



## **S.A.ENGINEERING COLLEGE,CHENNAI-77**

**AUTONOMOUS INSTITUTION**

**REGULATIONS 2024**

**CHOICE BASED CREDIT SYSTEM**

### **B.E. –Electronics and Communication Engineering**

#### **I. Vision**

To achieve overall excellence in education, by continuously upgrading the teaching learning process, and incorporating latest technological advancements happening worldwidewith ethical responsibilities.

#### **II. Mission**

**M1:** To impart sound d i v e r s i f i e d technical competency and quality education for students to enhance the employability and ethical values.

**M2:** To provide conducive environment for faculty and students with excellent facilities to improve research activity.

#### **III. Programme Educational Objectives**

**PEO1:** Our graduate Engineers will have diversified professional competency in Electronics and Communication Engineering and allied technologies with good foundation in Mathematics and basic sciences.

**PEO2:** Our graduates will possess lifelong learning process and augment their engineering skills for new challenges with sustainability.

**PEO3:** Our graduates will have effective communication skills and work in Multidisciplinary team with critical thinking.

**PEO4:** Our graduates will practice the profession with ethics, integrity, leadership and social responsibility.

#### **IV. Program Outcomes**

- PO 1.** *Engineering knowledge:* Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO 2.** *Problem analysis:* Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO 3.** *Design/development of solutions:* Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- PO 4.** *Conduct investigations of complex problems:* Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- PO 5.** *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.

- PO 6.** *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.
- PO 7.** *Environment and sustainability:* Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- PO 8.** *Ethics:* Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO 9.** *Individual and team work:* Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO 10.** *Communication:* Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO 11.** *Project management and finance:* Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- PO 12.** *Life-long learning:* Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## **V. Program Specific Outcomes**

**PSO1:** To inculcate the ability to design quality products and to develop solutions which suits the real time societal needs by applying modern tools and the best universal practices.

**PSO2:** To define and adhere the communication standards leading towards green communication.

**PSO3:** To adapt to emerging Information and Communication Technologies (ICT) and to innovate ideas and solutions for the existing/novel problems.

**B.E.ELECTRONICSANDCOMMUNICATIONENGINEERING CHOICE  
BASED CREDIT SYSTEM-2024 R  
CURRICULUM FOR SEMESTERS I TO VIII**

**SEMESTERI**

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODSPER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.		Induction Programme	-	-	-	-	-	<b>0</b>
<b>THEORY</b>								
2.	<b>TA3101</b>	Heritage of Tamils	<b>HSMC</b>	1	0	0	1	1
3.	<b>HS3101</b>	Professional English I	<b>HSMC</b>	3	0	0	3	3
4.	<b>MA3101</b>	Matricesand Calculus	<b>BSC</b>	3	1	0	4	4
5.	<b>PH3101</b>	Engineering Physics	<b>BSC</b>	3	0	0	3	3
6.	<b>CY3101</b>	Chemistry For Engineers	<b>BSC</b>	3	0	0	3	3
7.	<b>CS3101</b>	Programming for problem solving Using C	<b>ESC</b>	3	0	0	3	3
8.	<b>ME3101</b>	Engineering Graphics	<b>ESC</b>	2	1	0	3	3
<b>PRACTICALS</b>								
9.	<b>BS3101</b>	Physics and Chemistry Laboratory	<b>BSC</b>	4	0	0	4	2
10.	<b>CS3102</b>	Programmingfor problem solving Using C Laboratory	<b>ESC</b>	4	0	0	4	2
<b>TOTAL</b>				<b>26</b>	<b>3</b>	<b>0</b>	<b>28</b>	<b>24</b>

**SEMESTERII**

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODSPER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
<b>THEORY</b>								
1.	<b>TA3201</b>	Tamils and Technology	<b>HSMC</b>	1	0	0	1	1
2.	<b>HS3201</b>	Professional English II	<b>HSMC</b>	3	0	0	3	3
3.	<b>MA3201</b>	Engineering Mathematics	<b>BSC</b>	3	1	0	4	4
4.	<b>PH3203</b>	Physics for Electronics Engineering	<b>BSC</b>	3	0	0	3	3
5.	<b>CY3201</b>	Environmental Science and Sustainability	<b>BSC</b>	2	0	0	2	1
6.	<b>EE3201</b>	Basic Electrical Electronics and Instrumentation Engineering	<b>ESC</b>	3	0	0	3	3
7.	<b>CS3201</b>	Programming in Python	<b>ESC</b>	3	0	0	3	3
<b>PRACTICALS</b>								
8.	<b>GE3201</b>	Engineering Practices Laboratory	<b>ESC</b>	0	0	4	4	2
9.	<b>CS3202</b>	Programming in Python Laboratory	<b>ESC</b>	0	0	4	4	2
<b>TOTAL</b>				<b>18</b>	<b>1</b>	<b>8</b>	<b>27</b>	<b>22</b>

**SEMESTER III**

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
<b>THEORY</b>								
1.	MA3302	Random Process and Linear Algebra	BSC	3	1	0	4	4
2.	IT3308	Object Oriented Programming in Java	ESC	3	0	0	3	3
3.	EC3301	Signals and Systems	PCC	3	1	0	4	4
4.	EC3302	Electronic Devices and Circuits I	PCC	3	0	0	3	3
5.	EC3303	Network Theory and Circuit Analysis	PCC	3	0	0	3	3
6.	EC3304	Digital Circuits Design	PCC	3	0	0	3	3
<b>PRACTICALS</b>								
7.	EC3305	Electronic Devices and Circuits I Laboratory	PCC	0	0	3	3	1.5
8.	EC3306	Digital Circuits Design Laboratory	PCC	0	0	3	3	1.5
9.	EC33VAC	Value Added Course I	VAC	0	0	3	3	0
10.	EC33PT	Aptitude Skills-I	EEC	0	0	3	3	0
<b>TOTAL</b>				<b>18</b>	<b>2</b>	<b>12</b>	<b>32</b>	<b>23</b>

**SEMESTER IV**

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
<b>THEORY</b>								
1.	EC3401	Electromagnetic Fields	PCC	3	0	0	3	3
2.	HV3401	Universal Human Values	HSMC	3	0	0	3	3
3.	EC3402	Linear Integrated Circuits	PCC	3	0	0	3	3
4.	EC3403	Electronic Circuits II (Lab Integrated)	PCC	3	0	2	5	4
5.	EC3404	Control Systems Engineering	PCC	3	0	0	3	3
6.	EC3405	Analog and Digital Communication Systems	PCC	3	0	0	3	3
<b>PRACTICALS</b>								
8.	EC3406	Analog and Digital Communication Systems Laboratory	PCC	0	0	4	3	1.5
9.	EC3407	Linear Integrated Circuits Laboratory	PCC	0	0	4	3	1.5
10.	HS3303	English Language Enhancement and Business Communication Laboratory	HSMC	0	0	4	3	1.5

11.	EC34VAC	Value Added Course II	VAC	0	0	3	3	0
12.	EC34PT	Aptitude Skills-II	EEC	0	0	3	3	0
<b>TOTAL</b>				<b>18</b>	<b>0</b>	<b>20</b>	<b>36</b>	<b>23.5</b>

#### SEMESTER V

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
<b>THEORY</b>								
1.	EC3501	Microprocessor and Microcontroller	PCC	3	0	0	3	3
2.	EC3502	Digital Signal Processing	PCC	3	1	0	4	4
3.	EC3503	Transmission lines and Waveguides	PCC	3	0	0	3	3
4.		Professional Elective I	PEC	3	0	0	3	3
5.		Professional Elective II	PEC	3	0	0	3	3
6.		Open Elective I	OEC	3	0	0	3	3
<b>PRACTICALS</b>								
7.	EC3504	Digital Signal Laboratory	PCC	0	0	3	3	1.5
8.	EC3505	Microprocessor and Microcontroller Laboratory	PCC	0	0	3	3	1.5
9.	EC35VAC	Value Added Course III	VAC	0	0	3	3	0
10.	EC35PT	Advanced Coding Skills I	EEC	0	0	3	3	0
<b>TOTAL</b>				<b>18</b>	<b>1</b>	<b>9</b>	<b>28</b>	<b>22</b>

#### SEMESTER VI

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
<b>THEORY</b>								
1.	EC3601	Antenna and Microwave Engineering (Lab Integrated)	PCC	3	0	2	5	4
2.	EC3602	VLSI Design	PCC	3	0	0	3	3
3.	EC3603	Wireless Communication	PCC	3	0	0	3	3
4.		Professional Elective III	PEC	3	0	0	3	3
5.		Professional Elective IV	PEC	3	0	0	3	3
6.		Open Elective II	OEC	3	0	0	3	3
<b>PRACTICALS</b>								
7.	HS3606	Professional and Career Advancement Laboratory	HSMC	0	0	3	3	1.5
8.	EC3604	VLSI Lab	PCC	0	0	3	3	1.5
9.	EC36SLC	Self Learning Course (MOOC Courses)	SLC	0	0	0	0	1*
10.	EC36VAC	Value Added Course IV	VAC	0	0	3	3	0
11.	EC36PT	Advanced Coding Skills II	EEC	0	0	3	3	0
<b>TOTAL</b>				<b>18</b>	<b>0</b>	<b>14</b>	<b>32</b>	<b>22</b>

**SEMESTERVII**

S. NO .	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
<b>THEORY</b>								
1.		Elective-Management <sup>#</sup>	HSMC	3	0	0	3	3
2.	EC3701	Embedded Systems and IoT Design	PCC	3	0	0	3	3
3.	EC3702	Optical Communication	PCC	3	0	0	3	3
5.		Professional Elective V	PEC	3	0	0	3	3
6.		Professional Elective VI	PEC	3	0	0	3	3
<b>PRACTICALS</b>								
7.	EC3703	Summer internship	EEC	0	0	6	6	2
8.	EC3704	Project Phase I	EEC	0	0	6	6	2
9.	EC3705	Embedded Lab	PCC	0	0	3	3	1.5
10.	EC37VAC	Value Added Course V	VAC	0	0	3	3	0
<b>TOTAL</b>				<b>18</b>	<b>0</b>	<b>18</b>	<b>36</b>	<b>23.5</b>

**SEMESTERVIII**

S. NO .	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
<b>PRACTICALS</b>								
1.	EC3801	Project Work	EEC	0	0	16	16	8
<b>TOTAL</b>				<b>0</b>	<b>0</b>	<b>16</b>	<b>16</b>	<b>8</b>

**TOTALCREDITS:165**

<b>SEMICONDUCTOR TECHNOLOGIES</b>	<b>SIGNAL PROCESSING</b>	<b>ADVANCED WIRELESS COMMUNICATION AND NETWORKS</b>	<b>BIO – MEDICAL TECHNOLOGIES</b>	<b>SENSOR TECHNOLOGIES AND IOT</b>	<b>AIDS AND NETWORK SECURITY</b>	<b>NAVIGATION</b>
Advanced Digital Sytem Design	Speech Processing	Communication Networks	Body Area Network	Introduction To Sensors And Actuators	Foundation Course On Machine Learning	Positioning And Navigation
Analog Ic Design	Image Processing	Adhoc Wireless Sensor Networks	Wearable Devices	Fundamentals Of Nano Electronics	Artificial Intelligence And Machine Learning.	Underwater Communication
Fpga Architecture And Design	Advanced Digital Signal Processing	Electromagnetic Interference And Compatability	Human Assist Devices	Iot Based System Design	Deep Learning And Its Application	Satellite Communication
Testing Of Vlsi Circuits	Dsp Architecture And Programmin g	Massive Mimo Networks	Medical Imaging System	Iot Processors	Quantum Computing	Radar Technology
Low Power Ic Design	Software Defined Radio	Rf Transceivers	Brain Computer Interface And Applications.	Mems And Nems	Cyber Security	Avionics Systems
Cad For Vlsi	Computer Vision	Advanced Wireless Communication Techniques	Therapeutic Equipments	Industrial Iot And Industry 4.0	Ai In Communication Engineering	Remote Sensing

### PROFESSIONAL ELECTIVE I

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PERWEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
<b>THEORY</b>								
1.	EC3506	Advanced Digital System Design	PE	3	0	0	3	3
2.	EC3507	Speech Processing	PE	3	0	0	3	3
3.	EC3508	Communication Networks	PE	3	0	0	3	3
4.	EC3509	Body Area Network	PE	3	0	0	3	3
5.	EC3510	Introduction To Sensors And Actuators	PE	3	0	0	3	3
6	EC3511	Foundation Course On Machine Learning	PE	3	0	0	3	3
7	EC3512	Positioning And Navigation	PE	3	0	0	3	3

### PROFESSIONAL ELECTIVE II

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PERWEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
<b>THEORY</b>								
1.	EC3513	Analog Ic Design	PE	3	0	0	3	3

2.	EC3514	Image Processing	PE	3	0	0	3	3
3.	EC3515	Adhoc Wireless Sensor Networks	PE	3	0	0	3	3
4.	EC3516	Wearable Devices	PE	3	0	0	3	3
5.	EC3517	Fundamentals Of Nano Electronics	PE	3	0	0	3	3
6.	EC3518	Deep Learning And Its Application	PE	3	0	0	3	3
7.	EC351	Underwater Communication	PE	3	0	0	3	3

### PROFESSIONAL ELECTIVE III

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
<b>THEORY</b>								
1.	EC3605	Fpga Architecture And Design	PE	3	0	0	3	3
2.	EC3606	Advanced Digital Signal Processing	PE	3	0	0	3	3
3.	EC3607	Electromagnetic Interference And Compatability	PE	3	0	0	3	3
4.	EC3608	Human Assist Devices	PE	3	0	0	3	3
5.	EC3609	IoT Based System Design	PE	3	0	0	3	3
6.	EC3610	Artificial Intelligence And Machine Learning.	PE	3	0	0	3	3
7.	EC3611	Satellite Communication	PE	3	0	0	3	3

### PROFESSIONAL ELECTIVE IV

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
<b>THEORY</b>								
1.	EC3612	Testing Of VLSI Circuits	PE	3	0	0	3	3
2.	EC3613	DSP Architecture And Programming	PE	3	0	0	3	3
3.	EC3614	Massive MIMO Networks	PE	3	0	0	3	3
4.	EC3615	Medical Imaging System	PE	3	0	0	3	3
5.	VL3611	IoT Processors	PE	3	0	0	3	3
6.	VL3613	Quantum Computing	PE	3	0	0	3	3
7.	EC3616	Radar Technology	PE	3	0	0	3	3

### PROFESSIONAL ELECTIVE V

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
<b>THEORY</b>								

1.		Low Power Ic Design	PE	3	0	0	3	3
2.		Software Defined Radio	PE	3	0	0	3	3
3.		Rf Transceivers	PE	3	0	0	3	3
4.		Brain Computer Interface And Applications.	PE	3	0	0	3	3
5.		Mems And Nems	PE	3	0	0	3	3
6.		Cyber Security	PE	3	0	0	3	3
7.		Avionics Systems	PE	3	0	0	3	3

### PROFESSIONAL ELECTIVE VI

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
<b>THEORY</b>								
1.		Cad For Vlsi	PE	3	0	0	3	3
2.		Computer Vision	PE	3	0	0	3	3
3.		Advanced Wireless Communication Techniques	PE	3	0	0	3	3
4.		Therapeutic Equipments	PE	3	0	0	3	3
5.		Industrial Iot And Industry 4.0	PE	3	0	0	3	3
6.		Ai In Communication Engineering	PE	3	0	0	3	3
7.		Remote Sensing	PE	3	0	0	3	3

### SUMMARY

Name of the Programme: B.E. Electronics and Communication Engineering											
S.No	Subject Area	Credits per Semester								Total Credits	Percentage (%)
		I	II	III	IV	V	VI	VII	VII I		
1	HSMC	4	4		4.5		1.5	3		17	10.3%
2	BSC	12	8	4						24	14.54%
3	ESC	8	10	3						21	12.72%
4	PCC			16	19	13	11.5	11.5		71	41.21%
5	PEC					6	6	6		18	10.09%
6	OEC					3	3			6	3.6%
7	EEC						1	2	8	11	6.6%
<b>Total</b>		<b>24</b>	<b>22</b>	<b>23</b>	<b>23.5</b>	<b>22</b>	<b>23</b>	<b>22.5</b>	<b>8</b>	<b>165</b>	<b>100</b>

### SEMESTER VII

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
<b>THEORY</b>								
1.		Elective - Management <sup>#</sup>	HS	3	0	0	3	3
2.	EC3701	Embedded Systems and IoT Design	PC	3	0	2	5	4
3.	EC3702	Optical Communication	PC	3	0	0	3	3
4.	EC3703	Adhoc and Wireless Networks	PC	3	0	0	3	3
5.		Professional Elective V	PE	3	0	0	3	3
6.		Professional Elective VI	PE	3	0	0	3	3
<b>PRACTICALS</b>								
5.	EC3704	Summer internship	PW	0	0	6	6	2
<b>TOTAL</b>				<b>18</b>	<b>0</b>	<b>8</b>	<b>26</b>	<b>21</b>

### SEMESTER VIII

S. NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
<b>PRACTICALS</b>								
1.	EC3801	Project Work	PW	0	0	20	20	10
<b>TOTAL</b>				<b>0</b>	<b>0</b>	<b>20</b>	<b>20</b>	<b>10</b>

**TOTAL CREDITS: 168**

### SUMMARY

Name of the Programme: B.E. Electronics and Communication Engineering											
S.No	Subject Area	Credits per Semester								Total Credits	Percent age(%)
		I	II	III	IV	V	VI	VII	VII I		
1	HS	4	4		4.5		1.5	3		17	10.05
2	BS	12	8	4						24	13.9
3	ES	8	10	3						21	12.5
4	PC			15	20	13	12	10		70	41.66
5	PE					6	6	6		18	10.3
6	OE					3	3			6	3.55
7	PW						2	2	8	12	7.14
<b>Total</b>		<b>24</b>	<b>22</b>	<b>22</b>	<b>24.5</b>	<b>22</b>	<b>24.5</b>	<b>21</b>	<b>10</b>	<b>168</b>	<b>100</b>

**அலகு I மொழி மற்றும் இலக்கியம்:** 3  
இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

**அலகு II மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக் கலை:** 3  
நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள்- பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளூர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

**அலகு III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:** 3  
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

**அலகு IV தமிழர்களின் திணைக் கோட்பாடுகள்:** 3  
தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறை முகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

**அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு:** 3  
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிக்கள் - தமிழ்ப் புத்தகங்களின் அச்ச வரலாறு.

**TOTAL : 15 PERIODS**

**TEXT-CUM-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. பொருளை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL - (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: 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 Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) - Reference Book.

**COURSE OBJECTIVES:**

- To improve the communicative competence of learners
- To learn to use basic grammatical structures in suitable contexts.
- To acquire lexical competence and use them appropriately in a sentence and understand their meaning in a text
- To help learners use language effectively in professional contexts
- To develop learners' ability to read and write complex texts, summaries, articles, blogs, Definitions, essays and user manuals.

**UNIT I INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION 9**

Reading - Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts and emails and introduction to effective communication. Listening - Listening for gist, Innovative Video making; Writing - Writing emails, letters in general contexts. Grammar - Content vs Function words; Question types: Wh/ Yes or No/ and Tags.

Vocabulary - Sentence Completion; Abbreviations & Acronyms (as used in technical contexts).

**UNIT II NARRATION AND SUMMATION 9**

Reading - Reading biographies, travelogues, Excerpts from literature, Writing - Guided writing—Paragraph writing (Analytical, Narrative, Compare & Contrast), Short Report on an event (field trip etc.) Grammar –Tenses (All three tenses) Worksheet 2; and Prepositions. Vocabulary - Word forms (prefixes&; suffixes); Phrasal verbs. Speaking- Asking & Giving Directions. Listening-Listening to INK Talks.

**UNIT III DESCRIPTION OF A PROCESS/PRODUCT 9**

Reading – Reading advertisements, gadget reviews and user manuals, reviewing a short story. Writing – Writing definitions; Instructions. Grammar – Subject-Verb agreement; Adjectives; Degrees of comparison; Vocabulary - Compound Nouns, discourse markers (connectives & sequence words).

**UNIT IV CLASSIFICATION AND RECOMMENDATIONS 9**

Reading – Newspaper articles and Non Verbal Communication ( tables, pie charts etc.) Writing –Note-making / Note-taking (\*Study skills to be taught, not tested)Flash Cards; Writing recommendations; Transferring information from non- verbal ( chart , graph etc. to verbal mode) Grammar – Articles; Pronouns - Possessive & Relative pronouns. Vocabulary – Collocation and Compound Nouns; Fixed /Semi fixed expressions.

**UNIT V EXPRESSION 9**

Reading – Reading Sports Articles; and Opinion Blogs; Writing – Essay Writing (Descriptive or narrative). Grammar –Punctuation; and Simple, Compound & Complex Sentences. Vocabulary - Cause & Effect Expressions. Speaking - PPT preparation and poster presentation

**TOTAL: 45 PERIODS****COURSE OUTCOMES:**

**On the successful completion of the course, students will be able to**

**CO1:**To use appropriate words in a professional and general context and read and infer the denotative and connotative meanings of technical contexts.

**CO2:**To gain understanding of basic grammatical structures and use them in paragraph writing.

**CO3:** To write definitions, descriptions and narrations.

**CO4:** To interpret the information in any form and give probable suggestions

**CO5:** To write essays on various topics

### **CO-PO Mapping**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	0	0	0	0	0	1	3	2	3	3	3	2
<b>CO2</b>	0	0	0	0	0	3	3	1	3	2	2	1
<b>CO3</b>	0	0	0	0	0	1	2	3	3	3	3	2
<b>CO4</b>	0	0	0	0	0	3	3	2	3	2	1	2
<b>CO5</b>	0	0	0	0	0	1	2	3	3	3	3	1

### **TEXTBOOKS:**

1. English for Engineers & Technologists Orient Blackswan Private Ltd. Department of English, Anna University, (2020 edition)

English for Science & Technology Cambridge University Press, 2021.

2. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. K N. Shoba, and Dr. Lourdes Jovani, Department of English, Anna University.

### **REFERNCES:**

1. Technical Communication – Principles And Practices By Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2. A Course Book On Technical English By Lakshminarayanan , Scitech Publications (India) Pvt. Ltd.
3. English For Technical Communication (With CD) By Aysha Viswamohan, Mcgraw Hill Education, ISBN : 0070264244.
4. Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House.
5. Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi, 2003.
6. English Grammar in Use – Raymond Murphy- Cambridge, Fifth edition

**COURSE OBJECTIVES:**

- To Understand the concepts of Matrices which are needed for practical applications.
- To familiarize the students with differential calculus.
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations of higher order that model in various engineering problems.
- To familiarize the student with functions of several variables that is needed in many branches of engineering.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

**UNIT I MATRICES****12**

Eigen values and Eigen vectors of a real matrix – Properties of Eigen values - Cayley-Hamilton theorem (excluding proof) – Diagonalization of matrices - Reduction of Quadratic form to canonical form by using orthogonal transformation - Nature of a Quadratic form.

**UNIT II DIFFERENTIAL CALCULUS****12**

Representation of functions – Limit of a function – Continuity – Derivatives – Differentiation rules Maxima and Minima of functions of one variable.

**UNIT III DIFFERENTIAL EQUATIONS****12**

Higher order linear differential equations with constant coefficients- Method of undetermined 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 IV MULTIVARIABLE CALCULUS****12**

Partial derivatives (excluding Euler's theorem) – 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 V MULTIPLE INTEGRALS****12**

Double integrals – Change of order of integration – Double integrals in polar co-ordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

**TOTAL: 60 PERIODS****COURSE OUTCOMES:**

**On the successful completion of the course, students will be able to**

**CO1:** Use the matrix algebra methods to diagonalizable the matrix

**CO2:** Apply differential calculus tools in solving various engineering problems

**CO3:** Use both the limit definition and rules of differentiation to differentiate functions.

**CO4:** Apply differentiation to solve maxima and minima problems.

**CO5:** Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.

**CO-PO Mapping**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	3	3	1	1	1	0	0	0	2	0	2	3
<b>CO2</b>	3	3	1	1	1	0	0	0	2	0	2	3
<b>CO3</b>	3	3	1	1	1	0	0	0	2	0	2	3
<b>CO4</b>	3	3	1	1	1	0	0	0	2	0	2	3
<b>CO5</b>	3	3	1	1	1	0	0	0	2	0	2	3

**TEXTBOOKS:**

1. Grewal, B.S., Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, 2016.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, Inc., 2016.
3. James Stewart, " Calculus : Early Transcendentals ", Cengage Learning, 8th Edition, New Delhi, 2015.

**REFERNCES:**

1. Bali,N.P., Goyal,M.,Watkins,C.,Advanced Engineering Mathematics, Laxmi Publications Pvt. Limited, 2007.
2. Boyce,W.E.,andDiPrima,R.C., Elementary Differential Equations and Boundary Value Problems, Wiley India, 2012.
- 3.Dennis G,Zill, Michael R.Cullen., "Differential Equations with boundary value problems", Cengage Learning, 7th Edition, New Delhi, 2009.
4. GeorgeB.ThomasJr.,MauriceD.Weir,JoelR.Hass,Thomas'Calculus:Early Transcendental, 13th Edition, Pearson Education, 2013.
5. O'Neil. P. V., "Advanced Engineering Mathematics", 7th Edition, Cengage Learning India Pvt., Ltd, New Delhi, 2011.
6. T.Veerarajan, Engineering Mathematics, Mc Grawhill Publications, New Delhi 2017.

**COURSE OBJECTIVES:**

- To Understand and identify different crystal structures and their imperfections
- To Explain the elastic and thermal properties of materials and understand their significance
- To Provide an overview of the production, detection and applications of ultrasound
- To Explain the origin of laser action, production of laser, fiber optics and their applications
- To Develop an understanding of quantum mechanical phenomena and their applications

**UNIT I - CRYSTAL PHYSICS**

9

Crystalline and Amorphous solids – single crystalline and Polycrystalline solids - Lattice – Unit cell– Bravais lattice – Lattice planes – Miller indices – interplanar spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius –Packing factor for SC, BCC, FCC and HCP structures – Crystal Defects – Point, line and Volume defects.

**UNIT II - PROPERTIES OF MATTER AND THERMAL PHYSICS**

9

Elasticity- Hooke's law - stress -strain diagram– Poisson's ratio –Factors affecting elasticity– Torsional stress & deformations – Twisting couple – Torsion pendulum - theory and experiment - Uniform & Non uniform bending: theory and experiment - I-shaped girders. Modes of heat transfer – conduction, convection and radiation - thermal conductivity– Lee's disc method – Heat transfer application in Engineering.

**UNIT III - ULTRASONICS AND NDT**

9

Introduction – production – magnetostriction effect – magnetostriction generator – piezoelectric effect – piezo electric generator –properties –detection – cavitation –acoustic grating – velocity measurement – applications –Sonar –velocity of blood flow – NDT – Liquid Penetrant method – Ultrasonic flaw detector – A scan, B scan, C scan – X- ray radiography and fluoroscopy – Thermography- Strategies for minimizing transmission loss using coupling agents

**UNIT IV - LASER AND FIBRE OPTICS**

9

Characteristics of Laser - spontaneous emission - stimulated emission- population inversion – pumping methods - conditions for Laser action - Types of lasers – Nd: YAG, He – Ne, Semiconductor Lasers – Homojunction diode Laser – Heterojunction diode Laser - Industrial and Medical Applications. Principle and propagation of light in optical fibers – Numerical aperture and Acceptance angle - Fibre Optical Communication system (Block diagram) – Mechanisms of Attenuation, Types of losses in fiber optic communication systems, , Applications of fiber optic communication system.

**UNIT V - BASIC QUANTUM PHYSICS**

9

Inadequacy of classical physics- Photons and light waves- Electrons and matter waves- G.P.Thomson Experiment- wave function and physical significance- Schrodinger wave equation (Time dependent and independent forms) – Application of one dimensional of box- Barrier penetration and quantum tunneling(qualitative)- Scanning tunneling microscope

**TOTAL: 45 PERIODS****COURSE OUTCOMES:**

**On the successful completion of the course, students will be able to**

**CO1:** Analyze the crystal structures and their defects.

**CO2:** Demonstrate and explain the general concepts of elastic and thermal properties of materials

**CO3:** Analyze the applications of ultrasonic in engineering and medical disciplines

**CO4:** Elucidate the principle and working of lasers and optical fibers, and their applications in the field of industry, medicine and telecommunication

**CO5:** Understand the importance of quantum physics and apply quantum mechanical principles towards material diagnostics

#### CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	3	1	1	2	0	0	1	0	0	0	0	1
<b>CO2</b>	3	1	1	2	0	0	1	0	0	0	0	1
<b>CO3</b>	3	1	1	2	0	0	1	0	0	0	0	1
<b>CO4</b>	3	1	1	2	0	0	1	0	0	0	0	1
<b>CO5</b>	3	1	1	1	0	0	1	0	0	0	0	1

#### TEXTBOOKS:

1. Gaur R.K and Gupta, S.L, Engineering Physics, Dhanpat Rai Publishers, 2012.
2. Serway R.A and Jewett J.W, Physics for Scientists and Engineers, Cengage Learning, 2010.

#### REFERNCES:

1. Halliday D, Resnick R and Walker J, Principles of Physics, Wiley, 2015.
2. Tipler P.A and Mosca G, Physics for Scientists and Engineers with Modern Physics, WH Freeman, 2007.
3. Avadhanulu M. N and Kshirsagar P. G, A Text Book of Engineering Physics, S. Chand & Co. Ltd., Ninth Revised Edition, 2012.
4. You tube link: <https://www.youtube.com/watch?v=XEzJCuWfVuo>
5. You tube link: <https://www.youtube.com/watch?v=kIVfjRW-INM>
6. You tube link: <https://www.youtube.com/watch?v=nMfOo7HhybY>

**COURSE OBJECTIVES:**

- To make the students conversant with hardness, boiler feed water requirements, related problems and water treatment techniques
- To develop an understanding of different advanced polymeric materials.
- To impart knowledge about the nanomaterial synthesis, properties and applications
- It enables the students to gain information about Electrochemical reaction, corrosion and its prevention.
- To make the students familiar with the different types of Engineering materials.
- To help the students to recognize different categories of sustainable energy sources.

**UNIT I WATER TREATMENT AND TECHNOLOGY****9**

Introduction – Water quality parameters - Hardness of water – types – expression of hardness – units – Determination of Hardness by EDTA method. Boiler troubles (scale & sludge - Caustic Embrittlement) - Softening of hard water – external treatment process: Demineralization, internal treatment process: boiler compounds (phosphate, calgon and colloidal conditioning) – Application of Artificial intelligence in water treatment process - Desalination of brackish water by Reverse Osmosis.

**UNIT II – ADVANCED POLYMERIC MATERIALS****9**

Basics of Polymers -Definition, Classification, Properties. Advanced polymer introduction, preparation, properties and applications of:( 1) Conducting Polymer-Nafion; (2) Polymer optical fiber - PMMA; (3) Piezoelectric polymer-PVDF; (4) Intelligent polymers- (a)Shape memory polymer (SMP) –Polyurethane (b) Self-Healing Polymers-Hydrogel (c) Electro active polymer-PANI

**UNIT III NANO CHEMISTRY****9**

Introduction to Nanoscience; Scope and General properties of bulk-materials and nanomaterials - Chemical methods of synthesis of Nanomaterials & its advantages - Chemical vapor deposition method, Precipitation method. Properties and applications of Nanowires, Nanorods, Nanotubes and Nanoclusters.; CNTs-Single walled & Multiwalled . CNTs. Nanomaterials for Green systems - Green materials including biomaterials, biopolymers, Bioplastics and composites. Nanotech Materials for Truly Sustainable Construction: Windows, Skylights, and Lighting. Application of Nanomaterials (Medicine, Electronics, Catalyst and Agriculture).

**UNIT IV ELECTROCHEMISTRY AND CORROSION****9**

Introduction – Cell terminology –Electrodes–origin of electrode potential–single electrode potential, standard electrode. Electrochemical cells- Electrochemical series and its applications. Electrochemical techniques for corrosion measurement.

Corrosion: Dry & wet corrosion – mechanism, Corrosion Control- Material selection and design aspects – corrosion prevention – corrosion inhibitors.

**UNIT V ENGINEERING MATERIALS****9**

Alloys-Properties of alloys- Significance of alloying- ferrous alloys (stainless steel and carbon steels) -non-ferrous alloys (brass and bronze) - Special alloys ( shape memory alloys). Lubricants - Characteristics of lubricants - viscosity, viscosity index, oiliness, flash point and fire point, cloud point and pour point - solid lubricant (graphite). Role of Machine learning in Materials selection.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

**On the successful completion of the course, students will be able to**

**CO1:** Categorize the hardness of water, related problems and its treatment and explore the utilization of AI in water treatment.

**CO2:** Recognize the characteristics and applications of various polymeric materials.

**CO3:** Classify the synthesis methods, properties, and applications of nano materials.

**CO4:** Exemplify electrochemical cells, categorize types of corrosion, and outline methods for corrosion control.

**CO5:** Select the appropriate materials for Engineering applications.

**CO-PO Mapping**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	2	1	1	0	0	1	1	0	0	0	0	0
<b>CO2</b>	2	1	1	0	0	1	1	0	0	0	0	0
<b>CO3</b>	2	1	2	0	0	1	0	0	0	0	0	0
<b>CO4</b>	2	1	0	0	0	0	1	0	0	0	0	0
<b>CO5</b>	1	1	1	0	0	1	1	0	0	0	0	0

**TEXTBOOKS:**

1. Jain P.C. and Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2010

**REFERNCES:**

1. Shashi Chawla, "Test book of engineering chemistry" Gagan Kapur publishers, 2020.
2. Shree Meenakshi, "Engineering Chemistry", Bharathi Publishers, Chennai, 2021.
3. Dara S.S, Umare S.S, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2010.

<b>CS3101</b>	<b>PROGRAMMING FOR PROBLEM SOLVING USING C</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES:**

To develop C Programs with

- Basic programming constructs.
- Arrays and strings.
- Functions and pointers.
- Applications in C using structures.
- Input/output and file handling in C.

### **UNIT I INTRODUCTION TO PROGRAMMING AND BASICS OF C PROGRAMMING 9**

Introduction to programming paradigms. Introduction to components of a computer system, Idea and Representation of Algorithm, From algorithms to programs. Introduction to C,C Programming: Tokens, Identifiers, Keywords, Data Types, Variables, Constants, Input/ Output statements, C Operators, Expressions, Type conversion. Control structures: Decision-making statements, Looping statements, Switch case, Break, Continue, goto statements.

### **UNIT II ARRAYS AND STRINGS 9**

Introduction to Arrays. One dimensional array: Declaration, Initialization, Accessing the elements, Bubble sort, Selection sort, Linear search, Binary search. Two-dimensional arrays: Declaration, Initialization, Accessing the elements, Matrix Operations (Addition, Scaling, Multiplication, Transpose). Strings: Reading, Writing, String handling functions, String Arrays.

### **UNIT III FUNCTIONS AND POINTERS 9**

Introduction to functions: Function prototype, function definition, function call, Built- in functions (string functions, math functions), User defined functions. Recursion, Types of Recursion, Computation of Sine series, Scientific calculator, Scope of variables, Storage Classes. Introduction to Pointers, Declaration, Null Pointers, Arrays of pointers, Parameter passing: Pass by value, Pass by reference.

### **UNIT IV STRUCTURES 9**

Introduction to Structures, Declaration, Initialization, Accessing members. Nested Structures. Arrays of structures. Structures and functions. Pointers to structures. Unions. Programs using structures and Unions, Enumerated data type. Dynamic Memory Allocation.

### **UNIT V FILE PROCESSING AND GRAPHICS PROGRAMMING 9**

Introduction to Files, Types of files: text file, binary file. File operations: open, close, read, write, append. Sequential access file, Random access file, Introduction to Graphics Programming in C basic concepts in graphics programming.

**TOTAL: 45 PERIODS**

### **COURSE OUTCOMES:**

**On the successful completion of the course, students will be able to**

**CO1:** Demonstrate simple applications in C using basic constructs

**CO2:** Design and implement applications using arrays and strings

**CO3:** Design and implement applications in C using functions and pointers.

**CO4:** Develop applications in C using structures.

**CO5:** Create applications using sequential and random access file Processing.

#### **CO-PO Mapping**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	2	2	0	2	0	0	0	0	0	0	0
<b>CO2</b>	3	1	1	1	1	2	0	0	0	0	0	0
<b>CO3</b>	3	2	2	2	1	3	0	0	0	0	0	0
<b>CO4</b>	3	2	2	2	1	3	0	0	0	0	0	0
<b>CO5</b>	2	1	1	1	1	2	0	0	0	0	0	0

#### **TEXTBOOKS:**

1. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.
2. Reema Thareja, "Computer fundamentals and programming in C "Second Edition New 2016
3. Kernighan, B.W and Ritchie, D.M, "The C Programming language", Second Edition, Pearson Education,2006

#### **REFERNCES:**

1. Paul Deitel and Harvey Deitel, "C How to Program", Seventh editin, Pearson Publication
2. Juneja,B.L and Anita Seth , "Programming in C",CENGAGE Learning India pvt.Ltd., 2011
3. Pradip Dey ,Manas Ghosh, "Fundamentals of Computing and Programming in C" ,First Edition,OxfordUniversityPress,2009.
4. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley(India)Pvt.Ltd.,PearsonEducationinSouthAsia,2011.
5. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996. C" , McGraw-HillEducation,1996.

**ME3101**

**ENGINEERING GRAPHICS**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>2</b>	<b>0</b>	<b>2</b>	<b>3</b>

**COURSE OBJECTIVES:**

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
- To expose them to existing national standards related to technical drawings

**UNIT 1 PLANE CURVES AND FREE HAND SKETCHING**

**12**

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method– construction of cycloid– Drawing of tangents and normal to the above curves. Visualization principles – Layout of views- Orthographic projection of multiple views from pictorial views of objects-Principal planes.

**UNIT 2 PROJECTION OF POINTS STRAIGHT LINES AND PLANE SURFACES**

**12**

Orthographic projections-principles-Principal planes-First angle projection-Projection of points - Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method. Projection of planes (polygonal and circular surfaces) inclined to one of the principal planes.

**UNIT 3 PROJECTION OF SOLIDS**

**12**

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method.

**UNIT 4 PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES**

**12**

Sectioning of Prisms, pyramids, cylinders and cones in simple vertical position - the cutting plane is inclined to one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids, cylinders and cones.

**UNIT 5 ISOMETRIC AND PERSPECTIVE PROJECTIONS**

**12**

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.

**TOTAL: 60 PERIODS**

**COURSE OUTCOMES:**

**On the successful completion of the course, students will be able to**

**CO1:**Familiarize with the fundamentals and standards of Engineering graphics

**CO2:**project orthographic projections of lines and plane surfaces.

**CO3:**Apply the principles of projections to draw projections of solids and development of surfaces.

**CO4:**visualize and to project isometric and perspective projections of simple solids.

**CO5:**perform the basic geometrical constructions and multiple views of objects.

#### **CO-PO Mapping**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	1	1	-	-	-	-	1	1	3	-	1
<b>CO2</b>	3	2	2	-	-	-	-	1	1	3	-	1
<b>CO3</b>	3	2	2	-	3	-	-	1	1	3	-	1
<b>CO4</b>	3	2	2	-	3	-	-	1	1	3	-	1
<b>CO5</b>	3	2	2	-	3	-	-	1	1	3	-	1

#### **TEXTBOOKS:**

1. NatrajanK.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai,2009.
2. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2008.

#### **REFERNCES:**

1. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50<sup>th</sup> Edition,2010.
2. N S Parthasarathy and Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015.
3. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore,2007.
4. Luzzader, Warren.J. and Duff,John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi,2005.
5. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2<sup>nd</sup> Edition,2009.
6. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.

**COURSE OBJECTIVES:**

- To acquaint the students with practical knowledge of physics principles in various fields such as optics, thermal physics, and properties of matter for developing basic experimental skills.
- To impart the knowledge in the quantitative chemical analysis of water.
- To learn about the basics of instrumental analysis-conductivity meter, and potentiometer.
- Examine the chloride content in water sample.

**LIST OF EXPERIMENTS (PHYSICS-OUT OF 7 ANY 5)**

EXP.I- Determination of Young's modulus of the material of the given beam by uniform bending method.

EXP.II-Determination of rigidity modulus of the material of the given wire using torsion pendulum.

EXP.III-Determination of velocity of sound in the given liquid and compressibility of the liquid using Ultrasonic interferometer.

EXP.IV-Determination of wavelength of laser, Numerical aperture, and acceptance angle of an optical fiber

EXP.V- Determination of energy band gap of the semiconductor.

EXP.VI-Determination of coefficient of thermal conductivity of the given bad conductor using Lee's disc.

EXP.VII-Determination of Solar cell characteristics

**LIST OF EXPERIMENTS(CHEMISTRY-OUT OF 7 ANY 5)**

EXP. I - Determination of total, temporary & permanent hardness of water by EDTA method.

EXP. II - Determination of DO content of water sample by Winkler's method.

EXP. III - Estimation of sulphate ion in drinking water by Conductivity method

EXP. IV- Estimation of iron content of the given solution using potentiometer.

EXP. V - Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.

EXP. VI- Conductometric titration of strong acid vs strong base.

EXP. VII - Determination of chloride content of water sample by Argentometric method.

**TOTAL: 60 PERIODS**

## CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	0	0	0	0	0	0	0	0
CO2	3	3	1	1	0	0	0	0	0	0	0	0
CO3	3	2	1	1	0	0	0	0	0	0	0	0
CO4	2	2	1	1	0	0	0	0	0	0	1	1
CO5	1	1	1	0	0	0	0	0	0	0	0	1

### TEXTBOOKS:

1. J.D. Wilson & C.A. Hernandez Hall "Physics Laboratory Experiments"  
Houghton Mifflin Company, New York, 2010.
2. M.N. Srinivasan, S. Balasubramanian & R. Ranganathan, "Practical Physics",  
S. Chand & Sons educational publications, New Delhi, 2011.
3. R. Sasikumar, "Practical Physics", PHI Learning Pvt. Ltd., New Delhi, 2011.

### REFERNCES:

#### REFERENCES

1. <https://www.vlab.co.in/broad-area-physical-sciences>
2. <https://vlab.amrita.edu/?sub=1>
3. Dr. D.Reuben Jonathan "Engineering Chemistry Laboratory Manual", 2<sup>nd</sup>  
Edition, D.D. Publications (2010)

**CS3102 PROGRAMMING FOR PROBLEM SOLVING USING C LABORATORY**

**L T P C**  
**0 0 4 2**

**COURSE OBJECTIVES:**

- Input and Output statements.
- Control state

**LIST OF EXPERIMENTS**

1. Branching & Looping.

- Write a C program to generate Pascal's triangle.
- Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, \*, /, % and use Switch Statement)
- Write a C program to find the sum of individual digits of a positive integer.

2. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence.

- Write a C program to generate the first n terms of the sequence.
- Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
- Write a C program to swap Numbers Using Temporary Variables.

3. Arrays

- Write a C program to search an array element using linear search.
- Write a C program to find both the largest and smallest number in a list of integers.
- Write a C program that uses functions to perform the following:
  - Addition of Two Matrices
  - Multiplication of Two Matrices
- Write a C program to implement Bubble Sort.

4. Strings

- Write a C program that uses functions to perform following operations
  - (i) To insert a sub-string in to given main string from a given position.
  - (ii) To delete n Characters from a given position in a given string.
- Write a C program to determine if the given string is a palindrome or not

5. Functions & Pointers:

- Write C programs that use recursive functions
- (i) To find factorial of given number
  - (ii) To solve Towers of Hanoi Problem.
  - (iii) To swap the variables using call by value and call by reference.

6. Generate mark sheet of students using structures.

7. Compute Salary Slip for five employees using structures and functions Insert, Update, delete and append telephone details of an individual or a company into a telephone directory using random access file.

**TOTAL: 60 PERIODS**

**COURSE OUTCOMES:**

**On the successful completion of the course, students will be able to**



**அலகு 1 தெசவு மற்றும் பொனைத் ததொழில்நுட்பம்**

சங்க காலத்தில் நெசவுத் நதாழில் கருப்புப் - பொனைத் நதாழில்நுட்பம் -  
.பாண்டங்களில் கீறல் குறியீடுகள் - சிவப்பு பாண்டங்கள்

**அலகு 2 வடிவனமப்பு மற்றும் கட்டிடத் ததொழில்நுட்பம்**

சங்க காலத்தில் கட்டுமாை நபாருட்களும் ெடு கல்லும் -  
சிலப்பதிகாரத்தில் மமனட வடிவனமப்பு பற்றிய

விவரங்கள், மாமல்லபுரச் சிற்பங்களும் மகாவில்களும் மசாழர் -  
- காலத்Fப் நபருங்மகாவில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள்  
ொயக்கர்கால மகாவில்கள், மீண்ாட்சியம்மை ஆலயம் மற்றும்  
திருமனல ொயக்கர் பிரிட்டிஷ் - வீடுகள் -  
மஹால் நசட்டிெொட்டு

காலத்தில் நசைனையில்ெஇமதா .சாமராநசைிக் கட்டிடக்கனல -

**அலகு 3 உற்பத்தி ததொழில்நுட்பம்**

கப்பல் கட்டும் கனல - இரும்புத் நதாழிற்சானல - உமலாகவியல் -  
இரும்பு உருக்குதல், - நசம்பு மற்றும் தங்க ொணயங்கள் -  
எஃகு

- மணி உருவாக்கம் நதாழிற்சானலகள் - ொணயங்கள் அச்சடித்தல்  
கல் மணிகள், கண்ணாடி மணிகள் சங்கு - மணிகள் -  
சுடுமண்

மணிகள்- எலும்பு Fண்டுகள்- நதால்லியல் சாண்றுகள் -  
சிலப்பதிகாரத்தில் மணிகளிண் வனககள்.

**அலகு 4 வவளொண்ணம மற்றும் ெீர்ப்பொசைத் ததொழில்நுட்பம்**

அண்ண - ஏரி, குளங்கள், மதகு - மசாழர்காலக் குமிழித் தூம்பிண்  
முக்கியத்Fவம் - கால்ெனட பராமரிப்பு - மவளொண்ணம சார்ெ்த  
நசயல்பாடுகள் - கடல்சார் அறிவு - மீண்்வளம் - முத்F மற்றும்  
முத்Fக்குளித்தல் - நபருங்கடல் குறித்த பண்ணடய அறிவு - அறிவு சார்  
சமுகம்.

**அலகு 5 அறிவியல் தமிழ் மற்றும் கணித்தமிழ்**

அறிவியல் தமிழிண் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களள  
மிண்்பதிப்பு நசய்தல் - தமிழ் நமைநபாருட்கள் உருவாக்கம் - தமிழ்  
இனணயக் கல்விக்கழகம் - தமிழ் மிண் நூலகம் - இனணயத்தில் தமிழ்  
அகராதிகள் - நசாற்குனவத் திட்டம்.

**TEXT – CUM – REFERENCE BOOKS**

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - மக.மக. பிள்ளள  
(நவளியீடு: தமிழ்ெொடு பாடநூல் மற்றும் கல்வியியல்  
பணிகள் கழகம்).
2. கணிைித்தமிழ்- முனைவர். இலசெ்ந்தரம் (விகடைபிரசுரம்).
3. கீழடி - னவனக ெதிக்கனரயில் சங்க கால ெகர  
ொகரிகம்.(நதால்லியல் Fனற நவளியீடு).
4. நபாருனெ - ஆற்றங்கனர ொகரிகம். (நதால்லியல் Fனற நவளியீடு)

5. Social Life of Tamils (Dr.K.K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by:

International Institute of Tamil Studies.

7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai'(Jointly Published by: 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 Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

**COURSE OBJECTIVES:**

- To engage learners in meaningful language activities to improve their LSRW skills
- To enhance learners' awareness of general rules of writing for specific audiences
- To help learners understand the purpose, audience, contexts of different types of writing
- To develop analytical thinking skills for problem solving in communicative contexts
- To demonstrate an understanding of job applications and interviews for internship and placements

**UNIT I MAKING PROFESSIONAL CORRESPONDENCE 9**

**Listening** – Evaluative Listening: Advertisements, Product Descriptions,- Audio/video; Listening and filling a Graphic Organiser (Choosing a product or service by comparison) **Speaking** – Marketing a product, Persuasive Speech Techniques **Reading** - Reading advertisements, user manuals, brochure **Vocabulary** – Contextual meaning of words **Writing** – Professional Responses for business communication letters- Open ended Essay **Grammar** – Numerical adjectives, Mixed Tenses, Prepositional phrases

**UNIT II USING APPROPRIATE FORMS OF WORDS & VOICES 9**

Listening - Listening to longer technical talks and completing– gap filling exercises. Listening technical information from podcasts – Listening to process/event descriptions to identify cause & effects **Speaking** – Describing and discussing the reasons of accidents or disasters based on news reports **Reading** - Reading longer technical texts–Extracts from Literature – Essays, Short stories, Biography **Writing**-Minutes of Meeting **Grammar** - Active Passive Voice transformations, Infinitive and Gerunds **Vocabulary** – Word Formation (Noun-Verb-Adj-Adv), Adverbs

**UNIT III PROBLEM SOLVING 9**

Listening – Listening to / Watching movie scenes / documentaries depicting a technical problem and suggesting solutions **Speaking** – Group Discussion (based on case studies) – Techniques and Strategies **Reading** - Technical case studies in General News reports news reports etc. **Writing** – Checklists, Conversations about problems and solutions **Grammar** – Error correction, conditional sentences **Vocabulary** – Compound Words, Sentence Completion

**UNIT IV REPORTING OF EVENTS AND RESEARCH 9**

Listening – Listening Comprehension based on news report and documentaries – Precis writing, Summarising **Speaking** – Interviewing, Presenting an oral report, Mini presentations on select topics **Reading** – Research Articles **Writing** – Transcoding, Accident Report, Survey Report **Grammar** – Reported Speech, Modals **Vocabulary** – Conjunctions - use of prepositions

**UNIT V THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY 9**

Listening – Listening to TED Talks, Presentations, Formal job interviews, (analysis of the interview performance); **Speaking** – Participating in a Role play, (interview/telephone interview), virtual interviews, Making presentations with visual aids; **Reading** – Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals; **Writing**

–Job/Internship application – Cover letter & Resume; Grammar – Relative Clauses  
Vocabulary – Idioms

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

**On the successful completion of the course, students will be able to**

**CO1:** Compare and contrast products and ideas in technical texts.

**CO2:** Identify cause and effect in events, industrial processes through technical texts

**CO3:** Analyze problems in order to arrive at feasible solutions and communicate them.

**CO4:** Prepare a report of events and the processes of technical and industrial nature.

**CO5:** Express their opinions in a planned and logical manner.

<b>CO-PO Mapping</b>												
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	0	0	0	0	0	1	3	2	3	3	3	2
<b>CO2</b>	0	0	0	0	0	3	3	1	3	2	2	1
<b>CO3</b>	0	0	0	0	0	1	2	3	3	3	3	2
<b>CO4</b>	0	0	0	0	0	3	3	2	3	2	1	2
<b>CO5</b>	0	0	0	0	0	1	2	3	3	3	3	1

**TEXT BOOKS :**

1. English for Engineers & Technologists (2020 edition) Orient Blackswan Private Ltd. Department of English, Anna University.
2. English for Science & Technology Cambridge University Press 2021. Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. K. N. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

**REFERNCES:**

1. Raman. Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford university press. New Delhi.
2. Improve Your Writing ed. V. N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi.
3. Learning to Communicate – Dr. V. Chellammal. Allied Publishers, New Delhi, 2003
4. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
5. Developing Communication Skills by Krishna Mohan, Meera Bannerji – Macmillan India Ltd. 1990, Delhi.

**COURSE OBJECTIVES:**

- To understand the standard technique of a complex variable theory in analytic functions and its mapping property.
- To describe basic properties of complex variables and have the ability to compute complex integrals.
- To enable the students to study the Laplace Transforms, properties of Laplace Transform, inverse Laplace Transform and some applications to solve the differential equations and integral equations.
- To enable the students to study the Z - Transforms, properties of Z- Transforms, inverse Z - Transform and some applications to solve the difference equations.
- To explain the concept of a vector integration in a plane and in space.

**UNIT I ANALYTIC FUNCTIONS 12**

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates(excluding proofs) – Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping – Mapping by functions(  $w = z + c$ ,  $w = cz$ ,  $w = \frac{1}{z}$  )

**UNIT II COMPLEX INTEGRATION 12**

Line integral – Cauchy's integral theorem(without proof) – Cauchy's integral formula(with proof) – Taylor's and Laurent's series – Singularities – Residues – Residue theorem(with proof) – Application of residue theorem for evaluation of real integrals – Use of circular and semicircular contour(excluding poles on the real axis)

**UNIT III LAPLACE TRANSFORMS 12**

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals - Initial and Final value theorems – Transform of periodic functions -Inverse Laplace transforms – Convolution theorem(without proof) — Solution of ordinary differential equations with constant coefficients using Laplace Transforms

**UNIT IV Z - TRANSFORMS AND DIFFERENCE EQUATIONS 12**

Z-transforms - Elementary properties – Inverse Z-transform (using partial fraction and residue) – Initial and final value theorems- Convolution theorem -Formation of difference equations Solution of difference equations using Z - transform.

**UNIT V VECTOR CALCULUS 12**

Gradient and directional derivative – Divergence and curl – Vector identities – Irrotational Solenoidal vector fields – Line integral over a plane curve – Surface integral – Area of a curved surface – Volume integral – Green's, Gauss divergence and Stoke's theorems(excluding proof) – Verification and application in evaluating line, surface and volume integrals-simple applications involving cubes and rectangular parallelepipeds

**TOTAL: 60 PERIODS****COURSE OUTCOMES:**

**On the successful completion of the course, students will be able to**

**CO1:**Demonstrate the concept of Analytic functions, conformal mapping in solving Engineering problems.

**CO2:**Demonstrate the concept of contour integration in solving Engineering problems.

**CO3:** Apply Laplace transform technique to solve the differential equations.

**CO4:**Apply Z-transform technique to solve the difference equation.

**CO5:**Understand the concept of divergence and curl to solve the line, surface and volume integrals using vector integration

<b>CO-PO Mapping</b>												
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	0	0	0	0	0	1	3	2	3	3	3	2
<b>CO2</b>	0	0	0	0	0	3	3	1	3	2	2	1
<b>CO3</b>	0	0	0	0	0	1	2	3	3	3	3	2
<b>CO4</b>	0	0	0	0	0	3	3	2	3	2	1	2
<b>CO5</b>	0	0	0	0	0	1	2	3	3	3	3	1

**TEXT BOOKS :**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, Inc., 20
2. Jain.R.K, Iyengar.S.R.K, Advanced Engineering Maths, 5th edition, Narosa Publishers,2019.
3. Grewal, B.S., Higher Engineering Mathematics, 44th Edition, Khanna Publishers, 2021.
4. James Stewart, Daniel K.Clegg, Saleem Watson, “ Calculus with Early Transcendental Functions Cengage Learning, 9th Edition, 2023.

**REFERNCES:**

1. O’Neil. P.V. “Advanced Engineering Mathematics”, 8th Edition, Cengage Learning India Pvt. , Ltd, New Delhi, 2023.
2. Zill.G, Patrick D. Shanahan , “Complex analysis”, Jones and Bartlett Publishers, Inc., 3<sup>rd</sup> Editio 2013.
3. Bali.N.P, Goyal.M, Watkins.C., Advanced Engineering Mathematics, Laxmi Publications Pvt. Limited, 2015.
4. Boyce, W.E., and DiPrima, R.C., Elementary Differential Equations and Boundary Value Proble Wiley India, 2012.
5. Veerarajan.T, Engineering Mathematics, Tata Mcgraw Hill publications co. ltd, New Delhi.2017

**COURSE OBJECTIVES:**

- To understand the physical properties of materials like electrical and thermal conductivity and the applications of quantum mechanics.
- Acquire knowledge on basics of semiconductor physics and its application in various devices.
- To instill knowledge on magnetic properties of materials.
- To understand the phenomena of superconductor, properties and their applications and the different types of dielectric materials.
- Ability to understand different types of Transistors and its characteristics and display devices.

**UNIT I: ELECTRICAL PROPERTIES OF MATERIALS****9**

Classical free electron theory – Expression for electrical conductivity – Thermal conductivity – deduction of Wiedemann - Franz law – Success and drawbacks of classical free electron theory – Electrons in metals – Particle in a three-dimensional box – degenerate states – Fermi - Dirac statistics – Density of energy states and carrier concentration in metals.

**UNIT II: SEMICONDUCTOR PHYSICS****9**

Intrinsic Semiconductors – Energy band diagram – Direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors – Variation of carrier concentration with temperature - extrinsic semiconductors - N type and P type semiconductors – Carrier transport in Semiconductor: drift, mobility, and diffusion – Hall Effect and Hall devices.

**UNIT III: MAGNETIC PROPERTIES OF MATERIALS****9**

Magnetism- Magnetic dipole moment – magnetic permeability and susceptibility – Magnetic material classification: dia, para and ferromagnetism – antiferromagnetism – ferrimagnetism – Ferromagnetism: origin and exchange interaction - saturation magnetization and Curie temperature – Domain Theory - M versus H behaviour – Hard and soft magnetic materials – Magnetic principle in computer data storage – Magnetic hard disc (GMR sensor).

**UNIT IV MATERIALS AT LOW TEMPERATURE AND DIELECTRIC PROPERTIES****9**

Temperature dependence of resistivity in superconducting materials - Meissner effect – Properties of superconductors - Type I and Type II superconductors - BCS theory (Qualitative) – Low T<sub>c</sub> and High T<sub>c</sub> (alloy) superconductors – Josephson's effect (AC and DC) – Applications of Superconductors-SQUIDS – CRYOTRON – MAG LEV.  
Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – uses of dielectric materials (capacitor and transformer).

## UNIT V FUNDAMENTALS OF ELECTRONIC SCIENCE AND DISPLAY DEVICES 9

JFET- Drain and Transfer Characteristics- Single Electron Transistor (SET), Spintronics - Classification of optical materials – carrier generation and recombination processes – Absorption emission and scattering of light in metals, insulators, and semiconductors (concepts only)- Display Devices-LED, Laser diode Solar cells.

**TOTAL: 45PERIODS**

### COURSE OUTCOMES:

**On the successful completion of the course, students will be able to**

**CO1:** gain knowledge on classical and quantum electron theories, and energy band structures

**CO2:** understand clearly of semiconductor physics and functioning of semiconductor devices

**CO3:** get knowledge on magnetic properties of materials and their applications in data storage

**CO4:** Summarize basics of dielectrics and superconductivity. Explore a few of their technological applications.

**CO5:** Develop an understanding the Fundamentals of Electronic Science and display devices.

### CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	3	3	1	1	1	0	0	0	2	0	2	3
<b>CO2</b>	3	3	1	1	1	0	0	0	2	0	2	3
<b>CO3</b>	3	3	1	1	1	0	0	0	2	0	2	3
<b>CO4</b>	3	3	1	1	1	0	0	0	2	0	2	3
<b>CO5</b>	3	3	1	1	1	0	0	0	2	0	2	3

### TEXT BOOKS :

1. S.O. Kasap. Principles of Electronic Materials and Devices, McGraw Hill Education (Indian Edition), 2020.
2. R.F.Pierret. Semiconductor Device Fundamentals. Pearson (Indian Edition), 2006.
3. G.W.Hanson. Fundamentals of Nanoelectronics. Pearson Education (Indian Edition), 2009.
4. Rajendran V, "Engineering Physics", Tata McGraw Hill, 2015.

**REFERNCES:**

1. Gaur R.K, Gupta S.L, "Engineering Physics", Dhanpat Publications, 2015.
2. Jasprit Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Education (Indian Edition), 2019.
3. Charles Kittel, Introduction to Solid State Physics, Wiley India Edition, 2019.
4. Mark Fox, Optical Properties of Solids, Oxford Univ.Press, 2001.
5. A.B. Gupta, Nurul Islam , "Solid State Physics and Electronics", 2017.
6. M. Morris Mano, "Digital Design", 3rd edition, Pearson Education, 2014.

**EE3202**

**BASIC ELECTRICAL AND INSTRUMENTATION  
ENGINEERING  
(Common to ECE and VLSI)**

**L T P C**

**3 0 0 3**

**COURSE OBJECTIVES:**

The purpose of learning this course is to:

- Acquire knowledge on basic DC and AC electrical circuits.
- Understand about the three phase circuits
- Recall the Construction, working principle and applications of AC and DC machines.
- Apply the Working principle of measuring instruments for various applications

**UNIT I: ELECTRICAL CIRCUITS**

**9**

DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm’s Law - Kirchhoff’s Laws –Independent and Dependent Sources – Simple problems- Nodal Analysis, Mesh analysis with independent sources only. (Steady state)  
Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor – Steady state analysis of RLC circuits. (Simple problems only)

**UNIT II: THREE PHASE CIRCUITS**

**9**

Three phase power supply – Star connection – Delta connection – Balanced and Unbalanced Loads-Power equation – Star Delta Conversion – power factor -Three Phase Power Measurement -Two wattmeter method, Energy meter.

**UNIT III: DC AND AC MACHINES**

**9**

Construction and Working principle- DC Separately and Self excited Generators, EMF equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications. Construction, working principle and Applications of Transformer, three phase Alternator, Synchronous motor and Three Phase Induction Motor.

**UNIT IV MEASURING INSTRUMENTS**

**9**

Functional elements of an instrument, Standards and calibration, Operating Principle, types -Moving Coil and Moving Iron meters, Instrument Transformers-CT and PT.

**UNIT V SENSORS AND TRANSDUCERS**

**9**

Transducers - Classification of Transducers: Resistive, Inductive, Capacitive, Thermoelectric, piezoelectric, photoelectric, Hall effect - Digital instruments (DSO) – Introduction to Data acquisition

**TOTAL: 45PERIODS**

**COURSE OUTCOMES:**

**On the successful completion of the course, students will be able to**

**CO1: Demonstrate proficiency in DC and AC electrical circuits**

**CO2:** Analyze the types of three-phase circuits, power measurement techniques using two wattmeter method

**CO3:** Be proficient in working and performance and applications of DC, AC machines

**CO4:** Apply the types of measuring instruments and oscilloscopes in electronics, telecommunications, automation, etc. with instrument transformers.

**CO5:** Have a sound basics in sensors and transducers

**CO-PO Mapping**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	3	1	1	1	0	0	0	2	0	2	3
<b>CO2</b>	3	3	1	1	1	0	0	0	2	0	2	3
<b>CO3</b>	3	3	1	1	1	0	0	0	2	0	2	3
<b>CO4</b>	3	3	1	1	1	0	0	0	2	0	2	3
<b>CO5</b>	3	3	1	1	1	0	0	0	2	0	2	3

**TEXT BOOKS :**

1. Kothari DP and I.J Nagrath, “Basic Electrical and Electronics Engineering”, Second Edition, McGraw Hill Education, 2020. Units I - V
2. S. K, Bhattacharya, “Basic Electrical and Electronics Engineering”, Second Edition, Pearson Education, 2017. Units I - V
3. BL Theraja, “A Textbook of Electrical Technology - Volume II”, S. Chand Publishing, Reprint 2020, Units I to III
4. A.K. Sawhney, Puneet Sawhney “A Course in Electrical & Electronic Measurements & Instrumentation”, Dhanpat Rai and Co, New Delhi, 2015. Units IV& V

**REFERNCES:**

1. Kothari DP and I.J Nagrath, “Basic Electrical and Electronics Engineering”, Second Edition, McGraw Hill Education, 2020. Units I - V
2. S. K, Bhattacharya, “Basic Electrical and Electronics Engineering”, Second Edition, Pearson Education, 2017. Units I - V
3. BL Theraja, “A Textbook of Electrical Technology - Volume II”, S. Chand Publishing, Reprint 2020, Units I to III
4. A.K. Sawhney, Puneet Sawhney “A Course in Electrical & Electronic Measurements & Instrumentation”, Dhanpat Rai and Co, New Delhi, 2015. Units IV& V



programs: Display student information using class and object, Deposit or Withdraw money in a bank account

**TOTAL: 45PERIODS**

**COURSE OUTCOMES:**

**On the successful completion of the course, students will be able to**

**CO1:**Understand the basics of Python Programming.

**CO2:**Be familiar with data expressions and statements.

**CO3:**Recognize control flow and function problems.

**CO4:**Comprehend lists, tuples and dictionaries.

**CO5:**Read and write data from/to files and exceptions in Python Programs.

<b>CO-PO Mapping</b>												
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	3	1	1	1	0	0	0	2	0	2	3
<b>CO2</b>	3	3	1	1	1	0	0	0	2	0	2	3
<b>CO3</b>	3	3	1	1	1	0	0	0	2	0	2	3
<b>CO4</b>	3	3	1	1	1	0	0	0	2	0	2	3
<b>CO5</b>	3	3	1	1	1	0	0	0	2	0	2	3

**TEXT BOOKS :**

1. Reema Thareja, “Problem Solving and Programming with python”, 2<sup>nd</sup>edition, Oxford University press, 2019.
2. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, 2nd edition, Updated for Python Shr off/ O’Reilly Publishers, 2016(<http://greenteapress.com/wp/thinkpython/>)
3. Guido van Rossum and Fred L. Drake Jr, “An Introduction to Python – Revised and updated for Python 3.2”, Network Theory Ltd., 2011.

**REFERNCES:**

1. Charles Dierbach, “Introduction to Computer Science using Python: A Computational Problem- Solving Focus, Wiley India Edition, 2013.
2. John V Guttag, “Introduction to Computation and Programming Using Python’’, Revised and expanded Edition, MIT Press, 2013.
3. Kenneth A. Lambert, “Fundamentals of Python: First Programs”, CENGAGE Learning, 2012.
4. Paul Gries, Jennifer Campbell and Jason Montojo, “Practical Programming: An Introduction to Computer Science using Python 3”, Second edition, Pragmatic Programmers, LLC, 2013.
5. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
6. Timothy A. Budd, “Exploring Python”, Mc-Graw Hill Education (India) Private Ltd., 2015.

**GE3201**

**ENGINEERING PRACTICES LABORATORY**

**L T P C**

**0 0 4 2**

**COURSE OBJECTIVES:**

- Drawing pipe line plan; laying and connecting various pipe fittings used in common Household plumbing work; Sawing; planning; making joints in wood materials used in common household wood work.
- To provide exposure to the students with hands on experience on various basic engineering practices in civil, mechanical, electrical and electronics engineering.

**GROUP – A (CIVIL)**

**15**

**PART I**

**CIVIL ENGINEERING PRACTICES**

**PLUMBING WORK:**

- a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
- b) Preparing plumbing line sketches.
- c) Laying pipe connection to the suction side of a pump
- d) Laying pipe connection to the delivery side of a pump.
- e) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

**WOOD WORK:**

- a) Sawing,
- b) Planning and
- c) Making joints like T-Joint, Cross-lap joint and Dovetail joint.

**Wood Work Study:**

- a) Studying joints in door panels and wooden furniture
- b) Studying common industrial trusses using models.

**GROUP – B (MECHANICAL)**

**15**

**PART II**

**MECHANICAL ENGINEERING PRACTICES**

**WELDING WORK:**

- a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
- b) Demonstration of gas welding.

**BASIC MACHINING WORK:**

- a) (simple)Turning.
- b) (simple)Drilling.
- c) (simple)Tapping.

**SPECIAL MACHINES:**

- a) Demonstration on VMC Machine
- b) Demonstration on CNC Machine



**COURSE OBJECTIVES:**

- To study python programs with conditionals and loops
- To use functions for python structured programs.
- Use strings for structuring Python programs.
- Represent compound data using Python lists, tuples and dictionaries.
- To read and write data from and to files in python.

**LIST OF EXPERIMENTS:**

1. Write a program to display the largest number among three numbers.
2. Write a program to display the Fibonacci series by using looping constructs.
3. Write a function to compute the GCD of two numbers.
4. Explore String Functions
5. With the help of strings, array or list, display a simple calendar in python program without using the calendar module.
6. With the help of list perform linear search and Binary search.
7. Create a text file using python file I/O. Read the content of the file and change them from lower to upper case characters.
8. Programs that take command line arguments (word count)
9. Find the most frequent words in a text read from a file.
10. Write a program using Dictionaries to compute the following.
  - i) Students marks statement,
  - ii) Retail bill preparation,
11. Write a program using sets to compute the following.
  - i) Intersection,
  - ii) Union,
  - iii) Symmetric Difference between sets.
12. Write a program using exceptions to calculate the following.
  - i) Voter's age validation,
  - ii) Marks range validation (0-100).
13. Write a program to Display student information using class and object.
14. Write a program to Deposit or Withdraw money in a bank account using class and objects

**TOTAL: 60 PERIODS****COURSE OUTCOMES:****On the successful completion of the course, students will be able to****CO1:**Design simple programs using conditionals and loops.**CO2:**Write functions to solve mathematical problems**CO3:**Use strings for structuring Python programs.**CO4:**Represent compound data using Python lists, tuples and dictionaries.

**CO5:**Identify to read and write data from and to files in python.

<b>CO-PO Mapping</b>												
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	3	1	1	1	0	0	0	2	0	2	3
<b>CO2</b>	3	3	1	1	1	0	0	0	2	0	2	3
<b>CO3</b>	3	3	1	1	1	0	0	0	2	0	2	3
<b>CO4</b>	3	3	1	1	1	0	0	0	2	0	2	3
<b>CO5</b>	3	3	1	1	1	0	0	0	2	0	2	3

<b>CY3201</b>	<b>ENVIRONMENTAL SCIENCE AND SUSTAINABILITY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>

**COURSE OBJECTIVES:**

The purpose of learning this course is to:

- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of global and Indian scenario of renewable and non-renewable resources, causes of their degradation and measures to preserve them.
- To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyse climate changes, concept of carbon credit and the challenges of environmental management.
- To inculcate and embrace sustainability practices and develop a broader understanding on green materials, energy cycles and analyze the role of sustainable urbanization

**UNIT- I ENVIRONMENT AND BIODIVERSITY** **6**

Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, Human-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In- situ and ex-situ..

**UNIT- II ENVIRONMENTAL POLLUTION** **6**

Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Artificial intelligence in pollution monitoring and management. Solid and E-Waste management. Disaster management –Flood, Land slide and Earth quake. Case studies

**UNIT -III RENEWABLE SOURCES OF ENERGY** **6**

Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy, Solar and wind energy.

**UNIT -IV SUSTAINABILITY AND MANAGEMENT** **6**

Sustainability- concept, needs and challenges-Economic and Social aspects of sustainability-from unsustainability to sustainability-millennium development goals, Sustainable Development Goals,Climate change-Green house effect,Global warming and Acid rain. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry-A case study.

**UNIT- V SUSTAINABILITY PRACTICES** **6**

Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Sustainable development index, Sustainable transports. Sustainable energy: Green Engineering: Sustainable urbanization- Socio- economical and technological change.

**TOTAL: 30 PERIODS**

**COURSE OUTCOMES:**

**On the successful completion of the course, students will be able to**

**CO1:** Recognize and infer the functions of environment, ecosystems and biodiversity and their conservation.

**CO.2:** Identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.

**CO.3:** Identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.

**CO 4:** Analyse the different goals of sustainable development and apply them for suitable technological advancement and societal development.

**CO 5:** Appreciate sustainability practices, identify green materials and the role of sustainable urbanization.

<b>CO-PO Mapping</b>												
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	3	1	1	1	0	0	0	2	0	2	3
<b>CO2</b>	3	3	1	1	1	0	0	0	2	0	2	3
<b>CO3</b>	3	3	1	1	1	0	0	0	2	0	2	3
<b>CO4</b>	3	3	1	1	1	0	0	0	2	0	2	3
<b>CO5</b>	3	3	1	1	1	0	0	0	2	0	2	3

**TEXT BOOKS :**

1. Anubha Kaushik and C. P. Kaushik's Perspectives in Environmental Studies, 7th Edition, New Age International Publishers, 2021.
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.
3. Gilbert M. Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
4. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall. 1st Edition 2011.
5. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, engage learning

**REFERNCES:**

1. Cunningham, W.P. Cooper, T.H. Gorhani, Environmental Encyclopedia, Jaico Publ., House, Mumbai, 2001.
2. Rajagopalan, R, Environmental Studies-From Crisis to Cure, Oxford University Press, Third Edition, 2015.
3. Erach Bharucha —Textbook of Environmental Studies for Undergraduate Courses, Orient Blackswan Pvt. Ltd. 2013.



**TEXTBOOKS:**

Ibe, O.C., “Fundamentals of Applied Probability and Random Processes”, Elsevier, 1st Indian Reprint, 2007.

Friedberg. A.H., Insel. A.J. and Spence. L., “Linear Algebra”, Prentice Hall of India, New Delhi, 4th Edition, 2004.

**REFERENCES:**

Hsu, “Schaum’s Outline of Theory and Problems of Probability, Random Variables and Random Processes”, Tata McGraw Hill Edition, New Delhi, 2004.

Trivedi, K.S., “Probability and Statistics with Reliability, Queueing and Computer Science Applications”, 2nd Edition, John Wiley and Sons, 2002.

Yates, R.D. and Goodman. D. J., “Probability and Stochastic Processes”, 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.

Kolman. B. Hill. D.R., “Introductory Linear Algebra”, Pearson Education, New Delhi, First Reprint, 2009.

**COURSE OBJECTIVES:**

- To understand Object Oriented Programming concepts and basics of Java programming language
- To know the principles of packages, inheritance and interfaces
- To develop a java application with threads and generics classes
- To define exceptions and use I/O streams
- To design and build Graphical User Interface Application using JAVAFX

**UNIT I INTRODUCTION TO OOP AND JAVA 9**

Overview of OOP – Object oriented programming paradigms – Features of Object Oriented Programming – Java Buzzwords – Overview of Java – Data Types, Variables and Arrays – Operators – Control Statements – Programming Structures in Java – Defining classes in Java – Constructors-Methods -Access specifiers - Static members- Java Doc comments

**UNIT II INHERITANCE, PACKAGES AND INTERFACES 9**

Overloading Methods – Objects as Parameters – Returning Objects –Static, Nested and Inner Classes. Inheritance: Basics– Types of Inheritance -Super keyword - Overriding – Dynamic Method Dispatch –Abstract Classes – final with Inheritance. Packages and Interfaces: Packages – Packages and Member Access –Importing Packages – Interfaces.

**UNIT III EXCEPTION HANDLING AND MULTITHREADING 9**

Handling basics – Multiple catch Clauses – Nested try Statements – Java’s Built-in Exceptions – User defined Exception. Multithreaded Programming Method: Java Thread Model–Creating a Thread and Multiple Threads – Priorities – Synchronization – Inter Thread Communication- Suspending –Resuming, and Stopping Threads –Multithreading. Wrappers – Auto boxing.

**UNIT IV I/O, GENERICS, STRING HANDLING 9**

I/O Basics – Reading and Writing Console I/O – Reading and Writing Files. Generics: Generic Programming – Generic classes – Generic Methods – Bounded Types – Restrictions and Limitations. Strings: Basic String class, methods and String Buffer Class.

**UNIT V JAVAFX EVENT HANDLING, CONTROLS AND COMPONENTS 9**

JAVAFX Events and Controls: Event Basics – Handling Key and Mouse Events. Controls: Checkbox, Toggle Button – Radio Buttons – List View – Combo Box – Choice Box – Text Controls – Scroll Pane. Layouts – Flow Pane – HBox and VBox – Border Pane – Stack Pane – Grid Pane. Menus – Basics – Menu – Menu bars – MenuItem.

**TOTAL : 45 PERIODS****Course Outcomes:**

Upon Completion of the course the students will be able to

**CO1:** Apply the concepts of classes and objects to solve simple problems

**CO2:** Develop programs using inheritance, packages and interfaces

**CO3:** Make use of exception handling mechanisms and multithreaded model to solve real world problems

**CO4:** Build Java applications with I/O packages, string classes, Collections and generics concepts

**CO5:** Integrate the concepts of event handling and JavaFX components and controls for developing GUI based applications

**CO PO MAPPING**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	0	0	0	0	0	3	3
CO2	3	3	3	3	3	0	0	0	0	0	3	3
CO3	3	3	3	3	3	0	0	0	0	0	3	3
CO4	3	3	3	3	3	0	0	0	0	0	3	3
CO5	3	3	3	3	3	0	0	0	0	0	3	3

**Text Books:**

1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw Hill Education, New Delhi, 2019
2. Herbert Schildt, "Introducing JavaFX 8 Programming", 1st Edition, McGraw Hill Education, New Delhi, 2015

**References:**

1. Cay S. Horstmann, "Core Java Fundamentals", Volume 1, 11th Edition, Prentice Hall, 2018.

**COURSE OBJECTIVES:**

- To understand the basic properties of signal & systems and the various methods of classification
- To learn Laplace Transform & Fourier transform and their properties
- To know Z transform & DTFT and their properties
- To characterize LTI systems in the Time domain and various Transform domains

**UNIT I - CLASSIFICATION OF SIGNALS AND SYSTEMS** **12**

Requirements of signal and system analysis in communication, Introduction to continuous and discrete time signals, Standard signals- Step, Ramp, Pulse, Impulse, Real and complex exponentials and Sinusoids, Basic operation on the signals -Problems on signal operations, Classification of signals – Continuous time (CT) and Discrete Time (DT) signals, Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals - Classification of systems- CT systems and DT systems- – Linear & Nonlinear, Time-variant & Time-invariant, Causal & Non-causal, Stable & Unstable.

**UNIT II- ANALYSIS OF CONTINUOUS TIME SIGNALS** **12**

Fourier series for periodic signals - Fourier Transform – properties- spectral analysis of CT signals-Laplace Transforms – properties -convergence of Laplace Transform.

**UNIT III-LINEAR TIME INVARIANT CONTINUOUS TIME SYSTEMS** **12**

System modeling of CT system- LTI system-Impulse response - Differential Equation- Analysis of CT system using Fourier and Laplace transforms-convolution integrals-CT system connected in series /parallel.

**UNIT IV- ANALYSIS OF DISCRETE TIME SIGNALS** **12**

Baseband signal sampling (only definition)– Fourier Transform of discrete time signals (DTFT)–Properties of DTFT-spectral analysis of DT signals- Z-Transform-ROC and its properties-Properties of Z- Transform.

**UNIT V- LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS** **12**

System modeling of DT system -Impulse response –Difference equations-Analysis of DT system using Discrete Time Fourier Transform and Z Transform -Convolution sum- DT system connected in series and parallel.

**TOTAL: 60 PERIODS**

**COURSE OUTCOMES:**

**On the successful completion of the course, students will be able to**

**CO1:** Analyze the properties of signals and systems.

**CO2:** Apply Laplace transform, Fourier transform in signal analysis

**CO3:** Evaluate continuous time LTI systems using Fourier and Laplace Transforms

**CO4:** Apply Z transform and DTFT in signal analysis

**CO5:** Analyze discrete time LTI systems using Z transform and DTFT

<b>CO-PO Mapping</b>												
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	2	2	2	3	1	1	1	2	2	1	2
<b>CO2</b>	3	3	3	3	3	1	1	1	2	2	2	2
<b>CO3</b>	3	3	3	3	3	1	1	1	2	2	2	2
<b>CO4</b>	3	3	3	3	3	2	2	1	2	2	2	3
<b>CO5</b>	3	3	3	3	3	2	2	1	3	3	3	3

**TEXTBOOKS:**

1. Allan V.Oppenheim,S.Wilsky and S.H.Nawab,—Signals and Systems||,Pearson,2015.(Unit 1-V)
2. R.E.Zeimer, W.H.Tranter and R.D.Fannin, —Signals & Systems - Continuous and Discretel, Pearson,2007.

**REFERNCES:**

1. B.P. Lathi,—Principles of Linear Systems and Signals,Second Edition,Oxford,2009.
2. John Alan Stuller,—An Introduction to Signals and Systems||,Thomson,2007

EC3302	ELECTRONIC DEVICES AND CIRCUITS	L	T	P	C
		3	0	0	3
<b>COURSE OBJECTIVES</b>					
<ul style="list-style-type: none"> <li>To acquaint the students with the construction, theory and operation of the basic electronic devices.</li> </ul>					
<ul style="list-style-type: none"> <li>To study about BJT and feedback amplifiers</li> </ul>					
<ul style="list-style-type: none"> <li>To study about FET and design oscillators.</li> </ul>					
<ul style="list-style-type: none"> <li>To study about MOSFET and control devices(SCR,TRIAC,DIAC).</li> </ul>					
<ul style="list-style-type: none"> <li>To design Multivibrators &amp; Schmitt Trigger.</li> </ul>					
<b>UNIT I SEMICONDUCTOR DEVICES 9</b>					<b>9</b>
PN diode Current equations, Diffusion and drift current densities, Switching Characteristics, PN junction diode – forward and Reverse bias characteristics– Zener diode construction & working Principle-characteristics - zener break down-avalanche break down –BJT-NPN , PNP Operations-Early effect-Current equations-Input and Output characteristics of CE, CB, CC.					
<b>UNIT II FET AND SPECIAL SEMICONDUCTOR DEVICES</b>					<b>9</b>
JFET–Operation, Drain and Transfer characteristics, MOSFET-Characteristics-D-MOSFET, E-MOSFET Characteristics, UJT, SCR, Diac, Triac, LDR-LED, LCD-Opto Coupler, CCD.					
<b>UNIT III BJT –BIASING AND AMPLIFIERS 9</b>					<b>9</b>
BJT– Need for biasing - DC Load Line and Bias Point – DC analysis of Transistor circuits – Various biasing methods of BJT – Thermal stability - Stability factors – Bias compensation techniques using Diode, thermistor and sensistor. Small Signal Hybrid $\pi$ equivalent circuit of BJT – Analysis of CE, CC and CB amplifiers using Hybrid $\pi$ equivalent circuits - Darlington Amplifier, Cascade, Cascode configurations - Differential amplifier.					
<b>UNIT IV FET AMPLIFIERS 9</b>					<b>9</b>
JFET - DC Load Line and Bias Point - Various biasing methods of JFET - MOSFET Biasing methods- Small Signal Hybrid $\pi$ equivalent circuit of FET and MOSFET - Analysis of CS, CD and CG, Basic FET differential pair, Current Mirror and Current Steering Circuits..					
<b>UNIT V POWER SUPPLIES 9</b>					<b>9</b>
Linear mode power supply - Rectifiers - Filters - Half-Wave Rectifier Power Supply - Full-Wave Rectifier Power Supply-Voltage regulators: Voltage regulation-Linear series, shunt and switching Voltage Regulators- Over voltage protection - BJT and MOSFET – Switched mode power supply (SMPS) - Design of Regulated DC Power Supply.					
<b>TOTAL: 45 PERIODS</b>					

**COURSE OUTCOMES:**

**On the successful completion of the course, students will be able to**

**CO1:** Understand the basic characteristics of diodes and BJT

**CO2:** Analyse the characteristics FET and Special semiconductor devices

**CO3:** Design BJT biasing circuits and amplifier circuits

**CO4:** Design FET biasing circuits and amplifier circuits

**CO5:** Analyse the Power supply circuits using LMPS and SMPS model.

<b>CO-PO Mapping</b>												
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	3	2	1	1	1	1	1	1	1	1	1
<b>CO2</b>	3	3	3	1	2	1	1	1	1	2	1	2
<b>CO3</b>	3	2	2	1	2	1	1	1	1	2	1	2
<b>CO4</b>	3	3	3	2	2	1	1	1	1	2	1	2
<b>CO5</b>	3	3	3	1	2	1	1	1	1	2	1	2

**TEXT BOOKS:**

1. Salivahanan.S,Suresh Kumar.N,Vallavaraj.A ,Electronic Devices and circuits ],Third Edition, Tata McGraw-Hill, 2008.
2. Donald A Neaman, —Semiconductor Physics and Devices ],Fourth Edition, Tata McGraw Hill Inc.2012.

**REFERENCES:**

1. Robert Boylestad and Louis Nashelsky,—Electron Devices and Circuit Theory ]Pearson Prentice Hall, 10th edition, July2008.
2. R.S.Sedha, A Text Book of Applied Electronics ]Chand Publications, 2006.
3. Millman J, Halkias.C.and Sathyabrada Jit, Electronic Devices and Circuits, 4th Edition, Mc Graw Hill Education (India) Private Ltd., 2015.
4. Floyd, Electronic Devices, Ninth Edition, Pearson Education, 2012.
5. David A. Bell, Electronic Devices & Circuits, 5th Edition, Oxford University Press, 2008.
6. Anwar A. Khan and Kanchan K. Dey, A First Course on Electronics, PHI, 2006.

EC3303

CIRUCIT THEORY

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

- To learn the basic concepts and behaviour of DC and AC circuits.
- To understand various methods of circuit/ network analysis using network theorems.
- To understand the transient and steady state response of the circuits subjected to DC excitations and AC with sinusoidal excitations.
- To learn the concept of coupling in circuits and topologies.

**UNIT I -DC CIRCUIT ANALYSIS**

**9**

Basic Components of electric Circuits, Charge, current, Voltage and Power, Voltage and Current Sources, Ohms Law, Kirchoff’s Current Law, Kirchoff’s voltage law, The single Node – Pair Circuit, series and Parallel Connected Independent Sources, Resistors in Series and Parallel, voltage and current division, Nodal analysis, Mesh analysis.

**UNIT II - NETWORK THEOREM AND DUALITY**

**9**

Useful Circuit Analysis techniques - Linearity and superposition, Thevenin and Norton Equivalent Circuits, Maximum Power Transfer, Delta-Wye Conversion. Duals, Dual circuits. Analysis using dependent current sources and voltage sources

**UNIT III- SINUSOIDAL STEADY STATE ANALYSIS**

**9**

Sinusoidal Steady – State analysis , Characteristics of Sinusoids, The Complex Forcing Function, The Phasor, Phasor relationship for R, L, and C, impedance and Admittance, Nodal and Mesh Analysis, Phasor Diagrams, AC Circuit Power Analysis, Instantaneous Power, Average Power, apparent Power and Power Factor, Complex Power.

**UNIT IV- TRANSIENTS AND RESONANCE IN RLC CIRCUITS**

**9**

Basic RL and RC Circuits, The Source- Free RL Circuit, The Source-Free RC Circuit, The Unit-Step Function, Driven RL Circuits, Driven RC Circuits, RLC Circuits, Frequency Response, Parallel Resonance, Series Resonance, Quality Factor.

**UNIT V-COUPLED CIRCUITS AND TOPOLOGY**

**9**

Magnetically Coupled Circuits, mutual Inductance, the Linear Transformer, the Ideal Transformer, An introduction to Network Topology, Trees and General Nodal analysis, Links and Loop analysis.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

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

**CO1:** Apply the basic concepts of circuit analysis such as Kirchoff’s laws, mesh current and node voltage method for analysis of DC and AC circuits.

**CO2:** Apply suitable network theorems and analyze AC and DC circuits

**CO3:** Analyze steady state response of any R, L and C circuits

**CO4:** Analyze the transient response for any RC, RL and RLC circuits and frequency response of parallel and series resonance circuits.

**CO5:** Analyze the coupled circuits and network topologies

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	3	2	1	1				1		1		
CO2	3	2	1	1				1		1		
CO3	3	2	1	1				1		1		
CO4	3	2	1	1				1		1		

CO5	3	2	1	1				1		1		
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**CO PO MAPPING**

**TEXTBOOKS:**

1. Hayt Jack Kemmerly, Steven Durbin, "Engineering Circuit Analysis", Mc Graw Hill education, 9th Edition, 2018.
2. Charles K. Alexander & Mathew N.O.Sadiku, "Fundamentals of Electric Circuits", Mc GrawHill, 2nd Edition, 2003.
3. Joseph Edminister and Mahmood Nahvi, —Electric Circuits, Schaum’s Outline Series, Tata McGraw Hill Publishing Company, New Delhi, Fifth Edition Reprint 2016.

**REFERNCES:**

1. Robert.L. Boylestead, "Introductory Circuit Analysis", Pearson Education India, 12th Edition, 2014. David Bell, "Fundamentals of Electric Circuits", Oxford University press, 7thEdition, 2009
2. John O Mally, Schaum’s Outlines "Basic Circuit Analysis", The Mc Graw Hill companies, 2nd Edition, 2011
3. Allan H.Robbins, Wilhelm C.Miller, “Circuit Analysis Theory and Practice”, Cengage Learning, Fifth Edition, 1st Indian Reprint 2013

**COURSE OBJECTIVES:**

- To present the Digital fundamentals, Boolean algebra and its applications in digital systems
- To familiarize with the design of various combinational digital circuits using logic gates
- To introduce the analysis and design procedures for synchronous and asynchronous sequential circuits
- To explain the various semiconductor memories and related technology
- To introduce the electronic circuits involved in the making of logic Gates

**UNIT I DIGITAL FUNDAMENTALS 9**

Number systems-decimal ,Binary ,Octal, Hexadecimal ,1's and 2's complements, Codes-Binary, BCD, Excess 3,Gray,Boolean theorems, Logic Gates, Universal gates, Sum of products and product of sums, Minterm and Maxterms, Karnaugh map minimization.

**UNIT II COMBINATIONAL CIRCUIT DESIGN 9**

Design of Half adder and Full adder, Half and Subtractor, Binary Parallel adder-Carry look ahead adder, BCD adder, Multiplexer, De-multiplexer, Magnitude comparator, Decoder, Encoder, Priority Encoder, Parity generator & Parity checker.

**UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 9**

Flip Flops-SR,JK ,T,D, Master/Slave FF-operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits-Moore/Mealy models, State minimization, State assignment, circuit implementation-Design of counters-Ripple counters, Ring Counters, Shift register, Universal shift register

**UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS 9**

Stable and Unstable states, output specifications, Cycles and Races, Race free assignments, State reduction, Fundamental and Pulse mode sequential circuits, Hazards, Design of Hazard free circuits

**UNIT V MEMORY DEVICES AND DIGITAL INTEGRATED CIRCUITS 9**

Basic memory Structure-ROM-PROM-EPROM-EEPROM-EAPROM, RAM –Static and Dynamic RAM- Programmable Logic devices-Programmable Logic Array(PLA)-Programmable Array Logic(PAL)-Field Programmable Gated Arrays(FPGA)-Implementation of combinational logic circuits using ROM, PLA and PAL.

Digital Integrated circuits: Logic levels ,Propagation delay, Power dissipation, Fan-out and Fan-in ,noise margin, Logic families and their characteristics-TTL,CMOS

**TOTAL: 45 PERIODS****COURSE OUTCOMES:**

**On the successful completion of the course, students will be able to**

**CO1:** Apply digital electronics in the present contemporary world

**CO2:** Design various combinational digital circuits using logic gates

**CO3:** Analyze the synchronous sequential circuits

**CO4:** Analyze the Asynchronous sequential circuits

**CO5:** Classify different logical families, semiconductor memories and implementations of PLD devices using logic gates

<b>CO-PO Mapping</b>												
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	2	2	2	3	1	1	1	2	2	1	2
<b>CO2</b>	3	3	3	3	3	1	1	1	2	2	2	2
<b>CO3</b>	3	3	3	3	3	1	1	1	2	2	2	2
<b>CO4</b>	3	3	3	3	3	2	2	1	2	2	2	3
<b>CO5</b>	3	3	3	3	3	2	2	1	3	3	3	3

**TEXTBOOKS:**

1.M.Moris Mano and Michal D.Ciletti,"Digital Design",6<sup>th</sup> edition,Pearson2017

**REFERNCES:**

1. CharlesH.Roth." Fundamentals of Logic design",7<sup>th</sup> edition, Thomas learning,2019.
2. Thomas L.Floyd, "Digital fundamentals",11th edition, Pearson education Inc,2017.
3. S. Salivahanan and S. Arivazhagan "Digital Electronics",Ist edition, Vikas Publishing House pvt Ltd,2012.
4. AnilK.Maini"DigitalElectronics",Wiley,2014.
5. A. Anand Kumar" Fundamentals of Digitalcircuits",4<sup>th</sup> edition, PHI learning Private Limited,2016.
6. SoumitraKumarMandal"DigitalElectronics",McGrawHillEducationPrivateLimited,2016

**EC3305 ELECTRONIC DEVICES AND CIRCUITS  
LABORATORY**

**L T P C**  
**0 0 3 1.5**

**COURSE OBJECTIVES**

- Study the Frequency response of CE, CB and CC Amplifier
- Learn the frequency response of CS Amplifiers
- Study the Transfer characteristics of differential amplifier
- Perform experiment to obtain the bandwidth of single stage and multistage amplifiers
- Perform SPICE simulation of Electronic Circuits

**LIST OF EXPERIMENTS:**

1. Characteristics of PN diode and Zener Diode
  - a. VI Characteristics of UJT and SCR
  - b. Design of Half wave and Full wave rectifier with filter
2. Frequency Response of CE, CB, CC and CS amplifiers
3. Darlington Amplifier
4. Differential Amplifiers - Transfer characteristics, CMRR Measurement
5. Cascode and Cascade amplifiers
6. VI Characteristics of LED and LDR using Spice
7. Frequency response of CE and CS using Spice
8. Analysis of FET, MOSFET with fixed bias, self-bias and voltage divider bias using
9. Simulation software like Spice
10. Analysis of Cascode and Cascade amplifiers using Spice
11. Characteristics of PN diode and Zener Diode

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

**On the successful completion of the course, students will be able to**

**CO1:** Obtain the characteristics of various electronic devices such as diodes, UJT, JFET, photo diode and photo transistor.

**CO2:** Understand the working of diodes in clipper, clamper circuits and regulated power supply.

**CO3:** Understand the working of transistor in CE amplifier, feedback amplifiers and oscillators.

**CO4:** Gain knowledge on the Wave shaping circuits using Transistor.

**CO5:** Understand the working of CRO and DSO for frequency and phase measurement and also analyze the basic electronic circuits using simulation software.

<b>CO-PO MAPPING</b>												
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	3	3	3	3	3	2	0	0	0	0	2
<b>CO2</b>	3	3	3	3	3	3	3	0	0	0	0	2
<b>CO3</b>	3	3	3	3	3	3	3	0	0	0	0	2
<b>CO4</b>	3	3	3	3	3	3	3	0	0	0	0	2
<b>CO5</b>	3	3	3	3	3	3	3	0	0	0	0	2

**COURSE OBJECTIVES:**

- To practice the design of various combinational digital circuits using logic gates
- To bring out the analysis and design procedures for synchronous and asynchronous Sequential circuits □
- To learn integrated circuit families.

**LIST OF DIGITAL EXPERIMENTS:**

1. Design and implementation of code converters using logic gates
  - i) BCD to excess-3code and vice versa (ii) Binary to gray and vice-versa
2. Design and implementation of 4 bit binary Adder/Subtraction and BCD adder using IC7483
3. Design and implementation of Multiplexer and De-multiplexer using logic gates
4. Design and implementation of encoder and decoder using logic gates
5. Construction and verification of 4 bit ripple counter and Mod-10 /Mod-12 Ripple counters
6. Design and implementation of 3-bit synchronous up/down counter
7. Implementation of SISO, SIPO, PISO and PIPO shift registers using Flip-flops.
8. Realize the Ring Counter and Johnson Counter using IC7476.
9. Design and verify the Truth Table of 3-bit Parity Generator and 4-bit Parity Checker using basic logic gates with an even parity bit.
10. Design a 2 bit magnitude comparator

**TOTAL:45 PERIODS****COURSE OUTCOMES: On the successful completion of the course, students will be able to:****CO1.** Design various combinational digital circuits using logic gates.**CO2.** Analyze various combinational circuits**CO3.** Design synchronous sequential circuits**CO4.** Analyze synchronous sequential circuits**CO5:** Design asynchronous sequential circuits

<b>CO-PO MAPPING</b>												
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	3	3	3	3	3	2	0	0	0	0	2
<b>CO2</b>	3	3	3	3	3	3	3	0	0	0	0	2
<b>CO3</b>	3	3	3	3	3	3	3	0	0	0	0	2
<b>CO4</b>	3	3	3	3	3	3	3	0	0	0	0	2
<b>CO5</b>	3	3	3	3	3	3	3	0	0	0	0	2