R.M.D. ENGINEERING COLLEGE

RSM Nagar, Kavaraipettai– 601206, Gummidipoondi (T.K), Thiruvallur (D.T), TamilNadu

(An Autonomous Institution)

Approved by AICTE, New Delhi/ Affiliated to Anna University, Chennai

All Eligible UG Courses are Accredited by NBA & Institution Accredited by NAAC An ISO 21001:2018 Certified Institution

Curriculum 2024

Bachelor of Engineering

Electronics & Communication Engineering

(2024-2028 Batch)

R.M.D ENGINEERING COLLEGE

(An Autonomous Institution)

B.E ELECTRONICS AND COMMUNICATION ENGINEERING

REGULATIONS – 2024

VISION AND MISSION OF THE DEPARTMENT

VISION:

To offer effective technical education to contribute to the global industrial development and socio-economic well-being of competent Electronics and Communication Engineers.

MISSION:

- **To produce competent engineers to face challenges of the society by providing conducive academic learning environment.**
- **To facilitate and encourage the students and faculty members to excel in research activities.**
- **To promote industry institute collaboration and develop the application skills of the Students.**
- **To adopt innovative teaching and learning methodologies that leads to self-improvement of Students.**
- **To develop sound technical knowledge, professional ethics, entrepreneurial and leadership Skills among students.**

PROGRAMME OUTCOMES:

Engineering Graduates will be able to:

a) **Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

b) **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

c) **Design / development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

d) **Conduct investigations of complex problems**: Use research-based knowledge and research methods, including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

e) **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations**.**

f) **The Engineer and Society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

g) **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

h) **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice**.**

i) **Individual and team work**: Function effectively as an individual, and as a member or leaderin diverse teams, and in multidisciplinary settings

j) **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

k) **Project Management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

l) **Life-long learning:** Recognize the need for, and have the preparation and ability to engagein independent and lifelong learning in the broadest context of technological change.

PROGRAM SPECIFIC OBJECTIVES (PSOs)

1. To analyze, design and develop solutions by applying foundational concepts of Electronics andCommunication Engineering.
2. To apply design principles and best practices for developing quality products for scientific andbusiness applications.
3. To adapt to emerging information and communication technologies (ICT) to innovate ideas andsolutions to existing/novel problems.

Curriculum 2024

Bachelor of Engineering

Electronics & Communication Engineering

B.E. ELECTRONICS AND COMMUNICATION ENGINEERING REGULATIONS-2024

CHOICE BASED CREDIT SYSTEM

MAPPING OF COURSE OUTCOMES WITH PROGRAMME OUTCOMES:

A broad relation between the Course Outcomes and Programme Outcomes is given in the table

COURSE COUTCOMES		PROGRAMME OUTCOMES											
Sem	COURSE NAME	a	b	c	d	e	f	g	h	i	j	k	l
	Programming in C++ (Lab Integrated)	✓	✓	✓					✓	✓	✓		✓
	Software Development Practices (Lab Integrated)	✓	✓	✓		✓	✓		✓	✓	✓		✓
	Physics for Electrical and Electronics Engineering (Lab Integrated)	✓	✓	✓	✓							✓	✓
	Electronic Devices and Circuit theory (Lab Integrated)	✓	✓	✓	✓	✓	✓					✓	✓
	Heritage of Tamils	✓								✓	✓		✓
	Matrices and Calculus	✓	✓	✓	✓	✓	✓	✓					✓
	Students Induction Programme (Non Credit)						✓	✓	✓	✓	✓	✓	
	Interpersonal skills, Psychometric Analysis and Career Development						✓	✓	✓	✓	✓	✓	
	Environmental Science & Sustainability (Non Credit)	✓	✓	✓	✓	✓						✓	✓
	Idea Lab I (Non Credit)	✓	✓	✓	✓	✓	✓	✓	✓				✓
	Programming in C (Non Credit)	✓	✓	✓					✓	✓	✓		✓
II	Transforms and Complex Analysis (Lab Integrated)	✓	✓	✓	✓	✓	✓						✓
	Data Structures and Algorithms (Lab Integrated)	✓	✓	✓		✓			✓	✓	✓		✓
	Java Programming (Lab Integrated)	✓	✓	✓		✓			✓	✓	✓		✓
	Chemistry for Electrical & Electronics Engineering (Lab Integrated)	✓	✓	✓	✓	✓						✓	✓
	Introduction to Artificial Intelligence (Lab Integrated)	✓	✓	✓					✓	✓	✓		✓
	Tamils and Technology	✓								✓	✓		✓
	Innovation and Creativity Skills Development						✓	✓	✓	✓	✓	✓	
	Idea Lab II	✓	✓	✓	✓	✓	✓	✓	✓				✓
	Yoga for Stress Management (Non Credit)							✓	✓	✓	✓	✓	✓

III	Probability and Random Processes	✓	✓	✓	✓					✓	✓		✓
	Analog Circuits	✓	✓	✓	✓	✓	✓		✓		✓		✓
	Database Management Systems (Lab Integrated)	✓	✓	✓		✓			✓	✓	✓		✓
	Control Systems	✓	✓	✓	✓	✓	✓		✓		✓		✓
	Universal Human Values 2: Understanding Harmony	✓	✓	✓	✓						✓		✓
	Advanced Java Programming (Lab Integrated)	✓	✓	✓		✓			✓	✓	✓		✓
	Product Development Lab - 1	✓	✓	✓	✓	✓	✓	✓	✓				✓
	Aptitude and Coding Skills I	✓	✓							✓	✓		
	Internship/Seminar (1 Week)	✓	✓							✓	✓		
	Indian Constitution (Non Credit)	✓	✓	✓		✓			✓	✓	✓		✓
IV	Statistics and Linear Algebra (Lab Integrated)	✓	✓	✓	✓					✓	✓		✓
	Analog and Digital Communication(Lab Integrated)	✓	✓	✓	✓	✓	✓		✓		✓		✓
	Web Development Frameworks (Lab Integrated)	✓	✓	✓		✓			✓	✓	✓		✓
	Linear Integrated Circuits (Lab Integrated)	✓	✓	✓	✓	✓	✓		✓		✓		✓
	Digital System Design(Lab Integrated)	✓	✓	✓	✓	✓	✓		✓		✓		✓
	Introduction to Internet of Things	✓	✓	✓	✓	✓	✓		✓		✓		✓
	Product Development Lab - 2	✓	✓	✓	✓	✓	✓	✓	✓				✓
	Aptitude and Coding Skills II	✓	✓							✓	✓		
	Value Education (Non Credit)	✓	✓							✓	✓		
V	Digital VLSI Design(Lab Integrated)	✓	✓	✓	✓	✓	✓					✓	✓
	Microprocessors and Microcontrollers (Lab Integrated)	✓	✓	✓	✓	✓							✓
	Electromagnetics and Antennas	✓	✓	✓	✓	✓	✓						✓
	Wireless Communication	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓
	Professional Elective I												
	Professional Communication – I (TOEFL)	✓	✓				✓	✓	✓	✓	✓	✓	✓
	Advanced Aptitude and Coding Skills I	✓	✓							✓	✓		
	Internship/Seminar (2 Weeks)	✓	✓							✓	✓		
	Product Development Lab - 3	✓	✓	✓	✓	✓	✓	✓	✓				✓

	Essence of Indian Traditional Knowledge (Non Credit)	✓	✓	✓	✓	✓	✓	✓	✓				✓
VI	Discrete Time Signal Processing(Lab Integrated)	✓	✓	✓	✓	✓	✓					✓	✓
	Design Thinking (Lab Integrated)	✓	✓	✓	✓	✓	✓					✓	✓
	Computer Networks	✓	✓	✓	✓	✓	✓					✓	✓
	Professional Elective II												
	Open Elective I												
	Professional Communication – II (TOEFL)	✓	✓	✓	✓	✓	✓					✓	✓
	Advanced Aptitude and Coding Skills II	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Product Development Lab - 4												
	Personality Development (Non-Credit)						✓	✓	✓	✓	✓	✓	
VII	Embedded Systems (Lab Integrated)	✓	✓	✓	✓	✓	✓						✓
	Professional Elective III												
	Professional Elective IV												
	Open Elective II												
	Internship/Seminar (4 weeks)	✓	✓	✓								✓	✓
VIII	Project Work	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

REGULATIONS–2024

CHOICE BASED CREDIT SYSTEM

SEMESTER–I								
Sl. No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY COURSES WITH LABORATORY COMPONENT								
1	24CS101	Programming in C++ (Lab Integrated)	ESC	6	3	0	3	4.5
2	24CS102	Software Development Practices (Lab Integrated)	ESC	6	3	0	3	4.5
3	24PH101	Physics for Electrical and Electronics Engineering (Lab Integrated)	BSC	5	3	0	2	4
4	24EC101	Electronic Devices and Circuit theory (Lab Integrated)	PCC	5	3	0	2	4
THEORY COURSES								
5	24MA101	Matrices and Calculus	BSC	4	3	1	0	4
6	24GE101	Heritage of Tamils	HSMC	1	1	0	0	1
EMPLOYABILITY ENHANCEMENT COURSES								
7	24HS111	Interpersonal skills, Psychometric Analysis and Career Development	EEC	2	0	0	2	1
MANDATORY COURSES								
8	24MC102	Environmental Science & Sustainability (Non Credit)	MC	2	2	0	0	0
9	24GE111	Idea Lab I (Non Credit)	EEC	1	0	0	1	0
10	24MC101	Students Induction Programme (Non Credit)	MC	3 Weeks				
11	24MC103	Programming in C (Noncredit)	MC	40 Hours				
TOTAL				32	18	1	13	23

SEMESTER–II								
Sl. No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY COURSES WITH LABORATORY COMPONENT								
1	24MA202	Transforms and Complex Analysis (Lab Integrated)	BSC	5	3	0	2	4
2	24IT201	Data Structures and Algorithms (Lab Integrated)	ESC	6	3	0	3	4.5
3	24CS202	Java Programming (Lab Integrated)	ESC	6	3	0	3	4.5
4	24CH201	Chemistry for Electrical & Electronics Engineering (Lab Integrated)	BSC	5	3	0	2	4
5	24AM201	Introduction to Artificial Intelligence(Lab Integrated)	ESC	4	2	0	2	3
THEORY COURSE								
6	24GE201	Tamils and Technology	HSMC	1	1	0	0	1
EMPLOYABILITY ENHANCEMENT COURSES								
7	24HS211	Innovation and Creativity Skills Development	EEC	1	1	0	0	1
8	24GE211	Idea Lab II	EEC	2	0	0	2	1
MANDATORY COURSES								
9	24AC201	Yoga for Stress Management (Non Credit)	MC	1	0	0	1	0
TOTAL				31	16	0	15	23

SEMESTER–III								
Sl. No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY COURSES WITH LABORATORY COMPONENT								
1	24EC301	Analog Circuits (Lab Integrated)	PCC	5	3	0	2	4
2	24CS302	Advanced Java Programming	ESC	6	3	0	3	4.5
3	24CS303	Database Management Systems	ESC	6	3	0	3	4.5
THEORY COURSES								
4	24MA302	Probability and Random Processes	BSC	4	3	1	0	4
5	24EC302	Control Systems	PCC	3	3	0	0	3
6	24GE301	Universal Human Values 2: Understanding Harmony	HSMC	3	2	1	0	3
EMPLOYABILITY ENHANCEMENT COURSES								
7	24GE311	Product Development Lab - 1	EEC	2	0	0	2	1
8	24EC311	Internship/Seminar (1 week)	EEC	1	0	0	1	0.5
9	24CS311	Aptitude and Coding Skills I	EEC	3	0	0	3	1.5
MANDATORY COURSES								
10	24MC301	Indian Constitution (Non-Credit)	MC	1	1	0	0	0
TOTAL				**34**	**18**	**2**	**14**	**26**

SEMESTER–IV								
Sl. No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY COURSES WITH LABORATORY COMPONENT								
1	24EC401	Analog and Digital Communication	PCC	5	3	0	2	4
2	24EC402	Linear Integrated Circuits	PCC	5	3	0	2	4
3	24EC403	Digital System Design	PCC	5	3	0	2	4
4	24IT402	Web Development Frameworks	ESC	6	3	0	3	4.5
5	24MA402	Statistics and Linear Algebra	BSC	5	3	0	2	4
THEORY COURSE								
6	24EC404	Introduction to Internet of Things	PCC	3	3	0	0	3
EMPLOYABILITY ENHANCEMENT COURSES								
7	24GE411	Product Development Lab - 2	EEC	2	0	0	2	1
8	24CS411	Aptitude and Coding Skills II	EEC	3	0	0	3	1.5
AUDIT COURSES								
9	24AC401	Value Education (Non Credit)	AC	1	1	0	0	0
TOTAL				**35**	**19**	**0**	**16**	**26**

SEMESTER–V								
Sl. No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY COURSES WITH LABORATORY COMPONENT								
1	24EC501	Digital VLSI Design	PCC	5	3	0	2	4
2	24EC502	Microprocessors and Microcontrollers	PCC	5	3	0	2	4
LABORATORY COURSE								
3		Professional Communication –I (TOEFL)	HSMC	4	0	0	4	2
THEORY COURSES								
4	24EC503	Electromagnetics and Antennas	PCC	3	3	0	0	3
5	24EC504	Wireless Communication	PCC	3	3	0	0	3
6		Professional Elective I	PEC	3	3	0	0	3
EMPLOYABILITY ENHANCEMENT COURSES								
7	24ME511	Product Development Lab-3	EEC	2	0	0	2	1
8	24EC511	Internship / Seminar (2 Weeks)	EEC	2	0	0	2	1
9	24CS511	Advanced Aptitude and Coding Skills I	EEC	3	0	0	3	1.5
MANDATORY COURSES								
10	24MC501	Essence of Indian Traditional Knowledge (Non Credit)	MC	1	1	0	0	0
TOTAL				30	15	0	15	21.5

SEMESTER–VI								
Sl. No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY COURSES WITH LABORATORY COMPONENT								
1	24EC601	Discrete Time Signal Processing	PCC	5	3	0	2	4
2		Design Thinking	HSMC	3	1	0	2	2
LABORATORY COURSE								
4		Professional Communication –II (TOEFL)	HSMC	2	0	0	2	1
THEORY COURSES								
5	24EC602	Computer Networks	PCC	3	3	0	0	3
6		Professional Elective II	PEC	3	3	0	0	3
7		Open Elective I	OEC	3	3	0	0	3
EMPLOYABILITY ENHANCEMENT COURSES								
8	24CS611	Advanced Aptitude and Coding Skills II	EEC	3	0	0	3	1.5
9	24ME611	Product Development Lab - 4	EEC	2	0	0	2	1
AUDIT COURSES								
10	24AC601	Personality Development (Non Credit)	AC	2	2	0	0	0
TOTAL				**26**	**15**	**0**	**11**	**18.5**

SEMESTER–VII								
Sl. No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY COURSES WITH LABORATORY COMPONENT								
1	24EC701	Embedded Systems	PCC	5	3	0	2	4
THEORY COURSES								
2	24EC702	Professional Ethics in Engineering	HSMC	3	3	0	0	3
3		Professional Elective III	PEC	3	3	0	0	3
4		Professional Elective IV	PEC	3	3	0	0	3
5		Open Elective II	OEC	3	3	0	0	3
EMPLOYABILITY ENHANCEMENT COURSES								
6	24EC711	Internship/Seminar (4 weeks)	EEC	4	0	0	4	2
TOTAL				**21**	**15**	**0**	**6**	**18**

SEMESTER–VIII								
Sl. No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
EMPLOYABILITY ENHANCEMENT COURSES								
1	24EC811	Project Work	EEC	16	0	0	16	8
TOTAL				16	0	0	16	8

CREDIT DISTRIBUTION

S. No.	Subject Area	CREDITS AS PER SEMESTER								Total Credits	Anna University
		I	II	III	IV	V	VI	VII	VIII		
1	HSMC	1	1	-	3	2	3	3	-	13	12
2	BSC	8	8	4	4	-	-	-	-	24	25
3	ESC	9	12	9	4.5	-	-	-	-	34.5	21
4	PCC	4	-	10	15	14	7	4	-	51	58
5	PEC	-	-	-	-	3	3	6	-	12	18
6	OEC	-	-	-	-	-	3	3	-	6	12
7	EEC	1	2	3	2.5	3.5	2.5	2	8	24.5	16
8	MC	-	-	-	-	-	-	-	-	-	12
TOTAL		23	23	26	29	22.5	18.5	18	8	165	162

PROFESSIONAL ELECTIVES
IOT

Sl. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1	24EC901	Sensors and Actuator Devices	PEC	3	3	0	0	3
2	24EC902	Application of IoT in Robotics	PEC	3	3	0	0	3
3	24EC903	Data Analytics for IoT	PEC	3	3	0	0	3
4	24EC904	Image Processing and Computer Vision	PEC	3	3	0	0	3
5	24EC905	Introduction to Industry 4.O	PEC	3	3	0	0	3
6	24EC906	IoT & Edge Computing	PEC	3	3	0	0	3

PROFESSIONAL ELECTIVES VLSI								
Sl. No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
1	24EC907	FPGA Architecture and Applications	PEC	3	3	0	0	3
2	24EC908	Low Power VLSI Design	PEC	3	3	0	0	3
3	24EC909	VLSI Verification and Testing	PEC	3	3	0	0	3
4	24EC910	RTL Design & Logic Synthesis	PEC	3	3	0	0	3
5	24EC911	VLSI Signal Processing	PEC	3	3	0	0	3
6	24EC912	VLSI Physical Design Automation	PEC	3	3	0	0	3
7	24EC913	ASIC Design	PEC	3	3	0	0	3
8	24EC914	CAD for VLSI Design	PEC	3	3	0	0	3

PROFESSIONAL ELECTIVES EMBEDDED								
Sl. No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
1	24EC915	Design of Embedded Systems	PEC	3	3	0	0	3
2	24EC916	Embedded RToS	PEC	3	3	0	0	3
3	24EC917	Embedded networking	PEC	3	3	0	0	3
4	24EC918	Software for Embedded Systems	PEC	3	3	0	0	3
5	24EC919	Embedded Processor Development	PEC	3	3	0	0	3
6	24EC920	Embedded System Security	PEC	3	3	0	0	3
7	24EC921	Embedded Control for Electric Drives	PEC	3	3	0	0	3
8	24EC922	Automotive Embedded Systems	PEC	3	3	0	0	3

PROFESSIONAL ELECTIVES TELECOM								
Sl. No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
1	24EC923	Satellite Communication	PEC	3	3	0	0	3
2	24EC924	Optical Communication & Networking	PEC	3	3	0	0	3
3	24EC925	Introduction to 5G Technology	PEC	3	3	0	0	3
4	24EC926	Wireless Sensor Networks	PEC	3	3	0	0	3
5	24EC927	Multimedia Compression and Communication	PEC	3	3	0	0	3
6	24EC928	4G/5G Communication Networks	PEC	3	3	0	0	3

2024

CURRICULUM OF B.E (HONOURS) IN ELECTRONICS AND COMMUNICATION ENGINEERING WITH SPECIALIZATION IN

Internet of Things / VLSI / High Speed Communication / Bio Medical Technology / Signal & Image Processing / Robotics &Automation

INTERNET OF THINGS

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	24EC941	Industrial and Medical IoT	PEC	3	3	0	0	3
2	24EC942	Programming and Web Technologies for IoT	PEC	3	3	0	0	3
3	24EC943	Robotic Operating System	PEC	3	3	0	0	3
4	24EC944	Design of Smart Cities	PEC	3	3	0	0	3
5	24EC979	Capstone Project	PEC	12	0	0	12	6

VLSI

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	24EC947	Semiconductor Devices and Fabrication Processes	PEC	3	3	0	0	3
2	24EC948	RFIC Design	PEC	3	3	0	0	3
3	24EC949	VLSI Algorithms and Architectures	PEC	3	3	0	0	3
4	24EC952	Reconfigurable Architectures	PEC	3	3	0	0	3
5	24EC979	Capstone Project	PEC	12	0	0	12	6

HIGH SPEED COMMUNICATION

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	24EC953	Advanced Wireless Communication	PEC	3	3	0	0	3
2	24EC954	Advanced Wireless Networks	PEC	3	3	0	0	3
3	24EC955	Software-defined networks	PEC	3	3	0	0	3
4	24EC956	Satellite Communication & Navigation Systems	PEC	3	3	0	0	3
5	24EC979	Capstone Project	PEC	12	0	0	12	6

BIO MEDICAL TECHNOLOGY

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	24EC959	Biometric Systems	PEC	3	3	0	0	3
2	24EC960	Bio-signal Processing	PEC	3	3	0	0	3
3	24EC962	Medical Imaging Techniques	PEC	3	3	0	0	3
4	24EC963	Brain Computer Interface and Applications	PEC	3	3	0	0	3
5	24EC979	Capstone Project	PEC	12	0	0	12	6

SIGNAL & IMAGE PROCESSING

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	24EC965	Computer Vision	PEC	3	3	0	0	3
2	24EC966	Big Data Analytics	PEC	3	3	0	0	3
3	24EC967	Image Processing with Python	PEC	3	3	0	0	3
4	24EC970	Pattern Recognition	PEC	3	3	0	0	3
5	24EC979	Capstone Project	EEC	12	0	0	12	6

ROBOTICS & AUTOMATION

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	24EC971	Concepts in Mobile Robotics	PEC	3	3	0	0	3
2	24EC972	Sensors and Actuators for Robotics	PEC	3	3	0	0	3
3	24EC973	Microcontrollers for Robotics	PEC	3	3	0	0	3
4	24EC974	Process Control Automation	PEC	3	3	0	0	3
5	24EC979	Capstone Project	EEC	12	0	0	12	6

R2024

B. E. (HONOURS) IN ELECTRONICS AND COMMUNICATION ENGINEERING

Additional 18 credits to be completed from the courses offered in the Professional Elective Verticals.

R2024

MINOR DEGREE CURRICULUM OFFERED BY DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING (FOR OTHER B.E. / B. TECH PROGRAMMES)

MINOR'S DEGREE IN INTERNET OF THINGS

S.NO	COURSE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	24EC404	Introduction to Internet of Things	PEC	3	3	0	0	3
2	24EC901	Sensors and Actuator Devices	PEC	3	3	0	0	3
3	24EC977	Image and Video Analytics	PEC	3	3	0	0	3
4	24EC943	Robot Operating Systems	PEC	3	3	0	0	3
5	24EC979	Capstone Project	EEC	12	0	0	12	6

OPEN ELECTIVES(Multidisciplinary)

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	24EC001	PCB Design	OEC	3	3	0	0	3
2	24EC002	Embedded Systems	OEC	3	3	0	0	3
3	24EC003	Principles of Analog and Digital Communication	OEC	3	3	0	0	3
4	24EC004	Sensors and Instrumentation	OEC	3	3	0	0	3
5	24EC005	Automotive Electronics	OEC	3	3	0	0	3
6	24EC006	Robotic Systems	OEC	3	3	0	0	3
7	24EC007	Consumer Electronics	OEC	3	3	0	0	3
8	24EC008	Healthcare Electronics	OEC	3	3	0	0	3
9	24EC009	Semiconductor Physics	OEC	3	3	0	0	3
10	24EC010	Biomedical Instrumentation	OEC	3	3	0	0	3
11	24EC011	MATLAB Programming	OEC	3	3	0	0	3
12	24EC012	Industrial IoT Applications	OEC	3	3	0	0	3

Course Code	MATRICES AND CALCULUS	L	T	P	C
24MA101		3	1	0	4

OBJECTIVES:

The course will enable the learners to:

- explain the concepts of matrix algebra techniques.
- understand various techniques to solve second and higher order differential equations.
- demonstrate simple applications of functions of several variables and vector calculus.
- comprehend the basic concepts of multiple integrals.
- illustrate elementary ideas of vector calculus.

UNIT I MATRICES **12**

Eigenvalues and Eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors – Statement and applications of Cayley-Hamilton Theorem – Diagonalization of matrices by orthogonal transformation (excluding similarity transformation) – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II DIFFERENTIAL EQUATIONS **12**

Second and Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients.

UNIT III FUNCTIONS OF SEVERAL VARIABLES **12**

Total derivative – Differentiation of implicit functions – Jacobian and properties – Taylor's series for functions of two variables – Maxima and minima of functions of two variables– Lagrange's method of undetermined multipliers.

UNIT IV MULTIPLE INTEGRALS **12**

Double integrals – Change of order of integration – Area enclosed by Cartesian Coordinates (excluding polar coordinates) – Triple integrals (excluding spherical and cylindrical coordinates) – Volume of solids (Cartesian Coordinates only).

UNIT V VECTOR CALCULUS **12**

Gradient, divergence and curl (excluding vector identities) – Directional derivative – Irrotational and Solenoidal vector fields – Green's theorem in a plane, Stoke's theorem and Gauss divergence theorem (Statement only) - Simple applications involving cubes and rectangular parallelopipeds.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: compute the matrix inverse and their higher powers.

CO2: solve second and higher order differential equations.

CO3: determine the maxima and minima of functions of two variables.

CO4: determine the volume and surface area using multiple integrals.

CO5: evaluate integrals using the concept of vector calculus.

CO6: apply matrix algebra techniques to diagonalize the matrix.

TEXT BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2021.

REFERENCES:

1. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015.
2. M. K. Venkataraman, "Engineering Mathematics", Volume I, 4th Edition, The National Publication Company, Chennai, 2003.
3. Sivaramakrishna Dass, C. Vijayakumari, "EngineeringMathematics", Pearson Education India, 4th Edition 2019.
4. H. K. Dass, and Er. Rajnish Verma, "Higher Engineering Mathematics", S. Chand Private Limited, 3rd Edition 2014.
5. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, 6th Edition, New Delhi, 2008.
6. NPTEL course on "Engineering Mathematics - I", by Prof. Jitendra Kumar, IIT Kharagpur: https://onlinecourses.nptel.ac.in/noc21_ma58/preview

Course Code	HERITAGE OF TAMILS	L	T	P	C
24GE102		1	0	0	1

OBJECTIVES:

The course will enable the learners to:

- recognize Tamil literature and its significance in Tamil culture.
- introduce the Tamils' rich artistic and cultural legacy.
- familiarize the different types of folk and martial arts that are unique to Tamil Nadu.
- acquaint the concept of Thinai in Tamil literature and culture.
- comprehend the significance of Tamil in developing Indian culture.

UNIT I LANGUAGE AND LITERATURE 3

Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry – Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT II HERITAGE - ROCK ART PAINTINGS TO MODERN ART- SCULPTURE 3

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making -- Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III FOLK AND MARTIAL ARTS 3

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV THINAI CONCEPT OF TAMILS 3

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Citiesand Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE 3

Contribution of Tamils to Indian Freedom Struggle – The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement – Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

TOTAL: 15 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: state the role of Tamil literature in shaping Tamil Cultural roots.

CO2: express the cultural and religious significance of Tamil art and sculptures.

CO3: identify and describe the techniques of folk and martial arts.

CO4: glassify the role of Thinai concept in Tamil culture and literature.

CO5: compare the idea of cultural and intellectual contributions of Tamils.

REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. Social Life of Tamils (Dr.K.K. Pillay) A joint publication of TNTB & ESC and RMRL –(in print)
5. Social Life of the Tamils - The Classical Period (Dr.S .Singaravelu) (Published by:International Institute of Tamil Studies.
6. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D.Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
7. The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by:International Institute of Tamil Studies.)
8. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by:
9. Department of Archaeology & Tamil Nadu Text Book and Educational ServicesCorporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr. K. K. Pillay)(Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil NaduText Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL)

Course Code	PROGRAMMING IN C++ (Theory Course with Laboratory Component)	L	T	P	C
24CS101		3	0	3	4.5

OBJECTIVES:

The Course will enable learners to:

- To learn problem solving and programming fundamentals.
- To gain knowledge on pointers and functions.
- To apply the principles of object orientated programming.
- To understand operator overloading, inheritance and polymorphism.
- To use the functionalities of I/O operations, files build C++ programs usingexceptions.

UNIT I PROGRAMMING FUNDAMENTALS 9+9

Types of computer programming languages - Genesis of C++ - Program Life Cycle - Structure of C++ program - Identifiers - Variables - Keywords - Number System -Binary Number System -Octal Number System- Decimal Number System -Hexadecimal Number System - Data types - Constants - Errors – Operators- Expressions - Type Conversions - Control-Flow Statements - Conditional Statements - Iterative Statements -Unconditional Control Statements - Arrays - One-Dimensional Arrays - Two-DimensionalArrays - Multi -Dimensional Arrays - Strings - String Manipulation Functions - Array of Strings.

List of Exercise/Experiments:

1. Write C++ programs for the following:
    a. Find the sum of individual digits of a positive integer.
    b. Compute the GCD of two numbers.
    c. Find the roots of a number (Newton's method)
2. Write C++ programs using arrays:
    a. Find the maximum of an array of numbers.
    b. Remove duplicates from an array of numbers.
    c. Print the numbers in an array after removing even numbers.
3. Write C++ programs using strings:
    a. Checking for palindrome.
    b. Count the occurrences of each character in a given word.

UNIT II POINTERS AND FUNCTIONS 9+9

Pointers - Pointer Variables - Pointer Operators & Expressions -Pointers with Arrays - Functions - Scope Rules -Function Arguments -return Statement - Function Variables - Storage Classes - Types of storage classes - Create Header Files - User-Defined Functions - Inline Functions - Function Overloading -Recursion - Namespaces.

List of Exercise/Experiments:

1. Generate salary slip of employees using structures and pointers. Create a structure Employee with the following members: EID, Ename, Designation, DOB, DOJ, Basic pay Note that DOB and DOJ should be implemented using structure within structure.

2. Compute internal marks of students for five different subjects using structures and functions.

UNIT III CLASSES AND OBJECTS 9+9

Concepts of Object Oriented Programming – Benefits of OOP – Simple C++ program – Classes and Objects - Member functions - Nesting of member functions - Private member functions - Memory Allocation for Objects - Static Data Members - Static Member functions - Array of Objects - Objects as function arguments - Returning objects - friend functions – Const Member functions - Constructors – Destructors.

List of Exercise/Experiments:

1. Write a program Illustrating Class Declarations, Definition, and Accessing ClassMembers.
2. Program to illustrate default constructor, parameterized constructor and copy constructors.

Practice Questions & Scenario Based Questions:

1. Imagine you are working as a software engineer at a tech company. Your team is developing a mathematical software library that will be used in various applications across the company. One of the features that your team lead has asked you to implement is a function that calculates the number of trailing zeros in the factorial ofa number.

   The team lead has emphasized the importance of encapsulation in your implementation.

2. Create a C++ class Calculator representing a simple calculator. The class should have the following attributes and methods:

   Attributes: Two operands and an operation (+, -, *, /)

   Methods: Perform the operation and return the result

   Implement constructors to initialize the calculator with default values (0,0) and with specified values. Also, implement a destructor to perform any necessary cleanup.

UNIT IV OPERATOR OVERLOADING, INHERITANCE AND POLYMORPHISM 9+9

Operator Overloading - Overloading Using Friend functions – Inheritance – Types of inheritance – Virtual Base Class - Abstract Class – Constructors in Derived Classes - member class: nesting of classes.

Pointer to objects – this pointer- Pointer to derived Class - Virtual functions – PureVirtual Functions – Polymorphism.

List of Exercise/Experiments:

1. Write a Program to Demonstrate the i) Operator Overloading. ii) Function Overloading.
2. Write a Program to Demonstrate Friend Function and Friend Class.
3. Program to demonstrate inline functions.
4. Program for Overriding of member functions.
5. Write C++ programs that illustrate how the following forms of inheritance aresupported: Single inheritance b) Multiple inheritance c) Multi level inheritance d) Hierarchicalinheritance.

Practice Questions & Scenario Based Questions:

1. Joy is a software developer at a 3D modeling company. The company is developinga new software tool that will be used by architects and engineers to design and analyze 3D models of various structures. One of the features that her project manager has asked is to implement a function that calculates the volume of basic 3Dshapes like cylinders and cuboids. The project manager has emphasized the importance of using function overloading in her implementation..

2. Imagine you are a software developer tasked with creating a utility program for a school that handles student scores. The school wants a simple program where teachers can enter the scores of students for a particular test, and the program will then provide the highest and lowest scores among them. This will help the teachers quickly identify the top performer and the student who might need extra help.

   Your task is to write program that satisfies the above scenario using **inline function**

3. Develop a software system to manage part-time worker students at a university. These students have unique attributes such as their name, student ID, hourly wage, and hours worked per week. Your goal is to create a C++ program that models this system.

4. Ramu is a software developer at a company specializing in developing softwaresolutions for geometric shapes. Recently, a client approached with a request to create a program to calculate the areas of rectangles and triangles.

UNIT V I/O, FILES AND EXCEPTIONS 9+9

C++ Streams – Unformatted I/O - Formatted Console I/O – Opening and Closing File – File modes - File pointers and their manipulations – Templates – Class Templates – Function Templates - Exception handling.

List of Exercise/Experiments:

1. Program to demonstrate pure virtual function implementation.
2. Count the number of account holders whose balance is less than the minimumbalance using sequential access file.
3. Write a Program to Demonstrate the Catching of all Exceptions.

Practice Questions & Scenario Based Questions:

1. Develop a simple library management system. Create a base class Book representing a book in the library. The class should have attributes such as title, author, and ISBN (International Standard Book Number). Implement a virtual functiondisplayDetails() to display information about the book.
2. A software developer working on a banking application. One of the requirements is toanalyze account holders' balances based on a minimum balance threshold. The application should read account information from a sequential access file, where each line represents an account record in the format: account_holder_name, balance.
3. The financial company is developing a new software tool that will be used by financial analysts to perform various calculations. One of the features of that projectis to implement is a function that performs division of two numbers.

   Write a program that takes two integer inputs, numerator and denominator, from the user. Implement error handling to check if the denominator is zero. If the denominator is zero, display the message "Division by zero is not allowed!" using an

   exception. If the denominator is not zero, calculate the result of the division and display it.
4. Mini project.

TOTAL: 45+45 = 90 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Solve problems using basic constructs in C++.

CO2: Implement C++ programs using pointers and functions.

CO3: Apply object-oriented concepts and solve real world problems.

CO4: Develop C++ programs using operator overloading and polymorphism.

CO5: Implement C++ programs using Files and exceptions.

CO6: Develop applications using C++ concepts

TEXT BOOKS:

1. Herbert Schildt, "The Complete Reference C++", 4th edition, MH, 2015. (Unit 1 & 2)
2. E Balagurusamy,"Object Oriented Programming with C++", 4th Edition, TataMcGraw-Hill Education, 2008. (Unit 3, 4 & 5)

REFERENCES:

1. Karl Beecher,"Computational Thinking: A beginner's guide to problem-solving and programming", BCS Learning & Development Ltd, 2017. (Unit 1)
2. Nell Dale, Chip Weems, "Programming and Problem Solving with C++", 5th Edition,Jones and Barklett Publishers, 2010.
3. John Hubbard, "Schaum's Outline of Programming with C++", MH, 2016.

4. Yashavant P. Kanetkar, "Let us C++", BPB Publications, 2020
5. ISRD Group, "Introduction to Object-oriented Programming and C++", Tata McGraw-Hill Publishing Company Ltd., 2007.
6. D. S. Malik, "C++ Programming: From Problem Analysis to Program Design", ThirdEdition, Thomson Course Technology, 2007.
https://infyspringboard.onwingspan.com/web/en/app/toc/
lex_auth_01297200240671948837_shared/overview

LIST OF EQUIPMENTS:

1. Standalone desktops with C/C++ compiler (or) Server with C/C++ compiler.

Course Code	SOFTWARE DEVELOPMENT PRACTICES (Theory Course with Laboratory Component)	L	T	P	C
24CS102		3	0	3	4.5

OBJECTIVES:

The Course will enable learners to:

- discuss the essence of agile development methods.
- set up and create a GitHub repository.
- create interactive websites using HTML
- design interactive websites using CSS.
- develop dynamic web page using Java script.

UNIT I AGILE SOFTWARE DEVELOPMENT AND Git and GitHub 9+9

Software Engineering Practices – Waterfall Model - Agility – Agile Process – Extreme Programming - Agile Process Models – Adaptive Software Development – Scrum – Dynamic Systems Development Method – Crystal – Feature Driven Development – Lean Software Development – Agile Modeling – Agile Unified Process – Tool set for Agile Process.

Introduction to Git –Setting up a Git Repository - Recording Changes to the Repository - Viewing the Commit History - Undoing Things - Working with Remotes -Tagging - Git Aliases - Git Branching - Branches in a Nutshell - Basic Branching and Merging - Branch Management - Branching Workflows - Remote Branches - Rebasing.

Introduction to GitHub – Set up and Configuration - Contribution to Projects, Maintaining a Project – Scripting GitHub.

List of Exercise/Experiments:

1. Form a Team, Decide on a project:
    a) Create a repository in GitHub for the team.
    b) Choose and follow a Git workflow
        - Each team member can create a StudentName.txt file with contents about themselves and the team project
        - Each team member can create a branch, commit the file with a proper commit message and push the branch to remote GitHub repository.
        - Team members can now create a Pull request to merge the branch to master branch or main development branch.
        - The Pull request can have two reviewers, one peer team member and one faculty. Reviewers can give at least one comment for Pull Request updating.
        - Once pull request is reviewed and merged, the master or main development branch will have files created by all team members.

2. Create a web page with at least three links to different web pages. Each of the web pages is to be designed by a team member. Follow Git workflow, pull request and peer reviews.

3. Form a Team, Decide on a project:
    c) Create a repository in GitHub for the team.
    d) Choose and follow a Git workflow
        - Each team member can create a StudentName.txt file with contents about themselves and the team project
        - Each team member can create a branch, commit the file with a proper commit message and push the branch to remote GitHub repository.
        - Team members can now create a Pull request to merge the branch to master branch or main development branch.
        - The Pull request can have two reviewers, one peer team member and one faculty. Reviewers can give at least one comment for Pull Request updation.
        - Once pull request is reviewed and merged, the master or main development branch will have files created by all team members.
4. Create a web page with at least three links to different web pages. Each of the web pages is to be designed by a team member. Follow Git workflow, pull request and peer reviews.

UNIT II HTML **9+9**

Introduction – Web Basics – Multitier Application Architecture – Cline-Side Scripting versus Server-side Scripting – HTML5 – Headings – Linking – Images – Special Characters and Horizontal Rules – Lists – Tables – Forms – Internal Linking – meta Elements – Form input Types – input and datalist Elements – Page-Structure Elements.

List of Exercise/Experiments:

1. Create web pages using the following:
    - Tables and Lists
    - Image map
    - Forms and Form elements
    - Frames

UNIT III CSS **9+9**

Inline Styles – Embedded Style Sheets – Conflicting Styles – Linking External Style Sheets – Positioning Elements – Backgrounds – Element Dimensions – Box Model and Text Flow – Media Types and Media Queries – Drop-Down Menus – Text Shadows – Rounded Corners – Colour – Box Shadows – Linear Gradients – Radial Gradients – Multiple Background Images – Image Borders – Animations – Transitions and Transformations – Flexible Box Layout Module – Multicolumn Layout.

List of Exercise/Experiments:

1. Apply Cascading style sheets for the web pages created.

UNIT IV JAVASCRIPT BASICS **9+9**

Introduction to Scripting – Obtaining user input – Memory Concepts – Arithmetic – Decision Making: Equality and Relational Operators – JavaScript Control Statements – Functions – Program Modules – Programmer-defined functions – Scope rules – functions – Recursion – Arrays – Declaring and Allocating Arrays – References and Reference Parameters – Passing Arrays to Functions – Multidimensional arrays.

List of Exercise/Experiments:

1. Form Validation (Date, Email, User name, Password and Number validation) using JavaScript.

UNIT V JAVASCRIPT OBJECTS **9+9**

Objects – Math, String, and Date, Boolean and Number, document Object – Using JSON to Represent objects – DOM: Objects and Collections – Event Handling.

List of Exercise/Experiments:

Implement Event Handling in the web pages.

Mini Projects-Develop any one of the following web applications (not limited to one) using above technologies.

a. Online assessment system
b. Ticket reservation system
c. Online shopping
d. Student management system
e. Student result management system
f. Library management
g. Hospital management
h. Attendance management system
i. Examination automation system
j. Web based chat application

TOTAL: 45+45=90 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Understand basic software engineering practices effectively.

CO2: Apply version control using Git and GitHub, and manage code repositories proficiently.

CO3: Design web applications using HTML, CSS, and JavaScript.

CO4: Analyze problems and create solutions using CSS for better web page presentation and usability.

CO5: Develop interactive web pages using JavaScript with an event-handling mechanism.

CO6: Apply the technological changes and improve skills continuously.

TEXT BOOKS:

1. Roger S. Pressman, "Software Engineering: A Practitioner.,s Approach", McGraw Hill International Edition, Nineth Edition, 2020.
2. Scott Chacon, Ben Straub, "Pro GIT", Apress Publisher, 3rd Edition, 2014.
   Deitel and Deitel and Nieto, "Internet and World Wide Web - How to Program", Pearson, 5th Edition, 2018.

REFERENCES:

1. Roman Pichler, "Agile Product Management with Scrum Creating Products that Customers Love", Pearson Education, 1 st Edition, 2010.
2. Jeffrey C and Jackson, "Web Technologies A Computer Science Perspective", Pearson Education, 2011.
3. Stephen Wynkoop and John Burke, "Running a Perfect Website", QUE, 2nd Edition, 1999.
4. Chris Bates, "Web Programming – Building Intranet Applications", 3rd Edition, Wiley Publications, 2009.
5. Gopalan N.P. and Akilandeswari J., "Web Technology", Second Edition, Prentice Hall of India, 2014.
6. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013382690411003904735_shared/overview
7. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013094421427470336209 9_shared/overview

LIST OF EQUIPMENTS:

1. Systems with either Netbeans or Eclipse
2. Java/JSP/ISP Webserver/Apache
3. Tomcat / MySQL / Dreamweaver or
4. Equivalent/ Eclipse, WAMP/XAMP

Course Code	PHYSICS FOR ELECTRICAL AND ELECTRONICS ENGINEERING (Theory Course with Laboratory Component)	L	T	P	C
24PH101		3	0	2	4

OBJECTIVES:

The course will enable the learners to:

- understand the classical free electron theory and Fermi distribution function
- differentiate the types of semiconductors and derive their carrier concentration
- relate the theory of laser with its applications in optical devices.
- solve the Schrodinger's wave equation in one dimensional and three dimensional box
- comprehend the behavior of semiconductor diodes in various electron devices and nano electronic devices.

UNIT I CONDUCTING MATERIALS **12**

Drude and Lorentz classical free electron theory - Expressions for electrical conductivity and thermal conductivity -Wiedemann-Franz law - Success and failures of classical free electron theory - thermal conductivity of a bad conductor- Lee's disc method -Fermi-Dirac distribution function - Effect of temperature on Fermi-Dirac distribution function- Density of energy states – Total energy and average energy of an electron at 0 K. (Theory-9)

1. Determination of thermal conductivity of a bad conductor- Lee's disc method

(Laboratory-3)

UNIT II SEMICONDUCTING MATERIALS **15**

Elemental and Compound semiconductors – Energy-wave vector diagram – Intrinsic semiconductor- carrier concentration in intrinsic semiconductors- Determination of Fermi energy and Bandgap - Extrinsic semiconductors - Carrier concentration in n-type and p-type semiconductors – Law of mass action -Variation of Fermi level with temperature and impurity concentration - Hall effect and its applications.

(Theory -9)

1. Band gap determination of intrinsic semiconductor
2. Determination of Hall-coefficient of semiconductor

(Laboratory -6)

UNIT III LASER AND OPTICAL DEVICES **18**

Laser characteristics - Spatial and Temporal Coherence - Population inversion - Relation between Einstein's A and B coefficients - Components of Laser - Optical amplification (qualitative) -

Semiconductor lasers: Homojunction and Heterojunction- Principle and propagation of light through an optical fiber -Acceptance angle and Numerical aperture, LED, PN photodiodes - PIN photodiode and Avalanche photodiode - -Engineering applications of lasers (qualitative)-.

(Theory -9)

1. Determination of divergence of laser beam
2. Determination of acceptance angle and numerical aperture of an optical fiber
3. Determination of wavelength of semiconductor laser

(Laboratory-9)

UNIT IV QUANTUM PHYSICS **15**

Planck's quantum theory- Black body radiation- Newton's law of Cooling – Heisenberg's Uncertainty principle – Schrodinger's wave equations (time independent and time dependent)- Physical significance of wave function - de Broglie hypothesis -Particle in a one-dimension box – Particle in a three- dimensional box (Qualitative) – Degenerate and Non degenerate energy states Tunneling through a potential barrier.

(Theory -9)

1. Determination of Planck's constant
2. Determination of emissivity – Newton's law of cooling

(Laboratory -6)

UNIT V NANO ELECTRONIC DEVICES **15**

Introduction to Nano materials – synthesis by sol gel method, properties – Moore's law - Electron density in bulk material (qualitative) -Size dependence of Fermi energy- Band gap of nanomaterial - Quantum confinement -Quantum Structures-Density of states in quantum well, quantum wire and quantum dot structures – Application: Quantum dot laser.

(Theory -9)

1. Synthesis of nano-powders by sol-gel method
2. Determination of particle size using laser source

(Laboratory -6)

TOTAL: 75 PERIODS

COURSE OUTCOMES

Upon completion of the course, the students will be able to:

CO1: derive electrical and thermal conductivities using classical free electron theory
CO2: use Fermi Dirac distribution function to determine the density of energy states
CO3: distinguish between the types of semiconductors using the hall effect experiment
CO4: associate the basic principles of working of laser and their applications in opto-electronic Devices
CO5: calculate the energy eigen value and eigen function for a particle in a one- dimensional and three dimensional box using Schrodinger wave equations
CO6: relate the quantum properties of nanoscale materials with their applications

TEXT BOOKS

1. Arthur Beiser, Concepts of Modern Physics, Tata McGraw-Hill, New Delhi, 2010.
2. M.N. Avadhanulu and P.G. Kshirsagar, A text book of Engineering Physics, S. Chand and Company, New Delhi, 2014.
3. Kasap, S.O. Principles of Electronic Materials and Devices, McGraw-Hill Education, 2007.
4. Wahab, M.A., Solid State Physics: Structure and Properties of Materials. Narosa Publishing House,2009.
5. William T. Silfvast, Laser Fundamentals, 2nd Edition, Cambridge University press, New York, 2004.

REFERENCES

1. R.K. Gaur and S.L. Gupta, Engineering Physics, Dhanpat Rai Publications (P) Ltd., Eighth Edition., New Delhi, 2001.
2. Hanson, G.W., Fundamentals of Nanoelectronics, Pearson Education, 2009
3. R. A. Serway and J.W. Jewett, Physics for Scientists and Engineers, Ninth Edition. Cengage Learning, 2014.
4. Rogers, B., Adams, J. & Pennathur, S. Nanotechnology: Understanding Small Systems. CRC Press, 2014.
5. Marikani, Materials Science, PHI Learning Private Limited, Eastern Economy Edition, 2017.
6. R. Wolfson, Essential University Physics, Volume 1 and 2 with Mastering Physics, Global Edition,3rd Edition, Pearson 2017.
7. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning India, 2012.
8. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc., 1995.

9. Garg, H.P., Treatise on Solar Energy, John Wiley & Sons, 2006.
10. Wilson J.D. and Hernandez C.A., Physics Laboratory Experiments, Houghton Mifflin Company, New York 2005.
11. NPTEL course on "Introduction to LASER" by Prof. M. R. Shenoy, IIT Delhi : https://onlinecourses.nptel.ac.in/noc24_ph45/preview
12. NPTEL course on "Introduction to Semiconductor Devices" by Prof. Naresh Kumar Emani, IIT Hyderabad : https://onlinecourses.nptel.ac.in/noc24_ee99/preview
13. Physics for Electronics Engineering – Laboratory Manual, R.M.D. Engineering College, 2022.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

S. No.	Description of Equipment	Quantity
1.	Semiconductor Laser	6 Nos.
2.	Determination of optical fiber parameters	6 Nos.
3.	Lee's disc apparatus	6 Nos.
4.	Emissivity Determination	6 Nos.
5.	Bandgap determination set up	6 Nos.
6.	Sol-gel synthesis of nano powders	6 Nos.
7.	Planck's constant apparatus	6 Nos.
8.	Hall effect set-up	2 Nos.

Course Code	ELECTRONIC DEVICES AND CIRCUIT THEORY (Theory course with laboratory component)	L	T	P	C
24EC101		3	0	2	4

COURSE OBJECTIVES:

- To discuss the behavior of semiconductor diodes in various applications.
- To familiarize the operation of BJT and FET.
- To construct electronic circuits using special semiconductor devices.
- To understand the fundamental laws of electric circuits.
- To analyze the response of electric circuits using network theorems.

UNIT I OVERVIEW OF ELECTRONIC DEVICES AND ELECTRICAL CIRCUITS **9+6**

Basic Electronic Components: Resistors, Capacitors, Inductors; Diodes types-PN Junction, Special purpose diodes- Zener Diode, Photodiode, LED, Solar Cell- Characteristics. Basic Electrical Circuits: Ohm's Law, Short and open circuits, Voltage division in series, current division in parallel. Analysis of series and parallel circuits.

List of Experiments:

1. VI Characteristics of PN diode.
2. VI Characteristics of Zener diode.

UNIT II BIPOLAR JUNCTION TRANSISTOR **9+6**

BJT Types - NPN and PNP transistors, Transistor Characteristics: Input and output characteristics, and the concept of operating regions (active, cutoff, saturation) in common base, common emitter and common collector Configurations -Advantages and Disadvantages of BJT.

List of Experiments:

3. .VI Characteristics of BJT in Common Emitter Configuration & also Simulate using PSPICE
4. VI Characteristics of BJT in Common Base Configuration & also Simulate using PSPICE
5. VI Characteristics of BJT in Common Collector Configuration & also Simulate using PSPICE

UNIT III FIELD EFFECT TRANSISTORS **9+6**

Theory and Operation of JFET: Structure, types, operation and characteristics of JFET. Advantages and Disadvantages of JFET. Theory and Operation of MOSFET: Structure, types, operation and characteristics of MOSFET (enhancement-mode, depletion-mode). Advantages and Disadvantages of MOSFET.

List of Experiments:

6. Characteristics of JFET & also Simulate using PSPICE or Multisim.
7. Characteristics of MOSFET & also Simulate using PSPICE or Multisim

UNIT IV CIRCUIT THEORY **9+6**

Equivalent resistance, Star-Delta conversion; Kirchhoff's Laws: Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL); Mesh Analysis and Node Analysis (AC and DC).

List of Experiments:

8. Verification of Kirchhoff's current law and Kirchhoff's voltage law

UNIT V NETWORK THEOREMS 9+6

Thevenin's and Norton's theorems – Superposition Theorem –Maximum power transfer theorem, Millman's theorem.

List of Experiments:

9. Verification of Thevenin's theorem.
10. Verification of Norton's theorem.

TOTAL: 45 THEORY + 30 LAB = 75 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Explain the operating principles of electronic devices

CO2: Analyze the V-I characteristics of electronic devices.

CO3: Design basic electronic circuits using various electron devices.

CO4: Analyze electric circuits using network theorems.

CO5: Evaluate the Performance of Electrical and Electronic Circuits Using SimulationTools

CO6: Develop simple circuits for real time applications.

TEXTBOOKS:

1. Charles K. Alexander, Matthew N. O. Sadiku, Fundamentals of Electric Circuits, 7thEdition, McGraw Hill, 2022.
2. Robert L. Boylestad, Louis Nashelsky, Electronic Devices and Circuit Theory, 11thEdition, 2017.

REFERENCES:

1. W.H.Hayt, J.E.Kemmerly and S.M.Durbin, Engineering Circuit Analysis, 9thEdition, McGraw Hill Education, New Delhi, India, 2019.
2. Joseph Edminister and Mahmood Nahvi, Electric Circuits, Schaum's Outline Series, 5thEdition Reprint, Tata McGraw Hill Publishing Company, New Delhi,2016.
3. David A Bell, Electric Circuits and Electronic Devices, Oxford University Press,2010.
4. Thomas L.Floyd, Electronic Devices, 9th Edition, Pearson, 2017.
5. Donald A.Neaman, Semiconductor Physics and Devices, 4th Edition, McGrawHill, 2017.
6. Dr.R.S.Sedha, A Textbook of Applied Electronics, S Chand and company limited, 2019.

NPTEL LINK

1. https://archive.nptel.ac.in/courses/108/108/108108122/2.
2. https://onlinecourses.nptel.ac.in/noc22_ee93/preview

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

Bread Boards -15 Nos

CRO (30MHz) - 10 Nos

Signal Generator /Function Generators (3 MHz) - 15 Nos

Transistor/FET/BJT(NPN-PNP) and MOSFET(NMOS/PMOS) - 25 Nos Dual power supply/ single mode power supply - 15 Nos

Multimeter -15 Nos

Ammeter (0-50) mA -15 Nos

Voltmeter (0-30) V-15 Nos

Standalone desktops PC with SPICE

Course Code	STUDENT INDUCTION PROGRAM (SIP)	L	T	P	C
24MC101		3 Weeks			

OBJECTIVES

The course will enable the learners to:

- Facilitate the adjustment of new students to the new environment, ensuring they feel comfortable and supported.
- Inculcate the institution's ethos and culture in new students, helping them internalize these values.
- Encourage the building of bonds among students and between students and faculty members.
- Expose students to a sense of larger purpose and guide them in their journey of self-exploration.

The various modules or core areas recommended for the 3-week SIP are

Module 1: Universal Human Values I **18**

Welcome and Introductions - Aspirations and Concerns - Self- Management - Health - Relationships - Society - Natural Environment - Sum Up - Self-evaluation and Closure.

Module 2: Physical Health and Related Activities **6**

Special Lecturers: Happy and Healthy lifestyle - Physical Health -Mental Health - Health and Fitness.

Module 3: Familiarization of Department/ Branch and Innovation **8**

Principal Address - Address by Head of Science and Humanities - Addresses by Respective Department HoDs – Campus Tour – CoE introduction – Introduction of Student Activity Cell (SAC).

Module 4: Visit to a Local Area **4**

Virtual tour: Government Museum - Theosophical Society - Fort St. George - Ripon Building - Kalakshetra Foundation - Anna Centenary Library - Marina Beach - St. Thomas Mount - Vivekananda House**.**

Module 5: Lectures by Eminent People **10**

Special Lecturers: Academics – industry – Careers – Art - Self-management.

Module 6: Proficiency Modules **30**

Basic Competencies: C Programming, Foundation in Mathematics, Interpersonal Communication.

Module 7: Literature / Literary Activities **7**

Literary Debate - Creative Writing Workshop - Literature Circle Discussions - Author Study and Presentation.

Module 8: Creative Practices **10**

Activity: Handicrafts (Painting / Drawing / Pottery / Knitting / Jewellery making, etc.)

Module 9: Extra Curricular Activities **10**

Students Activity Cell: Activities from Coding Club – Math Club -- Language Club - Astronomy Club - ECO Club - Photography Club - Tedx Club -Yoga Club.

Valedictory and Closing Ceremony **2**

TOTAL: 105 PERIODS

COURSE OUTCOMES

Upon completion of the course, the students will be able to:

- Achieve a smooth transition where students feel comfortable and confident in their new environment.
- Demonstrate a strong understanding and practice of the institution's ethos and culture within the campus community.
- Build meaningful and supportive relationships with peers and faculty members.
- Develop a clear sense of purpose and engage in self-exploration, leading to a deeper understanding of personal goals and aspirations.

REFERENCE:

https://www.aicte-india.org/sites/default/files/Detailed%20Guide%20on%20Student%20Induction%20program.pdf

Course Code	ENVIRONMENTAL SCIENCE AND SUSTAINABILITY	L	T	P	C
24MC102		2	0	0	0

OBJECTIVES:

The course will enable the learners

- To gain knowledge of the environment and various natural resources.
- To identify the Scientific and Technological solutions to pollution issues and waste management.
- To understand the significance of the conservation of biodiversity.
- To recognize the needs and benefits of sustainability and its management.
- To comprehend the effects of human population on the environment.

UNIT I NATURAL RESOURCES 7

Definition, scope and importance of environment – need for public awareness. Introduction to natural resources - types - forest resources: use and over-exploitation, deforestation and its impacts, food resources: effects of modern agriculture, organic farming, renewable energy sources - solar, wind, geothermal, tidal, OTE and biomass. field activity -tree plantation

UNIT II POLLUTION AND WASTE MANAGEMENT 7

Pollution - definition –causes, effects and control measures of (a) air pollution (b) water pollution (c) soil pollution (d) noise pollution (e) nuclear hazards - nuclear accidents and holocaust - role of an individual in prevention of pollution –case studies.

Waste management- municipal solid wastes, E- waste, plastic waste.

Field study – Solid waste management of the institution

UNIT III BIODIVERSITY AND ITS CONSERVATION 6

Biodiversity: types – values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity – endangered and endemic species, extinct, rare, vulnerable species of India – conservation of biodiversity: in-situ and ex-situ method.

Field study – Biodiversity of the institution

UNIT IV SUSTAINABILITY AND MANAGEMENT 5

Sustainability-concept, needs and challenges- circular economy - sustainable development goals-concept of carbon footprint, environmental impact assessment, clean development mechanism, solutions.

Field study – Alternate energy sources and its impacts

UNIT - V HUMAN POPULATION **5**

Introduction - population growth, variation among nations, population explosion, environment and human health – endemic/epidemic/pandemic – role of information technology in environment and human health.

Case Study – Pandemics of 21st century

TOTAL: 30 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students will be able

CO1: To investigate and use conservational practices to protect natural resources.

CO2: To identify the causes of pollutants and illustrate suitable methods for pollution abatement.

CO3: To analyze the values of biodiversity and its conservational methods.

CO4: To classify suitable sustainable development practices and apply it in day-to-day life.

CO5: To assess the impacts of human population and suggest suitable solutions.

CO6: To develop innovative solutions and strategies to address sustainability challenges.

TEXTBOOKS:

1. Anubha Kaushik and C.P. Kaushik, "Perspectives in environmental studies", New Age International Publishers, 8th edition, 2024.
2. Benny Joseph, Environmental Science and Engineering, McGraw-Hill, 1st edition, 2017.
3. Gilbert M. Masters, Introduction to Environmental Engineering and Science, Pearson Education, 3rd edition, 2014.
4. Erach Bharuch, Textbook of Environmental Studies for Undergraduate Courses, Universities Press(I) Pvt. Ltd., 3rd edition, 2021.

REFERENCES:

1. William P. Cunningham and Mary Ann Cunningham Environmental Science: A Global Concern, McGraw Hill, 14th edition, 2017.
2. Rajagopalan, R, Environmental Studies-From Crisis to Cure, Oxford University Press, 2015.
3. G. Tyler Miller and Scott E. Spoolman, —Environmental Science, Cengage Learning India Pvt, Ltd., Delhi, 2014.
4. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall, 2012.
5. Bradley. A.S; Adebayo, A.O. and Maria, P. Engineering applications in sustainable design and development, Cengage learning, 2015.
6. Environment Impact Assessment Guidelines, Notification of Government of India, 2006 and subsequent amendments, 2022

Course Code	INTERPERSONAL SKILLS, PSYCHOMETRIC ANALYSIS AND CAREER DEVELOPMENT	L	T	P	C
24HS111		1	0	0	1

OBJECTIVES

The course will enable the learners to:

- Evaluate and enhance language proficiency by using SMART Vox to assess communication skills and linguistic abilities.
- Explore future technologies, solve real-time problems, and prepare students for campus recruitment.
- Assess and develop work style, cognitive abilities, emotional intelligence, and work competencies
- Explore placements, internships, higher education options, GATE and CAT exams, and career development.
- Understand career milestones, assess personal skills and personality, and develop effective goal-setting strategies for successful career planning

UNIT I LANGUAGE PROFICIENCY EVALUATION 3

Identification of Strengths and Weaknesses - Assessing Language Skills (Diagnostic tests and interactive exercises) - Measuring Language Competence (Proficiency Levels) - Identifying Support Needs - Developing Individual Learning Plans - Enhancing Student Experience (Building Confidence) – Evaluation using SMART Vox

UNIT II CAREER GUIDANCE 3

Future of Engineering- Various aspects of Technology and its Applications - Future of Technologies – Branch Specific emerging technologies - Problems solving through open source - Campus recruitment process.

UNIT III PSYCHOMETRIC EVALUATION 3

Understanding Behavioural work style (Personality)- Testing of numerical, logical, and verbal reasoning skills (Cognitive Abilities / Aptitude) – Measure of emotional intelligence and interpersonal skills – Determination of Culture Preferences in various workplace scenarios – Evaluation of Work Competencies through targeted games and simulations

UNIT IV CAREER PREPARATION 3

Present Scenario of Engineering - Placement Opportunities - Internship Opportunities - Types of Internships- Higher Education opportunities in India and Abroad - Understanding GATE and CAT Exams - Other Opportunities - Career path development plans.

UNIT V CAREER VISION AND PLANNING **3**

Introduction to career milestones - Overview of the Vision Assessment and its benefits - Psychometric evaluation - Numeracy, Literacy, Visual Reasoning, Algorithmic Thinking - Introduction to a goal-setting model - Identification career pathways aligned with personality profiles
- Evaluate personal skills and abilities in various areas.

COURSE OUTCOMES **TOTAL: 15 PERIODS**

Upon completion of the course, the students will be able to:

CO1: Assess and improve their English language proficiency using SMART Vox, gaining insights into their communication skills and linguistic competence
CO2: Understand future engineering trends, emerging technologies, importance of solving real-time problems, and the process of campus recruitment.
CO3: Evaluate their behavioral work style, cognitive abilities, emotional intelligence, cultural preferences, and work competencies.
CO4: Understand the current engineering landscape, placement opportunities, and higher education prospects to develop effective career path plans
CO5: Develop a clear and actionable vision for their future career path.

Course Code	IDEA LAB – I	L	T	P	C
24GE111		0	0	1	0

The students may be grouped into 3 to 4. The device/Machine/system/component are studied by the students and a final presentation to be done by the students about the study of various devices or machinery at the end of the semester.

OBJECTIVES:
Students completing this course are expected to

- Understand the functionalities and limitation of various machines/equipment
- Demonstrate various operations that can be performed using various machines

LIST OF EXPERIMENTS

1. Study of fundamental operations of 3D Printer and Scanner with Software.
2. Study of Laser cutting machine.
3. Study of CNC Router machine.
4. Study of Fundamentals of basic circuit design, Soldering and Desoldering.
5. Study of PCB Milling Machine.

TOTAL: 15 PERIODS

OUTCOMES
After successful completion of the course the students will be able to

CO1 Describe the working of the 3D Printer.

CO2 Explain the operation of the CNC router and laser cutting machines.

CO3 Explain the basic parts and PCB fabrication process.

CO4 Develop the ability to handle delicate electronic components carefully, minimizing damage during the soldering process.

CO5 Describe the process for converting ideas into prototypes.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S.No	Equipment Name	Quantity
1	CNC Router	1 No
2	3D Printer	1 No
3	3D Scanner	1 No
4	Laser cutting Machine	1 No
5	Multimeter	5 Nos
6	Solder Stations	5 Sets
7	Desoldering Machine	1 No
8	PCB Milling Machine	1 No
9	Variable Power Supply	1 No
10	Electronic Components like Resistors, Transistors, Diode, Inductor, Capacitor, etc.	5 Sets

Course Code	TAMILS AND TECHNOLOGY	L	T	P	C
24GE201		1	0	0	1

OBJECTIVES:

The course will enable the learners to:

- recognize the historical significance of weaving and pottery technologies in ancientTamil civilization.
- highlight the concepts of design and construction technology during the Sangam age.
- provide an overview of manufacturing technology and its role in Tamil society.
- illustrate the agricultural and irrigation techniques employed in ancient Tamil society.
- promote scientific Tamil and Tamil computing.

UNIT I WEAVING AND CERAMIC TECHNOLOGY 3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY 3

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram – Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

UNIT III MANUFACTURING TECHNOLOGY 3

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting,steel -Copper and gold-Coins as source of history - Minting of Coins – Beads making-industries Stone beads - Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING 3

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

TOTAL: 15 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: identify the role of weaving and ceramic technology in ancient Tamil Culture.
CO2: assess the design and construction technology ideas in the current Tamil society.
CO3: identify the different types of manufacturing technology used in Tamil society and their significance.
CO4: classify agricultural and irrigation technologies in ancient Tamil society and its current relevance.
CO5: discuss the fundamentals of scientific Tamil and Tamil computing.

REFERENCE BOOKS

1. தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. Social Life of Tamils (Dr.K.K. Pillay) A joint publication of TNTB & ESC and RMRL –(in print)
5. Social Life of the Tamils - The Classical Period (Dr.S .Singaravelu) (Published by:International Institute of Tamil Studies.
6. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D.Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
7. The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by:International Institute of Tamil Studies.)
8. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by:
9. Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr. K. K. Pillay)(Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil NaduText Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL).

Course Code	TRANSFORMS AND COMPLEX ANALYSIS (Theory with Laboratory Component)	L	T	P	C
24MA202		3	0	2	4

OBJECTIVES:

The course will enable the learners to:

- comprehend the concepts of Laplace transforms.
- understand the basic ideas of Z-Transforms.
- illustrate the application of transforms in solving differential and difference equations.
- understand the concepts of analytic functions and conformal mapping.
- impart the knowledge of complex integration.

UNIT I LAPLACE TRANSFORMS 15

Laplace transforms – Sufficient condition for existence – Transform of elementary functions – Basic properties – Transforms of derivatives and integrals of functions – Derivatives and integrals of transforms –Transforms of unit step function and impulse functions – Transform of periodic functions – Inverse Laplace transform – Convolution theorem (Statement only).

Experiments using C Program:

1. Find the Laplace Transform of simple functions.
2. Find the inverse Laplace Transform of simple functions.

UNIT II Z – TRANSFORMS 15

Z-transforms – Elementary properties – Inverse Z-transforms – Partial fractions method – Residue method – Convolution theorem.

Experiments using C Program:

1. Find the Poles of X(z).
2. Resolve the X(z) by partial fraction method.

UNIT III SOLUTION OF DIFFERENTIAL AND DIFFERENCE EQUATIONS 15

Solution of linear ordinary differential equation of second order with constant coefficients and first order simultaneous equations with constant coefficients using Laplace transform. Formation of difference equations – Solution of first and second order difference equations with constant coefficients using Z-transform.

Experiments using C Program:

1. Find the solution of Ordinary Differential Equations.
2. Find the solution of Difference Equations.

UNIT IV ANALYTIC FUNCTIONS **15**

Analytic functions – Necessary and sufficient conditions in Cartesian coordinates (statement only) – Properties (only Cartesian coordinates) – Harmonic conjugates – Construction of an analytic function – Conformal mapping – Mapping by functions W= c+z, cz, 1/z – Bilinear transformation.

Experiments using C Language:

1. Compute Real and Imaginary Parts of the Exponential Function.
2. Compute the harmonic conjugate of a given function.

UNIT V COMPLEX INTEGRATION **15**

Cauchy's integral theorem (statement only) – Cauchy's integral formula (statement only) – Taylor's and Laurent's series – Singularities – Residues – Cauchy's Residue theorem (statement only) – Evaluation of real integrals using circular and semicircular contour (excluding poles on real axis).

Experiments using C Language:

1. Find the Taylor's series expansion of X(z) at any point.
2. Find the Residues of X(z).

TOTAL: 75 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: determine Laplace transform and inverse Laplace transform of simple functions.

CO2: determine Z- transform and inverse Z- transform of simple functions.

CO3: solve ordinary differential equations using Laplace transform and difference equations using Z-Transform.

CO4: construct an analytic function and analyze conformal mapping.

CO5: evaluate the real integrals using complex integration.

CO6: identify singularities using Taylor's and Laurent's series.

TEXT BOOKS:

1. N. Bali, M. Goyal and C. Watkins, "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
2. B.S. Grewal, Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2021.

REFERENCES:

1. Erwin. Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. R.K. Jain and S.R.K Iyengar "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
3. R.C. Wylie and L.C. Barrett, "Advanced Engineering Mathematics", Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.
4. M.K. Venkataraman, "Engineering Mathematics, Volume II", 4th Edition, The National Publication Company, Chennai, 2003.
5. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, 6th Edition, New Delhi, 2008.
6. NPTEL course on "Transform Techniques for Engineers", by S.R.Manam, IIT Madras: https://archive.nptel.ac.in/courses/111/106/111106111/
7. NPTEL course on "Advanced Engineering Mathematics", by Prof. P. N. Agarwal, IIT Roorkee: https://onlinecourses.nptel.ac.in/noc23_ma90/preview

Course Code	DATA STRUCTURES AND ALGORITHMS	L	T	P	C
24IT201		3	0	3	4.5

OBJECTIVES:

The Course will enable learners to:

- To understand the concepts of linear structures ADTs.
- To gain the knowledge of searching and sorting algorithms.
- To learn hashing algorithms and its applications.
- To understand the tree data structures.
- To understand graph structures.

UNIT I INTRODUCTION 9+9

Asymptotic Notations and Analysis of Algorithms– Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation - circular linked list implementation - Double linked list implementation - Applications of linked lists. Stack: Operations, array and linked representations of stacks, stack applications. Queues: Operations, array and linked representations of Queue, Queue applications.

List of Exercise/Experiments:

1. Implementation of Singly, Doubly and Circular Linked List
2. Implementation of Stack using Arrays and Linked List
3. Implementation of Stack applications
4. Implementation of Queue using Arrays and Linked List
5. Implementation of Queue applications

UNIT II SEARCHING AND SORTING ALGORITHMS 9+9

Incremental Design Strategies - Searching: Linear and binary search, Sorting: Bubble sort, Insertion sort - Selection sort -Divide & Conquer- Quick sort – Merge sort.

List of Exercise/Experiments:

1. Implementation of searching and sorting algorithms

UNIT III TREES 9+9

Trees: Binary Tree - Terminology and Properties - Binary Search Tree - Insertion, Deletion, Traversal – In order, Preorder and Post order, Level order traversal, finding min and max, finding the kth minimum element in a BST

List of Exercise/Experiments:

1. Implementation of Binary Search Tree

UNIT IV GRAPHS 9+9

Graphs – Representation - Traversal - BFS and DFS, Graph Algorithms: Minimum spanning Tree-Prims and Kruskal's, Shortest path algorithm - Dijkstra, Floyd and Warshall – Backtracking

List of Exercise/Experiments:

1. Implementation of Graph Traversal algorithm
2. Implementation of Minimum spanning tree algorithm
3. Implementation of Prims and Kruskal's algorithm
4. Implementation of Shortest path algorithm

UNIT V HEAPS AND HASHING 9+9

Heaps and Hashing - Implementation of Heaps, Binary Heap, Heap sort - Applications - Hash functions, open hashing-separate chaining, closed hashing - linear probing, quadratic probing, double hashing, random probing, rehashing

List of Exercise/Experiments:

1. Implementation of Hashing techniques
2. Implementation of Heap

TOTAL:45+45=90 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Analyze and compare functions using asymptotic analysis and Understand the concepts of basic data structures such as array and linked list.

CO2: Applying a suitable algorithm for searching and sorting.

CO3: Analyze the various tree algorithms for solving real time computing problems.

CO4: Understanding graph algorithms, operations, and applications

CO5: Understanding the importance of hashing.

CO6: Apply the appropriate data structure in context of solution of given problem.

TEXTBOOKS:

1. Thomas H. Cormen, C.E. Leiserson, R L. Rivest and C. Stein, Introduction to Algorithms, Third edition, MIT Press, 2009.

2. Anany Levitin, Introduction to the Design and Analysis of Algorithms, 3rd edition, Pearson Education, 2021

REFERENCES:

1. Kurt Mehlhorn, and Peter Sanders – Algorithms and Data Structures - The Basic Toolbox, Springer - Verlag Berlin Heidelberg, 2008.
2. Debasis Samanta, "Classic Data Structures", Prentice Hall of India, 2nd edition, 2014.

LIST OF EQUIPMENTS:

Systems with Linux Operating System and GNU Compiler

Course Code	JAVA PROGRAMMING	L	T	P	C
24CS202	(Theory Course with Laboratory Component)	3	0	3	4.5

OBJECTIVES:

The Course will enable learners to:

- explain object oriented programming concepts and fundamentals of Java
- apply the principles of packages, interfaces and exceptions
- develop a Java application with I/O streams, threads and generic programming
- build applications using strings and collections.
- apply the JDBC concepts

UNIT I JAVA FUNDAMENTALS 9+9

An Overview of Java - Data Types, Variables, and Arrays – Operators - Control Statements – Class Fundamentals – Declaring objects – Methods – Constructors – thiskeyword – Overloading methods - Overloading constructors - Access Control – Static –Final

List of Exercise/Experiments:

1. Develop a Java application to generate Electricity bill. You must use one super classcalled EB Bill and must have two sub classes namely Domestic Bill and Commercial Bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection (i.e domestic or commercial). Compute the bill amount using the following tariff
   If the type of the EB connection is domestic, calculate the amount to be paid asfollows: First 100 units - Rs. 1 per unit
   101-200 units - Rs. 2.50 per unit 201 -500 units - Rs. 4 per unit ,> 501 units - Rs. 6 per unit
   If the type of the EB connection is commercial, calculate the amount to be paid asfollows: First 100 units - Rs. 2 per unit ,101-200 units - Rs. 4.50 per unit 201 -500 units - Rs. 6 per unit, 501 units - Rs. 7 per unit
2. Arrays Manipulations: (Use Methods for implementing these in a Class)
   - Find kth smallest element in an unsorted array
   - Find the sub array with given sum
   - Matrix manipulations – Addition, Subtraction, Multiplication
   - Remove duplicate elements in an Array
   - Accept an integer value N and print the Nth digit in the integer sequence 1, 2, 3,4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 and so on till infinity.

   Example: The 11th digit in the sequence 12345678910111213…. is 0.

UNIT II INHERITANCE, INTERFACES AND EXCEPTION HANDLING 9+9

Inheritance: Inheritance basics, Using super, Method Overriding, Using Abstract Classes, Using final with Inheritance - Package and Interfaces: Packages, Packages and member access, Importing Packages, Interfaces, Static Methods in an Interface – Exception Handling: Exception- Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions.

List of Exercise/Experiments:

1. Develop a Java application to implement currency converter (Dollar to INR, EUROto INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM andvice versa), time converter (hours to minutes, seconds and vice versa) using packages.
2. Develop a Java application with Employee class with Emp_name, Emp_id, Address,Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% ofBP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.
3. Design a Java interface for ADT Stack. Implement this interface using array andbuilt-in classes. Provide necessary exception handling in both the implementations.
4. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains the methods print Area () that prints the areaof the given shape and Numberofsides() that prints the number of sides of the given shape.
5. Write a Java program to apply built-in and user defined exceptions.

UNIT III MULTITHREADING, I/O AND GENERIC PROGRAMMING 9+9

Multithreaded Programming: Creating a Thread, Thread Priorities, Synchronization, Interthread Communication – I/O: I/O Basics, Reading Console Input, Writing Console Output, Reading and Writing Files – Generics: Introduction, Generic class, Bounded Types, Generic Methods, Generic Interfaces, Generic Restrictions.

List of Exercise/Experiments:

1. Write a Java program to read and copy the content of one file to other by handling all file related exceptions.

UNIT IV STRING HANDLING AND COLLECTIONS 9+9

Lambda Expressions - String Handling – Collections: The Collection Interfaces, The Collection Classes – Iterator – Map - Regular Expression Processing.

List of Exercise/Experiments:

1. String Manipulation:
   a. Reversing a set of words and count the frequency of each letter in the string.
   b. Pattern Recognition - Find the number of patterns of form 1[0]1 where [0] represents any number of zeroes (minimum requirement is one 0) there should notbe any other character except 0 in the [0] sequence in a given binary string.
   c. Remove all the occurrences of string S2 in string S1 and print the remaining.
   d. Find the longest repeating sequence in a string
   e. Print the number of unique string values that can be formed by rearranging the letters in the string S.

2. Write a Java program that correctly implements producer consumer problem usingthe concept of inter thread communication.
3. Collections:
   a. Write a program to perform string operations using Array List. Write functions for the following
      i. Append - add at end
      ii. Insert – add at particular index
      iii. Search
      iv. List all string starts with given letter

   b. Find the frequency of words in a given text.

UNIT V JDBC CONNECTIVITY **9+9**

JDBC – DataSource, Configurations, Connection, Connection Pools, Driver Types, ResultSet, Prepared Statement, Named Parameter, Embedded SQL (Insert, Update,Delete, Join, union etc), ResultSet Navigation, Connection Close and Clean up.

List of Exercise/Experiments:

Mini Project (using JDBC)

TOTAL: 45+45=90 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Solve core Java programming concepts.

CO2: Utilize object-oriented programming (OOP) principles.

CO3: Demonstrate competency in handling exceptions and implementing multithreading.

CO4: Develop expertise in input/output (I/O) operations and file handling.

CO5: Apply advanced Java programming concepts with generics and lambda expressions.

CO6: Implement database connectivity using JDBC.

TEXTBOOKS:

1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw Hill Education, 2019.

REFERENCES:

1. Cay S. Horstmann, Gary Cornell, "Core Java Volume – I Fundamentals", 11thEdition, Prentice Hall, 2019.
2. Paul Deitel, Harvey Deitel, Java SE 8 for programmers, 3rd Edition, Pearson, 2015.
3. Steven Holzner, Java 2 Black book, Dream tech press, 2011.
4. Timothy Budd, Understanding Object-oriented programming with Java, ThirdEdition, Pearson Education, 2008.
5. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_29959473947367270000_shared/overview

LIST OF EQUIPMENTS:

1. Java and Eclipse / NetBeans IDE or Equivalent

Course Code	CHEMISTRY FOR ELECTRICAL AND ELECTRONICS ENGINEERING (Theory Course with Laboratory Component)	L	T	P	C
24CH201		3	0	2	4

OBJECTIVES:

The course will enable the learners

- To acquire knowledge on the fundamental principles of energy storage devices.
- To provide an overview of corrosion, its types and corrosion control methods.
- To gain insights into the basic concepts and applications of chemical sensors and cheminformatics.
- To identify the different types of smart materials and explore their applications in engineering and technology.
- To assimilate the preparation, properties and applications of nanomaterials in various fields.

UNIT I ENERGY STORAGE DEVICES AND GREEN FUEL 15

Introduction to electrochemical cell and its terminology - electrochemical series and its applications.

Batteries – classification - construction and working principle -primary alkaline battery - secondary battery - Pb-acid battery.

Green fuel – Hydrogen - production (photo electrocatalytic and photo catalytic water splitting), construction, working principle and applications in H_2 -O_2 fuel cell.

Batteries used in E-vehicle: Ni-metal hydride battery, Li-ion battery- Recycling of Li-ion batteries by direct cycling method; environmental effects of different energy storage devices.

(Theory-9)

1. Construction of electrochemical cell.
2. Determination of discharging state of Pb-acid battery by estimating the strength of the acid correlates with specific gravity.
3. Study of performance of a battery using battery analyzing module.

(Laboratory-6)

UNIT II CORROSION AND ITS CONTROL 15

Corrosion – causes of corrosion – principles of chemical corrosion – Pilling – Bedworth rule – principles of electrochemical corrosion – differences between chemical and electrochemical corrosion – factors influencing corrosion – types of corrosion – galvanic corrosion – differential aeration corrosion – stress corrosion– pitting corrosion, water line corrosion, impacts of corrosion on power plants.

Corrosion control and prevention – selection of materials and proper designing - cathodic protection – sacrificial anode—protective coatings - anodization, galvanization, anti-corrosive agents – molybdates and phosphates.

(Theory-9)

1. Determination of influence of pH on the rate of corrosion.
2. Demonstrate the effectiveness of the sacrificial anode in protecting the metal from corrosion.
3. Determination of corrosion rate at various % of NaCl - by weight loss method.

(Laboratory-6)

UNIT III CHEMICAL SENSORS AND CHEMINFORMATICS 15

Introduction - classification of chemical sensors -principle, construction and working of chemical sensors; pH sensor – Glass electrode; Breath analyzer; Industrial sensor – CO_2 sensors- sensor for health care – Glucose sensor.

Cheminformatics – definition, scope, and significance; applications in environmental sector – carbon footprint measurements, data analysis and interpretation.

(Theory-9)

1. Determination of the amount of given hydrochloric acid using a pH meter.
2. Calculate the carbon footprint from the provided dataset, analyze the results, and draw conclusions

(Laboratory-6)

UNIT IV SMART MATERIALS 15

Shape Memory Alloys: introduction - shape memory effect – functional properties of SMAs – types of SMA - Nitinol (Ni-Ti) alloy and its applications.

Chromogenic materials: introduction – types, applications in chemical and biological detection, display technologies, smart windows and light-modulating devices, biomedical and healthcare.

Smart Hydrogels – Introduction - Super Absorbent Polymers (SAP)- preparation, properties and applications of polyacrylic acid and sodium polyacrylate.

(Theory-9)

1. Demonstrate the shape memory effect using Nitinol wire.
2. Determination of pH sensitivity of bromothymol blue.
3. Determination of absorption efficiency of hydrogel by using kinetic study.

(Laboratory-6)

UNIT V NANO CHEMISTRY 15

Introduction – synthesis – top-down process (laser ablation, chemical vapor deposition), bottom-up process (precipitation, electrochemical deposition) – properties of nanomaterials – types –

nanotubes -carbon nanotubes, applications of CNT - nanocomposites – General applications of nanomaterials in electronics, information technology, medical and healthcare, energy, environmental remediation, construction and transportation industries.

(Theory-9)

1. Synthesis of nano $BaSO_4$ by precipitation method.
2. Demonstrate the efficiency of nano adsorbents in polluted water.

(Laboratory-6)

TOTAL: 75 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students will be able

CO1: To identify the suitability of batteries for various fields.

CO2: To analyze the different types and impacts of corrosion, and evaluate methods for corrosion control and prevention.

CO3: To apply the fundamental principles of chemical sensors, cheminformatics and their applications across various industries.

CO4: To analyze the types of smart materials used in various engineering fields.

CO5: To explore the applications of nanomaterials in various fields, considering their advantages and limitations.

CO6: To integrate the concepts of chemistry for various engineering applications.

TEXTBOOKS:

1. P. C. Jain and Monika Jain, "Engineering Chemistry". Dhanpat Rai Publishing Company Pvt. Ltd., New Delhi, 19th Edition, 2024.
2. Sivasankar B., "Engineering Chemistry". Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2nd reprint, 2012.

REFERENCES:

1. S.S. Dara and S.S. Umare, "A Textbook of Engineering Chemistry",S. Chand & Company, New Delhi, 12th Edition, 2022.
2. J. C. Kuriacose and J. Rajaram, "Chemistry in Engineering and Technology", Volume -1 & Volume -2, Tata McGraw-Hill Education Pvt. Ltd., 2010.

3. Barry A. Bunin, Brian Siesel, and J. Bajorath, "Chemoinformatics: Theory, Practice, & Products", Springer, First Edition, 2007.
4. Geoffrey A. Ozin, Andre C. Arsenault and Ludovico Cademartiri, "Nanochemistry: A Chemical Approach to Nanomaterials", RSC publishers, 2nd Edition, 2015.
5. J. Mendham, R. C. Denney, J. D. Barnes, M. J. K. Thomas and B. Sivasankar, "Vogel's Quantitative Chemical Analysis", Pearson Education Pvt. Ltd., 6th edition, 2019.
6. Pierre R. Roverge, Handbook of Corrosion Engineering, McGraw-Hill Publishers, 3rd Edition, 2019.
7. NPTEL course on "Electrochemical Energy Storage"
   Prof. Subhasish Basu Majumder, IIT Kharagpur,
   https://onlinecourses.nptel.ac.in/noc21_mm34/preview
8. NPTEL course on "Corrosion Protection Methods"
   Prof. Kallol Mondal, IIT Kanpur,
   https://onlinecourses.nptel.ac.in/noc24_mm01/preview
9. NPTEL course on "Nanotechnology, Science and Applications"
   Prof. Prathap Haridoss, IIT-M,
   https://onlinecourses.nptel.ac.in/noc22_mm33/preview

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

S. No.	Description of Equipment	Quantity
1.	Potentiometer	12 Nos.
2.	Conductivity meter	12 Nos.
3.	pH meter	12 Nos.
4.	CAN Enabled BMS unit	4 Nos.
5.	UV-Visible Spectrophotometer	2 Nos.

Course Code	INTRODUCTION TO ARTIFICIAL INTELLIGENCE (Theory Course with Laboratory Component)	L	T	P	C
24AM201		2	0	2	3

OBJECTIVES:

The Course will enable learners to:

- Understand the basics and applications of Artificial Intelligence.
- Apply the basics of Python programming.
- Use python libraries to solve simple problems.
- Understand the different types of Machine Learning algorithms.
- Solve real world problems using AI/ML.
- Explore the various applications in the field of Artificial Intelligence and Machine Learning.

UNIT I ARTIFICIAL INTELLIGENCE 6+6

Introduction – Types of AI – ANI, AGI, ASI – Narrow, General, Super AI, Examples - AI problems – Production Systems – State space Representation – Applications of AI in various industries.

List of Exercise:

1. Build a simple AI model using python.

UNIT II BASICS OF PYTHON 6+6

Introduction to Python programming – Arithmetic Operators - values and types - variables, expressions, statements – Functions – Conditionals and Recursion –Iteration.

Lists: Sequence, Mutable, Traversing, Operations, list slices, list methods - Tuples: Immutable, Tuple Assignment, Tuple as Return Values, Comparing and Sorting.

List of Exercises:

1. Compute the GCD of two numbers.
2. Operations on Tuples: a) finding repeated elements, b) slice a tuple c) reverse a tuple d) replace last value of a tuple.

UNIT III PYTHON LIBRARIES 6+6

Introduction to Numpy - Multidimensional Ndarrays – Indexing – Properties – Constants – Data Visualization: Ndarray Creation – Matplotlib - Introduction to Pandas – Series – Dataframes – Visualizing the Data in Dataframes - Pandas Objects – Data Indexing and Selection – Handling missing data – Hierarchical indexing – Combining datasets – Aggregation and Grouping – Joins- Pivot Tables - String operations – Working with time series – High performance Pandas.

List of Exercises:

1. Download, install and explore the features of R/Python for data analytics
   - Installing Anaconda
   - Basic Operations in Jupyter Notebook
   - Basic Data Handling
2. Working with Numpy arrays - Creation of numpy array using the tuple, Determine the size, shape and dimension of the array, Manipulation with array Attributes, Creation of Sub array, Perform the reshaping of the array along the row vector and column vector, Create two arrays and perform the concatenation among the arrays.
3. Working with Pandas data frames - Series, DataFrame , and Index, Implement the Data Selection Operations, Data indexing operations like: loc, iloc, and ix, operations of handling the missing data like

None, Nan, Manipulate on the operation of Null Vaues (is null(), not null(), dropna(), fillna()).

4. Perform the Statistics operation for the data (the sum, product, median, minimum and maximum, quantiles, arg min, arg max etc.).

5. Use any data set compute the mean ,standard deviation, Percentile.

UNIT IV MACHINE LEARNING **6+6**

Introduction – ML Algorithms Overview – Types – Supervised – Unsupervised – Reinforcement Learning – Introduction to Neural Networks – Working of Deep Learning – Applications of DL – Ethical consideration in AI and ML.

List of Exercise:

1. Apply any Machine Learning model to predict the sales in a store.

UNIT V CASE STUDIES **6+6**

Disease Prediction – Share Price Forecasting – Weather Prediction – Domain Specific Case Studies.

List of Domain Specific Case Studies:

- For CSE & allied: Sentiment analysis of product reviews using machine learning.
- For ECE & allied: Smart homes using AI.
- For EEE: Forecasting of Renewable energy availability during a specified period using AI.
- Civil: Application of ML for crack detection on concrete structures.
- Mech: Predictive Maintenance for CNC Machines Using AI and Machine Learning.

List of Exercise:

1. Build a machine learning model to solve any real-world problem from your domain.

TOTAL: 30(L) + 30(P) = 60 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Elaborate the basics and applications of Artificial Intelligence**.**

CO2: Apply the basics of Python programming to solve problems.

CO3: Use python libraries to solve simple ML problems.

CO4: Outline the different types of Machine Learning algorithms.

CO5: Use Machine Learning Algorithms to solve real world problems.

CO6: Outline the recent developments in the field of Artificial Intelligence.

TEXT BOOKS:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016.
2. Jake VanderPlas, "Python Data Science Handbook – Essential tools for working with data", O'Reilly, 2017.
3. Steve Abrams, "Artificial Intelligence and Machine Learning for Beginners: A simple guide to understanding and Applying AI and ML", Independently published, May 14, 2024.

REFERENCES:

1. Vinod Chandra S S, Anand Hareendran S, Artificial Intelligence and Machine Learning, PHI Learning, 2014.
2. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, Prentice Hall, 2010.
3. Ethem Alpaydın. Introduction to Machine Learning, Second Edition, the MIT Press, Cambridge, Massachusetts, London, England.
4. Stephen Marsland, Machine Learning - An Algorithmic Perspective, 2nd Edition, 2015, by Taylor & Francis Group, 2015.
5. Tom M. Mitchell, Machine Learning, McGraw-Hill Science, ISBN: 0070428077
6. Mayuri Mehta, Vasile Palade, Indranath Chatterjee, Explainable AI: Foundations, Methodologies and Applications, Springer, 2023.
7. Siddhartha Bhattacharyya, Indrajit Pan, Ashish Mani, Sourav De, Elizabeth Behrman, Susanta Chakraborti, "Quantum Machine Learning", De Gruyter Frontiers in Computational Intelligence, 2020.

LIST OF EQUIPMENTS:

1. Systems with Anaconda, Jupyter Notebook, Python.

Course Code	IDEA LAB – II	L	T	P	C
24GE211		0	0	2	1

OBJECTIVES:

Students completing this course are expected to

- Develop hands-on experience and practical application of theoretical knowledge.
- Develop their ability to explain the process involved.

LIST OF EXERCISES:

1. Printing of a 3D part.
2. Scanning of a 3D part.
3. Design and fabrication of press fit object using laser cutting machine.
4. Design and fabrication of 3D part using CNC Router.
5. Design and fabrication of simple PCB.
6. Soldering and desoldering of given electronic circuit.

TOTAL: 30 PERIODS

OUTCOMES:

After successful completion of the course, the students will be able to

CO1 Analyze the latest manufacturing methods in advancements and technologies related to their field.

CO2 Understand the operations of a laser cutting machine and CNC Router.

CO3 Analyze the process of design and fabrication of PCB and Soldering operations

CO4 Develop technical proficiency and problem-solving abilities, making more competent and confident in their field.

CO5 Develop themselves with the skills needed to address industry-specific problems.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S.No	Equipment Name	Quantity
1	CNC Router	1 No
2	3D Printer	1 No
3	3D Scanner	1 No
4	Laser cutting Machine	1 No
5	Multimeter	5 Nos
6	Solder Stations	5 Sets
7	Desoldering Machine	1 No
8	PCB Milling Machine	1 No
9	Variable Power Supply	1 No
10	Electronic Components like Resistors, Transistors, Diode, Inductor, Capacitor, etc.	5 Sets

Course Code	INNOVATION AND CREATIVITY SKILLS DEVELOPMENT	L	T	P	C
24HS211		1	0	0	1

OBJECTIVES:

The course will enable the learners to:

- Understand study plans, co-curricular activities, programming skills, recruitment test patterns, and hiring strategies through national qualifiers and hackathons.
- Equip students with strategies for higher education, resume enhancement, project management, and securing internships
- Understand entrepreneurship fundamentals, including key differences, global hubs, business ideas, and scalability.
- Develop essential entrepreneurial skills such as opportunity recognition, patience, risk management, communication, persistence, and leadership
- Understand life, success, self-confidence, health, scientific heritage, personal counseling, and cybercrime awareness

UNIT I STEPPING STONE – ENGINEERING CAREERS AND SKILL DEVELOPMENT 3

Study Plans and Resources - Identification of key resources and job opportunities - career prospects and academic growth through co-curricular activities - importance of programming/coding skills - Overview of test patterns and essential skills for popular campus recruiters - Comparison of IT Services, Dream, and Super Dream offers and their recruitment processes - National Qualifier Tests and their impact on hiring processes – Overview of Corporate contests and hackathons (e.g., TCS Codevita, HackerRank)

UNIT II STEPPING STONE – HIGHER EDUCATION AND CAREER DEVELOPMENT 3

Overview of higher education opportunities: GATE, GRE, GMAT, XAT, CAT, MAT - Exam formats, preparation strategies, and timelines - Resume Enhancement Strategies - Project Management - Steps to develop projects from proposal to prototype - Internship Pathways - Strategies for maximizing internship experiences for career advancement

UNIT III FUNDAMENTALS OF ENTREPRENEURSHIP: FROM IDEAS TO VENTURES 3

Introduction to Entrepreneurship – Intrapreneur vs. entrepreneur - Roles and Contributions - Global Entrepreneurship Hubs - Overview of Key Global Locations - Idea vs. Commercial Value - Transforming Ideas into Viable Business Models - Characteristics of Successful Business Ideas - Understanding Market Competition - Basics of Copyrights and Intellectual Property - Scalability in Business Ventures - Strategies for Scaling a Business

UNIT IV HUMAN SKILLS FOR ENTREPRENEURSHIP 3

Identifying and capitalizing on business opportunities - Case studies and anecdotes - Patience and Risk Management - The role of patience in entrepreneurial success and decision-making - Effective Communication - Techniques for clear and persuasive communication - Importance of communication in building and leading teams - Leadership qualities and their impact on entrepreneurial ventures - Analyzing success and failure stories

UNIT V FOUNDATIONS OF PERSONAL DEVELOPMENT AND WELL-BEING 3

Understanding Life and Success - Self-Confidence and Fear - Practical strategies for enhancing self-esteem - Adolescent Issues - Health Management - Basics of a balanced diet - Benefits of physical activity - Scientific Heritage of India - Overview of India's scientific achievements and contributions - Cyber Crime Awareness - Types and prevention strategies.

TOTAL: 15 PERIODS

COURSE OUTCOMES

Upon completion of the course, the students will be able to:

CO1: Create study plans, value co-curricular activities, develop programming skills, and navigate for career advancement

CO2: Understand about higher education options, resume enhancement, project management, and securing internships

CO3: Learn entrepreneurship skills and strategies to develop successful business ideas.

CO4: Develop key entrepreneurial skills like opportunity recognition, risk management, and leadership through real-world examples

CO5: Explore personal development, health management, scientific heritage, and cybercrime awareness.

Course Code	YOGA FOR STRESS MANAGEMENT	L	T	P	C
24AC201		0	0	1	0

OBJECTIVES:

The course will enable the learners to:

- Understanding the different types of stress and managing stress.
- Develop an understanding of practicing yoga
- Learning to do asanas, including sitting, standing and lying postures

Unit I: Stress Management **3**

Definition of Stress - Stress in Daily Life - Impact of Stress on Life - Identifying the Causes of Stress - Symptoms of Stress - Managing Stress (Habits, Tools, Training, Professional Help) - Complications of Stress Mismanagement - The Importance of Sleep for Mental Wellness - Connection Between Sleep and Digestion.

Unit II: Introduction to Yoga **3**

Meaning and Definition of Yoga - Aims and Objectives of Yoga - Guidelines for Practicing Asanas - Benefits of Yoga

Unit III: Different Asanas **3**

Methods of Performing Asanas - Pranayama - Suryanamaskar Asanas - Sitting Postures: Uttanpadasana, Paschimottanasana ,Janu Sirsasana , Baddha Konasana - Shishupal Asana - Vajrasana

Unit IV: Standing Postures **3**

Uttanasana -Trikonasana -Vrikshasana -Tadasana - Superbrain asana

Unit 5: Lying Postures **3**

Pavana Muktasana - Pada Sanchalanasana – Jhulana Lurhakanasana -Dhanurasana – Marjaryasana. BitilasanaDictionaries – Sorkuvai Project.

TOTAL: 15 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: relieve stress and achieve mental wellness.

CO2: experience the benefits of yoga

CO3: keep self and body healthy

REFERENCE BOOK:

1. Iyengar, Bellur Krishnamukar Sundara. "Light on yoga." (1965).

2. Desikachar, Tirumalai Krishnamacharya Venkata. The heart of yoga: Developing a personal practice. Simon and Schuster, 1999.

3. Davis, Martha, Elizabeth Robbins Eshelman, and Matthew McKay. The relaxation and stress reduction workbook. New Harbinger Publications, 2008.

4. Krishnamacharya, Tirumalai, et al. "Yoga makaranda: The nectar of yoga." Swathi Soft (2013).

COURSE CODE	COURSE TITLE	L	T	P	C
24EC301	ANALOG CIRCUITS (Theory Course with laboratory component)	3	0	2	4

UNIT I	BJT and FET Biasing	9+6

Bias Stability: Need for biasing - Load line analysis: DC Load Line, AC load line - BJT Biasing methods and basic stability: Fixed Bias, Voltage Divider bias- JFET Biasing: Fixed Bias, Self Bias, Voltage divider Bias.

List of Experiments:

1. Design of BJT amplifier with Fixed bias.
2. Analysis of JFET with Voltage divider bias using PSPICE.

UNIT II	Analysis of BJT Amplifier	9+3

Transistor Hybrid model - Analysis of Common emitter amplifier using h parameters, Millers Theorem, Analysis of common emitter amplifier using pi model-Frequencyresponse of BJT, Common emitter short circuit current gain ~~c~~ut off frequencies and unity gain.

List of Experiments:

3. Design and analysis of frequency response of Common emitter amplifier

UNIT III	Multistage BJT Amplifiers and Large Signal Amplifier	9+9

Multistage amplifier: Cascade Amplifier- Darlington amplifier - Cascode amplifier, Large Signal Amplifier: Classification, quantitative analysis, comparison of Class A-Class B-Class AB, Class C power amplifier.

List of Experiments:

4. Design of Class B Power Amplifier
5. Simulation of Class A Amplifier using PSPICE
6. Simulation of Darlington Amplifier using PSPICE

UNIT IV	Feedback Amplifiers	9+6

Classification of Amplifiers-Feedback concept – Transfer gain with feedback- Characteristics of negative feedback amplifiers, Topologies -Method of analysis of series-series, series-shunt, shunt-shunt and shunt- series feedback amplifiers.

List of Experiments:

7. Design and Implementation of a Current Series (Series-Series) Feedback Amplifier.
8. Simulation of feedback in voltage shunt (Shunt-shunt) feedback amplifier using PSPICE

UNIT V	Oscillators	9+6

Basic Principles of oscillation- Barkhausen criterion, RC phase shift oscillators, Wien bridge oscillator, LC oscillators: Colpitts, Hartley, Clapp Oscillator, crystal oscillators, UJT relaxation oscillator

List of Experiments:

9. Design of RC phase shift oscillator
10. Simulation of Hartley/Colpitts Oscillator using PSPICE

TOTAL:45Theory+30Lab=75PERIODS

COURSE OUTCOMES:

Upon completion of the course the students will be able to:

CO1: Explain different biasing methods for BJT and FET devices and their importance in circuit stability.

CO2: Analyze the frequency response of BJT amplifiers using small-signal models.

CO3: Compare different types of multistage and power amplifiers based on their performance.

CO4: Identify the characteristics and effects of negative feedback in amplifier circuits.

CO5: Design various oscillator circuits to meet given frequency specifications.

CO6: Simulate analog circuits using PSPICE and evaluate their performance.

TEXTBOOKS:

1. Jacob Millman, Christos C Halkias, Chetan D Parikh, Integrated Electronics: Analog and Digital Circuits and Systems, International Student Edition, Tata Mc Graw Hill, 2017.
2. Donald. A. Neamen, Electronic Circuits Analysis and Design, 3rd Edition, Mc Graw Hill Education (India) Private Ltd., 2010.

REFERENCES:

1. Salivahanan, N.Suresh Kumar- Electronic Devices and Circuits, 5th Edition, Tata Mc Graw Hill Education (India) Private Ltd.,2022
2. Jacob Millman and Christos.C.Halkias – Electronic devices and circuits, Tata Mc Graw Hill, Electrical and Electronic Engineering series 2000.
3. Robert L. Boylestad and Louis Nasheresky, - Electronic Devices and Circuit Theoryl, 11th Edition, Pearson Education, 2008.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No	Equipment	Quantity
1.	CRO(30MHz)	15
2.	Signal Generator/Function Generator(3MHz)	15
3.	Dual Regulated Power Supply(0-30V)	15
4.	Transistor-BC 107	60
5.	Resistors,Capacitors (Depending on the design)	60
6.	BreadBoards	15
7.	Multimeter	3
8.	Desktop with PSPICE Circuit Simulation Software	15

24CS302	ADVANCED JAVA PROGRAMMING (Lab Integrated) (Common to All Branches)	L	T	P	C
		3	0	3	4.5

COURSE OBJECTIVES:

The Course will enable the learners:

- Gain a comprehensive understanding of the Java Collections Framework and its various interfaces and implementations.
- Learn the details of Java I/O streams and utility classes for managing dates, numbers, and currencies.
- Develop a thorough understanding of the Stream API introduced in Java 8 and its various operations.
- Explore advanced object serialization and string tokenizing techniques, including pattern matching with regular expressions.
- Understand advanced Stream API features and gain proficiency in using regular expressions for text processing.

UNIT I	Collections Framework and Utility Classes	9+9

Introduction to Collections Framework - Collection Interface- Methods in Collection Interface - Iterable and Iterator Interfaces - List Interface- ArrayList - LinkedList - Set Interface - HashSet- LinkedHashSet - TreeSet - Map Interface - HashMap -LinkedHashMap- TreeMap - Queue Interface -PriorityQueue - Deque Interface - Utility Classes.

List of Experiments

1. Write a program that measures the time taken for insertion, deletion, and search operations on ArrayList, LinkedList, HashSet, and TreeSet for varying sizes of input data.
2. Implement a custom data structure that combines features of a list and a set.
3. Write a Java program to create a HashMap where the keys are strings, and the values are integers Add five key-value pairs to the map. Print all the keys and values in the map. Remove an entry by key. Update the value associated with a specific key. Check if the map contains a specific key and a specific value.

UNIT II	Date Handling and Serialization	9+9

Date – Calendar – Comparable interface – Observer Interface –– Serialization – Dates - Numbers, and Currency - Working with Dates - Numbers and Currencies - Object Serialization - Serializable Interface - Writing and Reading Serializable Objects -Transient Keyword- SerialVersionUID.

List of Experiments

1. Create a class representing a complex object with nested data structures. Serialize the object to a file, then deserialize it back and verify that the object remains intact.
2. Write a program that formats dates and currencies according to different locales.

Create a class hierarchy representing different types of objects (e.g., Person, Employee). Serialize instances of these classes to a file using object serialization.

UNIT III	Stream API and Functional Programming Paradigms	9+9

Overview of Stream API - Importance of Stream API in Java 8 and Beyond – Functional Programming Concepts - Creating Streams - Stream Interface Methods - Stream Operations - Intermediate Filtering (filter)-Mapping (map, flatMap)-Sorting (sorted)-Distinct (distinct) - Limit and Skip (limit, skip) - Terminal Operations -Collecting Results (collect) - Reducing and Summarizing (reduce, summaryStatistics)-Iterating (forEach) - Matching and Finding (anyMatch, allMatch, noneMatch, findFirst, findAny) -Counting (count).

List of Experiments

1. Write a program that performs stream operations like filtering, mapping, and reducing.
2. Create an infinite stream generator that generates prime numbers. Implement methods to check for primality and generate the next prime number.
3. Write a program that reads a text file containing sentences. Tokenize each sentence into words, filter out stopwords, and print the remaining words.

UNIT IV	Advanced String Processing and I/O Techniques	9+9

String Tokenizer –Parsing - Tokenizing and Formatting - Locating Data via Pattern Matching, Tokenizing - Streams - Types of Streams - The Byte-stream I/O hierarchy - Character Stream Hierarchy –Random Access File class –the java.io. Console Class - Advanced I/O - Piped Streams (PipedInputStream and PipedOutputStream) – SequenceInputStream - PushbackInputStream and PushbackReader.

List of Experiments

1. Write a program that reads a text file and tokenizes it into sentences using the StringTokenizer class.
2. Implement a java program that allows users to open a text file, navigate through it using random access, insert, delete, and modify text at specific positions within the file.
3. Implement a program that uses advanced I/O techniques like PipedInputStream, PipedOutputStream, SequenceInputStream, and PushbackInputStream.

Unit V	Advanced Stream Features and Regular Expressions	9+9

java.util.regex Package Pattern Class - Matcher Class - String Manipulation with Regex - Splitting Strings - Replacing Text (replaceAll, replaceFirst) - Replacing with Backreferences.

List of Experiments

1. Implement custom stream generators using Stream.generate and Stream.iterate methods.
2. Write a program that demonstrates advanced stream operations like flatMapping, chaining stream operations, and peeking.
3. Develop a program that utilizes regular expressions to perform string manipulation tasks such as splitting strings, replacing text, and extracting specific patterns.

TOTAL: 45+45 = 90 PERIODS

OUTCOMES

Upon completion of the course, the students will be able to:

CO1: Implement various data structures by utilizing core Java features and libraries

CO2: Demonstrate proficiency in handling Java I/O operations, including file manipulation for efficient data storage and retrieval.

CO3: Apply and Analyze the Stream API for functional programming and data processing.

CO4: Implement advanced object serialization for complex data structures.

CO5: Utilize regular expressions for text parsing and string manipulation.

CO6: Build applications using advanced Java programming techniques.

TEXT BOOKS

1. Cay S. Horstmann, "Core Java Volume I--Fundamentals," 12th Edition, 2019.
2. Joshua Bloch, "Effective Java," 3rd Edition, 2018.
3. Raoul-Gabriel Urma, "Java 8 in Action: Lambdas, Streams, and Functional-Style Programming," 1st Edition, 2014.
4. Herbert Schildt, "Java: The Complete Reference," 11th Edition, 2018.
5. Alan Mycroft and Martin Odersky, "Programming in Scala," 4th Edition, 2020.

REFERENCES

1. Bruce Eckel, "Thinking in Java," 4th Edition, 2006.
2. Herbert Schildt, "Java: A Beginner's Guide," 8th Edition, 2019.
3. Richard Warburton, "Java 8 Lambdas: Pragmatic Functional Programming," 1st Edition, 2014.

LIST OF EQUIPMENTS

JDK/Eclipse

24CS303	DATABASE MANAGEMENT SYSTEMS (Lab Integrated) (Common to CSE, CSD, ADS, CSBS, IT, EEE, ECE, ECA and EEV)	L	T	P	C
		3	0	3	4.5

COURSE OBJECTIVES:

The Course will enable the learners:

- To understand the basic concepts of Data Modeling and Database Systems.
- To understand SQL and effective relational database design concepts.
- To learn relational algebra, calculus and normalization.
- To know the fundamental concepts of transaction processing, concurrency control techniques, recovery procedure and data storage techniques.
- To understand query processing, efficient data querying and advanced databases

Unit I	Database Concepts	9+9

Concept of Database and Overview of DBMS - Characteristics of databases -Data Models, Schemas and Instances - Three-Schema Architecture - Database Languages and Interfaces- Introductions to data models types- ER Model- ER Diagrams - Enhanced ER Model - reducing ER to table Applications: ER model of University Database Application Relational Database Design by ER- and EER-to-Relational Mapping.

List of Exercise/Experiments

Case Study using real life database applications anyone from the following list

a) Inventory Management for a EMart Grocery Shop

b) Society Financial Management

c) Cop Friendly App – Eseva

d) Property Management – eMall

e) Star Small and Medium Banking and Finance

- Build Entity Model diagram. The diagram should align with the business and functional goals stated in the application.

Unit II	Structured Query Language	9+9

SQL Data Definition and Data Types – Constraints – Queries – INSERT, UPDATE, and DELETE in SQL - Views - Integrity Procedures, Functions, Cursor and Triggers - Embedded SQL - Dynamic SQL.

List of Exercise/Experiments

Case Study using real life database applications anyone from the following list and do the following exercises.

a) Inventory Management for a EMart Grocery Shop

b) Society Financial Management

c) Cop Friendly App – Eseva

d) Property Management – eMall

e) Star Small and Medium Banking and Finance

1. Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements

2. Database Querying – Simple queries, Nested queries, Sub queries and Joins
3. Views, Sequences, Synonyms
4. Database Programming: Implicit and Explicit Cursors
5. Procedures and Functions
6. Triggers
7. Exception Handling

Unit III	Relational Algebra, Calculus And Normalization	9+9

Relational Algebra – Operations - Domain Relational Calculus- Tuple Relational Calculus - Fundamental operations.

Relational Database Design - Functional Dependency – Normalization (1NF, 2NF 3NF and BCNF) – Multivalued Dependency and 4NF – Joint Dependencies and 5NF - De-normalization.

List of Exercise/Experiments

1. Case Study using real life database applications anyone from the following list
   a) Inventory Management for a EMart Grocery Shop
   b) Society Financial Management
   c) Cop Friendly App – Eseva
   d) Property Management – eMall
   e) Star Small and Medium Banking and Finance.

Apply Normalization rules in designing the tables in scope.

Unit IV	Transactions, Concurrency Control And Data Storage	9+9

Transaction Concepts – ACID Properties – Schedules based on Recoverability, Serializability – Concurrency Control Need for Concurrency Locking Protocols Two Phase Locking Transaction – Recovery Concepts – Deferred Update Immediate Update.

Organization of Records in Files Unordered, Ordered Hashing Techniques RAID Ordered – Indexes Multilevel Indexes - B+ tree Index Files B tree Index Files.

List of Exercise/Experiments

Case Study using real life database applications anyone from the following list
   a) Inventory Management for a EMart Grocery Shop
   b) Society Financial Management
   c) Cop Friendly App – Eseva
   d) Property Management – eMall
   e) Star Small and Medium Banking and Finance

Ability to showcase ACID Properties with sample queries with appropriate settings for the above scenario.

Unit V	Query Optimization And Advanced Databases	9+9

Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics.

Distributed Database Concepts – Design – Concurrency Control and Recovery – NOSQL Systems – Document-Based NOSQL Systems and MongoDB.

Explain Plan Statement – Parsing Output – Join Orders and Methods – Indexes - Standard Issues – Query Tuning - Explain Plan vs Explain Analyses.

List of Exercise/Experiments

Case Study using real life database applications anyone from the following list

a) Inventory Management for a EMart Grocery Shop
b) Society Financial Management
c) Cop Friendly App – Eseva
d) Property Management – eMall
e) Star Small and Medium Banking and Finance

Build PL SQL / Stored Procedures for Complex Functionalities, ex EOD Batch Processing for calculating the EMI for Gold Loan for each eligible Customer.

TOTAL: 45 + 45 = 90 PERIODS

COURSE OUTCOMES

After completing the course, students will have the ability to

CO1: Map ER model to Relational model to perform database design effectively.

CO2: Implement SQL and effective relational database design concepts.

CO3:Apply relational algebra, calculus and normalization techniques in database design.

CO4: Understand the concepts of transaction processing, concurrency control, recovery procedure and data storage techniques.

CO5:Evaluate and implement transaction processing, concurrency control mechanisms, and recovery procedures to maintain data integrity.

CO6:Analyze and optimize database queries and understand the features and applications of advanced and distributed database systems, including NoSQL.

TEXTBOOKS

1. Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Second Edition, Packt Publishing, 2018.
2. A. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction", Princeton University Press, 2016.

REFERENCES

1. Arshdeep Bahga, Vijay Madisetti, "Blockchain Applications: A Hands On Approach", VPT, 2017.
2. Andreas Antonopoulos, Satoshi Nakamoto, "Mastering Bitcoin", O"Reilly, 2014.
3. Roger Wattenhofer, "The Science of the Blockchain" Create Space Independent Publishing, 2016.
4. Alex Leverington, "Ethereum Programming" Packt Publishing, 2017.

24MA302	PROBABILITY AND RANDOM PROCESSES (Theory Course)	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

The course will enable the learners to:

- Provide the necessary basic concepts of random variables and introduce some standard distributions.
- Comprehend the concepts of joint distributions, marginal and conditional distributions.
- Understand the classification of random processes.
- Introduce the concept of auto correlation, cross correlation, and its spectral densities.
- Acquire the knowledge of linear systems with random inputs.

UNIT I	One-Dimensional Random Variables	12

Basic probability, Independent events, Conditional probability (definition) - Random variable - Discrete and continuous random variables - Moments - Moment generating functions - Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions

UNIT II	Two-Dimensional Random Variables	12

Joint distributions - Marginal and conditional distributions - Covariance - Correlation and linear regression - Transformation of random variables.

UNIT III	Random Processes	12

Classification - Stationary process - Poisson process - Markov process - Discrete time Markov chain-Random telegraph process

UNIT IV	Correlation and Spectral Densities	12

Auto correlation functions - Cross correlation functions - Properties - Power spectral density (continuous) - Cross spectral density (continuous) - Properties.

Unit V	Linear Systems with Random Inputs	12

Linear time invariant system - System transfer function - Linear systems with random inputs - Auto correlation and cross correlation functions of input and output.

TOTAL: 60 PERIODS

OUTCOMES

Upon completion of the course, the students will be able to:

CO1: compute the statistical measures of standard distributions.

CO2: determine the correlation and regression for two dimensional random variables.

CO3: analyze various types of Random Processes.

CO4: compute the auto correlation and power spectral densities of the random processes.

CO5: determine the output power spectral density of a linear system with random inputs.

CO6: apply the concept of correlation and spectral density in random telegraph signal processes.

TEXT BOOKS

1. R.D. Yates and D.J. Goodman, "Probability and Stochastic Processes", Wiley India Pvt. Ltd., 3rd Edition, 2021.
2. 2. O.C. Ibe," Fundamentals of Applied Probability and Random Processes", 2nd Edition, Elsevier, 2019

REFERENCES

1. G.R. Cooper and C.D. McGillem, "Probabilistic Methods of Signal and System Analysis", Oxford University Press, New Delhi, 3rd Indian Edition, 2012.

2. Murray R. Spiegel, John Schiller, R. Alu Srinivasan , "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill, 9th Edition, New Delhi, 2007.
3. S.L. Miller and D.G. Childers, "Probability and Random Processes with Applications to Signal Processing and Communications", Academic Press, 2nd Edition, 2012.
4. H. Stark. and J.W. Woods, "Probability and Random Processes with Applications to Signal Processing ", Pearson Education, Asia, 4th Edition, 2011.
5. P.Z. Peebles, "Probability, Random Variables and Random Signal Principles", Tata McGraw Hill, 4th Edition, New Delhi, 2002

COURSE CODE	COURSE TITLE	L	T	P	C
24EC302	CONTROL SYSTEMS	3	0	0	3

UNIT I	Systems and their Representation	9

Introduction to Control systems: Open and closed loop systems – Differential equations of Mechanical systems -Transfer function –Block diagram algebra –Signal flow graphs -Block diagram to Signal Flow Graph Conversion.

UNIT II	Time Response Analysis	9

Introduction - Standard Test signals –Time response of First and Second order system for unit step input Steady–state errors and error constants- Effect of adding a zero to a system - Design specifications of second order systems.

UNIT III	Frequency Response Analysis	9

Introduction to frequency response - Correlation between Time and Frequency Response – Polar plot Bode plot.

UNIT IV	Stability and Compensator Design	9

Concept of stability- Necessary conditions for stability – Routh Hurwitz criterion- Root locus techniques – Design of Lag, Lead and Lag Lead compensator using Bode plot

UNIT V	State Variable Analysis and Design	9

Concepts of state, state variables and state model- State models for Linear Continuous Time systems using phase variables –Introduction to Linear Discrete Time systems - –Concepts of controllability and observability.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Categorize the system components and their representation of various control systems.
CO2: Evaluate the Time domain specifications of second order control systems.
CO3: Analyze the frequency response characteristics of control system using Bode and Polar plot.
CO4: Analyze the stability of the system using Routh Hurwitz and Root locus techniques.
CO5: Design of compensators to meet the desired system specifications using Bode plot
CO6: Verify Controllability and observability of various control systems using state space model

TEXTBOOKS:

1. Nagarath I.J and Gopal M, Control Systems Engineering, New Age International, 2017
2. Katsuhiko Ogata, Modern Control Engineering, Pearson India Education, 2015.

REFERENCES:

1. Gopal M, Control System: Principle and design, McGraw Hill Education, 2012.
2. Richard C. Dorf and Bishop R.H, Modern Control Systems, Pearson India Education, 2009

24GE301	UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY	L	T	P	C
		2	1	0	3

OBJECTIVES:
The course is designed to:

- Development of a holistic perspective based on self-exploration about themselves (human beings), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society, and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

UNIT I **NEED, BASIC GUIDELINES, CONTENT AND PROCESS FOR VALUE EDUCATION** **9**

Purpose and motivation for the course - recapitulation from Universal Human Values-I -Self- Exploration–what is it? – It's content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration - Continuous Happiness and Prosperity- A Look at Basic Human Aspirations - Right understanding, Relationship and Physical Facility- the basic requirements for the fulfilment of aspirations of every human being with their correct priority - Understanding Happiness and Prosperity Correctly- A critical appraisal of the current scenario - Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Practice sessions: To discuss natural acceptance in human beings as the innate acceptance of living with responsibility (living in relationship, harmony, and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT II **UNDERSTANDING HARMONY IN THE HUMAN BEING – HARMONY IN MYSELF!** **9**

Understanding human beings as a co-existence of the sentient 'I' and the material 'Body' - Understanding the needs of Self ('I') and 'Body' - happiness and physical facility -Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) - Understanding the characteristics and activities of 'I' and harmony in 'I' - 'Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, the meaning of Prosperity in detail - Programs to ensure Sanyam and Health.

Practice sessions: To discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss programs for ensuring health vs dealing with the disease.

UNIT III **UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY- HARMONY IN HUMAN-HUMAN RELATIONSHIP** **9**

Understanding values in a human-human relationship - the meaning of Justice (nine universal values in relationships) and the program for its fulfillment to ensure mutual happiness -Trust and Respect as the foundational values of relationship - Understanding the meaning of Trust; Difference between intention and competence - Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in a relationship - Understanding the harmony in the society (society being an extension of the family) - Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals -
Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.
Practice sessions: To reflect on relationships in family, hostel and institute as extended family, real-life examples, teacher-student relationship, the goal of education etc. Gratitude as a universal value in relationships. Discuss scenarios. Elicit examples from students' lives.

UNIT IV **UNDERSTANDING HARMONY IN NATURE AND EXISTENCE - WHOLE EXISTENCE AS COEXISTENCE** **9**

Understanding the harmony in Nature - Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature - Understanding Existence as the Co-

existence of mutually interacting units in all-pervasive Space - Holistic perception of harmony at all levels of existence.

Practice sessions: To discuss human beings as the cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT V **IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY IN PROFESSIONAL ETHICS** **9**

Natural acceptance of human values - Definitiveness of Ethical Human Conduct - Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order - Competence in professional ethics: a. Ability to utilize professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for the above production systems - Case studies of typical holistic technologies, management models and production systems - Strategy for the transition from the present state to Universal Human Order: a. At the level of the individual: as socially and ecologically responsible engineers, technologists, and managers b. At the level of society: as mutually enriching institutions and organizations - Sum up.
Practice Exercises and Case Studies e.g. To discuss the conduct as an engineer or scientist etc.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the students can

CO1: develop self-awareness and a deeper understanding of their surroundings, including family, society, and nature.

CO2: identify and resolve inner conflicts based on natural acceptance.

CO3: become more responsible towards life, and handle problems with sustainable solutions by considering human relationships and natural harmony.

CO4: enhance their critical thinking and analyzing skills.

CO5: develop a stronger commitment towards human values, relationships, and societal well-being.

CO6: apply what they have learnt in different day-to-day settings in real life, and take the initial steps towards integrating these values into daily life.

TEXTBOOKS:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, First edition: New Delhi, 2010, ISBN: 978-81-7446-781-2 Reprint: 2010, 2011, 2013, 2016, 2018, 2019 (Second edition: New Delhi, 2019, ISBN: 978-93-87034-47-1)
2. A foundation course in Human Values and Professional Ethics RR Gaur, R Asthana, GP Bagaria, Third revised edition: New Delhi, 2023, ISBN: 978-81-957703-7-3 (Printed Copy), ISBN: 978-81-957703-6-6 (e-book), UHV Publications

REFERENCES:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful-E. F Schumacher.
6. Slow is Beautiful-Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – Pandit Sunderlal
9. Rediscovering India – by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi

COURSE CODE	COURSE TITLE	L	T	P	C
24GE311	PRODUCT DEVELOPMENT LAB -1	0	0	2	1

COURSE OBJECTIVES:

- To provide adequate understanding of project/product concepts and creative design process.
- To create a methodology for developing solutions to the complex systems.

S.NO.	LIST OF EXPERIMENTS
1.	Implementation of Design Process.
2.	Present the product idea.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

CO1: Develop their intellectual skills for understanding the concepts, rules or procedures.

CO2: Develop their cognitive strategy to think, organize, learn and behave.

CO3: Demonstrate the ability to provide conceptual design strategies for a product.

CO4: Describe procedure for designing a prototype.

CO5: Recognize interdisciplinary strategies for solving complex problems.

CO6: Apply integrative strategies for solving complex problems.

LIST OF EQUIPMENT:

Sl. No.	Equipment	Quantity
1.	CNC Router	1
2.	3D Printer	1
3.	3D Scanner	1
4.	Laser Cutting Machine	1
5.	Centre lathe	2
6.	Arc Welding transformer with cables and holders	2
7.	Plumbing tools	2 Sets
8.	Carpentry Tools	2 Sets
9.	Multimeter	10
10.	Drilling Machine	1
11.	Solder Stations	5 Sets
12.	Desoldering Machine	1
13.	PCB Milling Machine	1
14.	Variable Power Supply	1
15.	Electronic Components like Resistors, Transistors, Diode, Inductor, Capacitors, IC etc.,	10 Sets
16.	Personal Desktop Computers	30

COURSE CODE	COURSE TITLE	L	T	P	C
24EC311	INTERNSHIP/SEMINAR	0	0	1	0.5

COURSE OBJECTIVES:

- To define, formulate and analyze real world problem in the field of Electronics and Communication.
- To acquire knowledge in terms of innovation and product design development process of the project.
- To interpret and associate the team members to work as a team efficiently.
- To create, an Industrial environment and culture within the institution.
- To develop a professional attitude towards appearance and behavior in the workplace, time management skills and the ability to prioritize assignments.

An internship is the form of experiential learning that integrates knowledge and theory learned in the classroom with practical application and skills development in a professional setting. The students can opt for internship in any industry/academic institute/R&D/PSU/Government or semi-government organizations. This caters students, the opportunity to gain valuable applied experience and explore networks in professional fields they are considering for career paths; and give employers the opportunity to guide and evaluate talent. This will not only help students in gaining professional know-how but also benefits, corporate on fresh perspectives on business issues and even discovering future business leaders.

TOTAL:15 PERIODS

COURSEOUTCOMES:

On successful completion of this course, the student will be able to

CO1: Solve the real time problems using hardware, software, Computational tools.

CO2: Integrate software and the assembled components in the designed PCB.

CO3: Summarize the knowledge inferred through technical report.

CO4: Communicate a practical understanding of how a business organization actually operates.

CO5: Exhibit the ability to effectively work in professional environment and demonstrate work ethic and commitment in a work-based environment.

CO6: Reflect on personal and professional development needs and set strategic goals for advancing along an intended career path.

24CS311	APTITUDE AND CODING SKILLS – I (Common to All Branches)	L	T	P	C
		0	0	3	1.5

COURSE OBJECTIVES:

The Course will enable learners to:

- Develop vocabulary for effective communication and reading skills.
- Build the logical reasoning and quantitative skills.
- Develop error correction and debugging skills in programming.

List of Exercises:

1. **English – Phase I**

Vocabulary: Synonyms, Antonyms, Grammar: Subject-Verb Agreement, Tenses and Articles, Prepositions and Conjunctions, Speech and Voices, Comprehension: Inferential and Literal Comprehension, Contextual Vocabulary, Comprehension ordering

2. **Logical Reasoning – Phase I**

Deductive Reasoning: Coding deductive logic, Directional sense, Blood relations, Objective Reasoning, Selection decision tables, Puzzles, Inductive reasoning: Coding pattern and Number series pattern recognition, Analogy and Classification pattern recognition, Abductive Reasoning: Logical word sequence, Data sufficiency

3. **Quantitative Ability - Phase I**

Basic Mathematics: Divisibility, HCF and LCM, Numbers, decimal fractions and power, Applied Mathematics: Profit and Loss, Simple and Compound Interest, Time, Speed and Distance, Engineering Mathematics: Logarithms, Permutation and Combinations, Probability

4. **Automata Fix – Phase I**

Logical, Compilation and Code reuse

TOTAL: 45 PERIODS

OUTCOMES

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Develop vocabulary for effective communication skills.
CO2: Build the logical reasoning enhance critical thinking.
CO3: Develop error correction and debugging skills in programming.
CO4: Apply programming skills to develop programs efficiently
CO5: Solve problems using quantitative skills
CO6: Develop effective reading and listening skills.

COURSE CODE	COURSE TITLE	L	T	P	C
24MC301	INDIAN CONSTITUTION	1	0	0	0

COURSE OBJECTIVES:

- Teach history and philosophy of Indian Constitution.
- Describe the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- Summarize powers and functions of Indian government.
- Explain emergency rule.
- Explain structure and functions of local administration.

UNIT I	INTRODUCTION	3

History of Making of the Indian Constitution-Drafting Committee- (Composition & Working) - Philosophy of the Indian Constitution-Preamble-Salient Features

UNIT II	CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES	3

Fundamental Rights-Right to Equality-Right to Freedom-Right against Exploitation Right to Freedom of Religion-Cultural and Educational Rights-Right to Constitutional Remedies Directive Principles of State Policy-Fundamental Duties

UNIT III	ORGANS OF GOVERNANCE	3

Parliament-Composition-Qualifications and Disqualifications-Powers and Functions-Executive President-Governor-Council of Ministers-Judiciary, Appointment and Transfer of Judges, Qualifications Powers and Functions.

UNIT IV	EMERGENCY PROVISIONS	3

Emergency Provisions - National Emergency, President Rule, Financial Emergency

UNIT V	LOCAL ADMINISTRATION	3

District‟s Administration head- Role and Importance-Municipalities- Introduction- Mayor and role of Elected Representative-CEO of Municipal Corporation-Pachayati raj- Introduction- PRI- Zila. Panchayat - Elected officials and their roles- CEO Zila Pachayat- Position and role-Block level Organizational Hierarchy (Different departments)-Village level- Role of Elected and Appointed officials-Importance of grass root democracy.

TOTAL: 15 PERIODS

COURSE OUTCOMES:

After the completion of this course, the student will be able to :

CO1: Able to understand history and philosophy of Indian Constitution.

CO2: Able to understand the premises informing the twin themes of liberty and freedom

from a civil rights perspective.

CO3: Able to understand powers and functions of Indian government.

CO4: Able to understand emergency rule

CO5: Able to understand structure and functions of local administration.

TEXT BOOKS:

1. Basu D D, Introduction to the Constitution of India, Lexis Nexis, 2015.
2. Busi S N, Ambedkar B R framing of Indian Constitution, 1st Edition, 2015.

REFERENCES:

1. Jain M P, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
2. The Constitution of India (Bare Act), Government Publication,1950
3. Durga Das Basu, "Introduction to the Constitution of India ", Prentice Hall of India, New Delhi..
4. R.C.Agarwal, (1997) "Indian Political System", S.Chand and Company, New Delhi.
5. Sharma, Brij Kishore, "Introduction to the Constitution of India", Prentice Hall of India, New Delhi

NPTEL LINK:

https://onlinecourses.nptel.ac.in/noc20_lw03/preview

COURSE CODE	COURSE TITLE	L	T	P	C
24EC401	ANALOG AND DIGITAL COMMUNICATION (Theory course with laboratory component)	3	0	2	4

UNIT I	Amplitude Modulation	9+3

Need for Modulation – Principles and Types of Amplitude Modulation (AM, DSB-SC, SSB-SC, VSB) – Frequency Spectrum Analysis and Power Considerations in AM – AM Generation Methods: Collector Modulator – AM Detection: Envelope Detector - SSB Generation: Phase shift method – SSB Detection: Synchronous Detector – Comparison of AM Techniques – AM Superheterodyne Receiver

LIST OF EXPERIMENTS:

1. Hardware and Software Implementation of AM Modulation and Demodulation

UNIT II	Angle Modulation	9+3

Concepts of Angle Modulation – FM and PM Relationships – NBFM and WBFM - Generation Techniques: Direct (VCO based) and Indirect (Armstrong method) – FM Detection: PLL Demodulators – FM Super heterodyne Receiver

LIST OF EXPERIMENTS:

2. Hardware and Software Implementation of FM Modulation and Demodulation

UNIT III	Sampling and Analog to Digital Conversion	9+9

Block Diagram Digital Communication Systems – Ideal and Practical Sampling Techniques – Uniform and Non-Uniform Quantization – Pulse Code Modulation (PCM) – Differential PCM (DPCM) – Delta Modulation (DM) and Adaptive Delta Modulation (ADM) –Overview of Compressed Sensing for Efficient Sampling.

LISTOFEXPERIMENTS

3. Hardware and Software Implementation of Signal Sampling and reconstruction
4. Hardware and Software Implementation of Pulse Code Modulation and Demodulation
5. Hardware and Software Implementation of Delta Modulation and Demodulation

UNIT IV	Digital Modulation	9+9

Signal Space Representation – Coherent Detection – Generation and Detection of BASK, BFSK, BPSK, QPSK – Quadrature Amplitude Modulation (QAM) – Signal Constellations: BPSK, QPSK, 16-QAM

LIST OF EXPERIMENTS:

6. Simulation of BASK, BFSK, and BPSK Modulation and Demodulation and visualization of Signal Constellation
7. Simulation of QPSK and Visualization of Signal Constellation
8. Simulation of QAM and Visualization of Signal Constellation

UNIT V	Source and Channel Coding	9+6

Information Theory Basics: Entropy, Mutual Information – Channel Capacity: Hartley and Shannon Laws – Source Coding Techniques: Huffman Coding – Channel Coding Principles – Linear Block Codes–Basics of LDPC Codes used in Modern Wireless Systems.

LIST OF EXPERIMENTS:

9. Simulation of Source Coding Algorithms (Huffman Coding)
10. Simulation of Linear Block Codes and Error Correction Performance

TOTAL:45 PERIODS (THEORY) + 30 PERIODS (LAB)=75 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Design amplitude and frequency modulators to meet the specified requirements

CO2: Implement various pulse code modulation techniques to transmit analog signals using appropriate tools

CO3: Design digital modulation schemes to transmit digital data using hardware or simulation tools

CO4: Apply source coding principles to enhance data transmission efficiency

CO5: Implement error-detecting and error-correcting codes in digital communication to enhance the reliability of data transmission

CO6: Construct a communication system for real-world applications and validate its performance

TEXTBOOKS:

1. Simon Haykin, "Communication Systems," 5th Edition, Wiley India, 2023.
2. B.P. Lathi, "Modern Digital and Analog Communication Systems," 5th Edition, Oxford University Press, 2024

REFERENCES:

1. John G. Proakis and Masoud Salehi, "Fundamentals of Communication Systems," 3rd Edition, Pearson Education, 2023.
2. Sanjay Sharma, Communication Systems (Analog and digital), 7th Edition, S.K.Kataria & Sons, 2022.
3. Taub, Schilling, and Saha , "Principles of Communication Systems" McGraw-Hill Education, 4th Edition, 2022
4. Simon Haykin and Michael Moher "Analog and Digital Communications" Wiley, 2nd Edition, 2020
5. Roddy and Coolen, Electronic Communication, 4th Edition, Pearson Education, Noida, India, 2014.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

Sl. No.	Name of Equipment	Quantity
1.	AM Transmitter & AM Receiver Trainer Kit	2
2.	FM Transmitter & FM Receiver Trainer Kit	2
3.	Signal Sampling and reconstruction Trainer Kit	2
4.	Pulse Code Modulation - Transmitter and Receiver Trainer Kit	1
5.	Delta Modulation and Demodulation - Transmitter and Receiver Trainer Kit	2
6.	ASK Modulation and Demodulation - Transmitter and Receiver Trainer Kit	1
7.	FSK Modulation and Demodulation - Transmitter and Receiver Trainer Kit	1
8.	PSK Modulation and Demodulation - Transmitter and Receiver Trainer Kit	1
9.	QPSK Modulation and Demodulation - Transmitter and Receiver Trainer Kit	1
10.	DSO/CRO	15
11.	Function Generator (3 MHz)	5
12.	Dual Power Supply	5

13.	Spectrum Analyser	1
14.	Matlab/Scilab/Equivalent Open Software	15 user
15.	Personal Computer	15

COURSE CODE	COURSE TITLE	L	T	P	C
24EC402	LINEAR INTEGRATED CIRCUITS (Theory Course with laboratory component)	3	0	2	4

UNIT I	Operational Amplifier Characteristics	9+3

Advantages of ICs over discrete components, Classification, Basic information about Op-amps – Ideal Op-amp Characteristics, Equivalent Circuit, General operational amplifier stages, Open and Closed loop configurations of IC 741, Inverting Amplifier and Non-Inverting Amplifier, Differential amplifier - DC and AC performance characteristics and its compensation techniques, Slew Rate.

List of Experiments:

1. Design of Inverting, non-inverting and differential amplifier.

UNIT II	Applications of Operational Amplifiers	9+12

Linear Applications: Voltage Follower, Adder, Subtractor, Instrumentation Amplifier, Integrator, Differentiator, **Non-linear Applications:** Logarithmic Amplifier, Antilogarithmic Amplifier, Comparators, Schmitt trigger, Precision rectifier, clipper and clamper, **Active Filters:** First order and Higher order Low- Pass, High-Pass and Band-Pass Butterworth Filters

List of Experiments:

2. Instrumentation amplifier using PSPICE
3. Design of Integrator, Differentiator using op-amp
4. Design of Schmitt Trigger using op-amp
5. Active Filters design- LPF, HPF using PSPICE

UNIT III	Analog Multiplier and PLL	9+3

Analog Multiplier ICs and their applications, PLL: Operation of the basic PLL, closed loop analysis, Voltage Controlled Oscillator IC 566, Monolithic PLL IC 565, Applications of PLL: FM Demodulator, FSK Demodulator, Frequency synthesizing and clock synchronization.

List of Experiments:

6. Study of PLL characteristics using IC565

UNIT IV	Analog to Digital and Digital to Analog Converters	9+6

Analog and Digital Data Conversions, D/A converter – specifications - weighted resistor type, R- 2R Ladder type: Voltage Mode and Current Mode - Switches for D/A converters, high speed sample-and-hold circuits, A/D converters – specifications - Flash type - Successive Approximation type - Single Slope and Dual Slope.

List of Experiments:

7. Design of R-2R ladder type DAC using Op-amp 741
8. Design of Flash Type ADC using PSPICE

UNIT V	Waveform Generators and Voltage Regulators	9+6

Waveform generators: Sine-wave generators – RC phase shift and Wien Bridge Oscillator, Triangular wave generator, IC 555 Timer and its modes of operation, Fixed voltage regulator– LM317 Adjustable voltage regulator- IC723 general purpose regulator.

List of Experiments:

9. Design of Voltage Regulator using IC 723
10. Design of Astable and Monostable multivibrators using IC 555 timer.

TOTAL: 45 Theory + 30 Lab = 75 PERIODS

COURSE OUTCOMES:

After successful completion of the course, the students will be able to

CO1: Explain the fundamental concepts of Linear Integrated Circuits.

CO2: Describe the fundamentals of PLL, ADC and DAC technologies.

CO3: Design analog circuits using operational amplifiers.

CO4: Design analog multiplier and waveform generators.

CO5: Analyze the characteristics of operational amplifiers.

CO6: Analyze the characteristics of waveform generators, PLL & voltage regulators.

TEXTBOOKS:

1. D. RoyChoudhry, Shail B Jain, Linear Integrated Circuits, 5thEdition, New Age International Pvt. Ltd., 2020.
2. Salivahanan S and Kanchana Bhaaskaran V S, Linear Integrated Circuits, 3rd Edition, McGraw Hill Education, 2018.

REFERENCES:

1. Ramakant A. Gayakwad, ―OP-AMP and Linear ICs‖, 4th Edition, Pearson Education, 2015.
2. Sergio Franco, Design with Operational Amplifiers and Analog Integrated Circuits, 4th Edition, TMH, 2016.
3. Robert F.Coughlin, Frederick F.Driscoll, Operational Amplifiers and Linear Integrated Circuits, 6th Edition, PHI, 2015.
4. Gray and Meyer, Analysis and Design of Analog Integrated Circuits, 5th Edition, Wiley International, 2019.
5. William D. Stanley, Operational Amplifiers with Linear Integrated Circuits, 4th Edition, Pearson Education,2014.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No	Equipment	Quantity
1.	CRO/DSO (Min 30 MHz)	15
2.	Function generator (3MHz)	15
3.	Dual regulated power supply (0-30V)	15
4.	Desktop with PSPICE	15
5.	Resistors, Capacitors (As required)	50
6.	Bread Boards	15
7.	IC 741, IC 555, IC 723, IC 565	50

COURSE CODE	COURSE TITLE	L	T	P	C
24EC403	DIGITAL SYSTEM DESIGN (Theory Course with laboratory component)	3	0	2	4

UNIT I	DIGITAL LOGIC PRINCIPLES	9+3

Review of Boolean algebra theorems, sum of product and product of sum simplification, canonical forms, min term and max term, Simplification of Boolean expressions- Karnaugh map (up to 4-variables), tabulation method (up to 4-variables). Implementation of Boolean expressions using logic gates and Universal gates.

List of Experiments:

1. Implementation of Boolean expression using logic gates.

UNIT II	DESIGN OF COMBINATIONAL LOGIC CIRCUITS	9+12

Design of combinational circuits - Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder – Carry look ahead Adder, 2 bit Magnitude Comparator, Decoder, Encoder, Priority Encoder, Mux/De-mux, Parity Generator/Checker, Code converters (Gray to Binary, BCD to Excess-3,vice versa)

List of Experiments:

2. Design and Verification of adders and subtractors.
3. Design and Implementation of Multiplexers & Demultiplexers.
4. Design and Implementation of Encoders and Decoders.
5. Design and Verification of Code converters(Gray to Binary & Binary to Gray)

UNIT III	DESIGN OF SEQUENTIAL CIRCUITS	12+9

Design of clocked sequential circuits - Moore/Mealy models, state minimization, state assignment, circuit implementation. Latches, Flip flops – SR, JK, T, D, Master/Slave FF, Shift Registers - SISO, SIPO, PISO, PIPO. Design and Analysis of synchronous sequential circuits: state table and state diagrams, Design of counters: Modulo-n, Johnson, Ring, Up/Down, Asynchronous counter.

List of Experiments:

6. Design and implementation of 3 bit ripple counter.
7. Design and implementation of 3 bit synchronous counter.
8. Design and implementation of shift registers

UNIT IV	ASYNCHRONOUS SEQUENTIAL CIRCUITS	6+0

Stable and Unstable states, output specifications, cycles and races, state reduction, race free assignments, Hazards, Essential Hazards, Design of Hazard free circuits.

UNIT V	MEMORY AND PROGRAMMABLE LOGIC DEVICES	9+6

Basic memory structure ROM: PROM – EPROM – EEPROM –RAM – Static and dynamic RAM – Programmable Logic Devices: Programmable Logic Array (PLA) – Programmable Array Logic (PAL) – Implementation of combinational logic circuits using PLA, PAL.

List of Experiments:

9. Implementation of combinational logic circuits using PLA.
10. Implementation of combinational logic circuits using PAL

TOTAL: 45 Theory + 30 Lab = 75 PERIODS

COURSE OUTCOMES:

After successful completion of the course, the students will be able to

CO1: Apply Boolean algebra to simplify and implement digital circuits.

CO2: Design combinational circuits to meet specific functional requirements using logic gates.

CO3: Demonstrate the operation of counters and shift registers using flip-flops in sequential circuits.

CO4: Analyze synchronous sequential circuits to determine their behavior and performance characteristics.

CO5: Analyze digital circuits to detect and resolve hazards, races, and other design issues.

CO6: Construct combinational circuits using Programmable Logic Devices (PLDs) to solve complex digital design problems.

TEXTBOOKS:

1. M. Morris Mano and Michael D. Ciletti, Digital Design, With an Introduction to the Verilog HDL, VHDL, and System Verilog, 6th Edition, Pearson, 2018.
2. A.Anandkumar, Fundamental of digital circuits, 4th Edition, PHI Publication, 2016.

REFERENCES:

1. S.Salivahanan and S.Arivazhagan, Digital Circuits and Design, 5th Edition, Oxford University Press, 2018.
2. CharlesH.Roth, Jr. and Larry L. Kinney, Fundamentals of Logic Design, 7th Edition, Thomson Learning, 2014.
3. WilliamKleitz, Digital Electronics-A Practical approach to VHDL, Prentice Hall International Inc, 2012.
4. Thomas L. Floyd, Digital Fundamentals, 11th Edition, Pearson Education Inc, 2017.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No	Equipment	Quantity
1.	IC Trainer Kit	15
2.	ICs (7400/ 7404 / 7486 / 7408 / 7432 / 7483 / 7473 / 7411/7474)	Each 30
3.	Resistors, Capacitors (As required)	50
4.	Bread Boards	15

	WEB DEVELOPMENT FRAMEWORKS	L	T	P	C
		3	0	3	4.5

COURSE OBJECTIVES

The Course will enable the learners:

- To understand web semantics and related tools and framework
- Able to get hands on latest JS based web frameworks
- To develop a scalable and responsive web application
- To develop an industry ready application web enterprise feature

UNIT I	ADVANCED TYPESCRIPT	9+9

Introduction to HTML5 and CSS3, Media Queries, JS, DOM, BootStrap, Variables, Loops, Operators, Scope Hoisting, Arrays, Spread, REST, DeStructuring

Introduction, Advantage of Using TS over JS, and where to Use and not to use TS - Understanding the Compiler (Transpiler), and its options, Scope of TS - Variable Scopes, Static Data Types - String, Number,Interface, Date - Union, Tuple, Undefined Data Types, Unknown vs any vs Never - Object Oriented , Arrow Funcions - Types, KeyOf, TypeOf, InstanceOf ,Narrowing, Conditional Types - Generics,Enum ,Required / Partial / Optional - Arrays, Modules ,Async Processing w Call backs ,Type Inference, Type Compatability, Utility Type - Unit Testing,TSLint

List of Exercise/Experiments

1. Create a TS Object for Bank Account (w attributes like à customer name, account type, balance, data of creation, bank name, branch name, pan card number). Using JS Object keyword, try to perform following activities
    - List down all the entries of the bank object
    - Check the existence of a key
    - If key found, get the value for the key
2. Spread Operator
    - Merge Customer and Account Arrays
    - Update the Customer Object with the new values
    - Develop a function that takes an Spread Argument and calculates total balance.

UNIT II	INTRODUCTION TO REACTJS	9+9

Introduction to React - ES6 Features,What is React?,React Features - Setting up React Development Environment:- Node.js and npm installation,Create React App,Project structure - JSX (JavaScript XML):- What is JSX?,JSX Syntax and Rules,JSX Expressions - Components in React:- Functional Components,Class Components,Props and PropTypes - State and Lifecycle :- State and setState,Lifecycle Methods,Mounting, Updating, and Unmounting,Handling Events in React - Event Handling in React :- Synthetic Events,Event Binding, - Conditional Rendering:-If-else Statements,Ternary Operator,Logical && Operator
Lists and Keys:-Rendering Lists,Keys and Reconciliation,Extracting Components.

List of Exercise/Experiments

1. A leading bank from APAC wants to modernize their banking services and decided to build a online multi channel mobile ecommerce platform. As part of the drive, starting building following feature set in a staggered model emplying ReactJS as front end library and associated libs from React eco system. Feature to be implemented are

- User Login Page
- Account Summary
- Funds Transfer (within bank and outside bank)
- Recurring and Fixed deposits
- Letter of Credit
- Salary or 3rd Party Payment

2. Unit 2 Scope – Project Setup, Web App Layout Completion using BootStrap or Tailwind, Login Page Implementation, Landing Page Implementation, Authentication and Authorization Implementation.

UNIT III	REACTJS COMPONENTS	9+9

Forms and Controlled Components :- Form Handling in React, Controlled Components, Uncontrolled Components - Basic Hooks :- useState,useRef,useEffect, - Routing in React:- Introduction to React Router,Route, Link, and Switch Components, Route Parameters,useNavigate,useParams, - REST API – Axios GET/PUT/Delete/Remove, Interceptor, Headers, Authorization Token, Promise and Observables (via rxjs)

List of Exercise/Experiments

1. Extend the Project developed in previous section with newly learnt concepts
    - Unit 3 Scope – Forms and Validation (React Form Validation), Integration of Back End Apis via Axios,API Security Implementaiton, Routes and Navigation with Priviate Routes, Usage of useEffect, UseContext hooks

UNIT IV	REACT PRO TOOLKIT: ERROR MANAGEMENT, ABSTRACTIONS AND DATA HANDLING	9+9

Error Handling :- Error Boundaries,componentDidCatch,Error Handling Strategies
Higher-Order Components (HOCs) :- What are HOCs?,Creating and Using HOCs,HOCs vs Render Props,Code Splitting and Lazy Loading,Server-Side Rendering - Data Fetching with React Query :- React Query,Introduction to React Query,Query Keys and Query Functions, Query Invalidation and Refetching.

List of Exercise/Experiments

1. Extend the Project developed in previous section with newly learnt concepts
    - Unit 4 Scope – Completion of Remaining Modules, Error Handling, HOC and AUX implementation, Lazy loaded components for improved performance
2. Extend the Project developed in previous section with newly learnt concepts

UNIT V	REACT UNDER THE HOOD: TESTING, CONTEXT API, AND REDUX	9+9

Testing React Components :- Introduction to Testing,Jest Framework,React Testing Library
Context API :- Creating Context,Providing and Consuming Context,useContext Hook
Redux Overview :- What is Redux?,Redux Principles,Single Source of Truth - Redux Actions and Reducers :- Redux Actions,Redux Reducers,Combining Reducers.

List of Exercise/Experiments

1. Extend the Project developed in previous section with newly learnt concepts
    - Unit 5 Scope – Unit Testing using JEST, Redux implementation for state management.

Business Use Case Implementations

1. Student Management System
2. Retail Bank System
3. eCommerce System
4. Student LMS Management System

TOTAL: 45+45=90 PERIODS

COURSE OUTCOMES

After completing the course, students will have the ability to

CO1. Understand and apply modern web technologies including HTML5, CSS3, JavaScript, and advanced TypeScript concepts to build dynamic web components.

CO2. Develop responsive and modular front-end applications using ReactJS, including component creation, state management, and routing.

CO3. Implement advanced React features like hooks (useState, useEffect, useRef), React Router, and REST API integration using Axios for dynamic content handling.

CO4. Utilize higher-order components (HOCs), lazy loading, and server-side rendering to optimize and abstract React applications.

CO5. Perform unit testing using Jest and RTL, and manage global application state efficiently using Context API and Redux.

CO6. Design and deliver scalable and real-world enterprise web applications with complete user interface flow, security, and error handling.

TEXTBOOKS

1. David Flanagan, Javascript The Definitive Guide, Paperback, 7th Edition, 2020.
2. David Choi ,Full-Stack React, TypeScript, and Node: Build cloud-ready web applications using React 17 with Hooks and GraphQL Paperback – Import, 18 December 2020.
3. Mehul Mohan, Advanced Web Development with React Paperback – 1 January 2020.

E-RESOURCES

1. Parental Website - https://reactjs.org/
2. The Road to Learn React: Your journey to master plain yet pragmatic React.js by Robin Wieruch
3. Learning React: Functional Web Development with React and Redux by Alex Banks and Eve Porcello
4. Learning React by KirupaChinnathambi
5. "React Up & Running" by StoyanStefanov
6. https://www.edureka.co/reactjs-redux-certification-training
7. CodePen
8. CodeSandbox (Preferred)
9. Stackblitz

LIST OF EQUIPMENTS

- NodeJS (v22.11.2)
- Github as code repository
- Visual studio code as IDE
- RTL as unit testing framework
- Responsive design w bootstrap
- ReactJS installation (v17)
- Chrome / FIreFox Browsers (latest)
- Responsive using Media Queries & Bootstrap Material&Antdesign
- Design based Apps

24MA402	STATISTICS AND LINEAR ALGEBRA (Theory Course with Laboratory Component)	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

The course will enable the learners to:

- test the hypothesis for small and large samples.
- introduce the concept of analysis of variance.
- understand the concept of statistical quality control.
- explain the concepts of vector space, bases, and dimensions.
- acquire knowledge on linear transformations and diagonalization.

UNIT I	TESTING OF HYPOTHESIS	15

Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal `distribution for single mean and difference of means - Tests based on t, F distributions for mean and variance- Chi-square test - Goodness of fit and Contingency table (test for independence).

List of Exercises/Experiments using R Programming:

1. Testing of hypothesis for given data using z - test.
2. Testing of hypothesis for given data using t - test

UNIT II	DESIGN OF EXPERIMENTS	15

One-way and two-way classifications - Completely randomized design - Randomized block design - Latin square design.

List of Exercises/Experiments using R Programming:

1. Perform one way ANOVA test for the given data.
2. Perform two way ANOVA test for the given data

UNIT III	STATISTICAL QUALITY CONTROL	15

Control charts for measurements $\bar{X}$ and R charts) - Control charts for attributes (p, c and np charts) - Tolerance limits.

List of Exercises/Experiments using R Programming:

1. Interpret the results for $\bar{X}$-Chart for variable data.
2. Interpret the results for R-Chart for variable data

UNIT IV	VECTOR SPACES	15

Vector spaces - Subspaces - Linear combinations and linear system of equations - Linear independence and linear dependence - Bases and dimensions.

List of Exercises/Experiments using R Programming:

1. Plot the vector subspace in 3-dimensional space.
2. Compute the null space of the matrix.

Unit V	LINEAR TRANSFORMATION AND DIAGONALIZATION	15

Linear transformation - Null spaces and ranges - Dimension theorem - Matrix representation of linear transformations - Eigenvalues and eigenvectors - Diagonalizability.

List of Exercises/Experiments using R Programming:

1. Write Matrix representation of linear transformations.
2. Find eigenvalue and eigenvector of linear transformation

TOTAL: 75 PERIODS

OUTCOMES

Upon completion of the course, the students will be able to:

CO1: implement the concept of testing of hypothesis to solve real life problems.

CO2: apply the concept of ANOVA for various experimental designs.

CO3: prepare the control charts for variables and attributes for analyzing the data.

CO4: identify the bases and dimensions of vector space.

CO5: apply linear transformations to practical problems in various fields.

CO6: solve problems involving eigenvalues, eigenvectors, and diagonalization.

TEXT BOOKS

1. R.A. Johnson, I. Miller and J. Freund, "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2023.
2. Stephen H. Friedberg, A. J. Insel, and L. Spence, "Linear Algebra" 5th Edition, Prentice Hall of India, New Delhi, 2022.

REFERENCES

1. J.L. Devore, "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 9th Edition, Reprint, 2020.
2. S.M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists", 6th Edition, Elsevier, 2020.
3. M.R. Spiegel, J. Schiller and R.A. Srinivasan, "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill, 4th Edition, 20013.
4. R. E. Walpole, R. H. Myers, S.L. Myers and K. Ye, "Probability and Statistics for Engineers and Scientists". Pearson Education, Asia, 9th Edition, Reprint 2021.
5. J.S. Milton and J.C. Arnold, "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2019.
6. Steven J. Leon, "Linear Algebra with Applications", Pearson Educational International", 9th Edition, United States of America, 2015

COURSE CODE	COURSE TITLE	L	T	P	C
24EC404	INTRODUCTION TO INTERNET OF THINGS	3	0	0	3

UNIT I	INTRODUCTION TO IOT	9

Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific IoTs - IoT and M2M.

UNIT II	IOT ARCHITECTURE	9

M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model – Domain model - information model - functional model - communication model – IoT reference architecture.

UNIT III	IOT PROTOCOLS	9

Protocol Standardization for IoT – Efforts – MQTT, CoAP, OMA LWM2M , WIFI, Bluetooth, Zigbee, LoRAWAN Protocols– SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus - 6LoWPAN.

UNIT IV	BUILDING IOT WITH RASPBERRY PI	9

Building IOT with RASPERRY PI - IoT Systems - Logical Design using Python – IoT Physical Devices & Endpoints - IoT Device -Building blocks -Raspberry Pi -Board - Linux on Raspberry Pi - Raspberry Pi Interfaces - Programming Raspberry Pi with Python - Controlling LED with Raspberry Pi,Interfacing an LED and Switch with Raspberry Pi ,Interfacing Light Sensor (LDR) with Raspberry Pi - Other IoT Platforms - Arduino.

UNIT V	CASE STUDIES AND REAL-WORLD APPLICATIONS	9

Real world design constraints – Applications - Industrial automation, smart grid, Commercial building automation Data Analytics for IoT – Software & Management Tools for IoT Cloud Storage Models & Communication APIs Cloud for IoT - Amazon Web Services for IoT.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

CO1: Understand the fundamental concepts, physical and logical design principles.

CO2: Analyze various IoT architectures, models, protocols, and deployment strategies.

CO3: Apply relevant IoT communication standards for secure and efficient data exchange.

CO4: Demonstrate the ability to design and prototype IoT applications using IoT Board. CO5:

Interpret real-world constraints and requirements to develop IoT solutions.

CO6: Utilize cloud platforms and communication protocols to support scalable IoT deployments.

TEXTBOOKS:

1. Arshdeep Bahga, Vijay Madisetti, ―Internet of Things – A hands-on approach‖, Universities Press, 2023.
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), ―Architecting the Internet of Things, Springer, 2019.

REFERENCES:

1. Honbo Zhou, ―The Internet of Things in the Cloud: A Middleware Perspective‖, CRC Press, 2020.
2. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle, - From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence, Elsevier, 2014
3. Olivier Hersent, David Boswarthick, Omar Elloumi, ―The Internet of Things – Key applications and Protocol, Wiley, 2012
4. David E. Goldberg, - IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, Cisco Press, 2017.

COURSE CODE	COURSE TITLE	L	T	P	C
24EC411	PRODUCT DEVELOPMENT LAB-2	0	0	2	1

COURSE OBJECTIVES:

- Develop comprehensive report on the engineering facts applied to a specific problem.
- Analyze the real time problems during project/product development in engineering perspective.
- Evaluate the effectiveness of the product or a system through the knowledge acquired.
- Synthesize the business opportunities for a new product with novel design.

LIST OF EXPERIMENTS

1. Develop a prototype.
2. Demonstration of the project/product and submission of report.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of this course, the students will be able to:

CO1: Understand and explain the real time problems through literatures.

CO2: Analyze the methods to develop solution to the systems.

CO3: Classify, compare and analyze business opportunities for a new product.

CO4: Summarize and prepare reports for the experimental determinations.

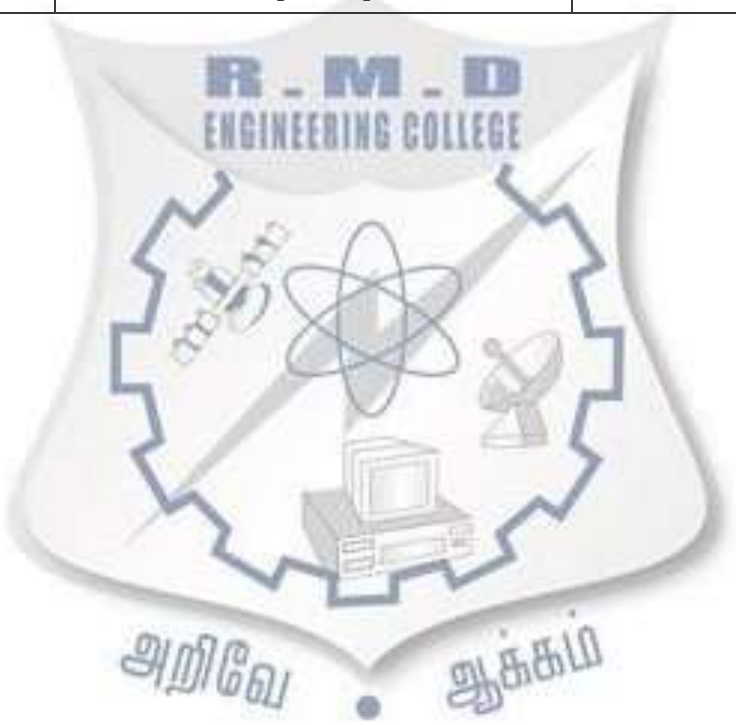
CO5**:** Evaluate the performance and effectiveness of the existing problems.

CO6: Develop life-long learning skills for a productive career.

LIST OF EQUIPMENT:

S.NO	EQUIPMENT NAME	QUANTITY
1.	CNC Router	1
2.	3D Printer	1
3.	3D Scanner	1
4.	Laser Cutting Machine	1
5.	Centre lathe	2
6.	Arc Welding transformer with cables and holders	2
7.	Plumbing tools	2 Sets
8.	Carpentry Tools	2 Sets

9.	Multimeter	10
10.	Drilling Machine	1
11.	Solder Stations	5 Sets
12.	Desoldering Machine	1
13.	PCB Milling Machine	1
14.	Variable Power Supply	1
15.	Electronic Components like Resistors, Transistors, Diode, Inductor, Capacitors, IC etc.,	10 Sets
16.	Personal Desktop Computers	30



24CS411	APTITUDE AND CODING SKILLS – II (Common to All Branches)	L	T	P	C
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COURSE OBJECTIVES:

The Course will enable learners to:

- Develop advanced vocabulary for effective communication and reading skills.
- Build an enhanced level of logical reasoning and quantitative skills.
- To develop error correction and debugging skills in programming.
- To apply data structures and algorithms in problem solving.

List of Exercises:

1. **English – Phase II**

Vocabulary: Synonyms, Antonyms, Grammar: Subject-Verb Agreement, Tenses and Articles, Prepositions and Conjunctions, Speech and Voices, Comprehension: Inferential and Literal Comprehension, Contextual Vocabulary, Comprehension ordering

2. **Logical Reasoning – Phase II**

Deductive Reasoning: Coding deductive logic, Directional sense, Blood relations, Objective Reasoning, Selection decision tables, Puzzles, Inductive reasoning: Coding pattern and Number series pattern recognition, Analogy and Classification pattern recognition, Abductive Reasoning: Logical word sequence, Data sufficiency

3. **Quantitative Ability - Phase II**

Basic Mathematics: Divisibility, HCF and LCM, Numbers, decimal fractions and power, Applied Mathematics: Profit and Loss, Simple and Compound Interest, Time, Speed and Distance, Engineering Mathematics: Logarithms, Permutation and Combinations, Probability

4. **Automata Fix – Phase II**

Logical, Compilation and Code reuse

5. **Automata - Phase II**

Data Structure Concepts: Array and Matrices, Linked list, String processing and manipulation, Stack/Queue, Sorting and Searching

Advanced Design and Analysis Techniques: Greedy Algorithms, Minimum Spanning Trees, String Matching, Divide and Conquer, Computational Geometry

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of the course, the students will be able to:

CO1: Develop advanced vocabulary for effective communication skills.

CO2: Build an enhanced level of logical reasoning and quantitative skills.

CO3: Develop error correction and debugging skills in programming.

CO4: Applydata structures and algorithms in problem solving.

CO5: Develop advanced vocabulary for effective reading skills

CO6: Apply advanced algorithm design techniques to develop programs