Prompt Engineering		
22GE009	Social Emotional Learning		
22GE010	Clean and Green Campus		
22GE011	Leadership and Sustainability		
24GE034	Overview of Emerging Technologies		

Annexure-IV (Program Electives)

Category	Course Code	Course Name	Credits
Program Elective 1			
PE1	23EC359	Mixed Signal Circuit Design	4
PE1	24EC370	Embedded Artificial Intelligence	
PE1	22EC315	Sensor and Communication Protocol	
PE1	22EC312	Digital Image Processing	
PE1	22EC313	Machine learning	
PE1	22EC314 22EC316	Robotics Lab-1 Robotics system modeling and control	
Program Elective 2			
PE2	22EC302	Analog Layout Design	
PE2	22EC321	Digital system Design	
PE2	23EC362	IoT Application Development	
PE2	22EC330	Microwave and Satellite communication	
PE2	22EC318	Introduction to Robotic sensors	
PE2	22EC319 22EC320	Aerial and Mobile Robotics Robotics lab -2	
Program Elective 3			
PE3	22EC305	IC Fabrication & Technology	
PE3	23EC368	VLSI Design and Verification	
PE3	23EC364	Embedded Linux	
PE3	22EC332	Advance Wireless Communication	
PE3	22EC326 22EC327	Machine Vision Robotics Lab-3	
PE3	22EC325	Embedded system design	
Program Elective 4			
PE4	23EC360	High Speed and Low Power VLSI Circuit Design	
PE4	23EC363	Cloud computing	
PE4	22EC331	Optical communication system	
PE4	22EC328	Information Theory and Coding	
PE4	22EC322	Cloud Computing & Virtualization	
PE4	22EC323	Biomedical Robotics	
PE4	22EC324	IOT and Industrial Application	
PE4	22EC333	Wearable technology and reality	

Annexure-V (Departmental Electives)

Subject Code	Course Name	Credits
Departmental Elective 1		
25ECE6300	Applied Programming in Engineering	4
25ECE6301	Applied IoT and Embedded System Design	
25ECE6302	Applied VLSI Design: Principles and Practices	
22EC334	Wireless Sensor Network	
22EC329	Introduction to mobile technology	
Departmental Elective 2		
23AI003	AI and Machine Learning	4
25ECE7300	Programming Concepts using Java	
23EC367	Cryptography	
23EC366	Synthesis of digital systems	
24EC371	Power Electronics	

Annexure-VI (Open Electives)

Course	Course Name	Credits
Open Elective-1		
22EC336	Scientific computing	3
22EC337	Computer system Architecture	
22EC338	Computer Networks	
22EC340	Database Management System	
22EC341	Object Oriented Software Engineering	
22EC342	Advanced Programming Concepts	
25UNI0104	Art of Communication (AoC)	
Open Elective-2		
25UNI0110	Numerical Aptitude & logical Reasoning - I (NALR-I)	3
22EC339	Operating Systems	
22EC344	Essentials of Information Technology	
22EC345	Probability Theory and Random Processes	
22EC346	Project Management	
22EC347	Data Analytics	

Program Overview

Course Category	Category	Credits											
		I	II	III	IV	V	VI	VII		VIII		Total	
								Scheme I**	Scheme II**	Scheme I**	Scheme II**	Scheme I**	Scheme II**
CC	BSC	7	3	-	-	-	-	-	-	-	-	10	10
	ESC	9	6	3	-	-	-	-	-	-	-	18	18
	PCC	-	9	14	20	12	3	3	-	-	-	61	58
EC	PEC	-	-	-	-	4	4	8	-	-	-	16	8
	OEC	-	-	-	-	-	6	-	-	-	-	6	6
	DEC	-	-	-	-	-	4	4	-	-	-	8	4
SC	MOOC	1	-	1	-		-		-	-	-	2	2
	VAC	2	-	3	-	2	-	2	2	-	-	9	9
	IOHT					2						2	2
	PW	-	-	1	-	1	3	3	20	20	20	28	45
	AC	-	-	-	-	-	-			6*	6*	-	-
Total												160	162

CC	Core Course	PEC
EC	Elective Course	OEC
SC	Special Course	DEC
PW	Project work	AC
BSC	Basic Science Course	MOOC
ESC	Engineering Science Course	VAC
PCC	Program Core Course	

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.

22AS001 - Calculus and Statistical Analysis 3-0-0 3

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.

23EC028 - Semiconductor Physics & devices 3-0-2 4

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.

22EC003 - Introduction to Programming for Problem Solving 2-0-4 4

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.

22ME004 - Design Thinking 0-0-4 2

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.

22EC002 - Engineering Infusion for skill Development 1-0-4 3

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. Identification of need statement, report writing and systematic analysis of need statement.

Mini MOOC Elective 1-0-0 1

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.

Value Addition Course (1/2/3) 0-0-2 1

Course provide necessary skills to increase the employability quotient and equipping the students with essential skills to succeed in life. It provide students an understanding of the expectations of industry. It improve employability skills of students, bridge the skill gaps, and make students industry ready. These courses develop inter-disciplinary skills. It enhances knowledge in domains like understanding India, environmental education, digital and technological solutions etc.

22AS002 Differential Equations and Transformations 3-0-0 3

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.

23EC029 - Electronic Circuits 3-0-2 4

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.

23EC033 - Digital Electronics 3-0-2 4

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

22EC005-Object Oriented Programming 1-0-4 3

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.

22EC006 – Prototyping Fundamentals 0-0-4 2

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.

23EC357- Electrical Engineering Fundamentals 0-0-2 1

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.

22ME005 - Foundation Workshop 0-0-2 1

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.

24EC030- Data handling using Artificial Intelligence - 1-0-4 3

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

22EC007- Linear Integrated Circuits 3-0-2 4

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.

22EC008- Microcontroller 2-0-4 4

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.

23EC031 -Signals & Systems 3-0-0 3

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.

22EC010- Network Analysis & Synthesis 3-0-0 3

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

22GE002- Environmental Sciences 2-0-0 2

Introduction to environmental studies, Concept of sustainability and sustainable development. Ecosystem,food webs and ecological succession, Forest, Grassland, Desert ecosystem, Aquatic ecosystems. Renewable and non-renewable resources, Deforestation, floods, renewable and non-renewable energy sources Biodiversity and Conservation. Environmental Pollution, Solid waste Management Environment Laws, Environmental ethics.

23EC507 - Integrated Project-1 0-0-2 1

The Integrated Project provides the opportunity to the students to apply their knowledge, which they learned in previous semesters. Assessment is by means of evaluating seminar presentations, submission of synopsis and project report. Projects are undertaken individually or in small groups that introduces the dimension of workload management into the program to enable completion of a large, relatively unstructured "assignment" over the course of the semester.

Global Week/MOOC 0-0-2 1

A MOOC (Mass Open Online Course) is a concise and focused learning experience designed to help students make the most of online education platforms like Coursera. This MOOC equips learners with practical strategies, tips, and tools to effectively navigate and engage with course content while exploring emerging technologies. By adopting efficient learning techniques, managing their time wisely, and leveraging additional resources and community support, learners can cultivate lifelong learning habits.

22EC012- Microelectronic Circuits 3-1-0 4

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.

22EC014- Digital Signal Processing 3-0-2 4

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

22EC020- Electromagnetic Waves and Antennas 3-0-0 3

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.

23EC015 –Linear Control System 3-0-0 3

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.

23EC361- RTOS Development 2-0-4 4

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.

22EC013- Measurement & Virtual Instrumentation lab 0-0-4 2

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

22EC018 - Analog and Digital Communication 3-0-2 4

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.

22EC019- Digital VLSI Design 3-0-2 4

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.

23EC032- Computer Networks and communication 2-0-4 4

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.

23EC359 -Mixed Signal Circuit Design 2-0-4 4

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.

22EC302-Analog Layout Design 2-0-4 4

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.

23EC362- IoT Application Development 2-0-4 4

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.

23EC506- Integrated Hands on Training 0-0-4 2

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.

22GE004 - Cyber Security 2-0-0 2

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.

22EC024- Research Tools & Engineering Writing 1-0-0 1

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.

23EC363 -Cloud Computing 2-0-4 4

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.

23EC364- Embedded Linux 2-0-4 4

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.

24EC370 - Embedded Artificial Intelligence 2-0-4 4

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

22EC312 - Digital Image Processing 2-0-4 4

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.

22EC313- Machine Learning 2-0-4 4

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.

22EC314 - Robotics Lab-1 0-0-8 4

Measurement of linear, angular displacement measurement of the velocity of a robot car using LVDT, Strain in a cantilever beams, Angular rotation of pulley ,RPM of the shaft, Pressure exerted measurement, temperature of heated water, change in light intensity in a room.

22EC315- Sensor and Communication Protocol 4 2-0-4

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.

22EC316- Robotics system modeling and control 2-0-4 4

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

22EC318 - Introduction to Robotic Sensors 2-0-4 4

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

22EC319 - Aerial and Mobile Robotics 2-0-4 4

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)

22EC320 -Robotics lab -2 0-0-8 4

To design a 4 channel RF module and interface motors and control the speed and direction of brushless motors , Interfacing a Gyro (MPU-6050) with Arduino. Demonstrate the implementation of I2C communication bus with Arduino. Control speed and direction of 4 motors using NRF module, Control balancing and position of the same.

22EC321- Digital System Design 2-0-4 4

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.

22EC322 - Cloud Computing & Virtualization 2-0-4 4

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.

22EC323 -Biomedical Robotics 2-0-4 4

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.

22EC324 IOT and Industrial Application 4-0-0 4

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.

22EC325 Embedded System Design 2-0-4 4

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.

22EC326 - Machine Vision 2-0-4 4

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.

22EC327 - Robotics Lab-3 2-0-4 4

4-Adjacency 8-Adjacency m-Adjacency in a binary image, image enhancement functions in spatial domain: Linear Transformations, Logarithmic Transformations, Power Law Transformations Piece-wise Linear Transformations, Image enhancement functions Correlation and convolution functions Compare the matrix and vector arrangements. Compare Mean Filters and Median Filters for spatial filtering, computationally.

22EC328 -Information Theory and Coding 2-0-4 4

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.

22EC329- Introduction to Mobile Technology 2-0-4 4

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.

22EC332 -Advance Wireless Communication 2-0-4 4

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.

22EC333 -Wearable technology and reality 2-0-4 4

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.

22EC334 - Wireless Sensor Networks 2-0-4 4

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.

25ECE6300- Applied Programming in Engineering 2-0-4 4

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 2-0-4 4

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 2-0-4 4

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.

22EC023- Wireless & Mobile Communication 3-0-0 3

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.

23EC508 -Research Project 1-0-4 3

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.

22GE001- Human Values and Professional Ethics 0-0-2 1

Concept of human values and value education, Aim of education and value education, Personal development, Principles for harmony, Human Dignity, Aspirations and Harmony ,Duties and Rights, Concept of Duty, Value Education and Professional Values– Religious, social and constitutional values. Impact of global development on ethics and values, Modern Challenges of Adolescents, Human rights, Indian and International Perspectives, Human rights of women and children.

22GE003 - Disaster Management 0-0-2 1

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.

22EC501 – Industry Oriented Hands-on Experience 20 0-0-25

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.

22EC502 - Co-oP Project at Industry: Module-I 20 0-0-25

22EC503 - Co-oP Project at Industry: Module-II 20 0-0-25

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)-22EC502 in semester 7 and (Module-2)-22EC503 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.

22EC343-Data Structures 1-0-4 3

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.

22EC307 - Web Development for IoT 2-0-4 4

Introduction to IoT enabled embedded devices, sensors, and actuators. IoT network protocols. Front end technologies: HTML, CSS. Bootstrap, Javascript, JQuery, Backend Technologies: PHP, MySQL, AJAX, JSON. Capstone project.

23AI003 AI and Machine Learning 2-0-4 4

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.

25ECE7300 Programming Concepts using Java 2-0-4 4

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.

23EC367 - Cryptography 3-0-2 4

Introduction and mathematical foundations: Overview of cryptography, Number Theory, Discrete Probability, Symmetric-key Encryption, Hash Functions, Public key cryptography, Digital signatures.

23EC366 -Synthesis of digital systems 3-0-2 4

VLSI Design Flow: High Level (or Behavioral) Synthesis, Register Transfer Level Synthesis: Re-timing and Finite State Machine Encoding techniques, Logic Synthesis: Two level Boolean Logic Synthesis, and Heuristic based Minimization, Multi-level Implementations, Layout Synthesis: Introduction to Placement, Technology Mapping, Routing and Timing Analysis.

22EC330- Microwave and Satellite Communication 3-0-2 4

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.

22EC331 –Optical communication system 2-0-4 4

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.

22EC305 -IC fabrication & Technology 2-0-4 4

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.

23EC368 - VLSI Design and Verification 2-0-4 4

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.

23EC360-High Speed and Low Power VLSI Circuit Design 2-0-4 4

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.

22EC308 - Cloud Computing for IoT Systems 2-0-4 4

Introduction to cloud computing, cloud deployment models, cloud service models, cloud concepts and technologies, cloud services and platforms, Python scripting for cloud computing, cloud application deployment using python, introduction to IoT platform, introduction to fog computing and edge computing, capstone project.

22EC022-Major project 0-0-6 3

Projects are undertaken individually or in small groups that introduce the dimension of workload management into the program to enable completion of a large, relatively unstructured "assignment" over the course of the semester. 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.

22EC336-Scientific Computing 3-0-0 3

Foundation of Scientific Computing, Quantum computing, Wentzel-Kramer-Brillouin Method, Runge-Kutta method, Trapezoidal method, Quasilinear, Laplace equation, wave packets, Pressure fluctuation, linearized shallow water wave equation, 1D convection equation, Upwinding, Numerical amplification factor, Parabolic partial differential equation, Elliptic partial differential equations, Lagrange and hermite interpolations.

22ECE337 -Computer System Architecture 3-0-0 3

Computer system architecture refers to the design and organization of hardware and software components that make up a computer system. It encompasses the arrangement of processors, memory, storage, input/output devices, and network connections. The architecture determines how these components interact and communicate, enabling the execution of tasks and the handling of data.

Computer Networks – 22EC338 3-0-0 3

Introduction to computer networks: network criteria, Physical topology, Categories of networks, Protocols and standards, Network Models: OSI and TCP/IP, Addressing: physical and logical, Transmission impairments, Data Rate limits, transmission media: guided and unguided, wireless switching, data link layer, data link protocols, channel allocation, multiple access protocols, routing protocols, process to process delivery, TCP and UDP, congestion control, DNS, SMTP, FTP, HTTP, WWW, and TELNET.

22EC340 - Database Management System 2-0-4 4

Introduction to Database Management System (DBMS), data models, schemas, client-server architecture for DBMS, ER model, relational model, introduction to normalization, transaction, concurrency control, dealing with deadlocks, recovery techniques, checkpoints, database security, distributed databases.

22EC341 -Object Oriented Software Engineering 2-0-4 4

Overview of System Analysis & Design, Business System Concept, System Development Life Cycle, Waterfall Model, Spiral Model, Feasibility Analysis, COCOMO model. System Requirement Specification, System Design , Decision tree, decision table and structured English; Functional vs. Object- Oriented approach, Structured

Programming, OO Programming, Information Hiding, Reuse, System Documentation. Testing, Test case Specification, Reliability Assessment, Validation & Verification Metrics, Monitoring & Control. Software Project Management, Project Monitoring. CASE TOOLS.

22EC342- Advanced Programming Concepts 3-0-0 3

Structure of a c program, Compilation, Linking & Execution, Identifiers, Variables, Constants, Reserved Keywords, Data Types, Expressions, Statements, Type Conversion / Type Casting, Input Output in C, Operations in C, Precedence, Decision Control Construct, Loops, Functions, Recursion , Storage classes, Array and its types, Sparse Matrix, Strings, , Pointers, File Handling , Functions for selecting record randomly, Structure, Union, Dynamic Allocation of Arrays.

25UNI0104 - Art of Communication (AoC) 3-0-0 3

Self-awareness, Stages of learning, SWOT analysis, Goal setting, Grooming & Body Language, Power dressing, Work Ethics, Values & Moral, Interpersonal Skills & Empathy, Leadership skills, Presentation Skills, Report writing, Team work, Interview Skills – Acing the Interview, Stress Interviews, Panel Interviews, Cracking Group Discussions, Stress Management, Anger management, Critical Thinking, Time Management, Conflict Resolution, Resume Making.

25UNI0110- Numerical Aptitude & logical Reasoning - I (NALR-I) 3-0-0 3

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).

22EC339- Operating Systems 0-0-6 3

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.

22EC344- Essentials of Information Technology 0-0-6 3

Information technology concepts and trends underlying current and future developments in information technology, and fundamental principles for the effective use of computer-based information systems. Networks and distributed computing, including the World Wide Web, hardware and operating systems, software development tools and processes, relational databases, security and cryptography, enterprise applications, and electronic commerce. Hands-on exposure to Web, database, and graphicauser interface (GUI) tools.

22EC345- Probability Theory and Random Processes 0-0-6 3

Probability Theory: Definitions of Probability, Axioms of Probability, Probability Spaces, Properties of Probabilities, Joint and Conditional Probabilities, Independent Events. Random Variables: Probability Distribution Functions, Probability Density Functions, Joint Distribution of Two Variables, Conditional Probability Distribution and Density, Independent Random Variables. Statistical Averages: Functions of Random Variables Statistical Averages, Characteristic Function of Random Variables. Random Processes: Stationarity, Ergoridicity, Covariance Function and their Properties.

22EC346 –Project Management 3-0-0 3

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-ExecutingProjectWork-Closing the Project, Close Project Procurements ,Close the Project or Phase Administratively.

22EC347-Data Analytics 3-0-0 3

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.

22EC504 – CEED Acceleration Program(CAP) Cohort-II-Module I 1-0-4 3

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.

24EC371 Power Electronics 2-0-4 4

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

24GE030 FASHIONEXT: Integration of Electronics in Fashion 0-0-2 1

Introduction to smart textiles., Uses of smart textiles in various industries., Discussion on designs done previously by fashion designers using electronics. Design Development: Understanding design process in Fashion. Ideation process for design development. Design & material selection. Developing the prototype of selected design., Developing final design.

24GE031 Responsible Consumption 0-0-2 1

Introduction to Responsible Consumption Definition and importance of responsible consumption. Overview of sustainable living principles and its importance. The impact of consumer choices on the environment and society. The Role of Consumerism in Society, Historical development of consumerism. Influence of media and advertising on consumer behaviour. The rise of ethical consumerism. Ethical and Eco-friendly Consumer Choices - Identifying eco-friendly and ethical products. Understanding labels and certifications. The importance of reducing, reusing, and recycling. Evaluate products for their environmental and ethical impacts. Environmental Impact of Consumption Carbon footprint and ecological footprint. o Impact of various industries: fashion, food, and electronics. Case studies on environmental degradation and resource depletion. Social and Economic Implications and Governance o Fair trade and ethical sourcing. o Consumer choices and their effects on labor markets and communities. o Economic systems and sustainable development. o Government policies on responsible consumption. Policy analysis: Review and discuss a local or national policy promoting sustainability. 6 Practical Approaches to Responsible Consumption o Implementing sustainable practices in daily life. o Innovations and technologies promoting sustainability.

24GE032 Green Campus 0-0-2 1

Sustainable Development goal's, Introduction to Circular Economy and key concepts, Sustainable Lifestyle and Waste Management, Sustainable consumption and production, Waste management. Sustainable living Practices Innovation and future trends in waste management, Community engagement and policy advocacy, Water conservation, Global water resources and distribution, Water conservation techniques. Wastewater treatment and reuse, Climate change and its impacts. Energy Conservation, Introduction to energy conservation, Energy efficiency in buildings, Renewable energy sources. Energy conservation in transportation, Lifestyle changes for energy conservation. Multiple cultivation techniques, Introduction to multiple cultivation techniques. Intercropping and companion planting, Crop rotation and soil management, Agroforestry and permaculture. Hydroponics and aquaponics, Organic farming and sustainable agriculture, Activity: Air pollution and Noise Pollution, Introduction to air pollution, Major air pollutants and their impacts, Air quality monitoring and standards, Introduction to noise pollution, Health and environmental impacts of noise pollution, Noise pollution control and management.

24GE033 Art and Aesthetic Value of Electronic Home Gadgets 0-0-2 1

Fundamental of arts and roll of science and technology in art, Brief historical reference though visual arts, explore the work of Leanado da Vinchi, Impressionism, New Media art, and Fluxus and Media art and technology in Art , Exploring the Golden ratio, Rule of third, calculation in art and aesthetic representation. basic compositional approach in Art and daily life observation, implementation, Fundamental of Aesthetics, The Objectivity of Aesthetic Judgment, What is Art, Art and time and implementation of object design and aesthetical, value in Electronic Gadgets, fundamental of Indian Aesthetics, Bhava and rasa. Exploring the aesthetic value and fundamentals of art drawing in electronics gadget design, collective and collaborative execution of Idea and project. 3D modeling and installation.

CHITKARA UNIVERSITY

PUNJAB

Chitkara University, Punjab

Chandigarh-Patiala National Highway (NH-64), Village
Jhansla, Rajpura, Punjab - 140401

www.chitkara.edu.in