



# SENGUNTHAR ENGINEERING COLLEGE (AUTONOMOUS)

(Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai)  
Recognized Under Section 2(f) & 12(B) of the UGC Act, 1956  
NAAC Accredited with 'A' Grade

TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU



## CURRICULAM & SYLLABI B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

(CHOICE BASED CREDIT SYSTEM)

### REGULATIONS – 2023

(For the Students admitted in the Academic Year 2023-2024 onwards)



Note: The regulations hereunder are subject to amendments as may be decided by the Academic Council of the Sengunthar Engineering College from time to time. Any or all such amendments will be effective from such date and to such batches of candidates including those already undergoing the program under the same Regulation as may be decided by the Academic Council.





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## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING REGULATION 2023 CURRICULUM AND SYLLABI

FOR B.E. – ELECTRONICS AND COMMUNICATION ENGINEERING

(For the Students admitted in the Academic Year 2023-2024 onwards)

FIRST SEMESTER

TO

EIGHTH SEMESTER





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## *SCHEME FOR CURRICULUM*

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*B.E. - ECE*





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## REGULATIONS 2023

### CHOICE BASED CREDIT SYSTEM

## B. E. ELECTRONICS AND COMMUNICATION ENGINEERING

### VISION

- To be recognized as a premier centre in the field of Electronics and Communication Engineering by imparting professional, technical skills and research attitude to meet the developing needs of industry and society.

### MISSION

- To impart technical education through effective teaching learning process in Electronics and Communication Engineering.
- To create research ambience to face the emerging technical challenges for the benefit of the society.
- To train the students to develop skills to solve complex technological problems and to make them competitive professionals through dynamic curriculum.

### PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduates can :

- ✓ Gain strong foundation in designing, manufacturing, testing, operating and maintaining systems in the field of Electronics and Communication Engineering and allied engineering industries.
- ✓ Able to solve problems of social relevance by applying the knowledge of electronics and communication engineering and to pursue higher education and research.
- ✓ Develop attitude in lifelong learning, applying and adapting new ideas and technologies in their respective domain.





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## PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

PO1	<b>Engineering knowledge</b>	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	<b>Problem analysis</b>	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	<b>Design/development of solutions</b>	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.
PO4	<b>Conduct investigations of complex problems</b>	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	<b>Modern tool usage</b>	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.
PO6	<b>The engineer and society</b>	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.
PO7	<b>Environment and sustainability</b>	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	<b>Ethics</b>	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	<b>Individual and team work:</b>	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.



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PO10	<b>Communication:</b>	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	<b>Project management and finance</b>	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.
PO12	<b>Life-long learning</b>	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## PROGRAM SPECIFIC OUTCOME (PSOs)

PSO1	Specify, design, proto type and test modern electronic systems through application of relevant electronics, mathematics and engineering principles
PSO2	Design, develop and analyze communication systems through the fundamentals from principles of communication, signal processing, RF System Design and Electromagnetics.
PSO3	Select, Architect and develop appropriate technologies for implementing innovative solutions related to the field of electronics and Communication







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## MAPPING OF COURSE OUTCOME AND PROGRAM OUTCOME

Year	Sem	Course Name	PO												PSO			
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
I	I	23HST101 - Professional English - I	-	-	-	-	-	1.4	2.2	1.25	1.8	3	-	3	-	-	-	
		23MAT101 - Matrices and calculus	3	3	2	-	-	-	-	-	-	-	1	2	-	-	-	
		23HST102 - தமிழர்மரபு/ Heritage of Tamils	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		23PHE103 – Applied Physics for Electronics Engineering	3	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-
		23CYE101 - Engineering Chemistry	1.6	1.6	2.4	1.25	1.8	1	2	-	-	-	-	-	1.5	-	-	-
		23GEE101 - Programming in C	2	2.3	2.3	1.16	2	1.6	1.0	0.83	2	0.1	2.8	2.3	1.8	2.1	-	-
		23EEC101 - Soft Skills	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	23MDC101 - Induction Program ( 2 Weeks )	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	II	23HST201 - Professional English - II	-	-	-	-	2	1.2	1.2	1	2	3	-	3	-	-	-	
		23MAT201 – Statistics and Numerical Methods with MATLAB	3	3	1	1	2	-	-	-	1	-	2	3	-	-	-	
		23PHT203 – Advanced Physics for Electronics Engineering	3	2	1	1	1	1	1	-	-	-	-	-	-	-	-	
		23CYT201 - Environmental Science and Sustainability	1.5	1.8	2.2	1.8	1.5	1.4	2.2	2	1	2	-	1	-	-	-	
		23HST202 - தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		23GEE201 - Engineering Graphics	3	2	2	-	2	2	-	-	-	2	-	2	2	2	2	2





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	23EEE201 - Circuit Theory	3	3	3	2.8	2	-	2	1	-	-	-	3	3	3	3
	23GEL201 - Engineering Practices Laboratory	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
	23EEC201 - Communication Skills	-	-	-	-	-	1.2	1.5	1.5	1.8	3	-	3	-	-	-
	23MDC201 - Life skills & Leadership Enhancement Programme	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

### MAPPING OF COURSE OUTCOME AND PROGRAM OUTCOME

Year	Sem	Course Name	PO											PSO			
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
II	III	23MAT302- Transforms and Random Processes	3	3	1	3	2	-	-	-	-	-	1	2	-	-	-
		23ECT301- Signals and Systems	3	3	3	3	3	2	-	-	-	-	-	3	2	3	1
		23EET301- Control and Instrumentation Engineering	3	3	3	3	-	-	-	1	-	2	-	2	3	-	2
		23ECE301- Electronic Devices and Circuits	3	3	3	3	2	2	-	-	-	-	-	1	2	1	1
		23ECE302- Digital Systems Design	3	3	3	2	2	2	-	-	-	-	2	2	3	3	2
		23GEE301- Problem Solving and Python Programming	2	3	3	3	2	-	-	-	-	-	2	2	3	-	-
		23EEC301 - Professional Development	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	IV	23ECT401- Electromagnetic Fields	2	2	2	2	2	2	1	-	-	1	1	2	2	2	2
		23ECT402- Networks and Security	2	2	1	2	2	1	1	-	1	1	1	2	2	2	2
		23ECT403- Microprocessors and Microcontrollers	3	3	3	2	2	2	-	-	-	-	2	2	3	2	2
		23ECE401- Digital Signal Processing	3	3	2	2	2	2	-	-	-	-	1	1	2	2	1





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	23ECE402- Communication Systems	3	3	3	3	2.5	1	1	-	-	-	1	1	2	1	1
	23ECE403- Linear Integrated Circuits	3	3	3	3	2	2	2	-	-	-	1	2	3	2	2
	23EEC401 - Value Added Course - I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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## CURRICULUM AND SYLLABI

### FOR B.E. / B.Tech. DEGREE PROGRAMMES

(For the Students Admitted in the Academic Year 2023-2024 onwards)

#### B.E- ELECTRONICS AND COMMUNICATION ENGINEERING - FIRST SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
<b>THEORY</b>									
23HST101	Professional English - I	HS	3	0	0	3	40	60	100
23MAT101	Matrices and calculus	BS	3	1	0	4	40	60	100
23HST102	தமிழர்மரபு /Heritage of Tamils	HS	1	0	0	1	40	60	100
<b>EMBEDDED COURSE</b>									
23PHE103	Applied Physics for Electronics Engineering	BS	3	0	2	4	50	50	100
23CYE101	Engineering Chemistry	BS	3	0	2	4	50	50	100
23GEE101	Programming in C	ES	3	0	2	4	50	50	100
<b>EMPLOYABILITY ENHANCEMENT COURSE</b>									
23EEC101	Soft Skills	EEC	1	0	0	1	100	-	100
<b>MANDATORY COURSE</b>									
23MDC101	Induction Program (2 Weeks)	MC	-	-	-	-	-	-	-
<b>TOTAL CREDITS IN SEMESTER - I</b>						<b>21</b>			

HS	:	Humanities and Social Sciences
BS	:	Basic Sciences
ES	:	Engineering Sciences
PC	:	Professional Core
PE	:	Professional Elective
OE	:	Open Elective
GE	:	General Elective
EEC	:	Employability Enhancement Courses
MC	:	Mandatory Courses
L	:	Lecture
T	:	Tutorial
P	:	Practical





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C : Credit Point  
CIA : Continuous Internal Assessment  
ESE : End Semester Examination  
TOT : Total





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## B.E- ELECTRONICS AND COMMUNICATION ENGINEERING - SECOND SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit C	Maximum Marks		
			L	T	P		CIA	ESE	TOT
<b>THEORY</b>									
23HST201	Professional English - II	HS	3	0	0	3	40	60	100
23MAT201	Statistics and Numerical Methods with MATLAB	BS	3	1	0	4	40	60	100
23PHT203	Advanced Physics for Electronics Engineering	BS	3	0	0	3	40	60	100
23CYT201	Environmental Science and Sustainability	HS	3	0	0	3	40	60	100
23HST202	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HS	1	0	0	1	40	60	100
<b>EMBEDDED COURSE</b>									
23GEE201	Engineering Graphics	ES	3	0	2	4	50	50	100
23EEE201	Circuit Theory	PC	3	0	2	4	50	50	100
<b>PRACTICALS</b>									
23GEL201	Engineering Practices Laboratory	ES	0	0	4	2	60	40	100
<b>EMPLOYABILITY ENHANCEMENT COURSE</b>									
23EEC201	Communication Skills	EEC	0	0	4	2	100	-	100
<b>MANDATORY COURSE</b>									
23MDC201	Life Skills & Leadership Enhancement Programme	MC	3	0	0	0	-	-	-
<b>TOTAL CREDITS IN SEMESTER - II</b>						<b>26</b>			

HS :	Humanities and Social Sciences
BS :	Basic Sciences
ES :	Engineering Sciences
PC :	Professional Core
PE :	Professional Elective
OE :	Open Elective
GE :	General Elective
EEC :	Employability Enhancement Courses
MC :	Mandatory Courses
L :	Lecture
T :	Tutorial
P :	Practical
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TOT :	Total





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## B.E- ELECTRONICS AND COMMUNICATION ENGINEERING -THIRD SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
<b>THEORY</b>									
23MAT302	Transforms and Random Processes	BS	3	1	0	4	40	60	100
23ECT301	Signals and Systems	PC	3	1	0	4	40	60	100
23EET301	Control and Instrumentation Engineering	PC	3	0	0	3	40	60	100
<b>EMBEDDED COURSE</b>									
23ECE301	Electronic Devices and Circuits	PC	3	0	2	4	50	50	100
23ECE302	Digital Systems Design	PC	3	0	2	4	50	50	100
23GEE301	Problem Solving and Python Programming	BS	3	0	2	4	50	50	100
<b>EMPLOYABILITY ENHANCEMENT COURSE</b>									
23EEC301	Professional Development	EEC	0	0	2	1	100	-	100
<b>TOTAL CREDITS IN SEMESTER-III</b>						<b>24</b>			

- HS : Humanities and Social Sciences
- BS : Basic Sciences
- ES : Engineering Sciences
- PC : Professional Core
- PE : Professional Elective
- OE : Open Elective
- GE : General Elective
- EEC : Employability Enhancement Courses
- MC : Mandatory Courses
- L : Lecture
- T : Tutorial
- P : Practical
- C : Credit Point
- CIA : Continuous Internal Assessment
- ESE : End Semester Examination
- TOT : Total





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## B.E- ELECTRONICS AND COMMUNICATION ENGINEERING - FOURTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit C	Maximum Marks		
			L	T	P		CIA	ESE	TOT
<b>THEORY</b>									
23ECT401	Electromagnetic Fields	PC	3	1	0	4	40	60	100
23ECT402	Networks and Security	PC	3	0	0	3	40	60	100
23ECT403	Microprocessors and Microcontrollers	PC	3	0	0	3	40	60	100
<b>EMBEDDED COURSE</b>									
23ECE401	Digital Signal Processing	PC	3	0	2	4	50	50	100
23ECE402	Communication Systems	PC	3	0	2	4	50	50	100
23ECE403	Linear Integrated Circuits	PC	3	0	2	4	50	50	100
<b>EMPLOYABILITY ENHANCEMENT COURSE</b>									
23EEC401	Value Added Course-I	EEC	0	0	4	2	100	-	100
<b>TOTAL CREDITS IN SEMESTER-IV</b>						<b>24</b>			

- HS : Humanities and Social Sciences
- BS : Basic Sciences
- ES : Engineering Sciences
- PC : Professional Core
- PE : Professional Elective
- OE : Open Elective
- GE : General Elective
- EEC : Employability Enhancement Courses
- MC : Mandatory Courses
- L : Lecture
- T : Tutorial
- P : Practical
- C : Credit Point
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## B.E- ELECTRONICS AND COMMUNICATION ENGINEERING - FIFTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
<b>THEORY</b>									
23ECT501	Transmission Lines and RF Systems	PC	3	1	0	4	40	60	100
	Professional Elective - I	PE	3	0	0	3	40	60	100
	Professional Elective - II	PE	3	0	0	3	40	60	100
	Professional Elective – III	PE	3	0	0	3	40	60	100
<b>EMBEDDED COURSE</b>									
23ECE501	VLSI and Chip Design	PC	3	0	2	4	50	50	100
23ECE502	Optical and Microwave Engineering	PC	3	0	2	4	50	50	100
<b>EMPLOYABILITY ENHANCEMENT COURSE</b>									
23EEC501	Value Added Course - II	EEC	0	0	4	2	100	-	100
<b>MANDATORY COURSE</b>									
23MDC501	Mandatory Course - I	MC	3	0	0	0	-	-	-
<b>TOTAL CREDITS IN SEMESTER - V</b>						<b>23</b>			

- HS : Humanities and Social Sciences  
 BS : Basic Sciences  
 ES : Engineering Sciences  
 PC : Professional Core  
 PE : Professional Elective  
 OE : Open Elective  
 GE : General Elective  
 EEC : Employability Enhancement Courses  
 MC : Mandatory Courses  
 L : Lecture  
 T : Tutorial  
 P : Practical  
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## B.E- ELECTRONICS AND COMMUNICATION ENGINEERING - SIXTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
<b>THEORY</b>									
23ECT601	Artificial Intelligence and Machine Learning	PC	3	0	0	3	40	60	100
	Professional Elective - IV	PE	3	0	0	3	40	60	100
	Professional Elective - V	PE	3	0	0	3	40	60	100
	Professional Elective – VI	PE	3	0	0	3	40	60	100
	Open Elective-I/NCC L1/ L3	OE	3	0	0	3	40	60	100
<b>EMBEDDED COURSE</b>									
23ECE601	Embedded Systems and IoT Design	PC	3	0	2	4	50	50	100
<b>EMPLOYABILITY ENHANCEMENT COURSE</b>									
23EEJ601	Project Work	EEC	0	0	10	5	40	60	100
<b>MANDATORY COURSE</b>									
23MDC601	Mandatory Course - II	MC	3	0	0	0	-	-	-
<b>TOTAL CREDITS IN SEMESTER - VI</b>						<b>24</b>			

HS	:	Humanities and Social Sciences
BS	:	Basic Sciences
ES	:	Engineering Sciences
PC	:	Professional Core
PE	:	Professional Elective
OE	:	Open Elective
GE	:	General Elective
EEC	:	Employability Enhancement Courses
MC	:	Mandatory Courses
L	:	Lecture
T	:	Tutorial
P	:	Practical
C	:	Credit Point
CIA	:	Continuous Internal Assessment
ESE	:	End Semester Examination
TOT	:	Total





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## B.E- ELECTRONICS AND COMMUNICATION ENGINEERING - SEVENTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
<b>THEORY</b>									
23HST701	Human Values and Ethics	HS	3	0	0	3	40	60	100
	Elective – Management	GE	3	0	0	3	40	60	100
	Open Elective-II/NCC-II L2/ L4	OE	3	0	0	3	40	60	100
	Open Elective - III	OE	3	0	0	3	40	60	100
<b>EMPLOYABILITY ENHANCEMENT COURSE</b>									
23EEC701	Research Paper Writing and Publication	EEC	0	0	4	2	100	-	100
<b>TOTAL CREDITS IN SEMESTER - VII</b>						<b>14</b>			

- HS : Humanities and Social Sciences  
 BS : Basic Sciences  
 ES : Engineering Sciences  
 PC : Professional Core  
 PE : Professional Elective  
 OE : Open Elective  
 GE : General Elective  
 EEC : Employability Enhancement Courses  
 MC : Mandatory Courses  
 L : Lecture  
 T : Tutorial  
 P : Practical  
 C : Credit Point  
 CIA : Continuous Internal Assessment  
 ESE : End Semester Examination  
 TOT : Total





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## B.E- ELECTRONICS AND COMMUNICATION ENGINEERING - EIGHTH SEMESTER

Course Code	Name of the Subject	Category	Periods /Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
<b>EMPLOYABILITY ENHANCEMENT COURSE</b>									
23EEJ801	Innovative Product Development	EEC	0	0	14	7	40	60	100
23EEC801	Internship	EEC	0	0	4	2	100	-	100
TOTAL CREDITS IN SEMESTER - VIII						9			

**TOTAL CREDITS: 165**

- HS : Humanities and Social Sciences  
 BS : Basic Sciences  
 ES : Engineering Sciences  
 PC : Professional Core  
 PE : Professional Elective  
 OE : Open Elective  
 GE : General Elective  
 EEC : Employability Enhancement Courses  
 MC : Mandatory Courses  
 L : Lecture  
 T : Tutorial  
 P : Practical  
 C : Credit Point  
 CIA : Continuous Internal Assessment  
 ESE : End Semester Examination  
 TOT : Total





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## LIST OF HUMANITIES AND SOCIAL SCIENCES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23HST101	Professional English - I	HS	3	0	0	3	40	60	100
23HST102	தமிழர்மரபு /Heritage of Tamils	HS	1	0	0	1	40	60	100
23HST201	Professional English - II	HS	3	0	0	3	40	60	100
23CYT201	Environmental Sciences and Sustainability	HS	3	0	0	3	40	60	100
23HST202	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HS	1	0	0	1	40	60	100
23HST701	Human Values and Ethics	HS	3	0	0	3	40	60	100

## LIST OF BASIC SCIENCES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23MAT101	Matrices and calculus	BS	3	1	0	4	40	60	100
23PHE103	Applied Physics for Electronics Engineering	BS	3	0	2	4	50	50	100
23CYE101	Engineering Chemistry	BS	3	0	2	4	50	50	100
23MAT201	Statistics and Numerical Methods with MATLAB	BS	3	1	0	4	40	60	100
23PHT201	Physics for Electronics Engineering	BS	3	0	0	3	40	60	100
23MAT302	Transforms and Random Processes	BS	3	1	0	4	40	60	100





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## LIST OF ENGINEERING SCIENCES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23GEE101	Programming in C	ES	3	0	2	4	50	50	100
23GEE201	Engineering Graphics	ES	3	0	2	4	50	50	100
23GEL201	Engineering Practices Laboratory	ES	0	0	4	2	60	40	100
23GEE301	Problem Solving and Python Programming	PC	3	0	2	4	50	50	100

## LIST OF PROFESSIONAL CORE

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23EEE201	Circuit Theory	PC	3	0	2	4	40	60	100
23ECT301	Signals and Systems	PC	3	1	0	4	40	60	100
23EET301	Control and Instrumentation Engineering	PC	3	0	0	3	40	60	100
23ECE301	Electronic Devices and Circuits	PC	3	0	2	4	50	50	100
23ECE302	Digital Systems Design	PC	3	0	2	4	50	50	100
23ECT401	Electromagnetic Fields	PC	3	1	0	4	40	60	100
23ECT402	Networks and Security	PC	3	0	0	3	40	60	100
23ECT403	Microprocessors and Microcontrollers	PC	3	0	0	3	40	60	100
23ECE401	Digital Signal Processing	PC	3	0	2	4	50	50	100
23ECE402	Communication Systems	PC	3	0	2	4	50	50	100
23ECE403	Linear Integrated Circuits	PC	3	0	2	4	50	50	100
23ECT501	Transmission Lines and RF Systems	PC	3	1	0	4	40	60	100
23ECE501	VLSI and Chip Design	PC	3	0	2	4	50	50	100
23ECE502	Optical and Microwave	PC	3	0	2	4	50	50	100





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	Engineering								
23ECT601	Artificial Intelligence and Machine Learning	PC	3	0	0	3	40	60	100
23ECE601	Embedded Systems and IoT Design	PC	3	0	2	4	50	50	100

## LIST OF PROFESSIONAL ELECTIVE COURSES

### Professional Elective - I

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23ECP501	Wide Band gap Devices	PE	3	0	0	3	40	60	100
23ECP502	Validation and Testing Technology	PE	3	0	0	3	40	60	100
23ECP503	Low Power IC Design	PE	3	0	0	3	40	60	100
23ECP504	VLSI Testing and Design For Testability	PE	3	0	0	3	40	60	100
23ECP505	Mixed Signal IC Design Testing	PE	3	0	0	3	40	60	100
23ECP506	Analog IC Design	PE	3	0	0	3	40	60	100

### Professional Elective - II

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23ECP507	Advanced Digital Signal Processing	PE	3	0	0	3	40	60	100
23ECP508	Image Processing	PE	3	0	0	3	40	60	100
23ECP509	Speech Processing	PE	3	0	0	3	40	60	100
23ECP510	Software Defined Radio	PE	3	0	0	3	40	60	100
23ECP511	DSP Architecture and Programming	PE	3	0	0	3	40	60	100
23ECP512	Computer Vision	PE	3	0	0	3	40	60	100





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## Professional Elective - III

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23ECP513	Wearable Devices	PE	3	0	0	3	40	60	100
23ECP514	Human Assist Devices	PE	3	0	0	3	40	60	100
23ECP515	Therapeutic Equipment	PE	3	0	0	3	40	60	100
23ECP516	Medical Imaging Systems	PE	3	0	0	3	40	60	100
23ECP517	Brain Computer Interface and Applications	PE	3	0	0	3	40	60	100
23ECP518	Body Area Networks	PE	3	0	0	3	40	60	100

## Professional Elective - IV

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23ECP601	RF Transceivers	PE	3	0	0	3	40	60	100
23ECP602	Signal Integrity	PE	3	0	0	3	40	60	100
23ECP603	Antenna and wave propagation	PE	3	0	0	3	40	60	100
23ECP604	MICs and RF System Design	PE	3	0	0	3	40	60	100
23ECP605	EMI/EMC Pre Compliance Testing	PE	3	0	0	3	40	60	100
23ECP606	RFID System Design and Testing	PE	3	0	0	3	40	60	100







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## Professional Elective - V

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23ECP607	Rocketry and Space Mechanics	PE	3	0	0	3	40	60	100
23ECP608	Wireless Sensor Network Design	PE	3	0	0	3	40	60	100
23ECP609	Industrial IoT and Industry 4.0	PE	3	0	0	3	40	60	100
23ECP610	Fundamentals of Nanoelectronics	PE	3	0	0	3	40	60	100
23ECP611	Underwater Communication	PE	3	0	0	3	40	60	100
23ECP612	Ocean Acoustics	PE	3	0	0	3	40	60	100

## Professional Elective - VI

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23ECP613	Wireless Broad Band Networks	PE	3	0	0	3	40	60	100
23ECP614	4G/5G Communication Networks	PE	3	0	0	3	40	60	100
23ECP615	Software Defined Networks	PE	3	0	0	3	40	60	100
23ECP616	Massive MIMO Networks	PE	3	0	0	3	40	60	100
23ECP617	Advanced Wireless Communication Techniques	PE	3	0	0	3	40	60	100
23ECP618	Satellite Communication	PE	3	0	0	3	40	60	100





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## LIST OF OPEN ELECTIVE COURSES

### OPEN ELECTIVES – I

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23MEO601	Introduction to Industrial Engineering	OE	3	0	0	3	40	60	100
23ECO602	Fundamentals of Electronic Devices and Circuits	OE	3	0	0	3	40	60	100
23EEO603	Electric Vehicle Technology	OE	3	0	0	3	40	60	100
23EEO604	Renewable Energy System	OE	3	0	0	3	40	60	100
23MEO605	Resource Management Technique	OE	3	0	0	3	40	60	100
23MAO606	Graph Theory	OE	3	0	0	3	40	60	100
23CEO607	Environmental and Social Impact Assessment	OE	3	0	0	3	40	60	100
23PMO608	Pharmaceutical Nanotechnology	OE	3	0	0	3	40	60	100
23RAO609	Foundation of Robotics	OE	3	0	0	3	40	60	100
23CSO610	Introduction to Drone Technologies	OE	3	0	0	3	40	60	100
23MDO611	Biomolecules	OE	3	0	0	3	40	60	100
23CSO612	Cyber Forensics and Ethical Hacking	OE	3	0	0	3	40	60	100

### OPEN ELECTIVES - II

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23HSO701	English for Competitive Examinations	OE	3	0	0	3	40	60	100
23MGO702	Democracy and Good Governance	OE	3	0	0	3	40	60	100
23MEO703	Fundamentals of Mechatronics	OE	3	0	0	3	40	60	100
23CEO704	Remote Sensing Concepts	OE	3	0	0	3	40	60	100





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23MEO704	Nano Technology	OE	3	0	0	3	40	60	100
23MDO705	Ultrasound Principles and its Medical Applications	OE	3	0	0	3	40	60	100
23PMO706	IPR For Pharma Industry	OE	3	0	0	3	40	60	100
23RAO707	Concepts in Mobile Robots	OE	3	0	0	3	40	60	100
23ECO708	Energy Technology	OE	3	0	0	3	40	60	100
23EEO709	Sensors and Actuators	OE	3	0	0	3	40	60	100
23MAO710	Operations Research	OE	3	0	0	3	40	60	100
23CSO711	Introduction to Cyber Security	OE	3	0	0	3	40	60	100
23MEO712	3D Printing and Design	OE	3	0	0	3	40	60	100

### OPEN ELECTIVES - III

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23HSO713	Project Report Writing	OE	3	0	0	3	40	60	100
23MAO714	Advanced Numerical Methods	OE	3	0	0	3	40	60	100
23CSO715	Fundamentals of Blockchain Technology	OE	3	0	0	3	40	60	100
23EEO716	Electrical, Electronic and Magnetic Materials	OE	3	0	0	3	40	60	100
23CEO717	Geographical Information System	OE	3	0	0	3	40	60	100
23ECO718	VLSI Design	OE	3	0	0	3	40	60	100
23MDO719	Wearable Technology	OE	3	0	0	3	40	60	100
23MEO720	Additive Manufacturing	OE	3	0	0	3	40	60	100
23RAO721	Nanomaterials and Application	OE	3	0	0	3	40	60	100
23MGO722	Cost Management of Engineering Projects	OE	3	0	0	3	40	60	100
23HSO723	Food Safety and Quality Regulations	OE	3	0	0	3	40	60	100
23MDO724	Lifestyle Diseases	OE	3	0	0	3	40	60	100





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## GENERAL ELECTIVES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23NCCL01	NCC AIRFORCE LEVEL-1	GE	3	0	0	3	40	60	100
23NCCL02	NCC AIRFORCE LEVEL - 2	GE	3	0	0	3	40	60	100
23NCCL03	NCC ARMY LEVEL - 3	GE	3	0	0	3	40	60	100
23NCCL04	NCC ARMY LEVEL - 4	GE	3	0	0	3	40	60	100

## ELECTIVE - MANAGEMENT

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23MGT701	Principles of Management	GE	3	0	0	3	40	60	100
23MGT702	Total Quality Management	GE	3	0	0	3	40	60	100
23MGT703	Engineering Economics and Financial Accounting	GE	3	0	0	3	40	60	100
23MGT704	Human Resource Management	GE	3	0	0	3	40	60	100
23MGT705	Knowledge Management	GE	3	0	0	3	40	60	100
23MGT706	Industrial Management	GE	3	0	0	3	40	60	100
23MGT707	Hospital Management	GE	3	0	0	3	40	60	100
23MGT708	e-Waste Management	GE	3	0	0	3	40	60	100





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## LIST OF EMPLOYABILITY ENHANCEMENT COURSES

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23EEC101	Soft Skills	EEC	1	0	0	1	100	-	100
23EEC201	Communication Skills	EEC	0	0	4	2	100	-	100
23EEC301	Professional Development	EEC	0	0	2	1	100	-	100
23EEC401	Value Added Course-I	EEC	0	0	4	2	100	-	100
23EEC501	Value Added Course - II	EEC	0	0	4	2	100	-	100
23EEJ601	Project Work	EEC	0	0	10	5	40	60	100
23EEC701	Research Paper Writing and Publication	EEC	0	0	4	2	100	-	100
23EEJ801	Innovative Product Development	EEC	0	0	14	7	40	60	100
23EEC801	Internship	EEC	0	0	4	2	100	-	100





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## LIST OF MANDATORY COURSES

### MANDATORY COURSES – I

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23MDC501	Introduction to Women and Gender Studies	MC	3	0	0	0	-	-	-
23MDC502	Elements of Literature	MC	3	0	0	0	-	-	-
23MDC503	Film Appreciation	MC	3	0	0	0	-	-	-
23MDC504	Disaster Risk Reduction and Management	MC	3	0	0	0	-	-	-
23MDC505	Constitution of India	MC	3	0	0	0	-	-	-

### MANDATORY COURSES – II

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23MDC601	Well Being with Traditional Practices- Yoga, Ayurveda and Siddha	MC	3	0	0	0	-	-	-
23MDC602	History of Science and Technology in India	MC	3	0	0	0	-	-	-
23MDC603	Political and Economical Thought for a Human Society	MC	3	0	0	0	-	-	-
23MDC604	State, Nation Building and Politics in India	MC	3	0	0	0	-	-	-
23MDC605	Industrial Safety	MC	3	0	0	0	-	-	-





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## CREDIT SUMMARY

### B.E. - ELECTRONICS AND COMMUNICATION ENGINEERING

Category	Credits Per Semester								Credit Total
	I	II	III	IV	V	VI	VII	VIII	
HS	4	7	-	-	-	-	3	-	14
BS	12	7	8	-	-	-	-	-	27
ES	4	6	-	-	-	-	-	-	10
PC	-	4	15	22	12	7	-	-	60
PE	-	-	-	-	9	9	-	-	18
OE	-	-	-	-	-	3	6	-	9
GE	-	-	-	-	-	-	3	-	3
EEC	1	2	1	2	2	5	2	9	24
MC	0	0	-	-	0	0	-	-	0
Total	21	26	24	24	23	24	14	9	165





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<b>23HST101</b>	<b>SEMESTER I PROFESSIONAL ENGLISH – I (Common to all B.E. &amp; B.Tech. Branches)</b>	<b>L T P C 3 0 0 3</b>
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## OBJECTIVES

- To develop learning English language through grammar.
- To use grammar efficiently for demonstrating all the four language skills (LSRW).
- To write business letters, dialogue writing, paragraph and essay writing.
- To speak effectively about self introduction and real time situation.
- To build the reading skills through reading comprehension and note taking

## UNIT I VOCABULARY 8

Synonyms and Antonyms - Word Formation - Sentence Types (declarative, imperative, interrogative & exclamatory) - Single Word Substitutes - Use of Abbreviations and Acronyms - Homonyms and Homophones - Collocation - British and American Vocabulary.

## UNIT II GRAMMAR 10

Parts of speech - Be, Have and Do verbs - Punctuation - Tenses - Numerical Adjectives - modal verbs - Single line Definition - Direct and Indirect Speech - Gerunds and Infinitives - Same Word Used as Different Parts of Speech.

## UNIT III WRITING 9

Letter Writing - Business communications - quotations, placing orders, complaints, replies to queries from business customers - Dialogue Writing – Paragraph Writing (descriptive, narrative, expository & persuasive) - Essay Writing - Writing Instructions.

## UNIT IV SPEAKING 9

Self-introduction - Giving personal and factual information - Talking about present circumstances, past experiences and future plans - Expressing opinions and justifying opinions - Agreement / disagreement - Likes and dislikes - Tongue twisters

## UNIT V READING SKILLS 9

Reading Comprehension – Reading techniques, pre-reading, post-reading, comprehension questions (multiple choice questions or short questions) - Short Comprehension Passages, practice skimming - Scanning and Predicting - Reading the passage and taking (Note making) Notes - Scan and understand main contents of the passage.

**TOTAL: 45 PERIODS**

**Mandatory activity:** Self Introduction







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## OUTCOMES

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

- Use a wide range of vocabulary in oral and written communication
- Frame grammatically correct sentences.
- Write letters, frame paragraphs and Essays, develop conversation.
- Develop speaking skills for self-Introduction, delivering speeches and Technical Presentation
- Read and comprehend the passage, technical content and take notes

## TEXT BOOKS

1. Board of Editors. Using English A Course book for Under graduate Engineers and Technologists. Orient Black Swan Limited, Hyderabad: 2015.
2. Richards, C. Jack. Interchange Students' Book-2 New Delhi: CUP, 2015.

## REFERENCES

1. Department of English, Anna University, "Mindscapes: English for Technologists and Engineers", 1<sup>st</sup> Edition, Orient Black Swan, Chennai, 2012.
2. MacMillan, Krishna Mohan, Meera Banerji, Developing Communication Skills, Paperback, 2019.

## E-RESOURCES

1. <http://www.usingenglish.com>.
2. <https://www.khanacademy.org/humanities/grammar>

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	-	1	3	1	2	3	-	3	-	-	-
2	-	-	-	-	-	1	2	-	1	3	-	3	-	-	-
3	-	-	-	-	-	3	3	2	3	3	-	3	-	-	-
4	-	-	-	-	-	1	2	1	2	3	-	3	-	-	-
5	-	-	-	-	-	1	1	1	1	3	-	3	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	-	-	-	-	-	1.40	2.20	1.25	1.80	3.00	-	3.00	-	-	-

1- Low 2- Medium 3- High '-' – No Correlation





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TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU



23MAT101

## MATRICES AND CALCULUS

L T P C

(Common to all B.E./ B.Tech. Branches)

3 1 0 4

### OBJECTIVES

- To develop the use of matrix algebra techniques those are needed by engineers for practical applications.
- To familiarize the students with differential and integral calculus.
- To describe the student with functions of several variables.
- To acquire the student with mathematical tools needed in evaluating multiple integrals and their applications.
- To acquaint the student with the concepts of vector calculus that is needed for problems in engineering disciplines.

### UNIT I MATRICES

9+3

Eigen values and Eigen vectors – Properties of Eigen values – Cayley-Hamilton theorem – Reduction of quadratic form to canonical form by orthogonal transformation – Nature of quadratic form.

### UNIT II DIFFERENTIAL AND INTEGRAL CALCULUS

9+3

Differentiation rules: Derivatives of polynomials and exponential functions – The product and quotient Rules – Derivatives of trigonometric functions – The Chain rule – Implicit differentiation – Applications of differentiation: Maximum and Minimum Values – Techniques of integration: Integration by parts – Trigonometric integrals – Integration of rational functions by partial fractions.

### UNIT III FUNCTIONS OF SEVERAL VARIABLES

9+3

Partial derivatives – Homogeneous functions – Euler's theorem – Total derivative – Jacobians – Taylor's theorem for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

### UNIT IV MULTIPLE INTEGRALS

9+3

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double integrals.

### UNIT V VECTOR CALCULUS

9+3

Scalar and vector point functions – Gradient – Divergence and curl – Line integral – Surface integral – Green's theorem in a plane – Volume integral – Divergence theorem – Irrotational and Solenoidal fields.





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## OUTCOMES

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

- Classify the matrix algebra methods for solving practical problems.
- Discover differential calculus tools in solving various application problems and compare different methods of integration in solving practical problems.
- Develop differential calculus ideas on several variable functions.
- Apply multiple integral ideas in solving areas, volumes and other practical problems.
- Solve engineering problems using the concept of vector calculus.

## LIST OF TUTORIALS

1. Computation of Eigen values and Eigenvectors.
2. Calculate differentiation and integration of simple functions.
3. Determining Maxima and minima of functions for two variables.
4. Evaluating double and triple integrals.
5. Computing Gradient, divergence and curl of point functions.

**TOTAL: 45+15= 60 PERIODS**

## TEXT BOOKS

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 43rd Edition, New Delhi, 2014.
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015.

## REFERENCES

1. Bali N.P, Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.
2. Kanti B. Dutta., "Mathematical Methods of Science and Engineering – Aided with MATLAB", Cengage Learning, New Delhi, 2013.

## E-RESOURCES

1. <https://nptel.ac.in/courses/111105121> (Differential Calculus and Integral Calculus)
2. <https://nptel.ac.in/courses/111107112> (matrix analysis)

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	-	-	-	-	-	-	-	1	2	-	-	-
2	3	3	2	-	-	-	-	-	-	-	1	2	-	-	-
3	3	3	2	-	-	-	-	-	-	-	1	2	-	-	-
4	3	3	2	-	-	-	-	-	-	-	1	2	-	-	-
5	3	3	2	-	-	-	-	-	-	-	1	2	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	3	2	-	-	-	-	-	-	-	1	2	-	-	-

**1-Low 2-Medium 3-High '-' – No Correlation**





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23HST102

HERITAGE OF TAMILS

L T P C  
1 0 0 1

## UNIT I LANGUAGE AND LITERATURE

3

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

## UNIT II HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE

3

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

## UNIT III FOLK AND MARTIAL ARTS

3

Therukoothu, Karagattam, Villupattu, KaniyanKoothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils

## UNIT IV THINAI CONCEPT OF TAMILS

3

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

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

3

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

**TOTAL: 15 PERIODS**

### TEXT BOOKS

1. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
2. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
3. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)





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5. 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)
6. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
7. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).

## REFERENCES

1. Heritage of Tamils, Published by: Yes Dee Publishing Pvt Ltd, Chennai.
2. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.





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23HST102

தமிழர் மரபு

L T P C

1 0 0 1

## அலகு I மொழி மற்றும் இலக்கியம் 3

இந்திய மொழி குடும்பங்கள்- திராவிட மொழிகள் -தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள்- சங்க இலக்கியத்தில் சமய சார்பற்ற தன்மை- சங்க இலக்கியத்தில் பகிர்தல் அறம்- திருக்குறளில் மேலாண்மை கருத்துக்கள் -தமிழ் காப்பியங்கள்- தமிழகத்தில் பௌத்த சமயங்களின் தாக்கம் -பக்தி இலக்கியம் ஆழ்வார்கள் மற்றும் நாயன்மார்கள்- சிற்றிலக்கியங்கள் -தமிழில் நவீன இலயக்யத்தின் வளர்ச்சி -தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு

## அலகு II மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை- சிற்பக்கலை 3

நடுகல் முதல் நவீன சிற்பங்கள் வரை -ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினை பொருட்கள் ,பொம்மைகள் -தேர் செய்யும் கலை-சுடுமண் சிற்பங்கள் -நாட்டுப்புற தெய்வங்கள்- குமரி முனையில் திருவள்ளூர் சிலை-இசை கருவிகள் -மிருதங்கம் ,பறை ,வீணை,யாழ், நாதஸ்வரம் ,தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

## அலகு III நாட்டுப்புற கலைகள் மற்றும் வீர விளையாட்டுகள் 3

தெருக்கூத்து,கரகாட்டம் ,வில்லுப்பாட்டு, கணியான் கூத்து ,ஓயிலாட்டம், தோல்பாவை கூத்து,சிலம்பாட்டம், வளரி ,புலியாட்டம், தமிழர்களின் விளையாட்டுகள்

## அலகு IV தமிழர்களின் திணைகோட்பாடுகள் 3

தமிழகத்தின் தாவரங்களும் , விலங்குகளும் -தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறகோட்பாடுகள்-தமிழர்கள் போற்றிய அறக்கோட்பாடு -சங்க காலத்தில் தமிழகத்தில் எழுத்தறிவு,கல்வியும்- சங்க கால நகரங்களும் துறை முகங்களும் -சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி -கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.





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## அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்கு தமிழர்களின் பங்களிப்பு

3

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு- இந்தியாவின் பிற்பகுதிகளில் தமிழ்பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்தமருத்துவத்தின் பங்கு- கல்வெட்டுகள், கையெழுத்துப்படிக்கள் -தமிழ் புத்தகங்களின் வரலாறு

**TOTAL: 15 PERIODS**

### TEXT BOOKS

- 1.தமிழக வரலாறு -மக்களும் பண்பாடும் -கே கே பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)
- 2.கணினி தமிழ் -முனைவர் இல சுந்தரம் (விகடன் பிரசுரம் )
- 3.கீழடி -வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு )
- 4.பொருறை ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு )

### REFERENCES

- 1.தமிழர் மரபு -முனைவர் ஆ பூபாலன் (வி ஆர்பி பி பப்ளிஷர்ஸ்)





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23PHE103

**APPLIED PHYSICS FOR ELECTRONICS ENGINEERING**

**L T P C**

(Common to ECE, EEE & Medical Electronics)

**3 0 2 4**

## OBJECTIVES

- To recognize different lattices and crystal structures
- To explore the principles of lasers and the uses for them in general.
- To build knowledge about optical fibre and its applications.
- To understand the applications of acoustics and ultrasonics in industry.
- To utilize Schrödinger's wave equation and the fundamentals of quantum mechanics to investigate the complicated physical phenomena.
- To analyze the engineering physics that may be used to calculate thermal properties, substance characteristics, optics, acoustics, and ultrasonics.

## UNIT I CRYSTAL PHYSICS

**9**

Lattice and Unit cell – Crystal Systems and Bravais Lattice – Lattice Planes – Miller Indices – d -Spacing in Cubic Lattice – Calculation of Number of Atoms per Unit Cell – Atomic Radius, Coordination number, Packing factor for SC, BCC, FCC and HCP Structures – Crystal Growth Techniques – Melt Growth Techniques (Bridgman and Czochralski).- Silicon chip Production Process.

## UNIT II PHOTONICS

**9**

Spontaneous and Stimulated Emission- Population Inversion - Derivation of Einstein's A and B co-efficient – Principle and Working of Laser - He Ne Laser - Direct Band gap and Indirect Bandgap Semiconductors - Semiconductor Diode Laser (Homo junction & hetero junction) - Applications of Lasers in Science, Engineering and Medicine – Working principle of Laser Printer - Digital Laser Material Processing Technology.

## UNIT III FIBRE OPTICS

**9**

Principle and Propagation light in Optical Fibres- Derivation of Numerical Aperture and Acceptance angle - Fibre Optic Communication System - Classification of Optical Fibre -Ray Optics - losses in Optical Fibre- Types of fibre optic sensors. (Pressure, Temperature fibre)- Local area Network (qualitative) -Advantages of Optical Fibre and Application of Optical Fibre.

## UNIT IV ACOUSTICS & ULTRASONICS

**9**

**ACOUSTICS:** Classification of Sound – Decibel - Weber Fechner law- Reverberation-Sabine's formula (Qualitative) - Factors affecting Acoustics of Buildings and their remedies.

**ULTRASONICS:** Properties -Production of ultrasonic's - Magnetostriction and Piezoelectric methods - Non Destructive Testing – Pulse Echo System, through Transmission and Reflection modes - Medical Endoscope - Sonogram.







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## UNIT V QUANTUM PHYSICS

9

Black Body Radiation – Planck's Theory (Derivation) – Electron Diffraction – Wave function and its Physical Significance – Schrödinger's Wave Equation: Time Independent and Time Dependent Equations – Particle in a One-Dimensional Box - Scanning Electron Microscope - Transmission Electron Microscope - Quantum Tunneling – Scanning Tunneling Electron Microscope.

**TOTAL: 45 PERIODS**

### OUTCOMES

Upon completion of this course, students will be able to;

- Apply crystallographic knowledge to get familiar with the structure of crystalline solids.
- Learn the basics of lasers and their use in some applications
- Acquire knowledge about fibre optics and apply it to various fields
- Understand the basics of Acoustic, Ultrasonic's and estimate the applications in diverse fields.
- Apply the basic principles of quantum mechanics and Schrödinger's wave equation to study the complex physical phenomenon.
- Relate elasticity, optics, and semiconductor physics in engineering applications.

### TEXT BOOKS

1. P.Mani, "Engineering Physics Practicals", Dhanam Publications, 2019.
2. Rajendiran V, "Engineering Physics" Tata McGraw Hill, 2012.
3. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, "Concepts of Modern Physics", McGrawHill (Indian Edition), 2017

### REFERENCES

1. Avadhanulu M.N & Kshirsagar P.G "Text Book of Engineering Physics". S.Chand, 2006.
2. Wahab, M.A. "Solid State Physics: Structure and Properties of Materials" Narosa Publishing House, 2009
3. K.Thyagarajan and A.Ghatak. "Lasers: Fundamentals and Applications", Laxmi Publications, (Indian Edition), 2019

### E-RESOURCES

1. <https://archive.nptel.ac.in/courses/122/107/122107035/>
2. <https://archive.nptel.ac.in/courses/115/101/115101107/>

### LIST OF EXPERIMENTS

**(Common to ECE EEE & Medical Electronics)**  
**(Eight experiments are to be conducted in Lab)**

1. Determination of wavelength of laser.
2. Determination of particle Size lycopodium powder using laser.





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3. Fibre Optics: Determination of Numerical Aperture and Acceptance angle.
4. Determination of wavelength of mercury spectrum- Spectrometer.
5. Determination of velocity of ultrasonic in liquid.
6. Verification of truth tables of logic gates using IC's: (OR, AND, NOT, XOR, NOR and NAND)
7. Determination of thickness of wire - Air wedge method.
8. Determination of bandgap of a given semiconductor diode.
9. Determination of reverse bias characteristics of the photodiode. (Virtual)
10. Compact disc- Determination of width of the groove using laser. (virtual)

**TOTAL: 15 PERIODS**

### Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	1	1	-	-	-	-	-	-	-	-	-	-	-
2	3	3	1	1	-	-	-	-	-	-	-	-	-	-	-
3	3	3	1	1	-	-	-	-	-	-	-	-	-	-	-
4	3	3	1	1	-	-	-	-	-	-	-	-	-	-	-
5	3	3	1	1	-	-	-	-	-	-	-	-	-	-	-
6	3	3	1	1	-	-	-	-	-	-	-	-	-	-	-
<b>AVG</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>

**1-Low 2-Medium 3-High '-' – No Correlation**





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Recognized Under Section 2(f) & 12(B) of the UGC Act, 1956  
NAAC Accredited with 'A' Grade

TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU  
ENGINEERING CHEMISTRY

(Common to CSE, EEE, ECE, CSE (CS), MDE, AIDS, IT & PT)



23CYE101

L T P C  
3 0 2 4

## OBJECTIVES

- To classify the impurities of water and know the treatment and the conditioning methods for domestic and industrial uses.
- To develop an understanding the fundamentals of polymers.
- To gain knowledge the phase rule and its applications in engineering field.
- To explain the basics of Nanochemistry, synthesis, properties and applications of nano materials.
- To be familiar with the types of corrosion and control measures and working of batteries.
- To inculcate practical skills in the determination of water quality parameters and instrumental analysis.

## UNIT I WATER TECHNOLOGY

9

Introduction - Characteristics – Hardness – Estimation of hardness by EDTA method – Alkalinity and its estimation - Boiler feed water – Requirements –Boiler troubles (Scale and Sludge) – Internal conditioning (colloidal, phosphate, calgon and carbonate conditioning methods) – External conditioning – Zeolite process, Demineralization process – Desalination of brackish water by reverse osmosis-Nano filtration - Municipality water treatment - Break point chlorination.

## UNIT II POLYMER CHEMISTRY

9

Introduction - Classification of polymers – Natural and Synthetic; Thermoplastic and Thermosetting plastic. Functionality – Degree of polymerization. Types of polymerization: Addition Condensation and Copolymerization, Properties of polymers: Glass transition temperature, Tacticity- Molecular weight – Weight average, Number average and Polydispersity index- Preparation, properties and uses of PVC, Nylon 6,6, Polyethylene - Rubbers – Types – Vulcanization of rubber – Plastics – Moulding constituents of plastics – Moulding of plastics - Compression, injection and blow moulding-Biodegradable polymers-Conducting polymers.

## UNIT III PHASE RULE AND ALLOYS

9

Phase rule - Explanation of terms involved – One component system – Water system – Condensed phase rule – Construction of phase diagram by thermal analysis – Simple eutectic systems (Lead – Silver system only). Alloys: Introduction – Definition- Properties of alloys- Significance of alloying, functions and effect of alloying elements - Ferrous alloys – Nichrome and stainless steel – Heat treatment of steel, non-ferrous alloys – Brass and bronze.

## UNIT IV CHEMISTRY OF NANO MATERIALS

9

Nano chemistry – Basics (Surface area to volume ratio - Quantum confinement – 0D, 1D, 2D& 3D) - Distinction between molecules, nanoparticles and bulk materials- Characterization of nanomaterials using EDX and HR-TEM. Synthesis of nano materials: Top down approach - Ball milling - Bottom up approach - Sol-gel method, Chemical vapour deposition - Properties of nanomaterials and Applications of nanomaterials (Nano products of today).





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## UNIT V ELECTROCHEMISTRY, CORROSION AND ITS CONTROL

9

Introduction- Electrochemical cells, applications of electrochemical series-Reference Electrode-standard calomel electrode, ion selective electrode, glass electrode, Potentiometric titration - Redox titration, Conductometric titration- Strong acid vs Strong base. Corrosion – Types – Chemical Corrosion – Electrochemical Corrosion (galvanic and differential aeration) - Factors influencing corrosion – Material selection and design aspects-Control methods of corrosion – sacrificial anodic and impressed current cathodic protection.

### OUTCOMES

Upon completion of the course, Students will be able to

- Infer the quality of water and Identify the method of removal of impurities from water for domestic and industrial purpose.
- Identify the different types of polymers, polymerization processes and some special properties and applications of polymers.
- Apply the knowledge of phase rule to alloy making for various engineering applications.
- Discuss the fundamentals of the nano materials and apply the basic concepts of nanochemistry in engineering applications.
- Analyze the causes of corrosion, suggest the control measures and discuss the functions of batteries.
- Determine the water quality parameters and perform quantitative chemical analysis by pH metery, flame photometry, conductometry and potentiometry.

**TOTAL: 45 + 15 = 60 PERIODS**

### TEXT BOOKS

1. Jain P.C and Monika Jain, "Engineering Chemistry", 17<sup>th</sup> Edition, Dhanpet Rai Publishing Company (P) Ltd. New Delhi, 2015.
2. Viswanathan B, "Nanomaterials" Alpha Science International Ltd, 2009.
3. O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.

### REFERENCES

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company Ltd, New Delhi, 2015.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2012.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Second Edition, Cambridge University Press, Delhi, 2019.

### E-RESOURCES

1. <https://nptel.ac.in/courses/104105084>
2. <http://library.iitbbs.ac.in/open-access-e-resources.php>





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## LIST OF EXPERIMENTS

(Any Eight Experiments to be conducted)

1. Determination of total, temporary & permanent hardness of water by EDTA method.
2. Determination of alkalinity in water sample.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by Argentometric method.
5. Determination of strength of given hydrochloric acid using pH meter.
6. Estimation of sodium and potassium present in water using flame photometer.
7. Conductometric Precipitation Titration using  $BaCl_2$  and  $Na_2SO_4$ .
8. Conductometric titration of strong acid vs strong base.
9. Estimation of Ferrous ions by Potentiometric Titration.
10. Estimation of copper content in the brass by Iodometry.

## Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	3	-	1	-	3	-	-	-	-	2	-	-	-
2	1	-	2	-	1	-	-	-	-	-	-	-	-	-	-
3	2	2	3	1	1	1	-	-	-	-	-	1	-	-	-
4	1	1	2	1	-	-	-	-	-	-	-	-	-	-	-
5	2	1	2	1	3	-	1	-	-	-	-	-	-	-	-
6	2	3	-	2	3	-	-	-	-	-	-	-	-	-	-
<b>AVG</b>	<b>1.6</b>	<b>1.6</b>	<b>2.4</b>	<b>1.25</b>	<b>1.8</b>	<b>1</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1.5</b>	<b>-</b>	<b>-</b>	<b>-</b>

1-Low 2-Medium 3-High '-' – No Correlation





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23GEE101

**PROGRAMMING IN C**  
(Lab Embedded Theory Course)

**L T P C**  
**3 0 2 4**

## OBJECTIVES

- To understand the constructs of C Language.
- To study arrays and strings for developing C programs.
- To know the functions and pointers application in C programs.
- To understand the concepts of structures and Union.
- To understand input/output and file handling in C.
- To develop programs and applications using C.

## UNIT I BASICS OF C PROGRAMMING

9

Introduction to programming paradigms – Structure of C program – C programming: Data Types– variables–Storage classes – Constants – Enumeration Constants – Keywords – Operators: Precedence and Associativity – Expressions –Input/Output statements, Assignment statements – Decision making statements – Switch statement – Looping statements – Pre-processor directives – Compilation process.

## UNIT II ARRAYS AND STRINGS

9

Introduction to Arrays: Declaration, Initialization – One dimensional array – Example Program: Computing Mean, Median and Mode – Two dimensional arrays – Example Program: Matrix Operations (Addition, Scaling, Determinant and Transpose) – String operations: length, compare, concatenate, copy –Sorting – Selection sort, Insertion sort, Merge sort, quick sort – Searching – linear and binary search.

## UNIT III FUNCTIONS AND POINTERS

9

Introduction to functions: Function prototype, function call, Built-in functions (string functions, math functions) – Recursion – Example Program: Computation of Sine series, Scientific calculator using built-in functions – Pointers – Pointer operators – Arrays and pointers – Example Program: Sorting of names – Parameter passing: Pass by value, Pass by reference – Example Program: Swapping of two numbers and changing the value of a variable using pass by reference.

## UNIT IV STRUCTURES AND UNION

9

Structure – Example Programs – Nested structures – Pointer in Structures – Array of structures -Example Program using structures and pointers – Self referential structures – Dynamic memory allocation, Union- Storage classes.





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## UNIT V FILE PROCESSING

9

Files – Operations of File – Types of file processing: Sequential access, Random access – Sequential access file – Random access file – Command line arguments.

### LIST OF EXPERIMENTS

(Any Eight Experiments to be conducted)

1. Programs using I/O statements, expressions and decision-making constructs.
2. Write a program to find whether the given year is leap year or Not.
3. Design a calculator to perform the operations, namely, addition, subtraction, multiplication, division and square of a number.
4. Check whether a given number is Armstrong number or not?
5. Given a set of numbers like <10, 36, 54, 89, 12, 27>, find sum of weights based on the following conditions.
  - a) 5 if it is a perfect cube.
  - b) 4 if it is a multiple of 4 and divisible by 6.
  - c) 3 if it is a prime number.
6. Populate an array with height of persons and find how many persons are above the average height.
7. From a given paragraph perform the following using built-in functions:(i)Find the total number of words.(ii)Capitalize the first word of each sentence.(iii)Replace a given word with another word.
8. Solve towers of Hanoi using recursion.
9. Locate and Display the Contents of an Array using Pointers.
10. Generate salary slip of employees using structures and pointers.
11. Count the number of account holders whose balance is less than the minimum balance using sequential access file.

**TOTAL: 45 +15 = 60 PERIODS**





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## OUTCOMES

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

- Build C programs for simple applications using basic construct.
- Develop C programs using arrays and strings.
- Construct C programs using functions, recursion and pointers.
- Implement applications in C using structures.
- Develop applications in C using file processing.
- Develop applications using C programming constructs.

## TEXT BOOKS

1. E.Balagurusamy, "Programming in ANSI C", Tata McGraw Hill, 8<sup>th</sup> Edition, 2019.
2. Kernighan, B.W and Ritchie, D.M, "The C Programming language", 2<sup>nd</sup> Edition, Pearson Education, 2016.

## REFERENCES

1. ReemaThareja, "Programming in C", Oxford University Press, 2<sup>nd</sup> Edition, 2016.
2. Juneja, B. L and Anita Seth, "Programming in C", CENGAGE Learning India pvt.Ltd, 2011.

## E – RESOURCES

1. <https://nptel.ac.in/courses/106/105/106105085/> (Introduction to C Programming)
2. <https://nptel.ac.in/courses/106/106/106106210/> (Stack Operations)

## Mapping CO's-PO's & PSO's

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	2	2	1	2	1	1	1	2	-	3	2	1	2	-
2	2	2	2	1	2	1	1	1	2	-	3	3	2	2	-
3	2	3	2	1	2	1	1	1	2	-	3	2	2	2	-
4	3	2	2	1	3	1	1	1	2	-	3	3	2	2	-
5	2	3	3	1	2	1	2	1	2	-	3	2	2	3	-
6	2	2	3	2	1	2	-	-	2	1	2	2	2	2	-
AVG	2.00	2.33	2.33	1.16	2.00	1.66	1.00	0.83	2.00	0.16	2.83	2.33	1.83	2.16	-

1 - Low, 2 - Medium, 3 - High, '-'- No correlation







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TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU

SEMESTER II



23HST201

PROFESSIONAL ENGLISH – II

L T P C

(Common to all B.E. & B.Tech. Branches)

3 0 0 3

## OBJECTIVES

- To use grammatical components effectively in written communication.
- To read and understand on comprehend technical writing.
- To develop skills for writing email, business letters, Job Application Letter and Resume.
- To write checklist, recommendation, transcoding graphics and letter.
- To speak fluently in real contexts.

## UNIT I GRAMMAR

9

Articles - Prepositions - Compound words - Conditionals - Subject verb agreement - Active and Passive voice - Impersonal Passive Voice.

## UNIT II LISTENING & READING

9

Syllabification – Reading Vocabulary - Reading Newspapers - Listening to Youtube Documentaries - Listening to Podcast - Listening to Motivational Movies.

## UNIT III BUSINESS WRITING

9

E-mail writing - fixing an appointment, cancelling appointment, conference details, training programme details, paper submission for seminars and conferences - Job Application Letter and Résumé.

## UNIT IV WRITING

9

Checklist - Writing Recommendations - Transcoding Graphics - Bar Chart, Flow Chart, Pie Chart and Tables - Formal Letter Writing - inviting dignitaries and declining invitations.

## UNIT V SPEAKING

9

Collaborative task - Turn taking (initiating and responding appropriately) - Negotiating - Exchanging - Suggesting - Comparing and Contrasting – Expressing - Finding out facts, attitudes and opinions - Situational Role-play.

**TOTAL: 45 PERIODS**

**Mandatory activity:** Power Point Presentation

## OUTCOMES

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

- Use grammar to frame sentences and write sentences in passive forms
- Read vocabulary, newspaper and improve listening skills
- Draft emails, write business letters, construct resume with job application letter.
- Frame checklist, write recommendation and Transcoding graphical representation.
- Develop speaking skill for taking part in Collaborative task and Situational Role-play.





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## TEXT BOOKS

1. S. Sumant Maven Learning. Technical English II.
2. KN Shoba, Lourdes Joavani Rayen. Communicative English. Published by Cambridge university, 2017.

## REFERENCES

1. Dr K Elango, Dr. Veena Selvam, Dr. Sujatha Priyadarshini, "Resonance English for Engineers and Technologists", Cambridge University Press, 1st Edition, Foundation Books, New Delhi, 2013.
2. Seely, John. Oxford Guide to Effective Writing and Speaking. Indian ed. New Delhi: Oxford University Press. 2005.
3. Norman Whitby, Business Benchmark- Pre-Intermediate to Intermediate, Students book, Cambridge University Press, 2006.

## E-RESOURCES

1. <https://www.fluentu.com/Blog/english/english-small-talk>
2. <https://www.britishcouncil.com>

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	-	1	1	-	2	3	-	3	-	-	-
2	-	-	-	-	2	1	1	1	2	3	-	3	-	-	-
3	-	-	-	-	2	1	2	1	2	3	-	3	-	-	-
4	-	-	-	-	-	1	1	1	1	3	-	3	-	-	-
5	-	-	-	-	-	2	1	1	3	3	-	3	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	-	-	-	-	2.00	1.20	1.20	1.00	2.00	3.00	-	3.00	-	-	-

1- Low 2- Medium 3- High '-' – No Correlation





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23MAT201

STATISTICS AND NUMERICAL METHODS WITH MATLAB

L T P C

(Common to all B.E./ B.Tech. Branches)

3 1 0 4

## OBJECTIVES

- To provide the necessary basic concepts in testing of hypothesis for small and large samples which plays an important role in real life problems.
- To acquaint the knowledge of classifications of design of experiments.
- To extend the basic concepts of solving algebraic and transcendental equations.
- To apply the numerical techniques of interpolation and integration.
- To produce the knowledge of various techniques in solving ordinary differential equations.

## UNIT I TESTING OF HYPOTHESIS

9+3

Sampling distribution – Testing of significance for single proportion, single mean and difference of means – Test of significance for small samples by 't' test – Snedecor's F- test of significance – Chi-square test : Chi-square test of goodness of fit – Independent of attributes.

## UNIT II DESIGN OF EXPERIMENTS

9+3

Basic principles of experimental design – Completely randomised design – Analysis of variance for one way classification – Randomised block design – Analysis of variation for two factor experiments variations – Latin square design.

## UNIT III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS

9+3

Solution of algebraic and transcendental equations by Newton Raphson method – Solution of simultaneous algebraic equations by Gauss elimination, Gauss Jordan and Gauss Seidel methods – Matrix Inversion by Gauss Jordan method – Eigen values of a matrix by Power method.

## UNIT IV INTERPOLATION AND NUMERICAL INTEGRATION

9+3

Interpolation: Newton's forward and backward interpolation formulae – Lagrange's interpolation formula – Newton's divided difference formula – Numerical integration by Trapezoidal and Simpson's 1/3 rule – Numerical double integration by Trapezoidal rule.

## UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS

9+3

Euler's method – Modified Euler's method – Fourth order Runge - Kutta method for solving first order equations – Taylor's series method – Predictor-corrector methods: Milne's method – Adams-Bashforth method.

## OUTCOMES

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

- Analyze the concept of testing of hypothesis for small and large samples in real life problems.
- Apply the basic concepts of classifications of design of experiments in the field of agriculture.





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- Summarize the numerical techniques of interpolation in various intervals and apply the numerical techniques of integration for engineering problems.
- Produce various techniques and methods for solving first and second order ordinary differential equations.
- Solve the partial and ordinary differential equations with initial conditions by using certain techniques with engineering applications.

### LIST OF TUTORIALS

1. Solving one sample and paired sample 't' test.
2. Determination of roots of a polynomial.
3. Solution of linear system of equations by Gauss Seidel methods.
4. Evaluation of line integrals by Trapezoidal rule.
5. Solution of ordinary differential equations by Euler's method.

**TOTAL:45+15=60 PERIODS**

### TEXT BOOKS

1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2. Dr.Kandasamy. P, Dr.Thilagavathy . K and Dr. Gunavathy .K., "Statistics and Numerical Methods", S. Chand and Company Ltd., NewDelhi, 2010.

### REFERENCES

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Gupta S.C. and Kapoor V.K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, 12th Edition, New Delhi, 2020.

### E-RESOURCES

1. <https://nptel.ac.in/courses/111/105/111105041/> (Statistics)
2. <https://nptel.ac.in/courses/111/107/111107105/> (Numerical Methods)

### Mapping of Cos-Pos & PSOs

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2	3	3	1	1	2	-	-	-	1	-	2	3	-	-	-
3	3	3	1	1	2	-	-	-	1	-	2	3	-	-	-
4	3	3	1	1	2	-	-	-	1	-	2	3	-	-	-
5	3	3	1	1	2	-	-	-	1	-	2	3	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>AVG</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1</b>	<b>-</b>	<b>2</b>	<b>3</b>	<b>-</b>	<b>-</b>	<b>-</b>

**1- Low 2- Medium 3- High '-' – No Correlation**





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23PHT203

**ADVANCED PHYSICS FOR ELECTRONICS ENGINEERING**

**L T P C**

(Common to ECE, EEE & Medical Electronics)

**3 0 0 3**

## OBJECTIVES

- To learn the basic conduction process in conducting materials
- To understand the fundamentals of semiconducting materials and plastic electronics.
- To develop the knowledge in Magnetic and Superconducting materials.
- To grab the concept of Spintronics & Nano Electronic Devices
- To know the basics of Biophotonics and Biomaterials.

## UNIT I CONDUCTING MATERIALS & DIELECTRIC MATERIALS

9

Conductors – Classical Free Electron Theory of Metals – Electrical and Thermal Conductivity – Wiedemann – Franz law, Lorentz number – Draw backs of Classical Theory -Fermi Dirac distribution function – Density of energy states – Carrier concentration in metal. Dielectric Materials: Electrical Susceptibility – Dielectric constant – Electronic, Ionic, Orientation and Space Charge Polarization- Internal field and Clausius-Mosotti Relation.

## UNIT II SEMICONDUCTING MATERIALS & PLASTIC ELECTRONICS

9

Elemental and Compound Semiconductors – Intrinsic Semiconductor – Carrier concentration derivation in Intrinsic Semiconductor – Extrinsic semiconductor- Derivation of carrier concentration in N-type and P-type semiconductor (qualitative) – Hall effect and applications.

**Plastic Electronics:** Principle of Organic Materials (OMs) - Properties of OMs, Including Electronic and Optical Properties - Organic devices and working principles (ex. Transistors, Diodes, Sensors, Solar cells) - Applications of organic materials and Devices.

## UNIT III MAGNETIC & SUPERCONDUCTING MATERIALS

9

Electron theory of magnetism; Dia, Para, Ferromagnetism and their Properties- Domain theory of Ferromagnetism – Hard and Soft magnetic Materials - Ferrites - Superconductivity: Properties – Type I and Type II Superconductors – BCS theory of superconductivity – General applications of Superconductors –Cryotron and Magnetic levitation.

## UNIT IV SPINTRONICS & NANO ELECTRONIC DEVICES

9

Introduction- Quantum confinement- Quantum well, Quantum Wire and Quantum Dot structure – Tunnelling: Single Electron Phenomena and Single Electron Transistor (SET) - Spintronics – Quantum Dot Laser- Quantum Bits (qubits)- Quantum Computing- Carbon Nano Tubes (CNT) structure, Properties and applications - Concepts of Graphene Transistor – Carbon nano tube transistor (qualitative) - Applications of Nanodevices and Nanosensors.

## UNIT-V BIOPHOTONICS & BIOMATERIALS

9

**BIOPHOTONICS:** Basic principles of light - Reflection - Refraction - Absorption - Polarization - Interference – Coherence- Principles of Optical biosensing - Immobilization of Bio-recognition elements-Types of Optical Biosensor.





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**BIOMATERIALS:** Definition and classification of Bio-Material- Viscoelasticity and biomaterial performance- Stainless Steel Alloys and its applications- Biopolymers and its Applications - Shape Memory Alloy.

**TOTAL: 45 PERIODS**

## OUTCOMES

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

- Obtain knowledge from conducting and dielectric properties of materials.
- Learn the fundamentals of plastic electronics, semiconductor physics, and how these technologies are used in many types of electronic devices.
- Utilize the uses of magnetic and superconducting materials.
- Demonstrate knowledge and understanding of spintronics and nano electronic devices
- Identify and explain the fundamentals of biophotonics and biomaterials.

## TEXT BOOKS

1. Rajendran V. "Engineering Physics". Tata McGraw Hill Publications, 2012.
2. R,Murugesan, Er,Kiruthiga sivaprasath "Modern Physics", S.chand, seventh Edition 2013.
3. Gupta and Kumar, "Solid State Physics" K. Nath & Co. (2018).

## REFERENCES

1. Sujata V. Bhatt, "Biomaterials", Second Edition, Narosa Publishing House, 2005.
2. Avadhanulu M.N & Kshirsagar P.G "Text Book of Engineering Physics". S.Chand, 2006.
3. Charles Kittel "Introduction to Solid State Physics", Wiley (2019).
4. D.N. Vasudeva "Electricity and Magnetism" S.Chand &Co, twelfth edition (2007).

## E – RESOURCES

1. <https://archive.nptel.ac.in/courses/115/101/115101092/>
2. <https://nptel.ac.in/courses/108104113>

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	1	1	1	-	-	-	-	-	-	-	-
2	3	2	1	1	1	1	1	-	-	-	-	-	-	-	-
3	3	2	1	1	1	1	1	-	-	-	-	-	-	-	-
4	3	2	1	1	1	1	1	-	-	-	-	-	-	-	-
5	3	2	1	1	1	1	1	-	-	-	-	-	-	-	-
AVG	3	2	1	1	1	1	1	-	-	-	-	-	-	-	-

1- Low 2-Medium 3-High '-' – No Correlation





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TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU



23CYT201

ENVIRONMENTAL SCIENCE AND SUSTAINABILITY

L T P C

(Common to All B.E /B.Tech Branches)

3 0 0 3

## OBJECTIVES

- To understand the importance of the environment, ecosystem, biodiversity and its conservation.
- To impart knowledge on various kinds of pollutions, solid waste management and precautionary measures for disasters.
- To be familiar with the social issues and identify the possible way to improve the quality of the environment.
- To analyze the problems of overpopulation and understand the value education.
- To familiarize the concept of sustainability and implement sustainable practices in various fields.

### UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY

9

Definition, scope and importance of environment – Need for public awareness - Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, rivers, oceans) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – Biogeographically classification of India – Value of biodiversity – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity – Endangered and endemic species of India – Conservation of biodiversity: In-Situ and Ex-Situ conservation of biodiversity.

**Activity: Biodiversity in and around the campus and report submission.**

### UNIT II ENVIRONMENTAL POLLUTION

9

Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – Solid waste management: causes, effects and control measures of municipal solid wastes - E-waste – Role of an individual in prevention of pollution - Pollution case studies – Disaster management: floods, earthquake and cyclone.

**Activity: Local pollution case study and report submission.**

### UNIT III SOCIAL ISSUES AND THE ENVIRONMENT

9

Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns, case studies - Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – Wasteland reclamation – Green Chemistry and principles - Environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – Public awareness.

**Activity: Creating environmental awareness.**





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## UNIT IV HUMAN POPULATION AND THE ENVIRONMENT

9

Population growth, variation among nations – Population explosion – Family welfare programme – Environment and human health – Human rights – Value education – HIV / AIDS – Women and child welfare – Role of information technology in environment and human health – Case studies.

**Activity: Visit to local primary health center.**

## UNIT V SUSTAINABLE MANAGEMENT

9

Sustainability-Concept, needs and challenges-economic, social and aspects of sustainability-From unsustainability to sustainability-Millennium development goals, and protocols-Sustainable Development Goals-Targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-Case studies. Zero waste and R concept, Material Life cycle assessment, Environmental Impact Assessment, Sustainable habitat: Energy efficiency, Sustainable transports.

**Activity: Field trips to local organizations or facilities with sustainable practices in place.**

**TOTAL: 45 PERIODS**

## OUTCOMES

Upon completion of the course, Students will be able to

- Acquire knowledge on public awareness & about the environment, ecosystem and biodiversity.
- Find solutions for pollutions and waste management to improve the quality of environment.
- Identify the causes of social issues and apply the concept of green chemistry to maintaining a clean environment.
- Analyze the effects of human population and issues related to the environment and human health.
- Understand the different goals of sustainable development and apply them for suitable technological advancement and societal development.

## TEXT BOOKS

1. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", 2<sup>nd</sup> edition, Pearson Education, 2004.
3. Allen, D. T. and Shonnard, D. R., "Sustainability Engineering: Concepts, Design and Case Studies", 1<sup>st</sup> edition, Prentice Hall, 2015.







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## REFERENCES

1. Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) Pvt Ltd, Hyderabad, 2015.
2. Dharmendra S. Sengar, "Environmental law", Prentice hall of India Pvt Ltd, New Delhi, 2007.
3. Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press, 2005.

## E-RESOURCES

1. <https://nptel.ac.in/courses/122102006/>
2. [https://swayam.gov.in/nd1\\_noc19\\_ge22/preview](https://swayam.gov.in/nd1_noc19_ge22/preview)

## Mapping of COs-POs & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	1	3	2	-	1	3	-	1	-	-	1	-	-	-
2	2	2	2	2	2	2	1	-	-	-	-	-	-	-	-
3	-	2	2	2	1	1	3	-	-	-	-	-	-	-	-
4	1	2	2	1	1	2	3	3	-	-	-	-	-	-	-
5	-	2	2	2	2	1	1	1	-	2	-	-	-	-	-
AVG	1.5	1.8	2.2	1.8	1.5	1.4	2.2	2	1	2	-	1	-	-	-

1-Low 2-Medium 3-High '-' – No Correlation





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TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU



23HST202

TAMILS AND TECHNOLOGY

L T P C  
1 0 0 1

## UNIT I WEAVING AND CERAMIC TECHNOLOGY

3

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

## UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY

3

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

## UNIT III MANUFACTURING TECHNOLOGY

3

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

## UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY

3

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

## UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING

3

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

**TOTAL: 15 PERIODS**

## TEXT BOOKS

1. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
2. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
3. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)





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5. 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)
6. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
7. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

## REFERENCES

1. Heritage of Tamils, Published by: Yes Dee Publishing Pvt Ltd, Chennai
2. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.



23HST202

தமிழரும் தொழில்நுட்பமும்

L T P C  
1 0 0 1

**அலகு I நெசவு மற்றும் பானைத் தொழில்நுட்பம்:** 3  
சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.

**அலகு II வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்:** 3  
சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு- சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரம் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக் கலை.

**அலகு III உற்பத்தித் தொழில் நுட்பம்:** 3  
கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

**அலகு IV வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்:** 3  
அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குழுவித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.

**அலகு V அறிவியல் தமிழ் மற்றும் கணித்தமிழ்:** 3  
அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.

**TOTAL: 15 PERIODS**



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## TEXT BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணிணித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருறை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

## REFERENCES

1. தமிழரும் தொழில்நுட்பமும், முனைவர் கே பூபாலன் வி ஆர் பி பப்ளிஷர்ஸ்





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23GEE201

**ENGINEERING GRAPHICS**  
(Common to all Programmes)

**L T P C**  
**3 0 2 4**

## OBJECTIVES

- To acquire the knowledge of various curves.
- To learn projections of points, lines, planes viewed in different positions.
- To impart the graphic skills for converting pictorial views of solids into orthographic views and perspective projections.
- To learn the principles of projection of simple solids.
- To gain the knowledge about the section of solids and development of surfaces of the given solids.

### UNIT I PLANE CURVES (Manual drafting)

**9+3**

Principles of Engineering Graphics and their significance, usage of Drawing instruments, Types of Lines, Dimensioning Systems as per BIS conventions. **(Not for Examination)**

Construction of ellipse – Parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the curves.

### UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES (Manual drafting)

**9+3**

Projection of points – Projection of straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to one reference planes.

### UNIT III ORTHOGRAPHIC AND PERSPECTIVE PROJECTIONS (Manual drafting)

**9+3**

Conversion of isometric projection into orthographic projection. Perspective projection of prisms, pyramids, cones and cylinders by visual ray method.

### UNIT IV PROJECTION OF SOLIDS (CAD software)

**9+3**

Projections of solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

### UNIT V SECTION OF SIMPLE SOLIDS AND DEVELOPMENT OF SURFACES (CAD software)

**9+3**

Sectioning of simple solids like prisms – pyramids, cylinder and cone - Inclined to one reference plane. Development of lateral surfaces of simple and truncated solids: Prisms, Pyramids, Cylinders and Cones.

**TOTAL: 45+15=60 PERIODS**





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## OUTCOMES

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

- Predict the construction of various curves.
- Analyze the principles of projection of various planes by different angle to project points, lines and plane surfaces.
- Draw the projection of three dimensional into two dimensional objects and perspective projections.
- Draw the principles of projection of simple solids by change of position method.
- Construct the sectional views of components and develop the component surface.

## TEXT BOOKS

1. Venugopal K. and Prabhu Raja V., - "Engineering Graphics", 15<sup>th</sup> Edition, New Age International (P) Limited, 2018.
2. Natarajan K.V., "Engineering Graphics", 32<sup>nd</sup> Edition, Dhanalakshmi Publishers, 2019.
3. Bhatt N.D., "Engineering Drawing", 53<sup>rd</sup> Edition Charotar Publishing House Pvt. Ltd., 2014.

## REFERENCES

1. K.R. Gopalakrishna, "Engineering Drawing Volume 1 & 2", 55<sup>th</sup> Edition, Subhas Publications, Bangalore, 2017.
2. T.Jeyapooan., "Engineering Graphics using Auto CAD" 3<sup>rd</sup> Edition, vikas publishing house Pvt Ltd, New Delhi, 2017.
3. Dhananjay A. Jolhe, Engineering Drawing with an introduction to AutoCAD, Tata McGraw Hill Publishing Company Limited, 2008.

## E- RESOURCES

1. <https://nptel.ac.in/courses/112/103/112103019/> - (Geometric Constructions)
2. <https://nptel.ac.in/courses/105/104/105104148/> - (Projections)

### Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	-	2	2	-	-	-	2	-	2	2	2	2
2	3	2	2	-	2	2	-	-	-	2	-	2	2	2	2
3	3	2	2	-	2	2	-	-	-	2	-	2	2	2	2
4	3	2	2	-	2	2	-	-	-	2	-	2	2	2	2
5	3	2	2	-	2	2	-	-	-	2	-	2	2	2	2
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	2	2	-	2	2	-	-	-	2	-	2	2	2	2

1-Low 2-Medium 3-High '-' – No Correlation





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TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU



23EEE201

**CIRCUIT THEORY**  
(Common to ECE & EEE)

**L T P C**  
**3 0 2 4**

## OBJECTIVES

- To introduce electric circuits and its analysis.
- To impart knowledge on solving circuit equations using network theorems.
- To introduce the phenomenon of resonance and coupled circuits.
- To educate on obtaining the transient response of circuits.
- To introduce Phasor diagrams and analysis of three phase circuits.
- To simulate various electric circuits using MATLAB.

## UNIT I BASIC CIRCUITS ANALYSIS 9

Ohm's Law - Kirchhoff's laws - DC and AC Circuits - Resistors in series and parallel circuits - Mesh current and node voltage method of analysis for D.C and A.C. circuits - Sinusoidal steady State analysis of RL-RC-RLC circuits.

## UNIT II NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS 9

Network reduction: Voltage and current division, source transformation – Star-Delta conversion. Thevenin's and Norton's Theorem - Superposition Theorem - Maximum power transfer theorem - Reciprocity Theorem with Matlab simulation - Application to DC and AC Circuits.

## UNIT III RESONANCE AND COUPLED CIRCUITS 9

Series and parallel resonance - Frequency response - Quality factor and Bandwidth - Self and mutual inductance - Dot rule - Coefficient of coupling - Tuned circuits - Single tuned circuits.

## UNIT IV TRANSIENT ANALYSIS 9

Natural response - Forced response - Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input - Characterization of two port networks in terms of Z, Y, h and ABCD parameters.

## UNIT V THREE PHASE CIRCUITS 9

Average and RMS value - Phasor diagram - Power, power factor and Energy - Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & unbalanced - Phasor diagram of voltages and currents - Power and power factor measurements in three phase circuits.

## LIST OF EXPERIMENTS

1. Simulation and Experimental verification of electrical circuit problems using Kirchhoff's voltage and current laws.
2. Simulation and Experimental verification of electrical circuit problems using Thevenin's theorem and Norton's theorem.







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**TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU**

- Simulation and Experimental verification of electric circuit problems using Superposition theorem and Maximum Power transfer Theorem.
- Simulation and Experimental validation of R-C electric circuit transients.
- Simulation and Experimental validation of frequency response of RLC electric circuit.
- Simulation of three phase balanced and unbalanced star, delta networks circuits.
- Calibration of single phase Energy meter.

**TOTAL : 45+15= 60 PERIODS**

## OUTCOMES

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

- Learn the basic concepts of DC and AC electrical circuits.
- Understand and apply the knowledge of circuit theorems.
- Acquire knowledge about resonance and coupled circuits.
- Apply the concepts in transients.
- Analyze the three phase circuits.
- Understand and apply circuit theorems and concepts in engineering applications.

## TEXT BOOKS

- William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", Tata McGraw Hill publishers, New Delhi, Ninth edition, 2020.
- Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", McGraw Hill, Second Edition, 2019.

## REFERENCES

- Chakrabati A, "Circuits Theory (Analysis and synthesis), Dhanpat Rai Publishing Co Pvt Ltd, New Delhi, Seventh Edition, 2018.
- Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", Tata McGraw Hill, Fifth Edition, 2017.

## E-RESOURCES

- <https://nptel.ac.in/courses/108102042/> - (Circuit Theory)
- <https://nptel.ac.in/courses/108104139/> - (Basic Electric Circuit)

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2	2	-	2	1	-	-	-	3	3	3	3
2	3	3	3	3	2	-	2	1	-	-	-	3	3	3	3
3	3	3	3	3	2	-	2	1	-	-	-	3	3	3	3
4	3	3	3	3	2	-	2	1	-	-	-	3	3	3	3
5	3	3	3	3	2	-	2	1	-	-	-	3	3	3	3
6	3	3	3	3	2	-	2	1	-	-	-	3	3	3	3
<b>AVG</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2.8</b>	<b>2</b>	<b>-</b>	<b>2</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>

**1-Low 2-Medium 3-High '-' – No Correlation**





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23GEL201

ENGINEERING PRACTICES LABORATORY

L T P C

0 0 4 2

## OBJECTIVES

- Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planing; making joints in wood materials used in common household wood work.
- Wiring various electrical joints in common household electrical wirework.
- Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipments; Making a tray out of metal sheet using sheet metal work.
- Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB

## GROUP – A (CIVIL & ELECTRICAL)

### PART I

### CIVIL ENGINEERING PRACTICES

15

#### 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) Planing and
- c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

#### Wood Work Study:

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

### PART II

### ELECTRICAL ENGINEERING PRACTICES

15

- a) Introduction to switches, fuses, indicators and lamps - Basic switch boardwiring with lamp, fan and three pin socket
- b) Staircase wiring





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- c) Fluorescent Lamp wiring with introduction to CFL and LED types.
- d) Energy meter wiring and related calculations/ calibration
- e) Study of Iron Box wiring and assembly
- f) Study of Fan Regulator (Resistor type and Electronic type using Diac/Triac/quadrac)
- g) Study of emergency lamp wiring/Water heater

## GROUP – B (MECHANICAL AND ELECTRONICS)

### PART III MECHANICAL ENGINEERING PRACTICES 15

#### WELDING WORK:

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

#### BASIC MACHINING WORK:

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

#### ASSEMBLY WORK:

- a) Assembling a centrifugal pump.
- b) Assembling a household mixer.
- c) Assembling an air conditioner.

#### SHEET METAL WORK:

- a) Making of a square tray

#### FOUNDRY WORK:

- a) Demonstrating basic foundry operations.

### PART IV ELECTRONIC ENGINEERING PRACTICES 15

#### SOLDERING WORK:

- a) Soldering simple electronic circuits and checking continuity.

#### ELECTRONIC ASSEMBLY AND TESTING WORK

- a) Assembling and testing electronic components on a small PCB.

#### ELECTRONIC EQUIPMENT STUDY:

- a) Study an elements of smart phone.
- b) Assembly and dismantle of LED TV.
- c) Assembly and dismantle of computer/ laptop

**TOTAL = 60 PERIODS**





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## OUTCOMES

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

- Draw pipe line plan; layout and connect various pipe fittings used in common household plumbing work; Sawing; planning; making joints in wood materials used in common household wood work.
- Wire various electrical joints in common household electrical wirework.
- Weld various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipments; Making a tray out of metal sheet using sheet metal work.
- Solder and tests simple electronic circuits; Assembling and testing simple electronic components on PCB

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
2	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
3	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
4	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
5	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
6	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
AVG	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1

1-Low 2-Medium 3-High '-' – No Correlation





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## COMMUNICATION SKILLS

(Common to all B.E. & B.Tech. branches)



23EEEC201

L T P C  
0 0 4 2

### OBJECTIVES

- To use vocabularies appropriately in a sentence and various situations.
- To improve communicative competence through listening.
- To make effective presentations and group discussions.
- To read and recognize different context.
- To write paragraph, essay and special addresses.

### UNIT I VOCABULARY

6

Vocabulary building – Articulate ideas and thoughts; usage of palindromes, greetings, wishes, festival related words - Vocabulary Words with Sentences. - Idiomatic Expressions.

### UNIT II LISTENING

6

Listening Skill- Its importance – Purpose - Process - Types- Barriers - Effective Listening strategies- Listening to telephonic conversations – Watching Inspiring Speech videos on Youtube - Listening native speaker's videos for pronunciation - Listening to broadcast, messages, announcements - Listening to Instagram Videos.

### UNIT III SPEAKING

6

JAM Talk - Role play - Debate - Conversational skills (formal and informal) - Conversation practice - Group Discussion and Interview Skills – Introducing oneself and others – Goal Settings - Immediate, Long term and short term.

### UNIT IV READING

6

Reading for the Main idea- Finding Specific Information - Reading for Detail - Read and recognize different text types ranging from newspaper, articles, magazines, books and Reading autobiographies.

### UNIT V WRITING

6

Paragraph Writing - Essay writing - Creative writing - Special Address on Specific topic - Welcome Address, vote of Thanks.

### OUTCOMES

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

- Improve vocabulary and express the same contextually.
- Listen and comprehend the general and technical text.
- Speak effectively in presentation, debate and group discussions.
- Read and understand the concept from newspapers, articles, magazines and books.
- Draft special addresses, welcome address, vote of thanks and write paragraph and essay.





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## TEXT BOOKS

1. Gramer F. Margot and Colin S. Ward Reading and Writing (Level 3) Oxford University Press: Oxford, 2011
2. Brooks, Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford: 2011

## REFERENCES

1. Davis, Jason and Rhonda Liss. Effective Academic Writing (Level 3) Oxford University Press: Oxford, 2006
2. E. Suresh Kumar and et al. Enriching Speaking and Writing Skills. Second Edition. Orient Black swan:
3. Anderson, Kenneth et al. Study Speaking: A Course in Spoken English for Academic Purposes. United Kingdom: Cambridge University Press 1992.
4. Technical communication by Asraf rezvi

## EXTENSIVE READING

1. Dr. A. P. J. Abdul Kalam " Wings of Fire "

## E-RESOURCES

1. <https://youglish.com>
2. <https://newsinlevels.com>
3. <https://britishcouncil.org>
4. <https://writeandimprove.com>

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	-	-	1	1	1	1	3	-	3	-	-	-
2	-	-	-	-	-	1	-	-	1	3	-	3	-	-	-
3	-	-	-	-	-	1	2	2	3	3	-	3	-	-	-
4	-	-	-	-	-	2	2	-	3	3	-	3	-	-	-
5	-	-	-	-	-	1	1	-	1	3	-	3	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	-	-	-	-	-	1.20	1.50	1.50	1.80	3.00	-	3.00	-	-	-

1-Low 2-Medium 3-High '-' – No Correlation





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SEMESTER III



23MAT302

TRANSFORMS AND RANDOM PROCESSES

L T P C

(Common to ECE & MDE)

3 1 0 4

## OBJECTIVES

- To provide necessary basic concepts in random variables for applications such as random signals, linear systems in communication engineering.
- To understand the basic concepts of one and two dimensional random variables describe real life phenomenon.
- To understand the classifications of random processes and concepts.
- To explain Fourier transforms techniques used in wide variety of situations.
- To utilize the effective mathematical tools to develop Z transform techniques for discrete time systems.

## UNIT I RANDOM VARIABLES

9+3

Random variables - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions – Functions of a random variable.

## UNIT II TWO – DIMENSIONAL RANDOM VARIABLES

9+3

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

## UNIT III RANDOM PROCESSES

9+3

Classification – Stationary process – Markov process – Poisson process – Discrete parameter-Markov chain – Chapman Kolmogorov equations (Statement only) – Limiting distributions.

## UNIT IV FOURIER TRANSFORMS

9+3

Statement of Fourier integral theorem – Fourier transform – Fourier sine and cosine transforms – Properties of Fourier transform – Convolution theorem for Fourier transform – Parseval's identity for Fourier transform.

## UNIT V Z - TRANSFORMS AND DIFFERENCE EQUATIONS

9+3

Z-transforms: Some standard Z-transforms – Elementary properties – Some useful Z-transforms and inverse Z- transforms – Convolution theorem – Evaluation of Inverse Z-transforms by partial fraction method – Application to difference equations.

**TOTAL: 45+15=60 PERIODS**





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## OUTCOMES

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

- Apply the concept of random variables in engineering disciplines.
- Understand the basic concepts of one and two dimensional random variables and apply them to model engineering problems.
- Understand the basic concepts of random processes which are widely used in signal processing to analyze and manipulate signals.
- Analyze some of the physical problems of engineering by Fourier transforms.
- Apply Z transforms techniques in solving difference equation.

## TEXT BOOKS

1. Grewal, B.S., "Higher Engineering Mathematics & quot;, 43rd Edition, Khanna Publishers, New Delhi, 2014..
2. Yates, R.D. and Goodman. D. J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.

## REFERENCES

1. Ibe, O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007.
2. Trivedi, K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", 2nd Edition, John Wiley and Sons, 2002.

## E-RESOURCES

1. <https://nptel.ac.in/courses/117105085> (Probability and Random Processes)
2. <https://archive.nptel.ac.in/courses/111/102/111102129/#> (Transforms)

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	1	3	2	-	-	-	-	-	1	2	-	-	-
2	3	3	1	3	2	-	-	-	-	-	1	2	-	-	-
3	3	3	1	3	2	-	-	-	-	-	1	2	-	-	-
4	3	3	1	3	2	-	-	-	-	-	1	2	-	-	-
5	3	3	1	3	2	-	-	-	-	-	1	2	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	3	1	3	2	-	-	-	-	-	1	2	-	-	-

1-Low 2-Medium 3-High '-' – No Correlation







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23ECT301

SIGNALS AND SYSTEMS

L T P C  
3 1 0 4

## OBJECTIVES

- To understand the basic properties of signals and systems.
- To study continuous time signals in the Fourier and Laplace domain.
- To know the methods of characterization of LTI systems in time domain.
- To relate the discrete time signals in the Fourier and Z transform domain.
- To aware the concepts of LTI discrete system in the Fourier and Z transform domain.

## UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS

12

Standard signals - Step, Ramp, Pulse, Impulse, Real and complex exponentials and Sinusoids–  
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 - Laplace Transforms and  
Properties.

## UNIT III LINEAR TIME INVARIANT CONTINUOUS TIME SYSTEMS

12

Impulse response - convolution integrals - Differential Equation - Fourier and Laplace  
transforms in Analysis of CT systems - Systems connected in series / parallel.

## UNIT IV ANALYSIS OF DISCRETE TIME SIGNALS

12

Baseband signal Sampling–Fourier Transform of discrete time signals (DTFT)– Properties of  
DTFT - Z Transform & Properties.

## UNIT V LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS

12

Impulse response–Difference equations–Convolution sum - Discrete Fourier Transform and Z  
Transform Analysis of Recursive & Non-Recursive systems - DT systems connected in series  
and parallel.

**TOTAL: 60 PERIODS**





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## OUTCOMES

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

- Analyze if a given system is linear/causal/stable.
- Determine the frequency components present in a deterministic signal.
- Apply the continuous LTI systems in the time domain and frequency domain.
- Design discrete LTI systems in the time domain and frequency domain.
- Determine the output of an LTI system in the time and frequency domains.

## TEXT BOOKS

1. Oppenheim, Willsky and Hamid, "Signals and Systems", Second Edition, Pearson Education, New Delhi, 2015.
2. Simon Haykin, Barry Van Veen, "Signals and Systems", Second Edition, Wiley 2002.

## REFERENCES

1. B. P. Lathi, "Principles of Linear Systems and Signals", Second Edition, Oxford, 2009.
2. M. J. Roberts, "Signals and Systems Analysis using Transform methods and MATLAB", McGraw- Hill Education, 2018.

## E-RESOURCES

1. <https://archive.nptel.ac.in/courses/117/104/117104074/> (Signals and Systems)
2. <https://nptel.ac.in/courses/108/104/108108100> (Principles of Signals and Systems)

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	-	3	-	3	2	-	-	-	-	-	3	-	-	1
2	3	-	3	-	-	2	-	-	-	-	-	3	-	3	-
3	3	3	-	-	3	2	-	-	-	-	-	3	2	-	-
4	3	3	-	-	3	2	-	-	-	-	-	3	-	3	1
5	3	3	-	3	3	2	-	-	-	-	-	3	-	3	1
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3	3	3	3	3	2	-	-	-	-	-	3	2	3	1

1-Low 2-Medium 3-High '-' – No Correlation





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23EET301

CONTROL AND INSTRUMENTATION ENGINEERING

L T P C

3 0 0 3

## OBJECTIVES

- To provide the fundamental concepts of control systems and mathematical modeling of the system.
- To determine the time response of systems and analyze the steady state error.
- To calculate the frequency domain specifications using frequency response plots and stability analysis of control systems.
- To understand general instrument system, error, calibration and the various operating principle of instruments which use to AC and DC measurements.
- To impart knowledge on various bridges and storage and display devices.

## UNIT I MODELLING OF CONTROL SYSTEMS

9

Introduction - Open Loop and Closed Loop Systems - Mathematical Model of Control Systems - Transfer Functions - Mechanical Translational Systems - Mechanical Rotational Systems - Block Diagram Algebra - Signal Flow Graph.

## UNIT II TIME DOMAIN ANALYSIS

9

Transient and steady state response analysis. Steady state error & error constants. Dynamic error and dynamic error coefficient-Effects of pole and zero addition on transient and steady state response- Absolute stability and relative stability- Routh's and Hurwitz criterion of stability, Root locus method of analysis.

## UNIT III FREQUENCY RESPONSE AND STATE SPACE MODELLING

9

Frequency Response - Frequency Domain Specifications - Resonant Peak – Resonant Frequency - Bandwidth- Cut-Off Rate - Gain Margin and Phase Margin - Frequency Response Plots - Bode Plot-Polar Plot – Correlation between time and Frequency response-Concepts of state, state variable and state model, controllability and observability.

## UNIT IV ELECTRICAL AND ELECTRONIC INSTRUMENTS

9

Functional elements of an instrument -classification – Elements of a generalized measurement - Static and dynamic characteristics -Standards and calibration -Principle and operation of analog voltmeters and ammeters: Moving iron: Attraction and repulsion type instruments, Moving coil instruments; PMMC, Dynamometer type, torque equation-Smart meters.

## UNIT V BRIDGES, DIGITAL INSTRUMENTS AND DISPLAY DEVICES

9

DC bridges: Wheatstone bridge, Kelvin's double bridge, Megger - AC bridges: Maxwell's, Anderson, Schering- Digital voltmeter: Ramp, Integrating and Successive approximation - Digital multi-meter - CRT display, dot matrix display, LED and LCD display - Digital energy meter - Digital Storage Oscilloscope (DSO) – Digital printers and plotters.

**TOTAL: 45 PERIODS**





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## OUTCOMES

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

- Apply transfer function models to analyze physical systems.
- Determine the transient and steady state behavior of systems subjected to standard test signals.
- Analyze the frequency domain and stability of the linear system in concepts of various system stability criterions.
- Understand the concepts of Fundamentals of electrical and electronics instrument.
- Acquire knowledge on various bridges and display devices.

## TEXT BOOKS

1. J.Nagrath and M.Gopal, "Control Systems Engineering", Sixth Edition, New Age International (P) Ltd, Publishers, 2017.
2. A.K.Sawhney, "A Course in Electrical & Electronic Measurements and Instrumentation", Dhanpat Rai and Co, Second Edition, 2021.

## REFERENCES

1. A.Nagoorkani, "Control Systems Engineering", Third Edition, RBA Publications, 2021.
2. R.K.Rajput, "Electrical Measurements and Measuring Instruments", S.Chand and Company Pvt. Ltd, Fourth Edition, 2016.

## E - RESOURCES

1. <https://nptel.ac.in/courses/108/106/108106098/> (Control Engineering)
2. <https://nptel.ac.in/courses/108/105/108105153/> (Electrical Measurements and Electronic Instrument)

## Mapping of Cos-Pos & PSOs

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2	3	3	3	3	-	-	-	1	-	2	-	2	3	-	2
3	3	3	3	3	-	-	-	1	-	2	-	2	3	-	2
4	3	3	3	3	-	-	-	1	-	2	-	2	3	-	2
5	3	3	3	3	-	-	-	1	-	2	-	2	3	-	2
AVG	3	3	3	3	-	-	-	1	-	2	-	2	3	-	2

1-Low 2-Medium 3-High '-' – No Correlation





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TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU

## ELECTRONIC DEVICES AND CIRCUITS

(Lab Embedded Theory)



23ECE301

L T P C  
3 0 2 4

### OBJECTIVES

- To study all types of semiconductor devices and circuits constructed with discrete components.
- To know the frequency response of small signal amplifiers.
- To learn multistage amplifiers and differential amplifier.
- To study about feedback amplifiers and oscillators principles.
- To understand the operation of power amplifiers and DC/DC converters.
- To experiment with semiconductor devices and amplifiers.

### UNIT I SEMICONDUCTOR DEVICES 9

PN junction diode, Zener diode, BJT, MOSFET, UJT –structure, operation and V-I characteristics, diffusion and transition capacitance - Rectifiers – Half Wave and Full Wave Rectifier, Zener as regulator.

### UNIT II AMPLIFIERS 9

Load line, operating point, biasing methods for BJT and MOSFET, BJT small signal model – Gain and frequency response – MOSFET small signal model – Analysis of CS, CG and Source follower – Gain and frequency response- High frequency analysis.

### UNIT III MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER 9

Cascode amplifier, Differential amplifier – Common mode and Difference mode analysis – MOSFET input stages – tuned amplifiers – Gain and frequency response.

### UNIT IV FEEDBACK AMPLIFIERS AND OSCILLATORS 9

Advantages of negative feedback – Voltage / Current, Series , Shunt feedback Amplifiers – positive feedback–Condition for oscillations, phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators.

### UNIT V POWER AMPLIFIERS AND DC/DC CONVERTERS 9

Power amplifiers - Class A - Class B - Class AB - Class C - Power MOSFET - Temperature Effect - Class AB Power amplifier using MOSFET – DC/DC convertors – Buck, Boost, Buck-Boost operations.

### LIST OF EXPERIMENTS

1. Characteristics of PN Junction Diode and Zener diode.
2. Full Wave Rectifier with Filters.
3. Design of Zener diode Regulator.
4. Common Emitter input-output Characteristics.





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5. MOSFET Drain current and Transfer Characteristics.
6. Frequency response of CE and CS amplifiers.
7. Frequency response of CB and CC amplifiers.
8. Frequency response of Cascode Amplifier
9. CMRR measurement of Differential Amplifier
10. Class A Transformer Coupled Power Amplifier.

**TOTAL: 45+15=60 PERIODS**

## OUTCOMES

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

- Analyze the structure and working operation of basic semiconductor devices.
- Design frequency response of BJT and MOSFET amplifiers.
- Design and analyze amplifiers.
- Determine feedback amplifiers and oscillator principles.
- Estimate the power amplifiers and converters.
- Evaluate the semiconductors and circuit design.

## TEXT BOOKS

1. David A. Bell, "Electronic Devices and Circuits", Oxford Higher Education press, Fifth Edition, 2010.
2. Robert L. Boylestad and Louis Nasheresky, "Electronic Devices and Circuit Theory", Tenth Edition, Pearson Education / PHI, 2008.

## REFERENCES

1. Donald.A. Neamen, "Electronic Circuit Analysis and Design", Tata McGraw Hill, Third Edition, 2010.
2. D.Schilling and C.Belove, "Electronic Circuits", McGraw Hill, Third Edition, 2002.

## E-RESOURCES

1. <https://nptel.ac.in/courses/108/105/108105158/> (Analog Electronic Circuits)
2. <https://nptel.ac.in/courses/117/103/117103063/> (Basic Electronics)





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### Mapping of Cos-Pos & PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	2	1	-	-	-	-	-	1	2	1	1
2	3	2	3	3	2	2	-	-	-	-	-	1	2	1	1
3	3	3	3	2	1	2	-	-	-	-	-	1	2	1	1
4	3	3	3	3	2	2	-	-	-	-	-	1	2	1	1
5	3	2	3	2	2	1	-	-	-	-	-	1	2	1	1
6	2	2	2	3	2	1	-	-	-	-	-	1	2	1	1
<b>AVG</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>1</b>

1-Low 2-Medium 3-High '-' – No Correlation





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23ECE302

**DIGITAL SYSTEMS DESIGN**  
(Lab Embedded Theory Course)

**L T P C**  
**3 0 2 4**

## OBJECTIVES

- To study the fundamentals of digital circuits and simplification methods.
- To know the design of various combinational digital circuits using logic gates.
- To relate the analysis and design procedures for synchronous sequential circuits.
- To understand the design procedures for asynchronous sequential circuits.
- To introduce semiconductor memories and related technology.
- To learn the basic digital logic circuits and converters.

## UNIT I BASIC CONCEPTS

9

Review of number systems-representation-conversions, Review of Boolean algebra- theorems, sum of product and product of sum simplification, canonical forms min term and max term, Simplification of Boolean expressions-Karnaugh map, completely and incompletely specified functions, Implementation of Boolean expressions using universal gates.

## UNIT II COMBINATIONAL LOGIC CIRCUITS

9

Problem formulation and design of combinational circuits , Half and Full Adders, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Code-Converters, Magnitude Comparator, Decoder, Encoder, Mux/Demux, Case study: Parity Generator/Checker, Seven Segment display decoder.

## UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS

9

Latches, Flip flops – SR, JK, T, D, Master/Slave FF, Analysis and design of synchronous sequential circuits – Counters, Ripple Counters, Ring Counters, Shift registers, Universal Shift Register. Model Development: Designing of rolling display/real time clock.

## UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS

9

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

## UNIT V MEMORIES AND PROGRAMMABLE LOGIC DEVICES

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) –Implementation of combinational logic circuits using PLA, PAL.







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## LIST OF EXPERIMENTS

1. Design of Adders, Subtractors and Code converters.
2. Design of Multiplexers and Demultiplexers.
3. Design of Encoders and Decoders.
4. Design of Magnitude Comparators.
5. Design and implementation of counters using flip-flops.
6. Design and implementation of shift registers.

**TOTAL: 45 +15 = 60 PERIODS**

## OUTCOMES

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

- Use Boolean algebra and simplification procedures relevant to digital logic.
- Design various combinational digital circuits using logic gates.
- Analyze and design procedures of synchronous sequential circuits.
- Analyze and perform asynchronous sequential circuits.
- Develop the memories and programmable devices.
- Design and implement digital logic circuits and flipflops.

## TEXT BOOKS

1. M.Morris Mano and Michael D.Ciletti, 'Digital Design', Pearson, Fifth Edition, 2013.
2. David Harris, "Digital Design and Computer Architecture", Morgan Kaufmann, 2012.

## REFERENCES

1. Charles H. Roth, Jr, 'Fundamentals of Logic Design', Jaico Books, Fourth Edition, 2002.
2. William I. Fletcher, "An Engineering Approach to Digital Design", Prentice- Hall of India, 2015.

## E-RESOURCES

1. <https://nptel.ac.in/courses/117/106/117106086/> (Digital Design)
2. <https://nptel.ac.in/courses/108/105/108105132/> (Integrated Circuits)





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## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	2	2	2	-	-	-	-	2	2	3	3	2
2	3	3	3	2	2	2	-	-	-	-	2	1	2	3	2
3	3	3	3	2	2	2	-	-	-	-	2	2	3	3	2
4	3	2	3	2	2	2	-	-	-	-	2	2	2	3	1
5	3	3	3	3	2	2	-	-	-	-	2	2	3	3	2
6	3	2	3	2	2	2					1	1	3	2	2
<b>AVG</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>

1-Low 2-Medium 3-High '-' – No Correlation





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23GEE301

## TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU PROBLEM SOLVING AND PYTHON PROGRAMMING (Lab Embedded Theory Course)

L T P C  
3 0 2 4

### OBJECTIVES

- To understand the basics of algorithmic problem solving.
- To learn the data types, expressions and the statements in python.
- To study the Python functions and function calls to solve problems.
- To learn python data structures-list, tuples, dictionaries to represent complex data.
- To understand the file modules and python packages.
- To practice various computational operations and develop solutions using python.

### UNIT I COMPUTATIONAL THINKING AND PROBLEM SOLVING 9

Fundamentals of Computing – Identification of Computational Problems -Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

### UNIT II DATA TYPES, EXPRESSIONS, STATEMENTS 9

Python interpreter and interactive mode, debugging; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

### UNIT III CONTROL FLOW, FUNCTIONS, STRINGS 9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

### UNIT IV LISTS, TUPLES, DICTIONARIES 9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.





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## UNIT V FILES, MODULES, PACKAGES & DATA VISUALIZATION

9

Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file - Importing Matplotlib – Introduction to plotting – visualizing errors – density and contour plots – Histograms.

### LIST OF EXPERIMENTS

(Any Eight Experiments to be conducted)

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.).
2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3. Scientific problems using Conditionals and Iterative loops.(Number series,Number Patterns, pyramid pattern).
4. Implementation of real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples).
5. Implementation of real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries).
6. Implementation of programs using Functions.(Factorial, largest number in a list, area of shape)
7. Implementation of programs using Strings.(reverse, palindrome, character count, replacing characters)
8. Implementation of programs using written modules and Python Standard Libraries(pandas, numpy. Matplotlib, scipy)
9. Implementation of real-time/technical applications using File handling.(copy from one file to another, word count, longest word)
10. Implementation of real-time/technical applications using Exception handling.(divide by zero error, voter's age validity, student mark range validation)

**TOTAL: 45 +15 = 60 PERIODS**





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## OUTCOMES

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

- Develop algorithmic solutions to simple computational problems.
- Develop python programs using expressions to solve the problem.
- Deploy functions and function calls to decompose python programs.
- Implement solutions using compound data in Python lists, tuples, dictionaries.
- Utilize file modules and python packages for developing applications.
- Implement python programs for solving various computational problems.

## TEXT BOOKS

1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", Second Edition, O'Reilly Publishers, 2016.
2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", First Edition, BCS Learning & Development Limited, 2017.

## REFERENCES

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, First Edition, 2021.
2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", First Edition, Notion Press, 2021.

## E-RESOURCES

1. <https://nptel.ac.in/courses/106104074> (Introduction to Algorithms)
2. <https://archive.nptel.ac.in/courses/106/106/106106182> (Joy of Computing)

### Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	2	-	-	-	-	-	2	2	3	3	-
2	3	3	3	3	2	-	-	-	-	-	2	2	3	-	-
3	3	3	3	3	2	-	-	-	-	-	2	-	3	-	-
4	2	2	-	2	2	-	-	-	-	-	1	-	3	-	-
5	1	2	-	-	1	-	-	-	-	-	1	-	2	-	-
6	2	2	-	-	2	-	-	-	-	-	1	-	2	-	-
AVG	2	3	3	3	2	-	-	-	-	-	2	2	3	-	-

1-Low 2-Medium 3-High '-' – No Correlation





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## SEMESTER IV

23ECT401

ELECTROMAGNETIC FIELDS

L T P C

3 1 0 4

### OBJECTIVES

- To learn the basics of static electric field and the associated laws.
- To impart knowledge on the basics of static magnetic field and the associated laws.
- To learn basic laws associated with magneto statics.
- To study the significance of Time varying fields.
- To learn of the propagation of EM waves.

### UNIT I INTRODUCTION

9

Electromagnetic model, Units and constants, Review of vector algebra, Rectangular, cylindrical and spherical coordinate systems, Line, surface and volume integrals, Gradient of a scalar field, Divergence of a vector field, Divergence theorem, Curl of a vector field, Stoke's theorem, Null identities, Helmholtz's theorem, Verify theorems for different path, surface and volume.

### UNIT II ELECTROSTATICS

9

Electric field, Coulomb's law, Gauss's law and applications, Electric potential, Conductors in static electric field, Dielectrics in static electric field, Electric flux density and dielectric constant, Boundary conditions, Capacitance, Parallel, cylindrical and spherical capacitors, Electrostatic energy, Poisson's and Laplace's equations, Uniqueness of electrostatic solutions, Current density and Ohm's law, Electromotive force and Kirchhoff's voltage law, Equation of continuity and Kirchhoff's current law.

### UNIT III MAGNETOSTATICS

9

Lorentz force equation, Ampere's law, Vector magnetic potential, Biot-Savart law and applications, Magnetic field intensity and idea of relative permeability, Calculation of magnetic field intensity for various current distributions Magnetic circuits, Behaviour of magnetic materials, Inductance and inductors, Magnetic energy, Magnetic forces and torques

### UNIT IV TIME-VARYING FIELDS AND MAXWELL'S EQUATIONS

9

Faraday's law, Displacement current and Maxwell-Ampere law, Maxwell's equations, Potential functions, Electromagnetic boundary conditions, Wave equations and solutions, Time-harmonic fields, Observing the Phenomenon of wave propagation with the aid of Maxwell's equations.





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## UNIT V PLANE ELECTROMAGNETIC WAVES

9

Plane waves in lossless media, Plane waves in lossy media (low-loss dielectrics and good conductors), Group velocity, Electromagnetic power flow and Poynting vector, Normal incidence at a plane conducting boundary, Normal incidence at a plane dielectric boundary

**TOTAL: 45 PERIODS**

### OUTCOMES

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

- Relate the fundamentals of vector, coordinate system to electromagnetic concepts.
- Analyze the characteristics of Electrostatic field.
- Determine the concepts of Magneto statics.
- Discuss the significance of time varying fields.
- Evaluate the effects of different EM waves in media.

### TEXT BOOKS

1. D.K. Cheng, "Field and wave electromagnetic", Second Edition, Pearson (India), 2002.
2. M.N.O.Sadiku and S.V. Kulkarni, "Principles of electromagnetics", Sixth Edition, Oxford, 2015.

### REFERENCES

1. Edward C. Jordan & Keith G. Balmain, "Electromagnetic waves and Radiating Systems", Second Edition, Prentice-Hall Electrical Engineering Series, 2012
2. W.H. Hayt and J.A. Buck, "Engineering electromagnetic", Seventh edition. McGraw-Hill (India), 2006.

### E-RESOURCES

1. <https://nptel.ac.in/courses/108/106/108106073/> (Electromagnetic Fields)
2. <https://nptel.ac.in/courses/117/103/117103065/> (Electromagnetic Theory)





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## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	1	1	-	2	1	-	-	1	-	2	2	1	2
2	2	2	3	3	2	2	2	--	-	1	1	2	2	2	2
3	2	2	3	2	2	2	1	-	-	1	1	2	2	2	2
4	2	2	3	2	2	2	1	-	-	1	1	2	2	2	2
5	2	2	2	2	2	2	1	-	-	2	2	1	2	2	1
AVG	2	2	2	2	2	2	1	-	-	1	1	2	2	2	2

1-Low 2-Medium 3-High '-'- No Correlation







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23ECT402

NETWORKS AND SECURITY

LTPC  
3003

## OBJECTIVES

- To learn the Network Models and data link layer functions.
- To understand routing in the Network Layer.
- To know the methods of communication and congestion control by the Transport layer.
- To study the Network Security Mechanisms.
- To learn various hardware security attacks and their countermeasures.

### UNIT I NETWORK MODELS AND DATALINK LAYER 9

Overview of Networks and its Attributes – Network Models – OSI, TCP/IP, Addressing – Introduction to Datalink Layer – Error Detection and Correction – Ethernet(802.3)- Wireless LAN – IEEE 802.11, Bluetooth – Flow and Error Control Protocols – HDLC – PPP.

### UNIT II NETWORK LAYER PROTOCOLS 9

Network Layer – IPv4 Addressing – Network Layer Protocols(IP,ICMP and Mobile IP) Unicast and Multicast Routing – Intra domain and Inter domain Routing Protocols – IPv6 Addresses – IPv6 – Datagram Format - Transition from IPv4 to IPv6.

### UNIT III TRANSPORT AND APPLICATION LAYERS 9

Transport Layer Protocols – UDP and TCP Connection and State Transition Diagram – Congestion Control and Avoidance (DEC bit, RED) - QoS - Application Layer Paradigms – Client – Server Programming – Domain Name System – World Wide Web, HTTP, Electronic Mail.

### UNIT IV NETWORK SECURITY 9

OSI Security Architecture – Attacks – Security Services and Mechanisms – Encryption – Advanced Encryption Standard – Public Key Cryptosystems – RSA Algorithm – Hash Functions – Secure Hash Algorithm – Digital Signature Algorithm..

### UNIT V HARDWARE SECURITY 9

Introduction to hardware security, Hardware Trojans, Side – Channel Attacks – Physical Attacks and Countermeasures – Design for Security. Introduction to Blockchain Technology.

**TOTAL: 45 PERIODS**





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## OUTCOMES

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

- Develop the Network Models, layers and functions.
- Categorize and classify the routing protocols.
- Analyze the functions of the transport and application layer.
- Analyze and choose the network security mechanisms.
- Discuss the hardware security attacks and countermeasures.

## TEXT BOOKS

1. Behrouz.A.Forouzan, “Data Communication and Networking”, Fifth Edition, TMH, 2017.
2. Bhunia Swarup, “Hardware Security –A Hands On Approach”, Morgan Kaufmann, First edition, 2018.

## REFERENCES

1. James.F.Kurose and Keith.W.Ross, “Computer Networking – A Top – Down Approach”, Sixth Edition, Pearson, 2017.
2. Douglas.E.Comer, “Computer Networks and Internets”, Sixth Edition, Pearson Education, 2015.

## E-RESOURCES

1. <https://nptel.ac.in/courses/106105031> (Cryptography and Network security)
2. <https://nptelvideos.com/lecture.php?id=5823>(System security)

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	1	2	2	1	1	-	1	2	1	3	2	1	3
2	1	2	1	2	2	-	-	-	1	1	1	2	2	2	2
3	2	3	1	2	3	-	-	-	1	1	1	2	2	1	2
4	2	1	-	1	1	-	-	-	2	1	1	2	2	3	1
5	1	2	1	2	2	1	1	-	1	2	1	3	2	2	3
6	2	2	1	2	2	1	1	-	1	1	1	2	2	2	2
AVG	2	2	1	2	2	1	1	-	1	1	1	2	2	2	2

1-Low 2-Medium 3-High '-' – No Correlation





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TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU



23ECT403

MICROPROCESSORS AND MICROCONTROLLERS

L T P C  
3 0 0 3

## OBJECTIVES

- To study the architecture of 8086 microprocessor.
- To learn the design aspects of Multiprogramming.
- To interface microprocessors with supporting chips.
- To study the architecture of 8051 microcontroller.
- To understand the concepts of interfacing microcontroller.

### UNIT I THE 8086 MICROPROCESSOR

9

Introduction to 8086 - Microprocessor architecture - Addressing modes - Instruction set and assembler directives - Assembly language programming - Modular Programming - Linking and Relocation - Stacks - Procedures - Macros - Interrupts and interrupt service routines - Byte and String Manipulation.

### UNIT II 8086 SYSTEM BUS STRUCTURE

9

8086 signals - Basic configurations - System bus timing - System design using 8086 - I/O programming - Introduction to Multiprogramming - System Bus Structure - Multiprocessor configurations - Coprocessor, Closely coupled and loosely Coupled configurations - Introduction to advanced processors.

### UNIT III I/O INTERFACING

9

Memory Interfacing and I/O interfacing - Parallel communication interface - Serial communication interface - D/A and A/D Interface - Timer - Keyboard /display controller - Interrupt controller - DMA controller - Programming and applications Case studies: Traffic Light control, LED display, LCD display, Keyboard display interface and Alarm Controller.

### UNIT IV MICROCONTROLLER

9

Architecture of 8051 - Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instructionset - Addressing modes - Assembly language programming.

### UNIT V INTERFACING MICROCONTROLLER

9

Programming 8051 Timers - Serial Port Programming - Interrupts Programming - LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors.

**TOTAL: 45 PERIODS**





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## OUTCOMES

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

- Analyze and execute programs based on 8086 microprocessor.
- Categorize 8086 basic configurations.
- Design and interface I/O circuits.
- Construct and implement 8051 microcontroller based systems.
- Design Microcontroller based peripheral interfacing.

## TEXT BOOKS

1. Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family Architecture, Programming and Design", Second Edition, Prentice Hall of India, 2007.
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Second Edition, Pearson education, 2011.

## REFERENCES

1. Douglas V.Hall, "Microprocessors and Interfacing Programming and Hardware", TMH, 2012.
2. A.K.Ray, K.M.Bhurchandi, "Advanced Microprocessors and Peripherals" Third edition, TataMcGraw Hill, 2012.

## E-RESOURCES

1. <https://nptel.ac.in/courses/108/105/108105102/> (Microprocessors and Microcontrollers)
2. <https://nptel.ac.in/courses/106/108/106108100/> (Microprocessors and Microcontrollers)

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2	2	2	-	-	-	-	2	2	3	2	2
2	3	3	3	2	2	2	-	-	-	-	2	2	3	2	2
3	3	3	3	2	2	2	-	-	-	-	2	2	3	2	2
4	3	3	3	2	2	2	-	-	-	-	2	2	3	2	2
5	3	3	3	2	2	2	-	-	-	-	2	2	3	2	2
AVG	3	3	3	2	2	2	-	-	-	-	2	2	3	2	2

1-Low 2-Medium 3-High '-' – No Correlation





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## DIGITAL SIGNAL PROCESSING

(Lab Embedded Theory Course)



23ECE401

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3 0 2 4

### OBJECTIVES

- To learn discrete Fourier transforms, properties of DFT and its application.
- To know digital IIR filters and apply these filters to various frequency bands.
- To understand the concept of digital FIR Filters.
- To study the effects of finite precision representation on digital filters.
- To learn the concepts of DSP applications.
- To perform basic signal processing operations and frequency analysis using MATLAB.

### UNIT I DISCRETE FOURIER TRANSFORM 9

Sampling Theorem, concept of frequency in discrete-time signals, summary of analysis & synthesis equations for FT & DTFT, frequency domain sampling, Discrete Fourier transform (DFT) - deriving DFT from DTFT, properties of DFT - periodicity, symmetry, circular convolution. Linear filtering using DFT. Filtering long data sequences - overlap save and overlap add method. Fast computation of DFT - Radix-2 Decimation-in-time (DIT) Fast Fourier transform (FFT), Decimation-in-frequency (DIF) Fast Fourier transform (FFT). Linear filtering using FFT.

### UNIT II INFINITE IMPULSE RESPONSE FILTERS 9

Characteristics of practical frequency selective filters. Characteristics of commonly used analog filters - Butterworth filters, Chebyshev filters. Design of IIR filters from analog filters (LPF, HPF, BPF, BRF) - Approximation of derivatives, Impulse invariance method, Bilinear transformation. Frequency transformation in the analog domain. Structure of IIR filter - direct form I, direct form II, Cascade, parallel realizations.

### UNIT III FINITE IMPULSE RESPONSE FILTERS 9

Design of FIR filters - symmetric and Anti-symmetric FIR filters-- design of linear phase FIR filters using Fourier series method - FIR filter design using windows (Rectangular, Hamming and Hanning window), Frequency sampling method. FIR filter structures - linear phase structure, direct form realizations.

### UNIT IV FINITE WORD LENGTH EFFECTS 9

Fixed point and floating point number representation - ADC - quantization - truncation and rounding - quantization noise - input / output quantization - coefficient quantization error - product quantization error - overflow error - limit cycle oscillations due to product quantization and summation - scaling to prevent overflow.





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## UNIT V DSP APPLICATIONS

9

Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor – Adaptive Filters: Introduction, Applications of adaptive filtering to equalization-DSP Architecture Fixed and Floating point architecture principles.

### LIST OF EXPERIMENTS

#### MATLAB / EQUIVALENT SOFTWARE PACKAGE

1. Generation of elementary Discrete-Time sequences.
2. Linear and Circular convolutions.
3. Auto correlation and Cross Correlation.
4. Frequency Analysis using DFT.
5. Design of FIR filters (LPF/HPF/BPF/BSF) and demonstrates the filtering operation.
6. Design of Butterworth and Chebyshev IIR filters (LPF/HPF/BPF/BSF).
7. Verification of Sampling Theorem.

#### DSP PROCESSOR BASED IMPLEMENTATION

1. Study of architecture of Digital Signal Processor
2. Perform MAC operation using various addressing modes
3. Generation of various signals and random noise.
4. Design and demonstration of FIR Filter for Low pass, High pass, Band pass and Band stop filtering.
5. Design and demonstration of Butter worth and Chebyshev IIR Filters for Low pass, High pass, Band pass and Band stop filtering.

**TOTAL: 45+15=60 PERIODS**

### OUTCOMES

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

- Apply DFT for the analysis of digital signals and systems.
- Design and realize IIR filters.
- Design and realize FIR filters using windows.
- Analyze the effects of finite precision representation on digital filters.
- Develop DSP application in communication systems.
- Demonstrate their abilities towards MATLAB based implementation of various DSP systems.





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## TEXT BOOKS

1. John G. Proakis and Dimitris G.Manolakis, Digital Signal Processing – Principles, Algorithms and Applications, Fourth Edition, Pearson Education / Prentice Hall, 2006.
2. V. Oppenheim, R.W. Schafer and J.R. Buck, —Discrete-Time Signal Processing”, Eighth Indian Reprint, Pearson, 1999.

## REFERENCES

1. Emmanuel C. I feachor and Barrie. W. Jervis, “Digital Signal Processing”, Second Edition, Pearson Education / Prentice Hall, 2012.
2. Sanjit K. Mitra, “Digital Signal Processing – A Computer Based Approach”, Tata Mc Graw Hill, 2007.

## E-RESOURCES

1. <https://nptel.ac.in/courses/117/102/117102060/> (Digital Signal Processing)
2. <https://nptel.ac.in/courses/108/106/108106151/> (Digital Signal Processing)

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	2	2	-	-	-	-	1	1	3	3	2
2	3	3	3	3	2	2	-	-	-	-	1	1	2	2	2
3	3	3	2	2	2	2	-	-	-	-	1	1	1	2	2
4	3	3	2	2	3	1	-	-	-	-	1	1	2	2	3
5	3	2	2	2	3	2	-	-	-	-	1	1	2	2	1
6	3	3	2	2	2	2	-	-	-	-	1	1	2	2	1
AVG	3	3	2	2	2	2	-	-	-	-	1	1	2	2	1

1-Low 2-Medium 3-High '-' – No Correlation





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**TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU**  
**COMMUNICATION SYSTEMS**

(Lab Embedded Theory Course)



23ECE402

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## OBJECTIVES

- To understand the Amplitude Modulation Schemes.
- To learn the random process and sampling.
- To study the various digital techniques.
- To know the various digital modulation schemes.
- To study the digital demodulation techniques.
- To demonstrate the digital systems and spectrum analysis.

## UNIT I AMPLITUDE MODULATION

9

Review of signals and systems, Time and Frequency domain representation of signals, Principles of Amplitude Modulation Systems- DSB, SSB and VSB modulations. Angle Modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated signals. SSB Generation – Filter and Phase Shift Methods, VSB Generation – Filter Method, Hilbert Transform, and Super heterodyne Receiver.

## UNIT II RANDOM PROCESS AND SAMPLING

9

Review of probability and random process. Gaussian and white noise characteristics, Noise in amplitude modulation systems, Noise in Frequency modulation systems. Low pass sampling – Aliasing - Signal Reconstruction-Quantization - Uniform & non-uniform quantization - quantization noise - Nyquist criterion- Logarithmic Companding.

## UNIT III DIGITAL TECHNIQUES

9

Pulse modulation, Differential pulse code modulation. Delta modulation, Noise considerations in PCM,, Digital Multiplexers, Channel coding theorem - Linear Block codes - Hamming codes - Cyclic codes - Convolutional codes - Viterbi Decoder.

## UNIT IV DIGITAL MODULATION SCHEME

9

Geometric Representation of signals - Generation, detection, IQ representation, PSD & BER of Coherent BPSK, BFSK, & QPSK - QAM - Carrier Synchronization - Structure of Non-coherent Receivers Synchronization and Carrier Recovery for Digital modulation, Principle of DPSK.







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## UNIT V DEMODULATION TECHNIQUES

9

Elements of Detection Theory, Optimum detection of signals in noise, Coherent communication with waveforms- Probability of Error evaluations. Baseband Pulse Transmission- Inter symbol Interference, Optimum demodulation of digital signals over band-limited channels.

### LIST OF EXPERIMENTS

1. AM- Modulator and Demodulator.
2. FM - Modulator and Demodulator.
3. Signal sampling and TDM.
4. Pulse Code Modulation and Demodulation.
5. Pulse Amplitude Modulation and Demodulation.
6. Digital Modulation – ASK, PSK, FSK.
7. Delta Modulation and Demodulation.
8. Simulation of ASK, FSK, and BPSK Generation and Detection Schemes.
9. Simulation of DPSK, QPSK and QAM Generation and Detection Schemes.
10. Simulation of Linear Block and Cyclic Error Control coding Schemes.

**TOTAL: 45+15=60 PERIODS**

### OUTCOMES

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

- Describe the Amplitude Modulation techniques.
- Apply the concepts of Random Process to the design of communication systems.
- Develop the various digital techniques and sampling codes.
- Analyze the various signals and its spectrum.
- Discuss the importance of demodulation techniques.
- Demonstrate their knowledge in various digital modulation techniques and its simulation.





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## TEXT BOOKS

1. Simon Haykins, “Communication Systems”, Wiley, Fifth Edition, 2009
2. B.P.Lathi, “Modern Digital and Analog Communication Systems”, Fourth Edition, Oxford University press, 2011.

## REFERENCES

1. A.Papoulis, “Probability, Random variables and Stochastic Processes”, McGraw Hill, Third edition, 1991.
2. B.Sklar, “Digital Communications Fundamentals and Applications”, Second Edition Pearson Education 2007.

## E-RESOURCES

1. <https://nptel.ac.in/courses/117/102/117102059/> (Communication Engineering)
2. <https://nptel.ac.in/courses/117/101/117101051/> (Digital Communication)

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	2	1	1	-	-	-	1	1	2	1	1
2	3	3	3	3	2	1	1	-	-	-	1	1	2	1	1
3	3	3	3	3	3	1	1	-	-	-	1	1	2	1	1
4	3	3	3	3	3	1	1	-	-	-	1	1	2	1	1
5	3	3	3	3	2	1	1	-	-	-	1	1	2	1	1
6	3	3	3	3	3	1	1	-	-	-	1	1	2	1	1
AVG	3	3	3	3	2.5	1	1	-	-	-	1	1	2	1	1

1-Low 2-Medium 3-High ‘-’ – No Correlation





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23ECE403

## LINEAR INTEGRATED CIRCUITS

(Lab Embedded Theory Course)

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### OBJECTIVES

- To introduce the basic building blocks of linear integrated circuits.
- To learn the linear and non-linear applications of operational amplifiers.
- To introduce the theory and applications of analog multipliers and PLL.
- To understand the theory of ADC and DAC.
- To introduce the concepts of waveform generation and introduce some special function ICs.
- To gain hands on experience in design and simulation of electronic circuits.

### UNIT I BASICS OF OPERATIONAL AMPLIFIERS

9

Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage References, BJT Differential amplifier with active loads, Basic information about op-amps – Ideal Operational Amplifier - General operational amplifier stages -and internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate, Open and closed loop configurations – MOSFET Operational Amplifiers – LF155 and TL082.

### UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS

9

Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.

### UNIT III ANALOG MULTIPLIER AND PLL

9

Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing and clock synchronization.

### UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS

9

Analog and Digital Data Conversions, D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode R - 2R Ladder types - switches for D/A converters, high speed sample-and-hold circuits, A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type – Dual Slope type - A/D Converter using Voltage-to-Time Conversion - Over-sampling A/D Converters, Sigma – Delta converters.





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## UNIT V WAVEFORM GENERATORS AND SPECIAL FUNCTION ICs

9

Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator - Monolithic switching regulator, Low Drop – Out(LDO) Regulators - Switched capacitor filter IC MF10, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Opto couplers and fibre optic IC.

### LIST OF EXPERIMENTS

#### DESIGN AND ANALYSIS OF THE FOLLOWING CIRCUITS

1. Series and Shunt feedback amplifiers-Frequency response, Input and output impedance.
2. RC Phase shift oscillator and Wien Bridge Oscillator.
3. RC Integrator and Differentiator circuits using Op-Amp.
4. Instrumentation amplifier.
5. Active low-pass, High pass & Band pass filters.
6. PLL Characteristics and its use as frequency multiplier, clock synchronization.
7. R-2R ladder type D-A converter using Op-Amp.
8. Schmitt Trigger circuit with Predictable hysteresis
9. Tuned Collector Oscillator.
10. Astable and Monostable multivibrators.
11. Simulation of Active low-pass, high-pass and band-pass filters using op-amp.
12. Simulation of Astable and Monostable multivibrators using NE555 Timer.

**TOTAL: 45+15=60 PERIODS**

#### OUTCOMES

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

- Analyze the Op-AMP Characteristics.
- Design linear and nonlinear applications of OP – AMPS.
- Design applications using analog multiplier and PLL.
- Design ADC and DAC using OP – AMPS.
- Develop waveforms using OP – AMP Circuits.
- Design and simulate Op-Amp circuits, oscillators and multivibrators using SPICE Tool.





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## TEXT BOOKS

1. D.Roy Choudhry, Shail Jain, “Linear Integrated Circuits”, New Age International Pvt. Ltd., 2018, Fifth Edition.
2. Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, Fourth Edition, Tata Mc Graw-Hill, 2016.

## REFERENCES

1. Robert F.Coughlin, Frederick F.Driscoll, “Operational Amplifiers and Linear Integrated Circuits”, Sixth Edition, PHI, 2001.
2. Ramakant A. Gayakwad, “OP-AMP and Linear ICs”, Fourth Edition, Prentice Hall / Pearson Education, 2015.

## E-RESOURCES

1. <https://archive.nptel.ac.in/courses/108/108/108108111/> (Op-Amps)
2. [https://onlinecourses.nptel.ac.in/noc23\\_ee77/preview\(Analog Electronic Circuits\)](https://onlinecourses.nptel.ac.in/noc23_ee77/preview(Analog Electronic Circuits))

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2	2	2	2	-	-	-	1	2	3	2	2
2	3	3	3	2	2	2	2	-	-	-	1	2	3	2	2
3	3	3	3	2	2	2	2	-	-	-	1	2	3	2	2
4	3	3	3	2	2	2	2	-	-	-	1	2	3	2	2
5	3	3	3	2	2	2	2	-	-	-	1	2	3	2	2
6	3	3	3	2	2	2	2	-	-	-	1	2	3	2	2
<b>AVG</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>

1-Low 2-Medium 3-High '-' – No Correlation





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## **DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING REGULATION-2023**

### **MINOR DEGREE / HONOURS – INTERNET OF THINGS CURRICULUM AND SYLLABI**





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## CURRICULUM AND SYLLABI FOR B.E. / B.Tech. DEGREE PROGRAMMES (MINOR/HONOURS DEGREE-INTERNET OF THINGS)

### B.E- ELECTRONICS AND COMMUNICATION ENGINEERING

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
<b>THEORY</b>									
23ECIT01	Introduction To Internet of Things	PC	3	0	0	3	40	60	100
23ECIT02	VLSI For IoT Systems	PC	3	0	0	3	40	60	100
23ECIT03	Industrial IoT and Industry 4.0	PC	3	0	0	3	40	60	100
<b>EMBEDDED COURSE</b>									
23ECIE01	IoT with Arduino, ESP and Raspberry Pi	PC	3	0	2	4	50	50	100
<b>EMPLOYABILITY ENHANCEMENT COURSE</b>									
23ECIP01	Project Work	EEC	0	0	12	6	40	60	100
<b>TOTAL CREDITS</b>			<b>19</b>						

- PC : Professional Core
- EEC : Employability Enhancement Courses
- L : Lecture
- T : Tutorial
- P : Practical
- C : Credit Point
- CIA : Continuous Internal Assessment
- ESE : End Semester Examination
- TOT : Total





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## SEMESTER III

23ECIT01

INTRODUCTION TO INTERNET OF THINGS

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### OBJECTIVES

- To study the fundamentals of IoT ecosystem.
- To learn the M2M technologies relating to the IoT.
- To know about the IoT architecture.
- To learn and deploy the IoT applications.
- To study the IoT privacy and security issues.

### UNIT I FUNDAMENTALS OF IoT

9

IoT & Web Technology: The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy.

### UNIT II M2M COMMUNICATION

9

M2M to IoT – A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, an emerging industrial structure for IoT, the international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview.

### UNIT III IoT ARCHITECTURE

9

IoT Architecture -State of the Art – Introduction, State of the art, Architecture Reference Model-Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture-Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

### UNIT IV IoT INDUSTRIAL APPLICATIONS

9

IoT Applications for Value Creations Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT for Oil and Gas Industry.

### UNIT V IoT PRIVACY AND SECURITY ISSUES

9

Internet of Things Privacy, Security and Governance Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smart Approach.

**TOTAL: 45 PERIODS**







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## OUTCOMES

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

- Analyze the technology and standards relating to IoTs.
- Build machine to machine communication.
- Develop the critical ecosystem required to mainstream IoTs.
- Acquire skills on developing their own national and enterprise level technical strategies.
- Analyze the privacy and security for IoT system.

## TEXT BOOKS

1. Nitesh Dhanjani, "Abusing the Internet of Things", Shroff Publisher/O'Reilly Publisher, 2015.
2. RMD Sundaram Shriram K Vasudevan, Abhishek S Nagarajan, "Internet of Things" John Wiley and Sons, 2019.

## REFERENCES

1. Shriram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram, "Internet of Things", John Wiley & Sons, 2019.
2. Cuno Pfister, "Getting Started with the Internet of Things", Shroff Publisher/Maker Media, 2011.

## E - RESOURCES

1. <https://archive.nptel.ac.in/courses/106/105/106105166/>(Introduction To Internet of Things)
2. [https://freevideolectures.com/course/4638/nptel-introduction-internet-things\(Interoperability in IoT, Introduction to Arduino Programming\)](https://freevideolectures.com/course/4638/nptel-introduction-internet-things(Interoperability-in-IoT,-Introduction-to-Arduino-Programming))

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	-	2	2	2	-	-	-	-	-	-	1	2	1	-
2	2	-	2	2	2	-	-	-	-	-	-	1	2	1	-
3	2	-	2	2	2	-	-	-	-	-	-	1	2	1	-
4	3	-	2	2	2	-	-	-	-	-	-	1	2	1	-
5	3	-	3	2	2	-	-	-	-	-	-	1	2	1	-
<b>AVG</b>	<b>2</b>	<b>-</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>-</b>

1-Low 2-Medium 3-High '-' – No Correlation





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## SEMESTER IV

23ECIT02

VLSI FOR IoT SYSTEMS

L P T C  
3 0 0 3

### OBJECTIVES

- To understand the concepts of IoT Systems.
- To study the components of IoT.
- To learn fabrication of IC technology.
- To understand the electronic system design for IoT.
- To know the various component models of IoT systems.

### UNIT I INTRODUCTION

9

Concept of connected world, Need, Legacy systems for connected world, features and limitations, key features of IoT architecture, Merits and Demerits of IoT Technology, Applications driven by IoT technology, examples.

### UNIT II COMPONENTS OF IoT

9

Review of classic embedded system architecture, Basic building blocks of an IoT system, Sensors and computing nodes. Sensors used in IoT Systems, Characteristics and requirements, Types of sensors for IoT systems, Compute nodes of IoT, Connectivity technologies in IoT, Software in IoT systems, features and properties.

### UNIT III IC TECHNOLOGY FOR IoT

9

SoC Architecture for IoT devices, Application processor, microcontrollers, smart analog, memory architecture for IoT, Non volatile memories(NVM), Embedded non volatile memories, Power management, Low drop out regulators, DC-to DC Converters, Voltage References, Power Management Units(PMUs) in IC's and Systems, Role of Field Programmability in IoT systems.

### UNITIV ELECTRONIC SYSTEM DESIGN FOR IoT

9

Electronic system Design for IoT, Requirements, Computing blocks in IoT systems, MCU's, DSPs and FPGA's, System power supply design for IoT systems, mixed signal challenges in hardware systems.

### UNIT V ANALYSIS OF IoT SYSTEMS

9

Component models and System Design, Feasibility and challenges, System level integration, Operating conditions of IoT devices and impact on Electronic System design, hardware security issues, EMI/EMC, SI/PI and Reliability analysis in IoT systems.

**TOTAL: 45 PERIODS**





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## OUTCOMES

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

- Discuss the concepts of IoT systems.
- Illustrate the components of IoT.
- Analyze the IC technology for IoT.
- Design of electronic system design for IoT.
- Apply the component models and system design.

## TEXT BOOKS

1. Alloto, "Enabling the internet of Things from Integrated Circuits to Integrated systems", Springer Publications, First Edition, 2017.
2. Pieter Harpe, Kofi A,A makinwa Andrea Baschiroto, " Hybrid ADCs, Smart sensors for the IoT, and sub-1V& Advanced Node analog circuit Design", Springer International Publishing AG,2017.

## REFERENCES

1. Rashid khan, Ajithvasudevan, "Learning IoT with Particle Photon and Electron", Packt Publishing Limited (Verlag), 2016.
2. Apek Muly, "Sustaining Moore's Law: Uncertainty Leading to a certainty of IoT Revolution", Margan and Claypool Publishers, 2015.

## E-RESOURCES

1. <https://archive.nptel.ac.in/courses/117/106/117106093/> (VLSI Technology)
2. <https://archive.nptel.ac.in/courses/106/105/106105166/> (Introduction to Internet of Things)

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	3	1	2	-	-	-	-	2	2	3	3	2	2
2	2	1	3	1	2	-	-	-	-	2	2	3	3	2	2
3	2	1	3	1	2	-	-	-	-	2	2	3	3	2	2
4	2	1	3	1	2	-	-	-	-	2	2	3	3	2	2
5	2	1	3	1	2	-	-	-	-	2	2	3	3	2	2
<b>AVG</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>

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## SEMESTER V

23ECIT03

INDUSTRIAL IoT AND INDUSTRY 4.0

LT P C

3 0 0 3

### OBJECTIVES

- To study the basic IoT architecture and applications.
- To know the communication protocol used in IoT.
- To learn the IoT physical devices.
- To study the IoT cloud dashboards.
- To relate in IoT system design – Hardware & Software.

### UNIT I IoT CONCEPT AND DEVELOPMENT PLATFORM

9

IoT Definition, Importance of IoT, Applications of IoT, IoT architecture, Understanding working of Sensors, Actuators, Sensor calibration, Study of Different sensors and their characteristics.

### UNIT II COMMUNICATION PROTOCOL USED IN IoT DEVELOPMENT

9

UART Communication Protocol, I2C Protocol device interfacing and decoding of signal, SPI Protocol device interfacing and decoding of signal, WIFI and Router interfacing, Ethernet Configuration, Bluetooth study and analysis of data flow, Zigbee Interfacing and study of signal flow.

### UNIT III IoT PHYSICAL DEVICES AND ENDPOINTS HARDWARE AND SENSORS

9

IoT Physical Devices and Endpoints- Introduction to Arduino and Raspberry Pi- Installation, Interfaces (serial, SPI, I2C), Programming – Python program with Raspberry PI with focus on interfacing external gadgets, controlling output, reading input from pins. Controlling Hardware- Connecting LED, Buzzer, Switching High Power devices with transistors, Controlling AC Power devices with Relays, Controlling servo motor, speed control of DC Motor, unipolar and bipolar Stepper motors; Sensors- Light sensor, temperature sensor with thermistor, voltage sensor, ADC and DAC, Temperature and Humidity Sensor DHT11, Motion Detection Sensors, Distance Measurement with ultrasound sensor.

### UNIT IV CLOUD SERVICES USED IN IoT DEVELOPMENT PLATFORM

9

Configuration of the cloud platform, Sending data from the IoT nodes to the gateways using different communication options; Transferring data from gateway to the cloud; Exploring the web services like mail, Messaging (SMS) and Twitter etc.; Tracking of cloud data as per the requirement; Google Cloud service architect.

### UNIT V CHALLENGES IN IoT SYSTEM DESIGN – HARDWARE AND SOFTWARE

9

Antenna design and placement, Chip-package system development, Power electronics, electromagnetic interference/compatibility (EMI/EMC), Electronics reliability; Battery simulation.

**TOTAL: 45 PERIODS**





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## OUTCOMES:

Upon completion of this course, Students will be able to:

- Analyze the building blocks of IoT technology and explore the vast spectrum of IoT applications.
- Develop processors and peripherals to design and build IoT hardware.
- Apply IoT physical devices and endpoints hardware.
- Analyze cloud services used in IoT.
- Design and implement IoT system design-hardware and software.

## TEXT BOOKS

1. Arshdeep Bahga and Vijay Madiseti, "Internet of Things-A Hands-on Approach", Universities Press, 2015, ISBN: 9788173719547.
2. Matt Richardson & Shawn Wallace, "Getting Started with Raspberry Pi", O'Reilly (SPD), 2014, ISBN: 9789350239759.

## REFERENCES

1. Raspberry Pi Cookbook, "Software and Hardware Problems and solutions", Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895.
2. N. Ida, Sensors, "Actuators and their Interfaces", SciTech Publishers, 2014.

## E-RESOURCES

1. <https://archive.nptel.ac.in/courses/106/105/106105166/>( Introduction to IoT)
2. [https://onlinecourses.nptel.ac.in/noc20\\_cs69/preview](https://onlinecourses.nptel.ac.in/noc20_cs69/preview) ( Introduction to Industry 4.0 and Industrial Internet of Things)





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## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	3	1	2	-	-	-	-	2	2	3	3	2	2
2	2	1	3	1	2	-	-	-	-	2	2	3	3	2	2
3	2	1	3	1	2	-	-	-	-	2	2	3	3	2	2
4	2	1	3	1	2	-	-	-	-	2	2	3	3	2	2
5	2	1	3	1	2	-	-	-	-	2	2	3	3	2	2
<b>AVG</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>

1-Low 2-Medium 3-High '-' – No Correlation





### SEMESTER VI

**23ECIE01 IoT WITH ARDUINO, ESP AND RASPBERRY PI**

**L T P C  
3 0 2 4**

#### OBJECTIVES

- To understand the concepts of IoT devices.
- To learn arduino and it's Interfacing.
- To study the basics of ESP board.
- To know the Raspberry Pi 3 and its configuration.
- To learn the various interfacing with sensor.
- To learn skills on hands-on experience using arduino and Raspberry Pi.

#### **UNIT I INTRODUCTION 9**

IoT- introduction and its components, IoT building blocks, Sensors and Actuators, IoT Devices, IoT boards (Arduino Uno, ESP 8266-12E Node MCU, and Raspberry Pi 3).

#### **UNIT II INTRODUCTION TO ARDUINO UNO 9**

Arduino Uno – getting started with the Uno boards, blink program, connection of sensors to the Uno board, reading values of sensors from the Uno board, interrupts. Case study: Temperature/Humidity Control; Case Study: Sending values Temperature/Humidity values to the Internet via GSM module.

#### **UNIT III GETTING STARTED WITH THE ESP BOARD 9**

ESP 8266-12E Node MCU – getting started with the ESP board, Micropython and Esplora IDE, Flushing the ESP8266 board with micropython, connecting sensors to the ESP board, Connecting ESP board to WiFi, Interfacing ESP with the Cloud (REST API- GET, POST, MQTT), interrupts, comparison of ESP 32 board with the ESP 8266 board. Case Study: Switching light on /off remotely. Case Study: Voice-based Home Automation for switching lights on/off (Android phone – Google Assistant (Assistant <-> IFTTT), MQTT (ESP <-> IFTTT), ESP 8266 <-> Lights).

#### **UNIT IV RASPBERRY PI 3 AND ITS CONFIGURATION 9**

Raspberry Pi 3 - Rpi3 introduction and installing the Raspbian Stretch OS, Headless - Computer and Rpi3 configuration to connect through SSH via Ethernet, Headless - connecting Rpi3 remotely without Ethernet cable via SSH, IP address, Rpi 3 - Testing the GPIO pins through Scripts.

#### **UNIT V RASPBERRY Pi3 INTERFACING WITH SENSOR 9**

Raspberry pi3 interfacing with Sensor DHT11, Raspberry pi3 python library install and reading sensor feed, 'Plug and play ' type cloud platform overview for integration to IoT devices, 'Plug and play' cloud platform for integration to IoT device - actuator (LED), Plug and play platform - Custom widget (DHT11-Sensor) integration through Python. New - Raspeberry Pi 4 Vs Raspberry Pi3 Model B Comparison, LoRawan /LPWAN – Overview.





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## LIST OF EXPERIMENTS

1. Introduction to Arduino Uno R3.
2. Blinking the LED with Arduino.
3. Read the analog voltage using ADC on Arduino.
4. Measure the distance of an object using ultrasonic sensor.
5. Getting started with Raspberry Pi, Install Raspian on your SD card.
6. Coding simple programs in Python.
7. Python-based IDE (integrated development environments) for the Raspberry Pi and how to trace and debug Python code on the device.
8. Raspberry Pi interacts with online services through the use of public APIs and SDKs.
9. Understanding the connectivity of Raspberry-Pi with IR sensor. Write an application to detect obstacle and notify user using LEDs.

**TOTAL: 45+15=60 PERIODS**

## OUTCOMES

Upon completion of this course, Students will be able to:

- Develop the concepts of IoT components.
- Discuss the arduino and Sensors interfacing.
- Apply commonly used IoT protocols such as REST API, MQTT through IOT based demonstration.
- Analyze the Raspberry Pi 3 and its configuration.
- Analyze analog sensor and digital sensor interfacing with IoT devices.
- Develop skills on hands-on experience using arduino and Raspberry Pi.

## TEXT BOOKS

1. Rao, M., "Internet of Things with Raspberry Pi 3: Leverage the power of Raspberry Pi 3 and JavaScript to build exciting IoT projects", Packt Publishing Ltd, 2018.
2. Baichtal, J. "Arduino for beginners: essential skills every maker needs", Pearson Education, 2013.







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## REFERENCES

1. Schwartz, M. "Internet of Things with ESP8266", Packt Publishing Ltd, 2016.
2. Richardson, M., & Wallace, S., "Getting started with raspberry Pi", O'Reilly Publisher Media, Inc., 2012.

## E-RESOURCES

1. <https://nptel.ac.in/courses/106105166> (Introduction to Internet of things)
2. <https://nptel.ac.in/courses/106105193> (Embedded system design with ARM)

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	2	2	2	-	-	-	-	2	2	3	3	2
2	3	3	3	2	2	2	-	-	-	-	2	1	2	3	2
3	3	3	3	2	2	2	-	-	-	-	2	2	3	3	2
4	3	2	3	2	2	2	-	-	-	-	2	2	2	3	1
5	3	3	3	3	2	2	-	-	-	-	2	2	3	3	2
6	3	2	3	2	2	2	-	-	-	-	1	1	3	2	2
<b>AVG</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>

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## SEMESTER VII

23ECIP01

PROJECT WORK

L T P C  
0 0 12 6

### OBJECTIVES

- To identify a specific problem for the current need of the society and collecting information related to the same through detailed review of literature.
- To build up skills to formulate a technical project.
- To develop the methodology to solve the identified problem.
- To teach use of new tools, algorithms and techniques required to carry out the projects.
- To train the students in preparing project reports and to face reviews and viva-voce examination.

### GUIDELINE FOR REVIEW AND EVALUATION

The students in a group of 3 works on a topic approved by the head of the department under the guidance of a faculty member who is familiar in this area of interest. The student can select any topic which is relevant to the area of engineering design. The topic may be theoretical or case studies. At the end of the semester, a detailed report on the work done should be submitted which contains clear definition of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work. The students will be evaluated through a viva-voce examination by a panel of examiners including one external examiner.

**TOTAL: 180 PERIODS**

### OUTCOMES

Upon completion of the project, Students will be able to:

- Formulate a real world problem, identify the requirement and develop the design solutions.
- Identify technical ideas, strategies and methodologies.
- Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.
- Prepare technical report and oral presentations.
- Lean the students will have a clear idea of their area of work and a systematic way.



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## Mapping of Cos-Pos & PSOs

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2	3	2	2	2	2	1	-	-	2	1	2	2	3	2	2
3	3	2	2	2	2	1	-	-	2	1	2	2	3	2	2
4	3	2	2	2	2	1	-	-	2	1	2	2	3	2	2
5	3	2	2	2	2	1	-	-	2	1	2	2	3	2	2
<b>AVG</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>

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## FOR B.E./ B.Tech. DEGREE PROGRAMMES (MINOR DEGREE /HONOURS - INTERNET OF THINGS)

### CREDIT SUMMARY

#### B.E.- ELECTRONICS AND COMMUNICATION ENGINEERING

Category	Credits Per Semester								Credit Total
	I	II	III	IV	V	VI	VII	VIII	
HS	-	-	-	-	-	-	-	-	-
BS	-	-	-	-	-	-	-	-	-
ES	-	-	-	-	-	-	-	-	-
PC	-	-	3	3	3	4	-	-	13
PE	-	-	-	-	-	-	-	-	-
OE	-	-	-	-	-	-	-	-	-
EEC	-	-	-	-	-	-	6	-	6
MC	-	-	-	-	-	-	-	-	-
Total	-	-	3	3	3	4	6	-	19





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## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

### REGULATION-2023

### MINOR DEGREE/HONOURS – ROBOTICS

### CURRICULUM AND SYLLABI





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## CURRICULUM FOR B.E./ B.Tech. DEGREE PROGRAMMES (MINOR/HONOURS DEGREE-ROBOTICS)

### B.E. – ELECTRONICS AND COMMUNICATION ENGINEERING

Course Code	Name of the Subject	Category	Periods /Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
<b>THEORY</b>									
23ECRT01	Principles of Robotics	PC	3	0	0	3	40	60	100
23ECRT02	Wireless Sensors Networks for Robotics	PC	3	0	0	3	40	60	100
23ECRT03	Artificial Intelligence for Robotics	PC	3	0	0	3	40	60	100
<b>EMBEDDED COURSE</b>									
23ECRE01	Microcontrollers for Robotics	PC	3	0	2	4	50	50	100
<b>EMPLOYABILITY ENHANCEMENT COURSE</b>									
23ECRP01	Project Work	EEC	0	0	12	6	40	60	100
<b>TOTAL CREDITS</b>						<b>19</b>			

- PC : Professional Core  
 EEC : Employability Enhancement Courses  
 L : Lecture  
 T : Tutorial  
 P : Practical  
 C : Credit Point  
 CIA : Continuous Internal Assessment  
 ESE : End Semester Examination  
 TOT : Total





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## SEMESTER III

23ECRT01

PRINCIPLES OF ROBOTICS

L T P C  
3 0 0 3

### OBJECTIVES

- To study the basic terminologies of the robotics.
- To know the grippers and sensors for robotics.
- To learn the basics of sensors drives and controllers.
- To study the robot system and programming languages.
- To introduce the functional elements of robotics and its applications.

### UNIT I INTRODUCTION TO ROBOTICS

9

Brief History-Basic Concepts of Robotics such as Definition - Three laws, Elements of Robotic Systems -Robot anatomy-DOF-Misunderstood devices -Classification of Robotic systems on the basis of various parameters such as work volume- type of drive-Associated parameters- Introduction to Principles & Strategies of Automation, Types & Levels of Automations, Need of automation, Industrial applications of robot.

### UNIT II GRIPPERS AND SENSORS FOR ROBOTICS

9

Grippers for Robotics - Types of Grippers, Guidelines for design for robotic gripper, Force analysis for various basic gripper systems. Sensors for Robots - Types of Sensors used in Robotics, Classification and applications of sensors, Characteristics of sensing devices, Selections of sensors. Need for sensors and vision system in the working and control of a robot.

### UNIT III DRIVES AND CONTROL FOR ROBOTICS

9

Drive - Types of Drives, Types of transmission systems, Actuators and its selection while designing a robot system. Control Systems: Types of Controllers, Introduction to closed loop control.

### UNIT IV PROGRAMMING AND LANGUAGES FOR ROBOTICS

9

Robot Programming: Methods of robot programming, WAIT, SIGNAL and DELAY commands, subroutines, Programming Languages: Generations of Robotic Languages, Introduction to various types such as VAL, RAIL, AML, Python, ROS etc., Development of languages since WAVE till ROS.

### UNIT V APPLICATIONS

9

Socio-Economic aspect of robotics Economical aspects for robot design, Safety for robot and standards, Introduction to Artificial Intelligence, AI techniques, Need and application of AI, New trends and recent updates in robotics.

**TOTAL: 45 PERIODS**





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## OUTCOMES

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

- Discuss update knowledge in the required area of robotic technology.
- Develop different views as per terminologies related to Robotics technology.
- Apply logic for selection of robotic subsystems and systems.
- Analyze basics of principals of robot system integration.
- Design the elements of robotics for its applications.

## TEXTBOOKS

1. Dilip Kumar Pratihari, "Fundamentals of Robotics", Narosa Publishing House, (2019).
2. S.B.Niku, "Introduction to Robotics – Analysis, Contro, Applications", Third Edition, John Wiley and Sons Ltd. (2020).

## REFERENCES

1. Mikell Groover, Mitchell Weiss, Roger N. Nagel, Nicholas Odrey, Ashish Dutta, "Industrial Robotics", Second Edition, SIE, McGraw Hill Education (India) Pvt Ltd (2012).
2. S.K.Saha, "Introduction to Robotics" Second Edition, TATA McGraw Hills Education, (2014).

## E-RESOURCES

1. <https://nptel.ac.in/courses/107106090> (Introduction to Robotics)
2. <https://nptel.ac.in/courses/108108147> (Sensors and Actuators)

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	-	-	1	3	2	1	-	-	-	3	3	2	2	2
2	3	2	3	1	3	2	1	-	-	-	3	3	2	2	2
3	3	2	3	1	3	2	1	-	-	-	3	-	2	2	2
4	3	2	3	1	3	2	1	-	-	-	3	-	2	2	2
5	3	2	3	1	3	2	1	-	-	-	3	-	2	2	2
AVG	3	2	3	1	3	2	3	-	-	-	3	3	2	2	2

1-Low 2-Medium 3-High '-' – No Correlation







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**SEMESTER IV**



23ECRT02

**WIRELESS SENSORS NETWORKS FOR ROBOTICS**

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

**OBJECTIVES**

- To know the basic wireless sensor networks.
- To study the architecture and tools used in networking.
- To impart knowledge in networking using sensors.
- To learn the basics in wireless architecture establishment.
- To know about the different sensor techniques used in network.

**UNIT I OVERVIEW OF WIRELESS SENSOR NETWORKS 9**

Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks.

**UNIT II ARCHITECTURES 9**

Joint distributions Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes Operating Systems and Execution Environments, Network Architecture -Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

**UNIT III NETWORKING SENSORS 9**

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC, The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing..

**UNIT IV INFRASTRUCTURE ESTABLISHMENT 9**

Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

**UNIT V SENSOR NETWORK PLATFORMS AND TOOLS 9**

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

**TOTAL: 45 PERIODS**





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## OUTCOMES

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

- Analyze the different techniques used in wireless sensor network.
- Analyze the basics of wireless architecture.
- Expose basic knowledge about wireless sensor networks.
- Discuss about the infrastructure establishment.
- Develop sensor network platforms and tools in networking.

## TEXTBOOKS

1. Holger Karl & Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

## REFERENCES

1. KazemSohraby, Daniel Minoli, &TaiebZnati, "Wireless Sensor Networks- Technology, Protocols, and Applications", John Wiley, 2011.
2. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.

## E-RESOURCES

1. <https://nptel.ac.in/courses/106105160> (Wireless Sensor Networks).
2. <https://nptel.ac.in/courses/117104118> (Estimation for Wireless Communications).

### Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	3	1	2	-	-	-	-	2	2	3	3	2	2
2	2	1	3	1	2	-	-	-	-	2	2	3	3	2	2
3	2	1	3	1	2	-	-	-	-	2	2	3	3	2	2
4	2	1	3	1	2	-	-	-	-	2	2	3	3	2	2
5	2	1	3	1	2	-	-	-	-	2	2	3	3	2	2
<b>AVG</b>	2	1	3	1	2	-	-	-	-	2	2	3	3	2	2

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**SEMESTER V**



23ECRT03

ARTIFICIAL INTELLIGENCE FOR ROBOTICS

L P T C  
3 0 0 3

**OBJECTIVES:**

- To learn the basics of artificial intelligence.
- To learn about planning in artificial intelligence.
- To introduce the reasoning concepts of machine learning.
- To study the methods of learning using Artificial Intelligence.
- To know the concepts of Artificial Intelligence in robotics.

**UNIT I INTRODUCTION 9**

State of the Art, Need for AI in Robotics. Thinking And Acting Humanly, Intelligent Agents, Structure Of Agents. PROBLEM SOLVING: Solving Problems by Searching –Informed Search and Exploration– Constraint Satisfaction Problems–Adversarial Search, Knowledge and Reasoning– Knowledge Representation – First Order Logic.

**UNIT II PLANNING 9**

Planning with forward and backward State space search – Partial order planning – Planning graphs  
Planning with propositional logic – Planning and acting in real world

**UNIT III REASONING 9**

Uncertainty – Probabilistic reasoning–Filtering and prediction–Hidden Markov models–Kalman filters– Dynamic Bayesian Networks, Speech recognition,making decisions.

**UNITIV LEARNING 9**

Forms of learning – Knowledge in learning – Statistical learning methods –reinforcement learning, communication, perceiving and acting, Probabilistic language processing, perception.

**UNIT V AI IN ROBOTICS 9**

Robotic perception, localization, mapping- configuring space, planning uncertain movements, dynamics and control of movement, Ethics and risks of artificial intelligence in robotics.

**TOTAL: 45 PERIODS**





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## OUTCOMES:

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

- Identify appropriate AI methods to solve a given problem.
- Analyze the problems that are amenable to solution by AI methods.
- Analyze a given problem in the language/framework of different AI methods.
- Implement basic AI algorithms.
- Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports.

## TEXTBOOKS

1. Stuart Russell, Peter Norvig, "Artificial Intelligence: A modern approach", Pearson Education, Third Edition, India, 2016.
2. Negnevitsky, M, "Artificial Intelligence: A guide to Intelligent Systems", Harlow: Addison Wesley, Second Edition, 2002.

## REFERENCES

1. Francis.X.Govers, "Artificial Intelligence for Robotics", Packt Publishing, Second Edition, 2018.
2. Huimin Lu, Xing Lu, "Artificial Intelligence and Robotics", Springer, First Edition, 2017.

## E-RESOURCES

1. <https://nptel.ac.in/courses/106105077>(Artificial Intelligence)
2. <https://nptel.ac.in/courses/106105078>(Probabilistic Reasoning)

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	1	3	3	2	-	-	-	-	2	2	3	2	3
2	2	3	1	3	3	2	-	-	-	-	2	2	3	2	3
3	3	3	1	3	3	2	-	-	-	-	2	2	3	2	3
4	2	2	1	3	3	2	-	-	-	-	2	2	3	2	3
5	2	3	1	3	3	2	-	-	-	-	2	2	3	2	3
<b>AVG</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>3</b>

1-Low 2-Medium 3-High '-' – No Correlation





## SEMESTER VI

23ECE01

MICROCONTROLLERS FOR ROBOTICS

LT P C  
3 0 2 4

### OBJECTIVES

- To study the basic architecture of microcontroller.
- To learn basic architecture and instruction set of AVR microcontroller.
- To study the AVR assembly and C programming.
- To know the AVR on-chip peripherals and its programming.
- To learn device interfacing and its programming.
- To experiment with robotic controller of real time operating systems.

### UNIT I FUNDAMENTALS OF MICROCONTROLLERS

9

History of microprocessor and microcontrollers, Difference between microprocessors and microcontrollers and Applications of microcontrollers, Comparison of 8-bit microcontrollers - 16-bit and 32-bit microcontrollers. Definition of embedded system and its characteristics - Role of microcontrollers in embedded Systems. Overview of the 8051 family Role of microcontrollers in embedded Systems. Introduction to Microcontroller Interfacing and applications.

### UNIT II ARCHITECTURE AND INSTRUCTION SET OF 8-BIT AVR MICROCONTROLLER

9

AVR Microcontroller architecture Registers, AVR status register, Memory Space, ATmega32(Arduino) pin-configuration & function of each pin, Addressing mode and instruction set AVR microcontroller, Data transfer, Arithmetic, Logic and Compare, Rotate and Shift, Branch and Call instructions, Bit manipulation instructions .

### UNIT III AVR ASSEMBLY AND C PROGRAMMING

9

AVR data types and assembler directives, AVR assembly language programs, AVR I/O Port, Programming, Time delay loop, Bit addressability, MACROs, Pros and cons of C and assembly language programming, Data types, Simple C programs for general purpose I/O and bit accessibility.

### UNIT IV AVR ON-CHIP PERIPHERALS AND ITS PROGRAMMING

9

AVR on-chip peripherals and its programming: General purpose I/O Ports, Timers, Interrupts, serial port, Serial port Interfacing protocols, SPI, I2C, UART. Assembly and C Language programming for peripherals.





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## UNIT V DEVICE INTERFACING AND ITS PROGRAMMING

9

Sensor interfacing, Relay, Opto-isolator and Stepper Motor Interfacing, Industrial servo interfacing, Raspberry Pi based programming for robots. Inverse Kinematics and Path Planning Programming using ROS

### LIST OF EXPERIMENTS

1. Introduction to Robotic controller card like Arduino UNO board and write program to blink LED using Arduino instructions, C language & Assembly language
2. Interfacing drivers for Arduino Controller for Robotic application. Various sensor interfacing with Robotic Controller like Arduino UNO board
3. Interfacing Seven Segment Display/ Alphanumeric Display.
4. ADC operation of Arduino using Potentiometer and Display.
5. Interface Stepper motor with AVR Microcontroller and Write program to rotate stepper motor in clockwise and anticlockwise direction.
6. Write Arduino program to receive IR Signal from IR remote and operate Electrical device based on switch pressed.
7. Write and execute Arduino program for serial communication. Transmit temperature value through serial communication and store it in spreadsheet or text file.
8. Toggle the ON/OFF status of an LED with a Switch.

**TOTAL: 45+15=60PERIODS**

### OUTCOMES

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

- Analyze the concepts of Microcontrollers.
- Discuss the Microcontroller architecture and instruction set of AVR.
- Develop AVR data types and simple C programs.
- Apply AVR on-chip peripherals and its programming.
- Analyze device interfacing and its programming.
- Design and implement C- language programming for Microcontroller applications.





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## TEXTBOOKS

1. Muhammad Ali Mazidi, Sarmad Naimi and SephehrNaimi, "The AVR Microcontroller and Embedded Systems", Using Assembly and C, Pearson Education, First Edition, 2012.
2. S. K. Saha, "Introduction to Robotics", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010.

## REFERENCES

1. R. K. Mittal, I. J. Nagrath, "Robotics and Control", Tata McGraw-Hill Publishing Company Ltd, 2017.
2. M. Morris Mano, "Computer System Architecture", Third Edition, Pearson Publication, 2007.

## E-RESOURCES

1. <https://nptel.ac.in/courses/117104072> (Microcontroller).
2. <https://nptel.ac.in/courses/106106210> (Programming and assembly language).

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	2	2	2	-	-	-	-	2	2	3	3	2
2	3	3	3	2	2	2	-	-	-	-	2	1	2	3	2
3	3	3	3	2	2	2	-	-	-	-	2	2	3	3	2
4	3	2	3	2	2	2	-	-	-	-	2	2	2	3	1
5	3	3	3	3	2	2	-	-	-	-	2	2	3	3	2
6	3	2	3	2	2	2	-	-	-	-	1	1	3	2	2
<b>AVG</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>

1-Low 2-Medium 3-High '-' – No Correlation





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## SEMESTER VII

23ECRP01

PROJECT WORK

L T P C

0 0 12 6

### OBJECTIVES

- To identify a specific problem for the current need of the society and collecting information related to the same through detailed review of literature.
- To build up skills to formulate a technical project.
- To develop the methodology to solve the identified problem.
- To teach use of new tools, algorithms and techniques required to carry out the projects.
- To train the students in preparing project reports and to face reviews and viva-voce examination.

### GUIDELINE FOR REVIEW AND EVALUATION

The students in a group of 3 works on a topic approved by the head of the department under the guidance of a faculty member who is familiar in this area of interest. The student can select any topic which is relevant to the area of engineering design. The topic may be theoretical or case studies. At the end of the semester, a detailed report on the work done should be submitted which contains clear definition of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work. The students will be evaluated through a viva-voce examination by a panel of examiners including one external examiner.

**TOTAL: 180 PERIODS**

### OUTCOMES

Upon completion of the project, Students will be able to:

- Formulate a real world problem, identify the requirement and develop the design solutions.
- Identify technical ideas, strategies and methodologies.
- Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.
- Prepare technical report and oral presentations.
- Lean the students will have a clear idea of their area of work and a systematic way.







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1	3	2	2	2	2	1	-	-	2	1	2	2	3	2	2
2	3	2	2	2	2	1	-	-	2	1	2	2	3	2	2
3	3	2	2	2	2	1	-	-	2	1	2	2	3	2	2
4	3	2	2	2	2	1	-	-	2	1	2	2	3	2	2
5	3	2	2	2	2	1	-	-	2	1	2	2	3	2	2
<b>AVG</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>

1-Low 2-Medium 3-High '-' – No Correlation





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## FOR B.E./ B.Tech. DEGREE PROGRAMMES (MINOR DEGREE /HONOURS - ROBOTICS)

### CREDIT SUMMARY

#### B.E.- ELECTRONICS AND COMMUNICATION ENGINEERING

Category	Credits Per Semester								Credit Total
	I	II	III	IV	V	VI	VII	VIII	
HS	-	-	-	-	-	-	-	-	-
BS	-	-	-	-	-	-	-	-	-
ES	-	-	-	-	-	-	-	-	-
PC	-	-	3	3	3	4	-	-	13
PE	-	-	-	-	-	-	-	-	-
OE	-	-	-	-	-	-	-	-	-
EEC	-	-	-	-	-	-	6	-	6
MC	-	-	-	-	-	-	-	-	-
Total	-	-	3	3	3	4	6	-	19

