Program and Course Structure

B.Sc. (Hons.)
Electronics with Specialization in Robotics and Applications

Programme Code: SET0509

Session 2020-2022

1. Standard Structure of the Program at University Level

1.1 Vision, Mission and Core Values of the University

Vision of the University

To serve the society by being a global University of higher learning in pursuit of academic excellence, innovation and nurturing entrepreneurship.

Mission of the University

1. **Transformative educational experience**
2. **Enrichment by educational initiatives that encourage global outlook**
3. **Develop research, support disruptive innovations and accelerate entrepreneurship**
4. **Seeking beyond boundaries**

Creative Campaign Can be TEDs: This is guiding principle for promotion and wide circulation among various stakeholder.
Guidelines: Similar Mnemonics can be designed by schools.

Core Values

- **Integrity**
- **Leadership**
- **Diversity**
- **Community**

Note: Detailed Mission Statements of University can be used for developing Mission Statements of Schools/ Departments.

1.2 Vision and Mission of the School

Vision of the School

To become a globally acclaimed institution of higher learning in engineering and technology promoting excellence in research, innovation and entrepreneurship to provide sustainable solution to the needs of the society

Mission of the School

1. **To impart quality education with strong industry & academic connectivity in the expanding fields of Engineering and Technology in a conducive and enriching learning environment.**
2. **To produce technocrats equipped with technical & soft skills and experiential learning required to stay current with the modern tools in emerging technologies to fulfill professional responsibilities and uphold ethical values.**
3. **To inculcate a culture of interdisciplinary research, innovation and entrepreneurship to provide sustainable solutions to meet the growing challenges and societal needs.**
4. **To foster collaborative learning and to play adaptive leadership role in professional career and pursuit of higher education through effective mentoring and counseling.**

1.2.1Vision and Mission of the Department

Vision of the Department

To establish itself among internationally acclaimed destinations of academic eminencein the discipline of Electronics and Communication Engineering, promoting research, innovation and entrepreneurship, to serve the society.

Mission of the Department

M1- To offer a curriculum of Electronics and Communication Engineering that enables students with knowledge, skills and lifelong learning for exploring professional practices.

M2-To foster the students for accepting challenges of industry driven real time problems to provide solutions to meet the globally growing societal needs.

M3- To create an environment for multi- and interdisciplinary research, innovations and entrepreneurship among students to serve society with latest technologies

M4- To develop core values and professional ethics through counseling as well as mentoring for higher education

1.3 Programme Educational Objectives (PEO)

1.3.1 Writing Programme Educational Objectives (PEO)

The Educational Objectives of B.Sc. (Hons.) Electronics with Specialization in Robotics and Application are:

PEO1 :To produce graduates who would have developed a strong background in basic science and mathematics and ability to use these tools in their chosen fields of specialization.

PEO2 :To produce graduates who have the ability to demonstrate technical competence in the fields of electronics and robotics

PEO3 :To produce graduates who would attain professional competence through life-long learning such as advanced degrees, professional registration, and other professional activities.

PEO4 :To produce graduates who function effectively in a multi-disciplinary environment and individually, within a global, societal, and environmental context

Methods of Forming PEO's

STEP 1: The needs of the Nation and society are identified through scientific publications, Alumini, industry interaction and media.

STEP 2. Taking the above into consideration, the PEOs are established by the Program Committee of the department..

STEP 4. The PEOs are communicated to all the faculty members of the department and their feedback is obtained.

STEP 5. The PEOs are then put to the Board of Studies of the department for final approval.

1.3.2 Map PEOs with Mission Statements:

PEO Statements	School Mission 1	School Mission 2	School Mission 3	School Mission 4
PEO1:	**3**	**3**	**2**	**2**
PEO2:	**1**	**1**	**2**	**3**
PEO3:	**3**	**3**	**2**	**2**
PEO4:	**1**	**2**	**3**	**2**

Enter correlation levels 1, 2, or 3 as defined below:

1. Slight (Low) 2. Moderate (Medium) 3. Substantial (High)

1.3.2.1 Map PEOs with Department Mission Statements:

PEO Statements	Department Mission 1	School Mission 2	School Mission 3	School Mission 4
PEO1:	3	3	3	3
PEO2:	3	2	2	2
PEO3:	2	1	3	2
PEO4:	1	1	2	1

1.3.3 Program Outcomes (PO's)

1. **Practical knowledge**: Apply the knowledge of mathematics, science to develop practical concepts and to attain the solution of complex problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyze real time problems reaching substantiated conclusions using gained knowledge
.
3. **Development of solutions**: Development of solutions for complex problems anddesign system components or processes that meet the specified needs with appropriateconsideration for the public health and safety, and the cultural, societal, and environmentalconsiderations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and researchmethods including design of experiments, analysis and interpretation of data, and synthesis of theinformation to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern software tools to develop domestic and industry products.
.
6. **Service to society**: Apply reasoning informed by the contextual knowledge to assesssocietal, health, safety, legal and cultural issues and the consequent responsibilities relevant to theprofessional practice.

7. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms oftheprofessional practice.

8.**Individual and team work**: Function effectively as an individual, and as a member or leader indiverse teams, and in multidisciplinary settings.

9.**Communication**: Communicate effectively on complex activities with the science community and with society at large, such as, being able to comprehend and write effective reportsand design documentation, make effective presentations, and give and receive clear instructions.
10.**Project management and finance**: Demonstrate knowledge and understanding of the science and management principles and apply these to one's own work, as a member andleader in a team, to manage projects and in multidisciplinary environments.

11.**Life-long learning**: Recognize the need for, and have the preparation and ability to engage inindependent and life-long learning in the broadest context of technological change.

PSO1- graduates will be able to apply the knowledge of electronics science to solve real worldproblems using concepts of electronics and Robotics.

PSO2-Able to implement circuits of electronics and Robotics.

PSO3-graduates will be able to develop and test portable electronics and robotics projects

1.3.4 Mapping of Program Outcome Vs Program Educational Objectives

	PEO1	PEO2	PEO3	PEO4
PO1	3	3	2	2
PO2	3	3	2	2
PO3	2	3	2	1
PO4	2	3	2	2
PO5	3	2	1	-
PO6	2	2	3	3
PO7	1		3	3
PO8	1	2	3	3
PO9	1	2	3	3
PO10	2	3	3	3
PO11	3	3	2	2
PSO1	3	3	2	2
PSO2	3	2	2	2
PSO3	3	3	2	2

1. Slight (Low) *2. Moderate (Medium)* *3. Substantial (High)*

1.3.5The components of the curriculum

Course Component	Curriculum Content (% of total number of credits of the program)	Total number of contact hours	Total number of credits
Basic Sciences	9	13	13
Engineering Sciences	9	13	13
Humanities and Social	9	21	13
Sciences	-	-	-
Program Core	38	60	53
Program Electives	17.8	31	25
Open Electives	2.1	03	03
Project(s)	5.7	16	8

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3

CO.110	3	3	2	2							1	2	2	3
CO113	3	2	2	1	-	-	-	-	-	-	1	1	1	2
CO.120	2	2	2									1	2	1
CO.121	2	2	1									1	2	.5
CO107	3	2	2	1	-	-	-	-	-	-	1	1	1	3
CO114	2	3	3	2	2				2	2		3	3	2
CO013	3	1	-	-	-	2	-	2	-	-	3	-	3	3
CO210	3	3	2	-	-	-	-	-	-	-	3	3	3	2
CO239	3	3	3	2	3	-	-	-	-	-	-	-	3	2
CO.242	3	3	2	2	1						1	2	2	3
CO014	3	2	3	2	2	2		2	1	1	3	3	2	3
CO.220	3	3	2	2							1	2	2	3
CO.223	3	3	2	2							1	2	2	3
CO.015	3	3	2	2							1	2	2	3
CO.226	1	2	1	2							1	1	2	1
CO. 311	3	3	3	1	2	1						2	2	
CO313	3	2				1		1			3	1	2	3
CO320	3	2	2	2							1	2	2	
CO343	2	2	2	2	1	1	1	1	1	1	3	3	2	2
CO321	2	2	2	1	1	2	2	1	1	1	3	3	3	2

1.3.6 Program Outcome Vs Courses Mapping Table:

1.3.6.1 COURSE ARTICULATION MATRIX

1-Slight (Low)
2-Moderate (Medium)
3-Substantial (High)

Program Structure
B.Sc. (Hons.)
Electronics with Specialization in Robotics and Applications
Batch: 2018-2021
TERM: I

S. No.	Subject Code	Subjects	Teaching Load			Credits	Pre-Requisite/Co Requisite
			L	T	P		
THEORY SUBJECTS							
1.	ECR110	Basic Circuit Theory and Network Analysis	3	1	0	4	
2.	CSE113	Programming for Problem Solving	3	0	0	3	
3.	EVS103	Environmental Science	2	0	0	2	
4.	MTH141	Calculus, Analysis and linear Algebra	3	1	0	4	
5.	FEN101/FEN103	Functional English Beginners-I/Functional English Intermediate-I	0	0	2	1	
6.	PHY117	Engineering Physics (Semiconductor Physics)	3	1	0	4	
Practical/Viva-Voce/Jury							
7.	EPR110	Basic Circuit Theory and Network Analysis Lab	0	0	2	1	
8.	CSP113	Programming for Problem Solving Lab	0	0	2	1	
9.	ENP102	Functional English Lab-I	0	0	2	1	
TOTAL CREDITS						**21**	

Program Structure
B.Sc. (Hons.)
Electronics with Specialization in Robotics and Application
Batch: 2018-2021
TERM: II

S. No.	Course Code	Course	Teaching Load			Credits	Pre-Requisite/Co Requisite
			L	T	P		
THEORY SUBJECTS							
1.	ECR120	Semiconductor Devices	3	1	0	4	
2.	ECR121	Applied Physics	3	1	0	4	
3.	CSE114	Application based programming in Python	3	0	0	3	
4.	HMM126	Universal Human Values and Ethics	2	0	0	2	
5.	CHY111	Engineering Chemistry	3	0	0	3	
6.	FEN102/FEN104	Functional English Beginners-2 /Functional English Intermediate-2	0	0	2	1	
Practical/Viva-Voce/Jury							
7.	ENP103	Functional English Lab-2	0	0	2	1	
8.	EPR121	Applied Physics Lab	0	0	2	1	
9.	CSP114	Application based programming in Python	0	0	2	1	
10.	ECP107	Tinkering Lab	0	0	2	1	
11.	ECP241	Open Source Software	0	0	2	1	
TOTAL CREDITS						**22**	

Program Structure
B.Sc. (Hons.)
Electronics with Specialization in Robotics and Application
Batch: 2018-2021 TERM: III

S. No.	Course Code	Course	Teaching Load			Credits	Pre-Requisite/Co Requisite
			L	T	P		
THEORY SUBJECTS							
1.	ECR210	Electronics Circuits	3	1	0	4	
2.	ECE239	Digital System Design	3	0	0	3	
3.	CSE242	Programming in C and Data Structures	3	1	0	4	
4.	ECR014	Sensors and Transducers of robotics	3	1	0	4	
5.	HMM303	Organizational Behavior	3	0	0	3	
Practical/Viva-Voce/Jury							
6.	EPR210	Electronics Circuits Lab	0	0	2	1	
7.	ECP239	Digital System Design Lab	0	0	2	1	
8.	ARP203	Aptitude Reasoning and Business Communication Skills-Basic	0	0	4	2	
9.	EPR014	Sensors and Transducers of robotics Lab	0	0	2	1	
10.	ECR013	Introduction to Industrial Environment	0	0	2	1	
11.	CSP242	Programming in C and Data Structures lab	0	0	2	1	
TOTAL CREDITS						**25**	

Program Structure

B.Sc. (Hons.)
Electronics with Specialization in Robotics and Application
Batch: 2018-2021
TERM: IV

S. No.	Course Code	Course	Teaching Load			Credits	Pre-Requisite/Co Requisite
			L	T	P		
THEORY SUBJECTS							
1.	ECR220	Operational Amplifiers and Applications	3	1	0	4	
2.	ECR221	Signals and Systems	3	1	0	4	
3.	ECR223	Electronic Instrumentation	3	1	0	4	
4.	ECR015	Mechatronics of Robotics	3	1	0	4	
5.	ECR311	Consumer electronics	3	1	0	4	
Practical/Viva-Voce/Jury							
6.	ARP204	Aptitude Reasoning and Business Communication Skills-Intermediate	0	0	4	2	
7.	EPR220	Operational Amplifiers and Applications Lab	0	0	2	1	
8.	EPR223	Electronic Instrumentation Lab	0	0	2	1	
9.	ECR015	Mechatronics of Robotics Lab	0	0	2	1	
TOTAL CREDITS						**25**	

Program Structure
B.Sc. (Hons.)
Electronics with Specialization in Robotics and Application
Batch: 2018-2021
TERM: V

S. No.	Course Code	Course	Teaching Load			Credits	Pre-Requisite/Co Requisite
			L	T	P		
THEORY SUBJECTS							
1.	ECE226	Microprocessor and Interfacings	3	1	0	4	
2.	ECR320	Communication Electronics	3	1	0	4	
3.		D E -1	3	1	0	4	
4.		D E -2	3	0	0	3	
5.		OE-1	3	0	0	3	
Practical/Viva-Voce/Jury							
6.	ECP226	Microprocessor and Interfacings Lab	0	0	2	1	
7.	EPR320	Communication Electronics Lab	0	0	2	1	
8.		D E -1 Lab	0	0	2	1	
9.		D E -2 Lab	0	0	2	1	
10.	EPR381	Project Based Learning	0	0	4	2	
TOTAL CREDITS						**24**	

Program Structure
B.Sc. (Hons.)
Electronics with Specialization in Robotics and Application
Batch: 2018-2021, TERM: VI

S. No.	Course Code	Course	Teaching Load			Credits	Pre-Requisite/Co Requisite
			L	T	P		
THEORY SUBJECTS							
1.	ECE343	Microcontrollers and Applications	3	0	0	3	
2.	ECR321	Optoelectronics	3	1	0	4	
3.		D E -3	3	0	0	3	
4.		D E -4	3	0	0	3	
Practical/Viva-Voce/Jury							
5.	ECP343	Microcontrollers and Applications lab	0	0	2	1	
6.	EPR321	Optoelectronics Lab	0	0	2	1	
7.	ECR313	Industrial Interface of Robotics	0	0	4	2	
8.	EPR382	Project	0	0	12	6	
TOTAL CREDITS						**23**	
GRAND TOTAL						**140**	

DEPARTMENT CORE

School: SET		**Batch : 2018-21**	
Program: B.Sc.		**Current Academic Year:**	
Branch: Hons.		**Semester: 1**	
1	Course Code	ECR110	
2	Course Title	**Basic Circuit Theory and Network Analysis**	
3	Credits	04	
4	Contact Hours (L-T-P)	3-1-0	
	Course Status	Compulsory	
5	Course Objective	1.understand basic concepts of DC and AC circuit behavior. 2.develop and solve mathematical representations for simple RLC circuits. 3.understand the use of circuit analysis theorems and methods.	
6	Course Outcomes	CO1:understand basic concepts of circuit elements and their applications CO2: use network techniques, like node analysis and loop analysis, to write equations for large linear circuits. CO3: apply phasor analysis to AC circuits in sinusoidal steady state and resonance circuits CO4: apply various network theorems to solve the circuit problems CO5: understand the simple two-port circuits CO6: analyse and evaluate two-port network parameters	
7	Course Description	This course is about basic concepts of circuit components resistance, capacitance and inductance and analyzing small RLC circuits. It also describes use of network techniques, like node analysis and loop analysis, to write equations for large linear circuits. The course explains applications of Thevenin and Norton theorems to analyze and design for maximum power transfer and apply the concept of linearity and the associated technique of superposition to circuits and networks.	
8	Outline syllabus		CO Mapping
	Unit 1	**Basic Circuit Concepts**	
	A	Voltage and Current Sources, Resistors: Fixed and	CO1

		Variable resistors, Construction and Characteristics, Colour coding of resistors, resistors in series and parallel.	
	B	Inductors: Fixed and Variable inductors, Self and mutual inductance, Faraday's law and Lenz's law of electromagnetic induction, Energy stored in an inductor, Inductance in series and parallel, Testing of resistance and inductance using multimeter.	CO1
	C	Capacitors: Principles of capacitance, Parallel plate capacitor, Permittivity, Definition of Dielectric Constant, Dielectric strength, Energy stored in a capacitor, Air, Paper, Mica, Teflon, Ceramic, Plastic and Electrolytic capacitor, Construction and application, capacitors in series and parallel, factors governing the value of capacitors, testing of capacitors using multimeter.	CO1
	Unit 2	**Circuit Analysis and DC Transient Analysis**	
	A	Kirchhoff's Current Law (KCL), Kirchhoff's Voltage Law (KVL), Node Analysis, Mesh Analysis, Star-Delta Conversion.	CO2
	B	RC Circuit- Charging and discharging with initial charge, RL Circuit with Initial Current, Time Constant,	CO2
	C	RL and RC Circuits With Sources, DC Response of Series RLC Circuits.	CO2
	Unit 3	**AC Circuit Analysis**	
	A	Sinusoidal Voltage and Current, Definition of Instantaneous, Peak, Peak to Peak, Root Mean Square and Average Values. Voltage-Current relationship in Resistor, Inductor and Capacitor, Phasor, Complex Impedance,	CO3
	B	Power in AC Circuits: Instantaneous Power, Average Power, Reactive Power, Power Factor. Sinusoidal Circuit Analysis for RL, RC and RLC Circuits.	CO3
	C	Resonance in Series and Parallel RLC Circuits, Frequency Response of Series and Parallel RLC Circuits, Quality (Q) Factor and Bandwidth. Passive Filters: Low Pass, High Pass, Band Pass and Band Stop.	CO3
	Unit 4	**Network Theorems**	
	A	Principal of Duality, Superposition Theorem, Thevenin's Theorem, Norton's Theorem,	CO4
	B	Reciprocity Theorem, Millman's Theorem, Maximum Power Transfer Theorem.	CO4

	C	AC circuit analysis using Network theorems.			CO4
	Unit 5	**Two Port Networks**			
	A	Two Port Networks: Impedance (Z) Parameters,			CO5, CO6
	B	Admittance (Y) Parameters,			CO5, CO6
	C	Transmission (ABCD) Parameters			CO5, CO6
	Mode of examination	Theory/Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1.S. A. Nasar, Electric Circuits, Schaum's outline series, Tata McGraw Hill (2004) 2. Electrical Circuits, M. Nahvi and J. Edminister, Schaum's Outline Series, Tata McGraw-Hill.(2005)			
	Other References	1.Robert L. Boylestad, Essentials of Circuit Analysis, Pearson Education (2004) 2.W. H. Hayt, J. E. Kemmerly, S. M. Durbin, Engineering Circuit Analysis, Tata McGraw Hill(2005) 3. Alexander and M. Sadiku, Fundamentals of Electric Circuits , McGraw Hill (2008)			

Course Matriculation Matrix:

COs	PO1	PO2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C.110.1	3	3	2	2							1	2	2	3
C.110.2	3	3	2	2							1	2	2	3
C.110.3	3	3	2	2							1	2	2	3
C.110.4	3	3	2	2							1	2	2	3
C.110.5	3	3	2	2							1	2	2	3
C.110.6	3	3	2	2							1	2	2	3
CO.110	**3**	**3**	**2**	**2**							**1**	**2**	**2**	**3**

School: SET		**Batch : 2018-21**	
Program: B.Sc.		**Current Academic Year:**	
Branch: Hons.		**Semester: 1**	
1	Course Code	EPR110	
2	Course Title	**Basic Circuit Theory and Network Analysis Lab**	
3	Credits	01	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory	
5	Course Objective	1.understand basic concepts of DC and AC circuit behaviour. 2.develop and solve mathematical representations for simple RLC circuits. 3.understand the use of circuit analysis theorems and methods.	
6	Course Outcomes	CO1:understand basic concepts of circuit elements and their applications CO2: use network techniques, like node analysis and loop analysis for series and parallel RLC circuit to write equations for large linear circuits. CO3: apply phasor analysis to AC circuits in sinusoidal steady state and resonance conditions CO4: apply various network theorems to solve the circuit problems CO5: apply the fundamental concepts in solving and analyzing different Electrical networks CO6: select appropriate and relevant technique for solving the Electrical network in different conditions	
7	Course Description	This course is about basic concepts of circuit components resistance, capacitance and inductance and analyzing small RLC circuits. It also describes use of network techniques, like node analysis and loop analysis, to write equations for large linear circuits. The course explains applications of Thevenin and Norton theorems to analyze and design for maximum power transfer and apply the concept of linearity and the associated technique of superposition to circuits and networks.	
8	Outline syllabus		CO Mapping
	Unit 1	**Basic Circuit Concepts**	
	A	a)Resistance in series, parallel and series – Parallel. b) Capacitors & Inductors in series & Parallel.	CO1
	B	c) Multimeter – Checking of components. d) Voltage sources in series, parallel and series – Parallel	CO1
	C	e) Voltage and Current dividers	CO1

	Unit 2	**Circuit Analysis and DC Transient Analysis**			
	A	Measurement of Amplitude, Frequency & Phase difference using CRO.			CO2
	B	RC Circuit- Charging and discharging with initial charge, RL Circuit with Initial Current, Time Constant,			CO2
	C	RL and RC Circuits With Sources, DC Response of Series RLC Circuits.			CO2
	Unit 3	**AC Circuit Analysis**			
	A	RC Circuits: Time Constant, Differentiator, Integrator.			CO3
	B	Designing of a Low Pass RC Filter and study of its Frequency Response.			CO3,CO2
	C	Designing of a High Pass RC Filter and study of its Frequency Response.			CO3,CO2
	Unit 4	**Network Theorems-I**			
	A	Introduction to Ohm's Law			CO4
	B	Verification of Kirchoff's Law			CO4
	C	Verification of Norton's theorem.			CO4
	Unit 5	**Network Theorems-II**			
	A	Verification of Thevenin's Theorem.			CO5,CO6
	B	Verification of Superposition Theorem.			CO5,CO6
	C	Verification of the Maximum Power Transfer Theorem.			CO5,CO6
	Mode of examination	Practical			
	Weightage Distribution	CA		ETE	
		60%		40%	
	Text book/s*				
	Other References				

Course Matriculation Matrix:

COs	PO1	PO2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C.110.1	3	3	2	2							1	2	2	3
C.110.2	3	3	2	2							1	2	2	3
C.110.3	3	3	2	2							1	2	2	3
C.110.4	3	3	2	2							1	2	2	3
C.110.5	3	3	2	2							1	2	2	3
C.110.6	3	3	2	2							1	2	2	3
co.110	3	3	2	2							1	2	2	3

School: SET		**Batch :2018-22**	
Program: B.Tech		**Current Academic Year:**	
Branch: ALL		**Semester:1**	
1	Course Code	**CSE113** Course Name: Programming for problem solving	
2	Course Title	Programming for problem solving	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Core	
5	Course Objective	1. Learn basic programming constructs –data types, decision structures, control structures in C 2. learning logic aptitude programming in c language 3. Developing software in c programming	
6	Course Outcomes	Students will be able to: CO1: Create flowchart , algorithm and Pseudo-code CO2: Understanding basic C concept CO3: Implement Array and Functions CO4: Understand and implement Pointers CO5: Apply user-defined data types	
7	Course Description	Programming for problem solving gives the Understanding of C programming and implement code from flowchart or algorithm	
8	Outline syllabus		CO Mapping
	Unit 1	**Logic Building**	
	A	Flowchart: Elements, Identifying and understanding input/ output, Branching and iteration in flowchart	CO1,
	B	Algorithm design: Problem solving approach(top down/bottom up approach)	CO1
	C	Pseudo Code : Representation of different construct, writing pseudo-code from algorithm and flowchart	CO1
	Unit 2	**Introduction to C Programming**	
	A	Introduction to C programming language, Data types, Variables, Constants, Identifiers and keywords, Storage classes	CO2
	B	Operators and expressions, Types of Statements: Assignment, Control, jumping.	CO2
	C	Control statements: Decisions, Loops, break, continue	CO2
	Unit 3	**Arrays and Functions**	
	A	Arrays: One dimensional and multi dimensional arrays: Declaration, Initialization and array manipulation (sorting, searching).	CO3
	B	Functions: Definition, Declaration/Prototyping and Calling, Types of functions, Parameter passing: Call by value, Call by reference.	CO3
	C	Passing and Returning Arrays from Functions, Recursive Functions.	CO3
	Unit 4	**Pre-processors and Pointers**	

	A	Pre-processors: Types, Directives, Pre-processors Operators (#,##,\) , Macros: Types, Use, predefined Macros			CO4
	B	Pointer: Introduction, declaration of pointer variables, Operations on pointers: Pointer arithmetic, Arrays and pointers, Dynamic memory allocation.			CO4
	C	String: Introduction, predefined string functions, Manipulation of text data, Command Line Arguments.			CO4
	Unit 5	**User Defined Data Types and File Handling**			
	A	Structure and Unions: Introduction, Declaration, Difference, Application, Nested structure, self-referential structure, Array of structures, Passing structure in function.			CO5
	B	Files: Introduction, concept of record, I/O Streaming and Buffering, Types of Files: Indexed file, sequential file and random file,			CO5
	C	Creating a data file, Opening and closing a data file, Various I/O operations on data files: Storing data or records in file, adding records, Retrieving, and updating Sequential file/random file.			CO5
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	Kernighan, Brian, and Dennis Ritchie. *The C Programming Language*			
	Other References	1. B.S. Gottfried - Programming With C - Schaum's Outline Series - Tata McGraw Hill 2nd Edition - 2004. 2. E. Balagurusamy - Programming in ANSI C - Second Edition - Tata McGraw Hill- 1999			

Course Atriculation Matrix:

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PS O1	PSO 2	PSO 3	PSO 5
CO113.1	3	3	2	2	-	-	-	-	-	-	-	2		1	3
CO113.2	1	1	2	-	-	-	-	-	-	-	-	-	2	-	2
CO113.3	2	2	1	-	-	-	-	-	--	-	-		1	2	3
CO113.4	2	1	2	-	-	-	-	-	-	-	1	-	2	-	3
CO113.5	3	2	1	-	-	-	-	-	-	-	1	1	-	1	3
CO113	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**1**	**1**	**3**

School: SET		**Batch: 2018**	
Program: B.Tech.		**Current Academic Year: 2018-19**	
Branch: CSE		**Semester: I**	
1	Course Code	CSP113	
2	Course Title	Programming for problem solving	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory	
5	Course Objective	4. Learn basic programming constructs –data types, decision structures, control structures in C 5. learning logic aptitude programming in c language 6. Developing software in c programming	
6	Course Outcomes	Students will be able to: CO1: Understand core concept of c Programming CO2: Implement Array and String CO3: Implement Functions CO4: Use Union and Structure CO5: Understand and implement Pointers	
7	Course Description	Programming for problem solving gives the Understanding of C programming and implement code from flowchart or algorithm	
8	Outline syllabus		CO Mapping
	Unit 1	**Logic Building**	**CO1**
		Draw flowchart for finding leap year	
		Write a c Program to Add Two Integers	
		Write a program to create a calculator	CO1
	Unit 2	**Introduction to C Programming**	**CO2**
		Write a c program to convert length meter to cm	
		Write a c program to convert temp	
		Write a c program to swap two numbers	
	Unit 3	**Arrays and Functions**	**CO3**
		Write a c program to calculate the average using arrays	
		Write a c program to find the largest element of the array	
	Unit 4	**Pre-processors and Pointers**	**CO4**
		Write a c program to swap two values using pointers	
		Write a c program to find largest number from array using pointers	
	Unit 5	**User Defined Data Types and File Handling**	**CO5**
		Write a c program to store information of a student using structure	
		Write a c program to store information of a student using union	
			CO4

	Mode of examination	Practical			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	Kernighan, Brian, and Dennis Ritchie. *The C Programming Language*			
	Other References	3. B.S. Gottfried - Programming With C - Schaum's Outline Series - Tata McGraw Hill 2nd Edition - 2004. 4. E. Balagurusamy - Programming in ANSI C - Second Edition - Tata McGraw Hill- 1999			

Course Atriculation Matrix:

Cos	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2	PSO 3
CO113.1	3	3	2	2	-	-	-	-	-	-	-	2		3
CO113.2	1	1	2	-	-	-	-	-	-	-	-	-	2	2
CO113.3	2	2	1	-	-	-	-	-	--	-	-		1	3
CO113.4	2	1	2	-	-	-	-	-	-	-	1	-	2	3
CO113.5	3	2	1	-	-	-	-	-	-	-	1	1	-	3
CO113	3	2	2	1							1	1	1	3

Branch: All		Semester: I	
1	Course Code	**EVS-103**	
2	Course Title	Environmental Science	
3	Credits	02	
4	Contact Hours (L-T-P)	2-0-0	
	Course Status	Compulsory	
5	Course Objective	1. Enable students to learn the concepts, principles and importance of environmental science **2.** Provide students an insight of various causes of natural resource depletion and its conservation **3.** Provide knowledge of layers of atmosphere with an insight of role of climatic elements in dispersion of pollutants 4. Provide detailed knowledge of causes, effects and control of different types of environmental pollution, solid waste management and its effect on climate change, global warming and ozone layer depletion 5. Provide and enrich the students about social issues such as R&R, water conservation and sustainability.	
6	Course Outcomes	CO1.Understand the principles and scope of environmental science CO2.Knowledge about various types of natural resources and its conservation CO3.Study about the structure and composition of atmosphere and factors affecting weather and climate CO4.Study about pollution causes, effects and control and solid waste management CO5.Effect of global warming and ozone layer depletion CO6.Understand sustainable development, resettlement and rehabilitation, impact of population explosion on environment	
7	Course Description	Environmental Science emphasises on various factors as 1. Importance and scope of environmental science 2. Natural resource conservation 3. Pollution causes, effects and control methods and solid waste management 4. Social issues associated with environment	
8	Outline syllabus		CO Mapping
	Unit 1	**General Introduction**	

	A	Definition, principles and scope of environmental science			CO1
	B	Water Resources, Land Resources, Food Resources			CO2
	C	Mineral Resources, Energy Resources, Forest Resources			CO2
	Unit 2	**Atmosphere and meteorological parameters**			
	A	Structure and composition of atmosphere			CO3
	B	Meteorological parameters: Pressure, Temperature, Precipitation, Humidity,			CO3
	C	Radiation, Wind speed and direction, Wind Rose			CO3
	Unit 3	**Environmental Pollution (Cause, effects and control measures)**			
	A	Air, water, Noise and Soil pollution			CO4
	B	Case studies on pollution			CO4
	C	Solid waste management: Causes, effects and control measures of urban and industrial wastes.			CO4
	Unit 4	**Climate Change and its impact**			
	A	Concept of Global Warming and greenhouse effect			CO5
	B	Ozone layer Depletion and its consequences			CO5
	C	Climate change and its effect on ecosystem, Kyoto protocol and IPCC concerns on changing climate			CO5
	Unit 5	**Social Issues and the Environment**			
	A	Concept of sustainable development, Water conservation			CO6
	B	Resettlement and rehabilitation of people; its problems and concerns, Case studies			CO6
	C	Population explosion and its consequences			CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	

	Text book/s*	**1.** Joseph, Benny, "Environmental Studies", Tata Mcgrav Hill. **2.** .Howard S. Peavy, Donald R. Rowe, George Tchobanoglous. Environmental engineering McGraw-Hill, 1985	

Course Matriculation Matrix:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C.120.1	2	1	1									1	2	1
C.120.2	3	2	1									1	2	1
C.120.3	2	3	1									1	2	1
C.120.4	1	2	2									1	2	1
C.120.5	2	2										1	2	1
C.120.6	2	2	1									1	2	1
CO.120	**2**	**2**	**1**									**1**	**2**	**1**

School: SET		**Batch : 2018-2021**	
Program: B.Sc.		**Current Academic Year:**	
Branch:Hons.		**Semester: 2**	
1	Course Code	ECR121	
2	Course Title	Applied Physics	
3	Credits	4	
4	Contact Hours (L-T-P)	3-1-0	
	Course Status	Compulsory	
5	Course Objective	1. To know the basic concept of Quantum Mechanics and its applications. 2. To understand the wave and particle nature of Light and matter 3. To understand the properties of Materials 4. To understand the concept of electricity and magnetism and its applications	
6	Course Outcomes	CO1:The student will learn duality of light and matter, physics of smaller particle and its applications in real world. CO2: The student will learn, the structure of matter, by different models. CO3: The student will learn different mechanical and thermal properties of matter. CO4: The student will learn electrical properties of matter CO5: The student will learn magnetic properties of matter	
7	Course Description	The course is to understand the basic physics of Quantum Mechanics and different models, in order to explain the different mechanical, thermal, electrical and magnetic properties of different materials.	
8	Outline syllabus		CO Mapping
	Unit 1	**Quantum Physics:**	
	A	Inadequacies of Classical physics. Compton's effect, Photo-electric Effect, Wave-particle duality, de Broglie waves. Basic postulates and formalism of quantum mechanics: probabilistic interpretation of waves, conditions for physical acceptability of wave functions. Schrodinger wave equation for a free particle and in a force field (1 dimension), Boundary and continuity conditions. Operators in Quantum Mechanics, Conservation of probability	CO1
	B	Time-dependent form, Linearity and superposition, Operators, Timeindependent one dimensional Schrodinger wave equation, Stationary	CO1

		states, Eigen-values and Eigen functions. Particle in a one-dimensional box, Extension to a three dimensional box, Potential barrier problems			
	C	Phenomenon of tunneling. Kronig Penney Model and development of band structure. Spherically symmetric potentials, the Hydrogen-like atom problem.			CO2
	Unit 2	**Mechanical Properties of Materials:**			
	A	Elastic and Plastic Deformations, Hooke's Law, Elastic Moduli,			CO3
	B	Brittle and Ductile Materials, Tensile Strength, Theoretical and Critical Shear Stress of Crystals.			CO3
	C	Strengthening Mechanisms, Hardness, Creep, Fatigue, Fracture.			CO3
	Unit 3	**Thermal Properties:**			
	A	Brief Introduction to Laws of Thermodynamics, Concept of Entropy, Concept of Phonons, Heat Capacity,			CO3
	B	Debye's Law, Lattice Specific Heat, Electronic Specific Heat, Specific Heat Capacity for Si and GaAs,			CO3
	C	Thermal Conductivity, Thermoelectricity, Seebeck Effect, Thomson Effect, Peltier Effect.			CO3
	Unit 4	**Electric and Magnetic Properties:**			
	A	Conductivity of metals, Ohm's Law, relaxation time, collision time.			CO4
	B	mean free path, electron scattering and resistivity of metals			CO4
	C	heat developed in current carrying conductor, Superconductivity.			CO4
	Unit 5	**Magnetic Properties:**			
	A	Classification of Magnetic Materials, Origin of Magnetic moment, Origin of dia, para, ferro and antiferro magnetism and their comparison			CO5
	B	Ferrimagnetic materials Saturation Magnetisation and Curie temperature,Magnetic domains,			CO5
	C	Concepts of Giant Magnetic Resistance (GMR), Magnetic recording.			CO5
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. S. Vijaya and G. Rangarajan, Material Science, Tata Mcgraw Hill (2003)			

		2. W. E. Callister, Material Science and Engineering: An Introduction, Wiley India (2006)	
	Other References	1. A. Beiser, Concepts of Modern Physics , McGraw-Hill Book Company (1987) 2. A. Ghatak& S. Lokanathan, Quantum Mechanics: Theory and Applications, Macmillan India (2004)	

Course Matriculation Matrix:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C.121.1	2	1										1		
C.121.2	3	2											2	
C.121.3	2	3											3	
C.121.4		2	2											1
C.121.5		2	2											1
CO.121	**2**	**2**	**1**									**1**	**2**	**1**

Program: B.Sc.		**Current Academic Year:**	
Branch:Hons.		**Semester: 2**	
1	Course Code	EPR121	
2	Course Title	Applied Physics	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory	
5	Course Objective	1. To know the basic concept of Quantum Mechanics and its applications. 2. To understand the wave and particle nature of Light and matter 3. To understand the properties of Materials 4. To understand the concept of electricity and magnetism and its applications	
6	Course Outcomes	CO1: learn and analyse various properties of semiconductor and its applications in real world. CO2: learn and analyse the structure of matter, by different models. CO3: learn and analyse thermal properties of matter. CO4: learn and analyse different mechanical properties of matter. CO5: learn and analyse electrical and magnetic properties of matter.	
7	Course Description	The course is to understand the basic physics of Quantum Mechanics and different models, in order to explain the different mechanical, thermal, electrical and magnetic properties of different materials.	
8	Outline syllabus		CO Mapping
	Unit 1		
	A	1. To determine Energy band gap of a semiconductor using Four Probe method.	CO1
	B	2. To determine the variation of magnetic field along the axis of a current carrying coil and estimatethe radius of the coil.	
	C	3.To study Hall effect and determine the Hall coefficient, carrier density and the mobility of asemiconductor material	CO1
	Unit 2	**Mechanical Properties of Materials:**	
	A	Calculate the relevant elastic, plastic, and fracture properties of these materials from the stress	CO2,CO3
	B	Compare elastoplastic properties measured under uniaxial loading to those predicted from local surface tests (hardness and indentation).	CO2,CO3
	C	Interpret these results in the context of the nano- to micro- to macroscopic mechanisms of deformation.	CO3

	Unit 3	**Thermal Properties:**			
	A	To calculate Heat Capacity of different materials			CO3
	B	To calculate specific Heat Capacity of different materials (Si and GaAs)			CO3
	C	To measure thermal conductivity of materials			
	Unit 4	**Electrical Properties**			
	A	To verify Ohm's Law			CO4
	B	To verify KVL			CO4
	C	To verify KCL			CO4
	Unit 5	**Magnetic Properties:**			
	A	To draw hysteresis curve (B-H curve) of a specimen in the form of a transformer on a C.R.O.			CO5
	B	And to determine its hysteresis loss			CO5
	C	To verify Stefan's Law			CO5
	Mode of examination	Practical			
	Weightage Distribution	CA	MTE	ETE	
		60%	-	40%	
	Text book/s*	1. S. Vijaya and G. Rangarajan, Material Science, Tata Mcgraw Hill (2003) 2. W. E. Callister, Material Science and Engineering: An Introduction, Wiley India (2006)			
	Other References	1. A. Beiser, Concepts of Modern Physics , McGraw-Hill Book Company (1987) 2. A. Ghatak& S. Lokanathan, Quantum Mechanics: Theory and Applications, Macmillan India (2004)			

Course Matriculation Matrix:

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO9	PO 10	PO 11	PSO1	PSO 2	PSO 3
C.121.1	2	1										1		
C.121.2	3	2											2	
C.121.3	2	3											3	
C.121.4		2	2											1
C.121.5		2	2											1
CO.121	**2**	**2**	**1**									**1**	**2**	**1**

School:		**Batch: 2018-22**	
Program:		**Current Academic Year:2018**	
Branch:		**Semester:2**	
1	Course Code	ECP107	
2	Course Title	Tinkering Labs	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory	
5	Course Objective	• To be acquainted with hardware's in Consumer Electronics goods	
6	Course Outcomes	Students can able to CO1: Identify and explain the parts of Cell phone charger CO2: Identify and describe the parts of Mobile phones CO3: Understand the need of USB CO4: Explain and Identify the parts of Speakers CO5: Identify and describe the parts of Computers	
7	Course Description	Justify and enhance their Knowledge on consumer products	
8	Outline syllabus		CO Mapping
	Unit 1	**Inside Cell phone Charger**	
	A	Unscrew	CO1
	B	Identifying parts	CO1
	C	Working	CO1
	Unit 2	**Mobile phones**	
	A	Unscrew	CO2
	B	Identifying parts	CO2
	C	Working	CO2
	Unit 3	**USB**	
	A	Basics	CO3
	B	Inside USB cable/Port	CO3
	C	Working	CO3
	Unit 4	**Speakers**	
	A	Unscrew	CO4
	B	Identifying parts	CO4
	C	Working	CO4
	Unit 5	**Computers**	

	A	Unscrew			CO5
	B	Identifying parts ,Working			CO5
	C	Screw up			CO5
	Mode of examination	Practical & Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	Lab Manuals			
	Other References	https://www.youtube.com/watch?v=WNRzU5DLA0I https://www.youtube.com/watch?v=jghFENiUsBI			

Course Articulation Matrix

Cos	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2	PSO 3
CO107.1	3	3	2	2	-	-	-	-	-	-	-	2		3
CO107.2	1	1	2	-	-	-	-	-	-	-	-	-	2	2
CO107.3	2	2	1	-	-	-	-	-	--	-	-		1	3
CO107.4	2	1	2	-	-	-	-	-	-	-	1	-	2	3
CO107.5	3	2	1	-	-	-	-	-	-	-	1	1	-	3
CO107	**3**	**2**	**2**	**1**	-	-	-	-	-	-	**1**	**1**	**1**	**3**

School: SET		**Batch : 2018-2021**	
Program: B.Tech/B.Sc.		**Current Academic Year: 2018-19**	
Branch: All		**Semester: II**	
1	Course Code	CSE114 | Course Name	
2	Course Title	Application Based Programming in Python	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Compulsory	
5	Course Objective	Emphasis is placed on procedural programming, algorithm design, and language constructs common to most high-level languages through Python Programming.	
6	Course Outcomes	Upon successful completion of this course, the student will be able to: CO1. Select decision-making and looping structures in programming. CO2. Apply Modular programming approach using methods and functions. CO3.Show the use of Python lists, tuples and dictionary. CO4. Incorporate object-oriented programming concept in programming. CO5: Use of python packages in different applications.	
7	Course Description	Python is a language with a simple syntax, and a powerful set of libraries. It is widely used in many scientific areas for data exploration. This course is an introduction to the Python programming language for students without prior programming experience. We cover data types, control flow, object-oriented programming.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	History, Python Environment, Variables, Data Types, Operators.	CO5
	B	**Conditional Statements:** If, If- else, Nested if-else. **Looping:** For, While, Nested loops.	CO1,CO5
	C	**Control Statements:** Break, Continue, And Pass. Comments	CO1,CO5
	Unit 2	**List, Tuple and Dictionaries**	
	A	**Lists and Nested List:** Introduction, Accessing list, Operations, Working with lists, Library Functionand Methods with Lists.	CO3
	B	**Tuple:** Introduction, Accessing tuples, Operations, Working, Library Functions and Methods with Tuples.	CO3

	C	**Dictionaries :**Introduction, Accessing values in dictionaries, Working with dictionaries,LibraryFunctions			CO3
	Unit 3	**Functions and Exception Handling**			
	A	**Functions:** Defining a function, Calling a function, Types of functions, Function Arguments			CO2,CO5
	B	Anonymous functions, Global and local variables			CO2,CO5
	C	**Exception Handling**: Definition Exception, Exception handling Except clause, Try? finally clause			CO2,CO5
	Unit 4	**OOP and File Handling**			
	A	**OOPs concept** : Class and object, Attributes, Abstraction, Encapsulation, Polymorphism and Inheritance			CO4
	B	Static and Final Keyword, Access Modifiers and specifiers, scope of a class			CO4
	C	User Defined Exceptions			CO4
	Unit 5	**Module and Applications**			
	A	**Modules:** Importing module, Math module, Random module			CO2,CO5,CO5
	B	Matplotlib, Packages			CO2,CO5,CO5
	C	**Applications: Searching Linear Search, Binary Search. Sorting: Bubble Sort**			CO2,CO5,CO5
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	5. The Complete Reference Python, Martin C. Brown, McGrwHill			
	Other References	1. Introduction to computing in problem solving using Python, E Balahurusamy, McGrwHill 2. Introduction to programming using Python, Y. Daniel Liang, Pearson 3. Mastering Python, Rick Van Hatten, Packet Publishing House 4. Starting out with Python, Tony Gaddis, Pearson			

Course Matriculation Matrix:

COs	PO1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO114.1	1	3	2	2	1	-	-	-	1	1	-	2	2	3
CO114.2	3	3	3	3	3	-	-	-	3	3	-	3	3	3
CO114.3	3	3	3	3	2	-	-	-	3	2	-	3	3	2
CO114.4	2	2	2	1	2	-	--	-	2	1	-	2	1	1
CO114.5	2	3	2	1	2				1	2		1	2	1
CO114	**2**	**3**	**3**	**2**	**2**				**2**	**2**		**3**	**3**	**2**

School: SET		**Batch: 2018-2021**	
Program: B.Tech		**Current Academic Year: 2018**	
Branch:All		**Semester: II**	
1	Course Code	CSP114	
2	Course Title	Application Based Programming in Python Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory	
5	Course Objective	Emphasis is placed on procedural programming, algorithm design, and language constructs common to most high level languages through Python Programming.	
6	Course Outcomes	Upon successful completion of this course, the student will be able to: CO1. Apply decision and repetition structures in program design. CO2. Implement methods and functions to improve readability of programs. CO3. Demonstrate the use of Python lists, tuples and dictionaries CO4. Describe and apply object-oriented programming methodology. CO5. Apply top-down concepts in algorithm design. CO6. Write Python programs to illustrate concise and efficient algorithms	
7	Course Description	Python is a language with a simple syntax, and a powerful set of libraries. It is widely used in many scientific areas for data exploration. This course is an introduction to the Python programming language for students without prior programming experience. We cover data types, control flow, object-oriented programming.	
8	Outline syllabus		CO Mapping
	Unit 1	**Practical based on conditional statements and control structures**	
		1. Program to implement all conditional statements **2. Program to implement different control structures**	CO1,C06
	Unit 2	**Practical related to List, Tuples and ictionaries**	
		1. Program to implement operations on lists **2. Program to implement operations on Dictionary** **3. Program to implement operations on Tuple**	CO3,CO6
	Unit 3	**Practical related to Functions and Exception Handling**	
		1. Program to implement Exception Handling **2. Program to use different functions**	CO2,CO6
	Unit 4	**Practical related to Object Oriented Programming**	
		Program to use object oriented concepts like inheritance, overloading polymorphism etc. **Program for file handling**	CO4,CO6
	Unit 5	**Practical related to Modules and Applications**	
		Program to use modules and package **Program to implement searching and sorting**	CO2,CO5,CO6

	Mode of examination	Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	6. The Complete Reference Python, Martin C. Brown, McGrwHill			
	Other References	5. Introduction to computing in problem solving using Python, E Balahurusamy, McGrwHill 6. Introduction to programming using Python, Y. Daniel Liang, Pearson 7. Mastering Python, Rick Van Hatten, Packet Publishing House 8. Starting out with Python, Tony Gaddis, Pearson			

Course Matriculation Matrix:

COs	PO1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO114.1	1	3	2	2	1	-	-	-	1	1	-	2	2	3
CO114.2	3	3	3	3	3	-	-	-	3	3	-	3	3	3
CO114.3	3	3	3	3	2	-	-	-	3	2	-	3	3	2
CO114.4	2	2	2	1	2	-	--	-	2	1	-	2	1	1
CO114.5	2	3	2	1	2				1	2		1	2	1
CO114.6	1	2	1	2	1				1	1		3	2	2
CO114	**2**	**3**	**3**	**2**	**2**				**2**	**2**		**3**	**3**	**2**

School: SET		**Batch : 2018-21**	
Program:B.Sc		**Current Academic Year:**	
Branch: Hons		**Semester:III**	
1	Course Code	ECR013 | Course Name	
2	Course Title	Introduction to Industrial Environment	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	UG	
5	Course Objective	1. Acquire knowledge of the industry in which the internship is done. 2. Apply knowledge and skills learned in the classroom in a work setting. 3. To decide the future application areas of Computer Science and Engineering.	
6	Course Outcomes	CO1. An ability to apply knowledge of mathematics, science, and engineering CO2. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability CO3. An ability to function on multidisciplinary teams CO4. An ability to identify, formulate, and solve engineering problems CO5. An understanding of professional and ethical responsibility	
7	Course Description	An internship experience provides the student with an opportunity to explore career interests while applying knowledge and skills learned in the classroom in a work setting.	
8	Outline syllabus		CO Mapping
	Unit 1	Self-Evaluate Before You Start	CO1
	Unit 2	Build a Strong Resume	CO2
	Unit 3	Put Together a Great Presentation	CO3
	Unit 4	Apply for Multiple Internships	CO4
	Unit 5	An Impressive Cover Letter, Prepare for the Interview	CO5

School: SET	Batch: 2018-2021

	Mode of examination	Practical			
	Weightage Distribution	CA	MTE	ETE	
		60%	NIL	40%	
	Text book/s*	NA			
	Other References	NA			

CO and PO Mapping

PO and PSO mapping with level of strength for Industrial Intership

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PS O1	PSO2	PSO3
CO013.1	3	2	-	-	-	2	-	2	-	-	3	3	-	3
CO013.2	3	2	-	-	-	2	-	1	-	-	3	-	3	2
CO013.3	3	2	-	-	-	2	-	2	-	-	3	-	2	3
CO013.4	3	-	-	-	-	1	-	2	-	-	3	-	3	2
CO013.5	3	-	-	-	-	1	-	-	-	-	3	-	3	2
CO013	**3**	**1**	**-**	**-**	**-**	**2**	**-**	**2**	**-**	**-**	**3**	**-**	**3**	**3**

Program: B.Sc.		Current Academic Year:	
Branch: Hons.		Semester: 3	
1	Course Code	ECR210	
2	Course Title	**Electronics Circuits**	
3	Credits	4	
4	Contact Hours (L-T-P)	3-1-0	
	Course Status	Compulsory	
5	Course Objective	1. Understand the working and characteristics of diodes and transistors. 2. Understand the role of different electronic devices in various electronic problems. 3. Understand and identity the various amplifier and their limitations. 4. Apply fundamentals of semiconductor devices in electronics circuit design, evaluation and analysis.	
6	Course Outcomes	On successful completion of this course students will be able to CO1: Define the working and application of active electronic devices. CO2: Understand the application of diodes in rectifiers and regulators. CO3: Analyze and design switching and amplifier circuits using transistors. CO4: Analyze and design oscillators and filter circuits employing transistors. CO5: Able to design amplifier circuits using BJT s And FET's. and observe the amplitude and frequency responses of common amplifier circuits CO6: Develop the skill to build, and troubleshoot Analog circuits.	
7	Course Description	The course contents introduction to semiconductor devices. Characteristics and biasing of diodes and transistors. Design and analysis of circuits using diodes, bipolar transistors, and field effect transistors. Application of transistors as amplifiers and switches.	
8	Outline syllabus		CO Mapping
	Unit 1	**Diode Circuits**	
	A	Ideal diode, piecewise linear equivalent circuit, dc load line analysis, Quiescent (Q) point. Clipping and clamping circuits. Rectifiers: HWR, FWR (center tapped and bridge). Circuit diagrams, working and waveforms,	CO1, CO2
	B	Ripple factor & efficiency, comparison. Filters: types, circuit diagram and explanation ofshunt capacitor filter with waveforms	CO1, CO2
	C	Zener diode regulator circuit diagram and explanation for load and line regulation, disadvantages of Zener	CO1, CO2

		diode regulator.			
	Unit 2	**Bipolar Junction Transistor**			
	A	Review of CE, CB Characteristics and regions of operation. Hybrid parameters. Transistor biasing, DC load line, operating point, thermal runaway, stability and stability factor, Fixed bias without and with RE, collector to base bias, voltage divider bias and emitter bias (+VCC and –VEE bias), circuit diagrams and their working.			CO1,CO3
	B	Transistor as a switch, circuit and working**,** Darlington pair and its applications			CO1,CO3
	C	BJT amplifier (CE), dc and ac load line analysis, hybrid model of CE configuration, Quantitative study of the frequency response of a CE amplifier, Effect on gain and bandwidth for Cascaded CE amplifiers (RC-coupled).			CO1,CO3
	Unit 3	**Feedback Amplifiers**			
	A	Concept of feedback, negative and positive feedback, advantages and disadvantages of negative feedback,			CO3,CO4
	B	voltage (series and shunt), current (series and shunt) feedback amplifiers, gain, input and output impedances .			CO3,CO4
	C	Barkhausen criteria for oscillations, Study of phase shift oscillator, Colpitts oscillator and Hartley oscillator.			CO3,CO4
	Unit 4	**MOSFET Circuits**			
	A	Review of Depletion and Enhancement MOSFET,			CO3,CO4
	B	Biasing of MOSFETs, Small Signal Parameters,			CO3,CO4
	C	Common Source amplifier circuit analysis, CMOS circuits.			CO3,CO4
	Unit 5	**Amplifiers**			
	A	**Power Amplifiers:** Difference between voltage and power amplifier, classification of power amplifiers, Class A, Class B, Class C and their comparisons.			CO5,CO6
	B	Operation of a Class A single ended power amplifier. Operation of Transformer coupled Class A power amplifier, overall efficiency. Circuit operation of complementary symmetry Class B push pull power amplifier, crossover distortion, heat sinks.			CO5, CO6
	C	**Single tuned amplifiers**: Circuit diagram, Working and Frequency Response for each, Limitations of single tuned amplifier, Applications of tuned amplifiers in communication circuits.			CO5, CO6
	Mode of examination	Theory			
	Weightage	CA	MTE	ETE	

	Distribution	30%	20%	50%	
	Text book/s*	1.Electronic Devices and circuit theory, Robert Boylstead and Louis Nashelsky, 9th Edition, 2013, PHI 2. Electronic devices, David A Bell, Reston Publishing Company			
	Other References	1.D. L. Schilling and C. Belove, Electronic Circuits: Discrete and Integrated, Tata McGraw Hill (2002) 2. Donald A. Neamen, Electronic Circuit Analysis and Design, Tata McGraw Hill (2002) 3. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001)			

Course Matriculation Matrix:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO210.1	3	3	1	-	-	-	-	-	-	-	3	3	3	1
CO210.2	3	3	1	-	-	-	-	-	-	-	3	3	3	1
CO210.3	3	3	2	-	-	-	-	-	-	-	3	3	3	1
CO210.4	3	3	2	-	-	-	-	-	-	-	3	3	3	1
CO210.5	3	3	3								3	3	3	1
CO210.6	3	3	3								3	3	3	1
CO210	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**3**	**1**

Program: B.Sc.		**Current Academic Year:**
Branch: Hons.		**Semester: 3**
1	Course Code	EPR210
2	Course Title	**Electronics Circuits Lab**
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	1. Understand the working of diodes, transistors. 2. Understand the application of different electronic devices and simple circuits. 2. Apply fundamentals of semiconductor devices in electronics projects and circuit design, evaluation and analysis.
6	Course Outcomes	CO1:Understand the working of diodes CO2: Apply diodes as rectifiers and regulators CO3: Apply transistors as switch CO4: analyze and design amplifier circuits, oscillators and filter circuits employing BJT, FET devices. CO5: Design and experiment with various signal and power amplifier circuits CO6: Analyse the frequency response and design of tuned amplifiers.
7	Course Description	The course contents introduction to semiconductor devices. Characteristics and biasing of diodes and transistors. Design and analysis of circuits using diodes, bipolar transistors, and field effect transistors. Application of transistors as amplifiers and switches.

8	Outline syllabus		CO Mapping
	Unit 1		
	A	Study of characteristics of diode, piecewise linear equivalent circuit, dc load line analysis, Quiescent (Q) point. Clipping and clamping circuits.	CO1, CO2
	B	Study of the half wave rectifier and Full wave rectifier. Ripple factor & efficiency, comparison. Filters: types, circuit diagram and explanation of shunt capacitor filter with waveforms	CO1, CO2
	C	Study of power supply using C filter and Zener diode. Designing and testing of 3V/5 V DC regulated power	CO1, CO2

		supply and find its load-regulation			
	Unit 2				
	A	Study of Hybrid parameters. Transistor biasing, DC load line, operating point, thermal runaway, stability and stability factor, Fixed bias without and with RE, collector to base bias, voltage divider bias and emitter bias (+VCC and –VEE bias), circuit diagrams and their working.			CO3,CO4
	B	Transistor as a switch, circuit and working**,** Darlington pair and its applications			CO3,CO4
	C	BJT amplifier (CE), dc and ac load line analysis, hybrid model of CE configuration, Quantitative study of the frequency response of a CE amplifier, Effect on gain and bandwidth for Cascaded CE amplifiers (RC-coupled).			CO3,CO4
	Unit 3				
	A	Study of negative feedback			CO3,CO4
	B	voltage (series and shunt), current (series and shunt) feedback amplifiers, gain, input and output impedances .			CO3,CO4
	C	Study of phase shift oscillator, Colpitts oscillator and Hartley oscillator.			CO3,CO4
	Unit 4				
	A	Study of biasing of MOSFETs, Small Signal Parameters, Common Source amplifier circuit analysis, CMOS circuits.			CO3,CO4
	B	Analysis of voltage and power amplifier, classification of power amplifiers, Class A, Class B, Class C and their comparisons. Operation of a Class A single ended power amplifier. Operation of Transformer coupled Class A power amplifier, overall efficiency.			CO3,CO4
	C	Circuit operation of complementary symmetry Class B push pull power amplifier			CO3,CO4
	Unit 5				
	A	Study of Circuit diagram, Working and Frequency Response for tuned amplifier			CO5,CO6
	B	Limitations of single tuned amplifier,			CO5,CO6
	C	Applications of tuned amplifiers in communication circuits.			CO5,CO6
	Mode of examination	Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	Refer Lab Mannual			
	Other References				

Course Matriculation Matrix:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO210.1	2	2	1	-	-	-	-	-	-	-	3	2	2	1
CO210.2	2	2	1	-	-	-	-	-	-	-	2	3	2	1
CO210.3	3	3	2	-	-	-	-	-	-	-	3	3	3	1
CO210.4	3	3	2	-	-	-	-	-	-	-	3	3	3	1
CO210.5	3	3	2	-	-	-	-	-	-	-	3	3	3	1
CO210.6	3	3	2	-	-	-	-	-	-	-	3	3	3	1
CO210	3	3	2	-	-	-	-	-	-	-	3	3	3	1

School: SET		**Batch : 2018-22**	
Program: B.Tech		**Current Academic Year:**	
Branch: ECE		**Semester:III**	
1	Course Code	ECE239	
2	Course Title	Digital System Design	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Compulsory	
5	Course Objective	1.To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits. 2. To prepare students to perform the analysis and design of various digital electronic circuits.	
6	Course Outcomes	CO1:Design and analyse combinational logic circuits CO2:Design & analyse modular combinational circuits with MUX/DEMUX, Decoder, Encoder CO3:Design & analyse synchronous sequential logic circuits CO4:Use HDL & appropriate EDA tools for digital logic design and simulation CO5: Apply the tools to develop projects	
7	Course Description	This course covers combinational and sequential logic circuits. Topics include number systems, Boolean algebra, logic families, medium scale integration (MSI) and large scale integration (LSI) circuits, analog to digital (AD) and digital to analog (DA) conversion, and other related topics. Upon completion, students should be able to construct, analyse, verify, and troubleshoot digital circuits using appropriate techniques and test equipment.	
8	Outline syllabus		CO Mapping
	Unit 1	**Logic Simplification**	
	A	Review of Boolean Algebra and De-Morgan's Theorem, SOP & POS forms.	CO1, CO2
	B	Canonical forms, Karnaugh maps up to 5 variables	
	C	Binary codes, Code Conversion.	
	Unit 2	**Combinational Logic Design**	
	A	Half and Full Adders, Subtractors, Serial and Parallel Adders	
	B	Parity Generator-Even and Odd, ALU	CO1, CO3
	C	MSI devices like Comparators, Multiplexers, Encoder, Decoder,	

		Driver & Multiplexed Display			
	Unit 3	**Sequential Logic Design**			
	A	Building blocks like S-R, D,JK,T and Master-Slave JK FF, Edge triggered FF			CO3,CO4
	B	Ripple Counter, Synchronous counters, Shift registers			CO3,CO4
	C	Finite state machines, Design of synchronous FSM, Designing synchronous circuits like Pulse train generator, Pseudo Random Binary Sequence generator, Clock generation			CO3,CO4
	Unit 4	**Logic Families and Semiconductor Memories**			
	A	TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, ECL, CMOS families			CO3,CO4
	B	Memory elements, Concept of Programmable logic devices like PLDs, FPGA.			CO4
	C	Logic implementation using Programmable Devices.			CO4
	Unit 5	**VLSI Design flow**			
	A	Design entry: Schematic, FSM & HDL, different modelling styles in HDL			CO4,CO5
	B	Data types and objects, Dataflow, Behavioural and Structural Modelling.			CO4,CO5
	C	Synthesis and Simulation HDL constructs and codes for combinational and sequential circuits.			CO4,CO5
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	R.P. Jain, “Modern digital Electronics”, Tata McGraw Hill, 4th edition, 2009.			
	Other References	1. Douglas Perry, “VHDL”, Tata McGraw Hill, 4th edition, 2002. 2. W.H. Gothmann, “Digital Electronics- An introduction to theory and practice”, PHI, 2nd edition, 2006. 3. D.V. Hall, “Digital Circuits and Systems”, Tata McGraw Hill, 1989 4. Charles Roth, “Digital System Design using VHDL”, Tata McGraw Hill 2nd edition 2012.			

Course Matriculation Matrix:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO239.1	3	3	2	3	1	-	-	-	-	-	-	-	2	-
CO239.2	3	3	3	1	3	-	-	-	-	-	-	-	3	-
CO239.3	3	3	3	2	3	-	-	-	-	-	-	-	3	2
CO239.4	3	3	3	2	3	-	-	-	-	-	-	-	3	3
CO239.5	3	3	3	2	3	-	-	-	-	-	-	-	3	3
CO239	**3**	**3**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**

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School: SET		**Batch :**2018-2021	
Program: Bsc		**Current Academic Year:** 2018-19	
Branch:Hons.		**Semester:3**	
1	Course Code	CSE242	
2	Course Title	Programming in C and Data Structures	
3	Credits	4	
4	Contact Hours (L-T-P)	3-1-0	
	Course Status	Compulsory	
5	Course Objective	1. Learn the basic concepts of Data Structures and algorithms. 2. Design and Implementation of Various Basic and Advanced Data Structures. 3. Learn the concepts of various searching, Sorting and Hashing Techniques. 4. Choose the appropriate data structures and algorithm design method for a specified application.	
6	Course Outcomes	CO1: Implement operation like traversing, insertion, deletion, searching etc. on various data structures. CO2: Evaluate algorithms and data structures in terms of time and memory complexity. CO3 Understand the application of linear data structure(s) to solve various problems CO4: Understand the application of non linear data structure(s) to solve various problems. CO5: Implement and know when to apply standard algorithms for searching and sorting. CO6: Choose the most appropriate data structure(s) for a given problem	
7	Course Description	This course starts with an introduction to data structures with its classification, efficiency of different algorithms, array and pointer based implementations and Recursive applications. As the course progresses the study of Linear and Non-Linear data structures are studied in details. The course talks primarily about Linked list, stacks, queue, Tree structure, Graphs etc. This Course also deals with the concept of searching, sorting and hashing methods.	
8	Outline syllabus		CO Mapping
	Unit 1	**Arrays and Linked List**	
	A	Data Structure – Definition, Operations and Applications, Abstract Data Types, Algorithm – Definition, Complexity and Asymptotic notations, Time and Space tradeoffs.	CO1
	B	Programming Principles – The art of writing programs,	CO1

		Recursion – Definition, Examples- Tower of Hanoi problem, Fibonacci Series, Arrays: Implementation of One Dimensional Arrays, Multidimensional Arrays, Pointer Arrays. Applications of Arrays, Address Calculation, Matrix Operations, Dense and Sparse Data in Arrays.			
	C	Concept of Linked List, Garbage Collection, Overflow and Underflow, Array Implementation and Dynamic Implementation of Singly Linked Lists, Array Implementation and Dynamic Implementation of Doubly Linked List, Circularly Linked List			CO2
	Unit 2	**Stack and Queue**			
	A	Stacks: Definitions, Primitive operations, Application of stacks – Conversion of Infix Expression to Postfix form, Evaluation of Postfix Expressions			CO3
	B	Queues: Definition, Primitive Operations, Implementation of Circular Queues, Priority Queues			CO3
	C	Deques, Application of Queues. Implementation - Linked Stacks, Linked Queues.			CO3
	Unit 3	**Tree and Graphs**			
	A	Trees: Terminologies, Binary tree, Representation,Applications – Operations on Binary Search Trees, Binary Search Algorithm, B Trees - Operations on a B Tree, Applications of B-trees.AVL Tree			CO4, CO6
	B	Graph: Terminology, Representation, Traversals- Depth First Search, Breadth First Search.			CO4, CO6
	C	Graph Applications – Minimum Spanning Trees – Prim's and Kruskal's Algorithms, Shortest Path – Dijkstra'sandFlyodWarshall's Algorithm			CO4, CO6
	Unit 4	**Searching and Sorting**			
	A	Implementation and Analysis - Linear search, Binary Search			CO5
	B	Implementation and Analysis- Bubble Sort,			CO5
	C	Merge Sort, Insertion Sort.			CO5
	Unit 5	**Sorting and Hashing**			
	A	Implementation and Analysis - Quick Sort, Selection Sort,			CO5
	B	Heap Sort, Hashing: Concepts and Applications,			CO5
	C	Hash Functions, Methods of Resolving Clashes			CO5
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Lipschutz, "Data Structures" Schaum's Outline Series, TMH			
	Other References	1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein "Data Structures Using C and C++" , PHI 2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication 3. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill 4. R. Kruse etal, "Data Structures and Program Design in C",			

		Pearson Education 5. G A V Pai, “Data Structures and Algorithms”, TMH	

Course Matriculation Matrix:

Cos	PO1	PO2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C.242.1	3	3	2	2							1	2	2	
C.242.2	3	3	2	2							1	2	2	
C.242.3	3	3	2	2							1	2	2	
C.242.4	3	3	2	2							1	2	2	**3**
C.242.5	3	3	2	2	3						1	2	2	**3**
C.242.6	3	3	2	2	3						1	2	2	**3**
CO.242	3	3	2	2	1						1	2	2	3

School: SET		**Batch: 2018-2022**	
Program: B.Sc		**Current Academic Year: 2018-19**	
Branch:ECE		**Semester:**	
1	Course Code	CSP242	
2	Course Title	Programming in C and Data Structure Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory	
5	Course Objective	1. Learn the basicconcepts of Data Structures and algorithms. 2. Design and Implementation of Various Basic and Advanced Data Structures. 3. Learn the concepts of various searching, Sorting and Hashing Techniques. 4. Choose the appropriate data structures and algorithm design method for a specified application.	
6	Course Outcomes	CO1: Handle operation like traversing, insertion, deletion, searching etc. on various data structures. CO2 Implement the application of linear data structure(s) to solve various problems CO3: Implement the application of non linear data structure(s) to solve various problems. CO4: Implement and know when to apply standard algorithms for searching and sorting. CO5: Choose the most appropriate data structure(s) for a given problem CO6: Choose the most appropriate data structure(s) for a given problem	
7	Course Description	This course starts with an introduction to data structures with its classification, efficiency of different algorithms, array and pointer based implementations and Recursive applications. As the course progresses the study of Linear and Non-Linear data structures are studied in details. The course talks primarily about Linked list, stacks, queue, Tree structure, Graphs etc. This Course also deals with the concept of searching, sorting and hashing methods.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	CO1
	A	Program to implement Operation on Array such as Traversing, Insertion & Deletion operation	CO1
	B	Program based on Recursion such as Towers of Hanoi, Fibonacci series etc,	CO1, CO2

	C	Program to implement different operation on the following linked list: Singly, Doubly and circular linked list.			CO2
	Unit 2	**Stack & Queue**			CO3
	A	Program to Implement Stack operation using Array and Linked list			CO3
		Program to convert infix expression to post fix expression			CO3
	B	Program on Evaluation of Post fix expression			CO3
		Program to implement queue operation using array and linked list			CO3
	C	Program to implement circular queue and deque.			CO3
	Unit 3	**Tree & Graph**			
	A	Program to implement binary tree			CO4, CO6
	B	Program to implement binary BST.			CO4, CO6
	C	Program to implement MST and shortest path algorithm.			CO4, CO6
	Unit 4	**Searching**			CO5
	A	Introduction to Searching			CO5
	B	Program on Linear Searching			CO5
	C	Program on Binary searching			CO5
	Unit 5	**Sorting & Hashing**			CO5
	A	Introduction to Sorting & Hashing			
	B	Program on Sorting			CO5
	C	Program on Hashing			CO5
	Mode of examination	Practical			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	1. Lipschutz, “Data Structures” Schaum’s Outline Series, TMH			
	Other References	1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein “Data Structures Using C and C++” , PHI 2. Horowitz and Sahani, “Fundamentals of Data Structures”, Galgotia Publication 3. Jean Paul Trembley and Paul G. Sorenson, “An Introduction to Data Structures with applications”, McGraw Hill 4. R. Kruse etal, “Data Structures and Program Design in C”, Pearson Education 5. G A V Pai, “Data Structures and Algorithms”, TMH			

Course Matriculation Matrix:

Cos	PO1	PO2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C.242.1	3	3	2	2							1	2	2	
C.242.2	3	3	2	2							1	2	2	3
C.242.3	3	3	2	2							1	2	2	3
C.242.4	3	3	2	2							1	2	2	**3**
C.242.5	3	3	2	2	3						1	2	2	**3**
C.242.6	3	3	2	2	3						1	2	2	**3**
CO.242	3	3	2	2	1						1	2	2	3

School: SET		**Batch : 2018-21**	
Program: B.Sc.		**Current Academic Year:**	
Branch:Hons.		**Semester:3/4**	
1	Course Code	ECR014	
2	Course Title	Sensors and Transducers of Robotics	
3	Credits	4	
4	Contact Hours (L-T-P)	3-1-0	
	Course Status	PE	
5	Course Objective	1.Getting knowledge of sensors and transducers 2.Getting knowledge of measuring systems concepts 3.Exploring ideas on design and development of sensors and measurement systems of robotics	
6	Course Outcomes	CO1:Able to know basic knowledge and principles of sensors CO2:Getting knowledge of primary Mechanical and Electromechanical sensors CO3:Understanding various types of electronics systems for sensors and transducers CO4: Able to work with imaging sensors robotics CO5:Develop applications based on sensors	
7	Course Description	The course is intended to know principles of different of types of sensors and transducers of robotics systems. It is also gives knowledge on signal processing of different types of sensors and transducers. This course gives knowledge of image capturing and basic process techniques. Finally, details real time robotics sensors systems have been discussed.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction to Sensors and Transducers**	
	A	Understanding of sensors and transducer; Classification sensors and transducers	CO1
	B	Block diagram of robotics systems; identifying uses of sensors and transducers on robotics systems	CO1
	C	Introduction to vision system of tobotics	CO1
	Unit 2	**Position, Light Sensors and Transducers**	

	A	Potentiometers (Linear & Rotational); Encoders (Linear & Rotational); Sonar sensors;			CO2
	B	Photo resistors; Photo diodes; photo transistors;			CO2
	C	Interfacing techniques			CO2, CO5
	Unit 3	**Force, Velocity Sensors and Transducers**			
	A	Strain gauges; load cells; Piezo electric transducers;			CO3
	B	Optical encoders; Tacho-generators; Tactile sensors;			CO3
	C	Interfacing techniques			CO3,CO5
	Unit 4	**Robot Vision Sensors**			
	A	Illumination;			CO4
	B	2-D sensors; 3-D sensors;			CO4
	C	Interfacing techniques			CO4,CO5
	Unit 5	**Introduction to Image Processing**			
	A	Convolution and filtering;			CO4
	B	Image Processing;			CO4
	C	Image analysis;			CO4,CO5
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	Robot sensors and transducers by S Ruocco, Halsted Press			
	Other References				

Course Matriculation Matrix:

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO014.1	2	2	2	1	-	2	-	2	-	-	2	2	1	2
CO014.2	3	2	3	3	2	3	-	2	-	-	3	2	3	3
CO014.3	3	2	2	2	1	2	-	2	1	-	3	3	3	3
CO014.4	2	2	2	1	2	1	-	1	1	1	2	3	2	2
CO014.5	2	2	2	1	2	1	-	1	1	1	2	3	2	2
CO014	**3**	**2**	**3**	**2**	**2**	**2**		**2**	**1**	**1**	**3**	**3**	**2**	**3**

School: SET		**Batch: 2018-21**	
Program: B.Sc.		**Current Academic Year:2018**	
Branch:Hons.			
1	Course Code	EPR014	
2	Course Title	Sensors and Transducers of Robotics Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	PE	
5	Course Objective	• To do demo of temperature sensors of robotics • To explore knowledge on displacement sensors of robotics • To get practical knowledge on special sensors of robotics	
6	Course Outcomes	CO1: Able to select proper sensors for temperature sensing CO2: Able to handle displacement sensors CO3: Able to work with concepts of special sensors CO4: Able to interface digital sensors with controllers CO5:Develop applications based on sensors	
7	Course Description	Sensors and transducers are very important inputs to any analog and digital systems. They are very important for robotics systems. So, this lab gives total practical knowledge on sensors and transducers of robotics systems	
8	Outline syllabus		CO Mapping
	Unit 1	**Temperature Sensors and Transducers**	
	A	Characteristics of RTD & Thermocouple	CO1
	B	Characteristics of Thermistor, LM 34 & LM 35	CO1
	C	Characteristics of AD 592	CO1
	Unit 2	**Displacement Sensors and Transducers**	
	A	Characteristics of Linear and Rotor Pots	CO1,CO2
	B	Characteristics of Linear Encoders	CO1,CO2
	C	Characteristics of Rotational Encoders	CO1,CO2
	Unit 3	**Pressure, Force Sensors and Other Sensors**	
	A	Characteristics of Strain gauge or Tactile	CO1,CO3
	B	Characteristics of LDR	CO1,CO3
	C	Characteristics of sonic sensors	CO1,CO3
	Unit 4	**Other Sensors**	
	A	Proximity Sensors	CO1,CO4

	B	Current and Voltage Sensors for battery			CO1,CO4
	C	Digital Sensors DHT 11			CO1,CO4
	Unit 5	**Image Practicals**			
	A	Interfacing of Camera			CO1,CO5
	B	Image Processing with DSP Kit			CO1,CO5
	C	Image Recognition with DSP Kit			CO1,CO5
	Mode of examination	Practical & Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	Refer lab manuals			
	Other References				

Course Matriculation Matrix:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO014.1	2	2	2	1	-	2	-	2	-	-	2	2	1	2
CO014.2	3	2	1	2	2	3	-	2	-	1	3	2	3	2
CO014.3	3	1	2	1	1	2	-	2	1	-	2	2	2	3
CO014.4	2	2	2	1	2	1	-	1	1	1	2	3	2	3
CO014.5	2	2	2	1	2	1	-	1	1	1	2	3	2	3
CO014	**3**	**2**	**3**	**2**	**2**	**2**		**2**	**1**	**1**	**3**	**3**	**2**	**3**

School: SET		**Batch : 2018-21**
Program: B.Sc.		**Current Academic Year:**
Branch:Hons.		**Semester: 4**
1	Course Code	ECR220
2	Course Title	Operational Amplifiers and Applications
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Status	Compulsory
5	Course Objective	1.Getting knowledge of working and internal structure of operational

		amplifier 2.Exploring ideas on design and development of active filters 3.Ability to design analog computational circuits using OP-AMP	
6	Course Outcomes	CO1: Understand the properties of ideal amplifiers and the concepts of gain, input impedance, and output impedance CO2: Identify the difference between open-loop and closed-loop op-amp configuration; and compute the gain CO3: Analyze and design simple Multivibrator circuits. CO4: Describe the structure and behavior of analog computers, and design analog computer circuits to solve simple differential equations. CO5: Analyze and design active filter circuits CO6: Choose the appropriate integrated circuit modules to build a given application	
7	Course Description	The course includes the design of elements in bipolar- and CMOS-based op amps, feedback, power supplies, linear and non-linear applications circuits with the op amp as the basic building block, and transistor circuits for realising basic digital circuits. This course provides sufficient basic knowledge for the undergraduate to understand the design of op amps and their applications as well as the design of digital circuits	
8	Outline syllabus		CO Mapping
	Unit 1	**Basic Operational Amplifier & parameters**	
	A	Concept of differential amplifiers (Dual input balanced and unbalanced output), constant current bias, current mirror, cascaded differential amplifier stages with concept of level translator, block diagram of an operational amplifier (IC 741)	CO1, CO2
	B	Op-Amp parameters: input offset voltage, input offset current, input bias current, differential input resistance, input capacitance,	CO1, CO3
	C	Offset voltage adjustment range, input voltage range, common mode rejection ratio, slew rate, supply voltage rejection ratio.	CO3, CO4
	Unit 2	**Op-Amp Circuits & Comparators**	
	A	Op-Amp Circuits: Open and closed loop configuration, Frequency response of an op-amp in open loop and closed loop configurations, Inverting, Non-inverting, Summing and difference amplifier, Integrator, Differentiator, Voltage to current converter, Current to voltage converter.	CO2, CO4
	B	Comparators: Basic comparator, Level detector, Voltage limiters, Schmitt Trigger.	CO2, CO4
	C	Signal generators:Phase shift oscillator, Wein bridge	CO2, CO4

		oscillator, Square wave generator, triangle wave generator, saw tooth wave generator, and Voltage controlled oscillator(IC 566).			
	Unit 3	**Multivibrators:**			
	A	Multivibrators (IC 555): Block diagram,			CO3
	B	Astable and monostablemultivibrator circuit,			CO3
	C	Applications of Monostable and Astablemultivibrators.			CO3
	Unit 4	**PLL and IC regulators**			
	A	Phase locked loops (PLL): Block diagram, phase detectors, IC565.			CO4
	B	Fixed and variable IC regulators: IC 78xx and IC 79xx - concepts only,			CO4
	C	IC LM317- output voltage equation			CO4
	Unit 5	**Signal Conditioning circuits:**			
	A	Signal Conditioning circuits: Sample and hold systems,			CO5,CO6
	B	Active filters: First order low pass and high pass butterworth filter, Second order filters, Band pass filter, Band reject filter, All pass filter,			CO5,CO6
	C	Log and antilog amplifiers.			CO5,CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. R. A. Gayakwad, Op-Amps and Linear IC's, Pearson Education (2003) 2. R. F. Coughlin and F. F. Driscoll, Operational amplifiers and Linear Integrated circuits, Pearson Education (2001)			
	Other References	1. J. Millman and C.C. Halkias, Integrated Electronics, Tata McGraw-Hill,(2001) 2. A.P.Malvino, Electronic Principals,6th Edition , Tata McGraw-Hill,(2003)			

Course Matriculation Matrix:

COs	PO1	PO2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C.220.1	3	3	2	2							1	2	2	3
C.220.2	3	3	2	2							1	2	2	3

C.220.3	3	3	2	2							1	2	2	3
C.220.4	3	3	2	2							1	2	2	3
C.220.5	3	3	2	2							1	2	2	3
C.220.6	3	3	2	2							1	2	2	3
co.220	3	3	2	2							1	2	2	3

School: SET		**Batch : 2018-21**
Program: B.Sc.		**Current Academic Year:**
Branch:Hons.		**Semester: 4**
1	Course Code	EPR220
2	Course Title	Operational Amplifiers and Applications Lab
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	1.Getting knowledge of working and internal structure of operational amplifier 2.Exploring ideas on design and development of active filters 3.Ability to design analog computational circuits using OP-AMP
6	Course Outcomes	CO1: Understand the properties of ideal amplifiers and the concepts of gain, input impedance, and output impedance CO2: Identify the difference between open-loop and closed-loop op-amp configuration; and compute the gain: CO3:Analyze and design simple active filters. Analyze and design ideal integrator and differentiator circuits. CO4: Describe the structure and behavior of analog computers, and design analog computer circuits to solve simple differential equations. CO5: Analyze and design power supply circuits CO6: Choose the appropriate integrated circuit modules to build a given application
7	Course Description	The course includes the design of elements in bipolar- and CMOS-based op amps, feedback, power supplies, linear and non-linear applications circuits with the op amp as the basic building block, and transistor circuits for realising basic digital circuits. This course provides sufficient basic knowledge for the undergraduate to understand the design of op amps and their applications as well as the design of digital circuits
8	Outline syllabus		CO Mapping
	Unit 1		
	A	1.Study of op-amp characteristics: CMRR and Slew rate.	CO1, CO2
	B	2. Designing of an amplifier of given gain for an inverting	CO1, CO3

		and non-inverting configuration using an opamp.			
	C	3. Designing of analog adder and subtractor circuit.			CO3, CO1
	Unit 2				
	A	4. Designing of an integrator using op-amp for a given specification and study its frequency response.			CO2, CO3
	B	5. Designing of a differentiator using op-amp for a given specification and study its frequency response.			CO2, CO3
	C	6. Designing of a comparator using op-amp for a given specification			CO2, CO3
	Unit 3				
	A	7. Designing of a First Order Low-pass filter using op-amp.			CO1, CO3
	B	8. Designing of a First Order High-pass filter using op-amp.			CO1, CO3
	C	9. Designing of a RC Phase Shift Oscillator using op-amp.			CO1, CO3
	Unit 4				
	A	10. Study of IC 555 as an astable multivibrator.			CO3, CO4
	B	11. Study of IC 555 as mono-stable multivibrator.			CO3, CO4
	C	12. Study of IC 555 as bistable multivibrator.			CO3, CO4
	Unit 5				
	A	13. Study of Fixed voltage power supply using IC regulators			CO5,CO6
	B	14. Designing of Fixed voltage power supply using IC regulators using 78 series			CO5,CO6
	C	15. Designing of Fixed voltage power supply using IC regulators using 79 series			CO5,CO6
	Mode of examination	Practical			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	Refer Lab Manual			
	Other References				

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C.220.1	3	3	2	2							1	2	2	3
C.220.2	3	3	2	2							1	2	2	3
C.220.3	3	3	2	2							1	2	2	3
C.220.4	3	3	2	2							1	2	2	3
C.220.5	3	3	2	2							1	2	2	3
C.220.6	3	3	2	2							1	2	2	3
C.220	**3**	**3**	**2**	**2**							**1**	**2**	**2**	**3**

School: SET		**Batch : 2019-21**	
Program: B.Sc.		**Current Academic Year:**	
Branch:Hons.		**Semester: 4**	
1	Course Code	ECR223	
2	Course Title	**Electronic Instrumentation**	
3	Credits	4	
4	Contact Hours (L-T-P)	3-1-0	
	Course Status	Compulsory	
5	Course Objective	• To discuss about basic instrument and measurement system • To identify basic structure of electrical meters • To study techniques of RLC measurement • To give knowledge of electrical industry parameters measurement	
6	Course Outcomes	CO1: Getting knowledge of basic instrument and measurement systems CO2: Getting knowledge on construction of different electrical meters CO3: Getting concepts of RLC measurements CO4: Getting knowledge of construction CROs and working CO5: develop an understanding of construction and working of different measuring instruments CO6: describe functional blocks of data acquisition system.	
7	Course Description	This course covers the fundamentals of instrumentation used in industry. Emphasis is on electric, electronic, and other instruments. It covers basics of measurements using multimeter, bridges and oscilloscope. It also includes different types of transducers and sensors operations and their applications.	
8	Outline syllabus		CO Mapping
	Unit 1		
	A	**Qualities of Measurement:** Specifications of instruments, their static and dynamic characteristics, Error (Gross error, systematic error, absolute error and relative error) and uncertainty analysis. Statistical analysis of data and curve fitting.	CO1
	B	**Basic Measurement Instruments:** PMMC instrument, galvanometer, DC measurement - ammeter, voltmeter, **o**hm meter, AC measurement, Digital voltmeter systems (integrating and non-integrating types), digitalmultimeters, digital frequency meter system (different modes and universal counter).	CO1
	C	**Connectors and Probes:** low capacitance probes, high voltage probes, current probes, identifying electronic	CO1

		connectors – audio and video, RF/Coaxial, USB etc.	
	Unit 2		
	A	**Measurement of Resistance and Impedance:** Low Resistance: Kelvin's double bridge method, Medium Resistance by Voltmeter Ammeter method, Wheatstone bridge method, High Resistance by Megger. A.C. bridges, Measurement of Self Inductance,	
	B	Maxwell's bridge, Hay's bridge, and Anderson's bridge, Measurement of Capacitance, Schering's bridge, DeSauty's bridge, Measurement of frequency, Wien's bridge.	CO2
	C	**A-D and D-A Conversion:** 4 bit binary weighted resistor type D-A conversion, circuit and working. Circuit of R-2R ladder. A-D conversion characteristics, successive approximation ADC. (Mention of relevant ICs for all).	CO2
	Unit 3		
	A	**Oscilloscopes:** CRT, wave form display and electrostatic focusing, time base and sweep synchronization, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Dual trace oscilloscope, Sampling Oscilloscope, DSO	CO3
	B	Powerscope: Block diagram, principle and working, Advantages and applications, CRO specifications (bandwidth, sensitivity, rise time).	CO3
	C	**Signal Generators**: Audio oscillator, Pulse Generator, Function generators.	CO3
	Unit 4		
	A	**Transducers and sensors:** Classification of transducers, Basic requirement/characteristics of transducers, active & passive transducers,	CO4
	B	Resistive (Potentiometer, Strain gauge – Theory, types, temperature compensation and applications),	CO4
	C	Capacitive (Variable Area Type – Variable Air Gap type – Variable Permittivity type), Inductive (LVDT) and piezoelectric transducers.	CO4
	Unit 5		
	A	Measurement of displacement, velocity and acceleration (translational and rotational). Measurement of pressure (manometers, diaphragm, bellows),	CO5,CO6
	B	Measurement of temperature (RTD, thermistor, thermocouple, semiconductor IC sensors),	CO5,CO6
	C	Light transducers (photoresistors, photovoltaic cells,	CO5,CO6

		photodiodes).			
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1.H. S. Kalsi, Electronic Instrumentaion, TMH(2006) 2. W.D. Cooper and A. D. Helfrick, Electronic Instrumentation and Measurement Techniques, Prentice-Hall (2005).			
	Other References				

Course Matriculation Matrix:

COs	PO1	PO2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C.223.1	3	3	2	2							1	2	2	3
C.223.2	3	3	2	2							1	2	2	3
C.223.3	3	3	2	2							1	2	2	3
C.223.4	3	3	2	2							1	2	2	3
C.223.5	3	3	2	2							1	2	2	3
C.223.6	3	3	2	2							1	2	2	3
co.223	3	3	2	2							1	2	2	3

School: SET		**Batch : 2019-21**
Program: B.Sc.		**Current Academic Year:**
Branch:Hons.		**Semester: 4**
1	Course Code	EPR223
2	Course Title	**Electronic Instrumentation Lab**
3	Credits	2
4	Contact Hours (L-T-P)	0-0-4
	Course Status	Compulsory
5	Course Objective	• To discuss about basic instrument and measurement system • To identify basic structure of electrical meters • To study techniques of RLC measurement • To give knowledge of electrical industry parameters measurement
6	Course Outcomes	CO1: Getting knowledge of basic instrument and measurement systems CO2: Getting knowledge on construction of different electrical meters CO3: Getting concepts of RLC measurements CO4: Getting knowledge of construction CROs and working CO5: Getting knowledge of Optical transducers CO6: Explore concept of designing and operating principles of modern optical systems and networks
7	Course Description	This course covers the fundamentals of instrumentation used in industry. Emphasis is on electric, electronic, and other instruments. It covers basics of measurements using multimeter, bridges and oscilloscope. It also includes different types of transducers and sensors operations and their applications.
8	Outline syllabus		CO Mapping
	Unit 1		
	A	**1. Measurements of** Specifications of instruments, their static and dynamic characteristics, Error (Gross error, systematic error, absolute error and relative error) and uncertainty analysis. Statistical analysis of data and curve fitting.	CO1
	B	**2. Experiments with Measurement Instruments:** PMMC instrument, galvanometer, DC measurement - ammeter, voltmeter, **o**hm meter,	CO1
	C	**3.Experiments with Measurement Instruments:** AC measurement, Digital voltmeter systems (integrating and non-integrating types),	CO1

		digitalmultimeters, digital frequency meter system (different modes and universal counter).			
	Unit 2				
	A	**4. Measurement of Resistance and Impedance:** Low Resistance: Kelvin's double bridge method, Medium Resistance by Voltmeter Ammeter method,			
	B	**5.** Wheatstone bridge method, High Resistance by Megger. A.C. bridges, Measurement of Self Inductance,			CO2
	C	6. Experiments with Maxwell's bridge, Hay's bridge, and Anderson's bridge, Measurement of Capacitance			CO2
	Unit 3				
	A	7. **Measuments with Oscilloscopes:** measurement of voltage, frequency and phase by CRO			CO3
	B	8. **Experiments with Signal Generators**: Audio oscillator, Pulse Generator, Function generators.			CO3
	C	9. **Experiments with** Potentiometer, Strain gauge – Theory, types, temperature compensation and applications)			CO3
	Unit 4				
	A	10. **Experiments with** Capacitive (Variable Area Type – Variable Air Gap type – Variable Permittivity type), Inductive (LVDT) and piezoelectric transducers.			CO4
	B	11. Measurement of displacement, velocity and acceleration (translational and rotational). Measurement of pressure (manometers, diaphragm, bellows),			CO4
	C	12. Measurement of temperature (RTD, thermistor, thermocouple, semiconductor IC sensors),			CO4
	Unit 5				
	A	13. Study of photoresistors			CO5,CO6
	B	14. Study of photovoltaic cells			CO5,CO6
	C	15. Study of photodiodes			CO5,CO6
	Mode of examination	Practical			
	Weightage	CA	MTE	ETE	

	Distribution	60%	0%	40%	
	Text book/s*	Refer lab Manual			
	Other References				

Course Matriculation Matrix:

COs	PO1	PO2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C.223.1	3	3	2	2							1	2	2	3
C.223.2	3	3	2	2							1	2	2	3
C.223.3	3	3	2	2							1	2	2	3
C.223.4	3	3	2	2							1	2	2	3
C.223.5	3	3	2	2							1	2	2	3
C.223.6	3	3	2	2							1	2	2	3
co.223	3	3	2	2							1	2	2	3

School: SET		**Batch : 2018-21**	
Program: B.Sc		**Current Academic Year: 2018-19**	
Branch:Hons		**Semester:4**	
1	Course Code	ECR015	
2	Course Title	MECHATRONICS OF ROBOTICS	
3	Credits	4	
4	Contact Hours (L-T-P)	3-1-0	
	Course Status	PE	
5	Course Objective	• Discussing of basic components of mechatronics, architecture of basic robotics systems • Explaining different types of sensors of robotics systems • Discussing of different signal processing of different sensors • Identifying of different input outputs of robotics systems • Recognizing of different controllers, programming systems and tools of robotics systems	
6	Course Outcomes	CO1: Exploring knowledge on architecture of robotics system CO2: Identify and discussing different types of electrical actuators for robotics system CO3: Categorizing and discussing different types of signal processes techniques of sensors and transducers CO4: Identify and discussing different types of mechanical actuators for robotics system CO5:To develop a project based on Mechatronics	
7	Course Description	The integration of electronics, electrical, mechanical and computer technology culture is very popular and good trend in development of technology. A consequence of this is need for engineers and technicians to adopt an interdisciplinary and integrated approach to engineering. This subject fulfils the above objectives for upcoming engineering students.	
8	Outline syllabus		CO Mapping
	Unit 1	**Architecture and Applications of Mechatronics Systems**	
	A	What is mechatronics?, Evolution of Mechatronics, Systems, Measurement systems, Control Systems	CO1
	B	Microprocessors-based controllers, Response of systems	CO1
	C	The mechatronics approach, Brief introduction to manufacturing systems	CO1
	Unit 2	**Electrical Actuators Systems**	CO2
	A	Moving iron transducers; Solenoids; Relays	
	B	DC special type motors for robotics systems	
	C	Construction of analog and digital controllers of electrical actuators	CO2

	Unit 3	**Signal Processing and Data Acquisition Sensors**			
	A	Signal conditioning, Operational amplifier, Protection , Filtering, Wheatstone bridge, Digital signals, Multiplexers			CO3
	B	Data acquisition, Basics of signal processing, Pulse modulation			CO3
	C	Displays, Testing and calibration			CO3
	Unit 4	**Actuators and Its Mechanisms**			
	A	Actuation systems, Pneumatic and hydraulic systems, Directional control valves, Pressure control valves, Process control values			CO4
	B	Rotary actuators, Mechanical systems, Types of motion			CO4
	C	Cams, Gear trains, Belt and chain drives, Bearings			CO4
	Unit 5	**Mechanical Elements**			
	A	Flexible mechanical elements			CO5
	B	Friction Clutches;			CO5
	C	Design of Clutches; Brakes			CO5
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. W.Bolton, "Mechatronics (Electronic Control Systems in Mechanical and Electrical Engineering), Third Edition, Pearson Education, 2. Mechatronics: Principles and Applications By Godfrey Onwubolu			
	Other References	David G "Introduction to Mechatronics and Measurements Systems", Tata MeGraw Hill S.R. Deb and S. Deb, "Robotics Technology and Flexible Automation", Second edition, McGraw Hill, 2011 Muhammad Ali Mazidi, AVR Microcontroller and Embedded Systems: Using Assembly and C, Pearson Education			

Course Matriculation Matrix:

Cos	PO1	PO2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C.015.1	3	3	2	2							1	2	2	
C.015.2	3	3	2	2							1	2	2	
C.015.3	3	3	2	2							1	2	2	
C.015.4	3	3	2	2							1	2	2	3
C.015.4	3	3	2	2							1	2	2	3
CO.015	3	3	2	2							1	2	2	3

School: SET		**Batch: 2018-21**	
Program: BSc		**Current Academic Year:2018**	
Branch:Hons			
1	Course Code	EPR015	
2	Course Title	Mechatronics of Robtoics Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	PE	
5	Course Objective	• Students can get knowledge on different construction types robots • Practicing of basic parts design • Exploring knowledge on new robot constructions	
6	Course Outcomes	CO1: Able to setup robotics components CO2: Able to practice different shapes of robots CO3: Able to design any shape of part CO4: Getting knowledge of advance concept design CO5: To develop a project based on Mechatronics	
7	Course Description	The integration of electronics, electrical, mechanical and computer technology culture is very popular and good trend in development of technology. A consequence of this is need for engineers and technicians to adopt an interdisciplinary and integrated approach to engineering. This subject fulfils the above objectives for upcoming engineering students.	
8	Outline syllabus		CO Mapping
	Unit 1	**Disassembling and Assembling of Robot parts**	
	A	Robot 1 assembling and disassembling	CO1
	B	Robot 2 assembling and disassembling	CO1
	C	Robot 3 assembling and disassembling	CO1
	Unit 2	**Introduction to design tools**	
	A	Identifying of menu bar components of design tools	CO2
	B	Creating basic shapes in 2D	CO2
	C	Creating basic shapes in 3D	CO2
	Unit 3	**Creations of basic parts in 2D**	
	A	Creation of basic part1 in 2D	CO3
	B	Creation of basic part 2 in 2D	CO3
	C	Creation of basic part 3 in 2D	CO3
	Unit 4	**Creations of basic parts in 3D**	
	A	Creation of basic part1 in 3D	CO4
	B	Creation of basic part 2 in 3D	CO4
	C	Creation of basic part 3 in 3D	CO4
	Unit 5	**Practical based on Mechanical Elements**	
	A	Practical based on Flexible mechanical elements	CO5

	B	Practical based on Friction Clutches;			CO5
	C	Design of Clutches; Brakes			CO5
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	Refer lab manuals			
	Other References	Introduction to SolidWorks: A Comprehensive Guide with Applications in 3D printing by By Godfrey C. Onwubolu			

Course Matriculation Matrix:

COs	PO1	PO2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C.015.1	3	3	2	2							1	2	2	
C.015.2	3	3	2	2							1	2	2	
C.015.3	3	3	2	2							1	2	2	
C.015.4	3	3	2	2							1	2	2	3
C.015.5	3	3	2	2							1	2	2	3
co.015	3	3	2	2							1	2	2	3

School: SET		Batch : 2018-2021	
Program: B.Tech/BSc		Current Academic Year: 2018-19	
Branch: ECE		Semester:V	
1	Course Code	ECE226	
2	Course Title	Microprocessors and Interfacing	
3	Credits	4	
4	Contact Hours (L-T-P)	3-1-0	
	Course Status	Compulsory	
5	Course Objective	1. Knowledge of hardware and software features of 8-bit microprocessors. 2. Development of programming skills of students by applying their analytical and logical skills. 3. Ability to Interface the peripheral devices with microprocessor and their practical applications. 4. Exploration of the performance of 16-bit microprocessor. 5. Knowledge of features and practical applications of microcontrollers	
6	Course Outcomes	CO1: Explain and define the basic blocks and pin diagram of micro-processor CO2: Interpret various instructions and implement simple assembly language program for 8085, design and implementation of precise delay CO3: Examine and apply the interrupts and their priority. CO4: Employ interfacing chips with 8085 processor with programmable interrupt controller, ADC and DAC. CO5: Design memory maps by interfacing memory chips with 8085. CO6: Explain the basics of 8086 microprocessor and microcontroller	
7	Course Description	The modern digital systems including computer systems are designed with microprocessor as central device connected to memory and I/O devices. The subject introduces the students with basics of microprocessor, microprocessor architecture and programming, interfacing microprocessor with memory and various I/O (Input/Output) devices and introduction to the advance processors including RISC based processors.	
8	Outline Syllabus		CO Mapping
	Unit 1	**Introduction to 8 bit microprocessor**	
	A	An overview of microprocessor: microprocessor evolution and types, organization of Central Processing Unit (CPU) and operation of its components, buses.	CO1
	B	Pin description and internal architecture of 8- bit Microprocessor	CO1

		8085: Registers, programming model, Arithmetic Logic Unit (ALU).	
	C	Timing and control unit, control and status signal, bus timing diagram, tri-state buffer	.CO1
	Unit 2	**Programming techniques of 8085 microprocessor**	
	A	Instruction sets, Instruction formats, addressing modes.	CO2
	B	Instruction classifications: data transfer, arithmetic, logical, branch and machine control.	CO2
	C	Fundamentals of Programming, looping, counting and indexing, counters and time delays, assembler and assembler directives.	CO2
	Unit 3	**I/O Interfacing Techniques and Interrupts**	
	A	Interfacing of I/O devices, classification of I/O interfacing techniques: isolated I/O and memory mapped I/O.	CO3
	B	Interrupts: 8085 interrupt structure, maskable and non-maskable, vectored and non-vectored.	CO3
	C	Stacks and subroutines, conditional call and return instructions.	CO3
	Unit 4	**Programmable Peripheral Devices**	
	A	Programmable peripheral interface (8255), programmable timer/counter(8253/ 8254).	CO4
	B	Programmable interrupt controller (8259).	CO4
	C	ADC and DAC Chips and their interfacings	CO4
	Unit 5	**Memory interfacing and Advanced Processors**	
	A	Memory devices, memory classifications, memory interfacing, memory mapping and addressing technique.	CO5
	B	Introduction to 16-bit microprocessor (8086).	CO6
	C	Introduction to microcontrollers and system on chip (SOC)	CO6
	Mode of examination	Theory	

	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1.R.S. Gaonkar, 'Microprocessor Architecture Programming and Application', Wiley Eastern Ltd., New Delhi, 1995.		
	Other References	2.William Kleitz, 'Microprocessor and Micro Controller Fundamental of 8085 and 8051 Hardware and Software', Pearson Education, 1998. 3.Muhammad Ali Mazidi& Janice GilliMazidi, 'The 8051 Microcontroller and Embedded Systems', Pearson Education, 5th Indian reprint, 2003.		

Course Matriculation Matrix:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C226.1	3	3									1	2	2	
C226.2		3	3	2							1	1		
C226.3			3	3							1	2	3	
C226.4	3	2									1	1		
C226.5				3							1		2	3
C226.6				3							1		2	3
CO.226	**1**	**2**	**1**	**2**							**1**	**1**	**2**	**1**

School: SET		**Batch : 2018-21**
Program: B.Sc.		**Current Academic Year:**
Branch:Hons.		**Semester: 5**
1	Course Code	EPR310
2	Course Title	**Microprocessor and Interfacing lab**
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	6. Knowledge of hardware and software features of 8-bit microprocessors. 7. Development of programming skills of students by applying their analytical and logical skills. 8. Ability to Interface the peripheral devices with microprocessor and their practical applications. 9. Exploration of the performance of 16-bit microprocessor. 10. Knowledge of features and practical applications of microcontrollers

6	Course Outcomes	CO1: Explain and define the basic blocks and pin diagram of micro-processor CO2: Interpret various instructions and implement simple assembly language program for 8085, design and implementation of precise delay CO3: Examine and apply the interrupts and their priority. CO4: Employ interfacing chips with 8085 processor with programmable interrupt controller, ADC and DAC. CO5: Design memory maps by interfacing memory chips with 8085.	
7	Course Description	The modern digital systems including computer systems are designed with microprocessor as central device connected to memory and I/O devices. The subject introduces the students with basics of microprocessor, microprocessor architecture and programming, interfacing microprocessor with memory and various I/O (Input/Output) devices and introduction to the advance processors including RISC based processors.	
8	Outline syllabus		CO Mapping
	Unit 1		
	A	Write a program using 8085 and verify- a) Addition of two 8-bit numbers. b) Addition of two 16-bit numbers (with carry).	CO1
	B	Write a program using 8085 and verify- a) Subtraction of two 8-bit numbers. b)Subtraction of two 16-bit numbers (with borrow).	CO1
	C	Write a program using 8085 and verify- a) Largest/smallest of two 8-bit numbers. b) Largest/smallest of two 10 numbers.	CO1
	Unit 2		
	A	Write a program using 8085 and verify- a) Multiplication of two 8-bit numbers by rotation. b) Multiplication of two 8-bit numbers with respective addition.	CO2
	B	Write a program using 8085 and verify- a) Division of two 8-bit numbers by rotation. b) Division of two 8-bit numbers with respective subtraction.	CO2

	C	a)Write a Program to interface ADC with 8085 b)Write a Program to interface DAC with 8085	CO2,CO4
	Unit 3		
	A	a)Write a program to turn 'ON' and 'OFF' LEDs connected to port. b)Write a Program to alternate blink LEDs connected to Port.	CO3
	B	a)Write a Program to display 0-9 numbers on 7-segment display. b)Write a Program to interface LCD to Microcontroller and display "Sharda University" on it.	CO3
	C	Write a Program to interface D.C. Motor to Microprocessor.	CO3
	Unit 4		
	A	Write a Program to display various characters on 8x8 LED Matrix Display.	CO2, CO3
	B	Write a Program to interface Keyboard to Microprocessor.	CO2, CO3
	C	Write a Program to interface Stepper Motor to Microprocessor.	CO2, CO3
	Unit 5		

	A	Interfacings of 8255.			CO5,CO2
	B	Interfacing of 8253.			CO5,CO2
School: SET		**Batch :2018-21**			
	C	Write a Program for traffic light controller.			CO5,CO2
	Mode of examination	/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	Lab manuals			
	Other References				

Course Matriculation Matrix:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C226.1	3	3									1	2	2	
C226.2		3	3	2							1	1		
C226.3			3	3							1	2	3	
C226.4	3	2									1	1		
C226.5				3							1		2	3
CO.226	**2**	**2**	**2**	**2**							**1**	**2**	**2**	**1**

Program: B.Sc.		Current Academic Year:	
Branch: Hons.		Semester: 4	
1	Course Code	ECR311	
2	Course Title	CONSUMER ELECTRONICS	
3	Credits	04	
4	Contact Hours (L-T-P)	3-1-0	
	Course Status	Compulsory	
5	Course Objective	After studying this subject, students can understand and discuss the working principles and features of audio systems, video systems, electronic gadgets, home appliances, communication devices and smart devices	
6	Course Outcomes	1. Discussion of the need of digitization in consumer electronics and their challenges 2. Apply the electronics knowledge on Audio systems 3. Getting knowledge of construction and working of different types of video systems 4. Able to diagnose problems of home appliances 5. Able to identify the components of desktop publication systems	
7	Course Description	In developing nations demand of consumer electronic appliances is increasing day by day. This requires large number of technically trained men power in relevant industries. This subject will introduce the students with working principles, block diagram and advance features of consumer electronics appliances like audio-video systems, microwave oven, washing machine, air-conditioner, camcorder etc. which in-turn will develop skills to diagnosis fault and rectification of that in systematic way. Knowledge so gained would also help in working in production units of these consumer gadgets. Students may also start their own repair workshops and may engage in fruitful self employment.	
8	Outline syllabus		CO Mapping
	Unit 1	**Consumer devices**	
	A	Digitization of consumer products	CO1, CO2
	B	Success factors and challenges	CO1, CO2
	C	Components of MP3 player and DVD player,	CO1, CO2
	Unit 2	**Audio Systems**	
	A	Types and principles of microphones	CO1, CO2
	B	Head phones and hearing aids	CO1, CO2
	C	Types and construction details of loudspeakers,	CO1, CO2
	Unit 3	**Video and Digital Display Systems**	
	A	Digital TV : construction and working principle,	CO2 , CO3
	B	Digital displays-PDP-PCD-PALCD-OLED,	CO2 , CO3
	C	Remote controls for audio and video systems	CO2 , CO3
	Unit 4	**Electronic Gadgets and Home Appliances**	

	A	microwave oven types and working			CO3
	B	washing machine types and working			CO3,CO4
	C	Components and working of air conditioners and refrigerators			CO3,CO4
	Unit 5	**Communication and Computers and its Peripherals**			
	A	Components and working of telephone and mobile phone			CO5
	B	Components and working of printer and photocopy machine			CO5
	C	Components and working of computers			CO5
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. *AmitDhir, "The Digital Consumer Technology Handbook," Elsevier,* 2. *S.P. Bali, "Consumer Electronics," Pearson Education*			

Course Matriculation Matrix:

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO. 311.1	3	3	2	1	2	1	-	-	-	-	-	2	1	-
CO. 311.2	3	3	2	1	2	1	-	-	-	-	-	2	2	-
CO. 311.3	3	3	3	1	2	1	-	-	-	-	-	2	2	-
CO. 311.4	3	2	1	1	2	1	-	-	-	-	-	2	1	-
CO. 311.5	3	2	3	1	2	1	-	-	-	-	-	2	1	-
CO. 311	**3**	**3**	**3**	**1**	**2**	**1**						**2**	**1**	

Program: B.Sc.		**Current Academic Year:**	
Branch:Hons.		**Semester: 5**	
1	Course Code	ECR320	
2	Course Title	Communication Electronics	
3	Credits	4	
4	Contact Hours (L-T-P)	3-1-0	
	Course Status	Compulsory	
5	Course Objective	1. To recall the concept of signals 2. To introduce the concepts of analog communication systems. 3. To equip students with various issues related to analogue communication such as modulation, demodulation, transmitters and receivers and noise performance. 4. To discriminate various pulse modulation techniques 5. To understand multiplexing	
6	Course Outcomes	CO1: Comprehend the fundamentals in explain the functionality of modulation and demodulation environment CO2: Analyze the concepts of AM and AM Demodulation process in Communication. CO3: Know the origin of FM and FM-Demodulation process in communication and investigate pulsed modulation system and analyze their system performance CO4: Understand the basics of information theory, source coding techniques and calculate Entropy of source. CO5: Understand the basics of digital modulation techniques. CO6: Understand the generation, detection signal space diagram, spectrum, bandwidth efficiency	
7	Course Description	The **course** will introduce the participants to the signal representation in both time and frequency domain, basic **analog communication** techniques like modulation theory, system design for **analog** modulator and demodulator, random process and noise analysis.	
8	Outline syllabus		CO Mapping
	Unit 1		
	A	**Electronic communication**: Block diagram of an electronic communication system, electromagnetic spectrum-band designations and applications, need for modulation,	CO1
	B	Concept of channels and base-band signals.	CO1
	C	Concept of Noise, Types of Noise, Signal to noise ratio, Noise Figure, Noise Temperature, Friss formula	CO1
	Unit 2		
	A	**Amplitude Modulation:** Amplitude Modulation, modulation index and frequency spectrum	CO2

		Generation of AM, Amplitude Demodulation (diode detector), Concept of Double side band suppressed carrier,	
	B	Single side band suppressed carrier, other forms of AM (Pilot Carrier Modulation, Vestigial Side Band modulation, Independent Side Band Modulation). Block diagram of AM Transmitter and Receiver	CO2
	C	**Angle modulation:** Frequency and Phase modulation, modulation index and frequency spectrum, equivalence between FM and PM, Generation of FM (direct and indirect methods), FM detector (PLL). Block diagram of FM Transmitter and Receiver Comparison between AM, FM and PM.	CO3
	Unit 3	**Pulse Modulation**	
	A	**Pulse Analog Modulation:** Channel capacity, Sampling theorem, PAM, PDM, PPM modulation and detection techniques, Multiplexing, TDM and FDM.	CO3
	B	**Pulse Code Modulation:** Need for digital transmission, Quantizing, Uniform and Nonuniform Quantization	CO3
	C	Quantization Noise, Companding, Coding, Decoding, Regeneration.	CO3
	Unit 4	**Digital Information and Coding:**	
	A	Block diagram of digital transmission and reception,	CO4
	B	Information capacity, Bit Rate	CO4
	C	Baud Rate and M-ary coding.	CO4
	Unit 5	**Digital Modulation Techniques**:	
	A	Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK),	CO5,CO6
	B	Phase Shift Keying (PSK), Binary Phase Shift Keying (BPSK)	CO5,CO6
	C	Quadrature Phase Shift Keying (QPSK)	CO5,CO6
	Mode of examination	Theory	
	Weightage Distribution	CA / MTE / ETE	
		30% / 20% / 50%	
	Text book/s*	1.Electronic communication systems- Kennedy, 3rd edition, McGraw international Publications 2.Communication Systems, S. Haykin, Wiley India (2006)	
	Other References	1.Principles of Electronic communication systems – Frenzel, 3rd edition, McGraw Hill	

Course Matriculation Matrix:

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C320.1	3	3									1	2	2	
C320.2	3	3	3	2							1	1		
C320.3	3		3	3							1	2	3	
C320.4	3	2		2							1	2	1	
C320.5	3	2	3	3							1	3	3	
C320.6	3	2	3	2							1	2	3	
CO320	**3**	**2**	**2**	**2**							**1**	**2**	**2**	

Program: B.Sc.		Current Academic Year:	
Branch:Hons.		Semester: 5	
1	Course Code	EPR320	
2	Course Title	Communication Electronics lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory	
5	Course Objective	1. To recall the concept of signals 2. To introduce the concepts of analog communication systems. 3. To equip students with various issues related to analogue communication such as modulation, demodulation, transmitters and receivers and noise performance. 4. To discriminate various pulse modulation techniques 5. To understand multiplexing	
6	Course Outcomes	CO1: Comprehend the fundamentals in explain the functionality of modulation and demodulation environment CO2: Analyze the concepts of AM and AM Demodulation process in Communication. CO3: Know the origin of FM and FM-Demodulation process in communication CO4: Investigate pulsed modulation system and analyze their system performance CO5: To design a communication System	
7	Course Description	The **course** will introduce the participants to the signal representation in both time and frequency domain, basic **analog communication** techniques like modulation theory, system design for **analog** modulator and demodulator, random process and noise analysis.	
8	Outline syllabus		CO Mapping
	Unit 1		
	A	**Study of basic communication systems**	CO1
	B	Concept of channels and base-band signals.	CO1
	C	Concept of Noise, Types of Noise, Signal to noise ratio, Noise Figure, Noise Temperature, Friss formula	CO1
	Unit 2		
	A	**Experiments based on** Amplitude Modulation, modulation index and frequency spectrum. Generation of AM, Amplitude Demodulation (diode detector), Concept of Double side band suppressed carrier,	CO2
	B	Study of Single side band suppressed carrier, other forms of	CO2

		AM (Pilot Carrier Modulation, Vestigial Side Band modulation, Independent Side Band Modulation). Block diagram of AM Transmitter and Receiver			
	C	**1.Study of** Frequency and Phase modulation, modulation index and frequency spectrum, equivalence between FM and PM, 2. Generation of FM (direct and indirect methods), FM detector (PLL). Block diagram of FM Transmitter and Receiver 3.Comparison between AM, FM and PM.			CO3
	Unit 3	**Pulse Modulation**			
	A	**Experiments with** Channel capacity, Sampling theorem, PAM, PDM, PPM modulation and detection techniques, Multiplexing, TDM and FDM.			CO3
	B	Experiments for Quantizing, Uniform and Nonuniform Quantization			CO3
	C	Calculation of Quantization Noise, Companding, Coding, Decoding, Regeneration.			CO3
	Unit 4	**Digital Information and Coding:**			
	A	Study of digital transmission and reception			CO4
	B	Calculation of Baud Rate			CO4
	C	Experiments with M-ary coding.			CO4
	Unit 5	**Digital Modulation Techniques**			
	A	Experiments with Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK),			CO5,CO6
	B	Experiments with Phase Shift Keying (PSK), Binary Phase Shift Keying (BPSK)			CO5,CO6
	C	Experiments with Quadrature Phase Shift Keying (QPSK)			CO5,CO6
	Mode of examination	Practical			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	Refer Lab Manual			
	Other References				

Course Articulaion Matrix

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C320.1	3	3									1	2	2	
C320.2	3	3	3	2							1	1		
C320.3	3		3	2							1	2	2	
C320.4	3	2									1	1		
C320.5	3	2	3	1							1	3	1	
C320.6	3	2	3	1							1	3	1	
C320	**3**	**2**	**2**	**1**							**1**	**2**	**1**	

School: SET		**Batch : 2018-21**
Program: B.Tech/B.Sc.		**Current Academic Year: 2018-19**
Branch: Hons		**Semester: 6**
1	Course Code	ECE343
2	Course Title	**Microcontrollers and Applications**
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	COMPULSARY
5	Course Objective	• To identify and realize the basic features of basic microcontrollers. • To learn programming of 8051 using Assembly language. • To design a real time module interfacing. • Development of a projects based on interfacing. • Integrating of different real time modules interfacing with a microcontroller.
6	Course Outcomes	After completing this course students will be: CO1: Able to understand the features, internal architecture and functioning of basic microcontrollers. CO2: Proficient in assembly language programming of basic microcontrollers. CO3: Proficient in interfacing with different timers, Serial devices, Interrupt and their applications. CO4: Proficient in interfacing with different memory, LCD, 7 segments, ADC & DAC and their applications. CO5: Able to design an application or doing a case study on a real time application.
7	Course Description	This course aims at teaching primary concept of programing with machine language. It also aims to train the student for automated system design with the programing intelligence. The objective of this course is to become familiar with the architecture and the instruction set of 8-bit microcontoller. Assembly language programming will be studied as well as the design of various types of digital and analog interfaces. The accompanying lab is designed to provide practical hands-on experience with microcontoller software applications and interfacing techniques .
8	Outline syllabus	CO Mapping

	Unit –A	**Introduction**			
	A	Introduction to Microcontrollers. Introduction of 8-bit microcontroller			CO1
	B	Pin Description of 8051, Architecture of 8051, Program counter, On chip ROM			CO1
	C	Bit addresses for I/O and RAM ,Data types and directives.			CO1
	Unit –B	**Programming of 8051**			
	A	Arithmetic and logic instructions, JUMP and CALL Instructions..			CO1,CO2
	B	Time delay for various 8051 chips, I/O programming Various addressing Modes of 8051 .			CO1,CO2
	C	Immediate and register addressing modes. Accessing memory using various addressing modes.			CO1,CO2
	Unit –C	**Timer/Counter, Serial Communication, Interrupt**			
	A	Programming 8051 timers, counters.			CO3
	B	Basics of serial communication, 8051 connection to RS2328051 serial port programming in assembly, 8051 interrupts, Interrupt priority in 8051,			CO3
	C	Programming timer interrupts, Programming external hardware interrupts. Programming serial communication interrupts.			CO3
	Unit –D	**Interfacing**			
	A	Memory address decoding, 8031/51 interfacing with external ROM & RAM.			CO4
	B	7 segment display, LCD interfacing with 8051.			CO4
	C	ADC & DAC interfacing.			CO4
	UNIT-E	**Applications**			
	A	DC motor and stepper motor interfacing.			CO5
	B	Proximity & temperature sensors interfacing.			CO5
	C	Design of an application using 8051 microcontroller.			CO5
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	***Text Books*** 1. *Muhammad Ali Mazidi,Janice Gillispie Mazidi,Rolin D. McKinlay, "The 8051 Microcontroller and Embedded Systems" , Pearson Education, Second Edition.*			
	Other References	1. *Ajay V Deshmukh, "Microcontrollers & its applications" TMH, third Edition*			

Course Matriculation Matrix:

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO343.1	2	1	2	-	-	2	1	1	-	1	2	2	1	1
CO343.2	2	1	2	1	1	2	1	1	-	-	3	3	2	2
CO343.3	2	2	2	2	1	2	0	1	1	-	2	2	2	2
CO343.4	1	1	1	1	1	2	1	1	-	-	2	2	2	2
CO343.5	2	2	2	2	1	2	0	1	1	-	2	2	2	2
CO343	**2**	**2**	**2**	**2**	**1**	**5**	**1**	**1**	**1**	**1**	**3**	**3**	**2**	**2**

School: SET		**Batch : 2018-21**	
Program: B.Sc.		**Current Academic Year:**	
Branch: Hons.		**Semester: 5**	
1	Course Code	ECP343	
2	Course Title	**Microcontrollers and Applications lab**	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory	
5	Course Objective	1.a. Familiarize the architecture of 8051 processor, assembling language programming and interfacing with various modules. 2. The student can also understand of Microcontroller concepts, architecture, programming and application of Microcontrollers. 3. Student able to do any type of embedded systems, industrial and real time applications by knowing the concepts of Microcontrollers.	
6	Course Outcomes	CO1: understand the internal organization of some popular 8 bit microcontrollers (8051) and apply the impact of microcontroller based arithmetic and logical instructions CO2. Apply knowledge for real time data operations with programming techniques CO3. Design interfacing circuits of various ADC, DAC,LED devices with the microcontroller. CO4. Design interfacing circuits of various motors and LCD with the microcontroller CO5: Design embedded circuits for real time applications	
7	Course Description	This course aims at teaching primary concept of programing with machine language. It also aims to train the student for automated system design with the programing intelligence. The objective of this course is to become familiar with the architecture and the instruction set of 8-bit microcontoller. Assembly language programming will be studied as well as the design of various types of digital and analog interfaces. The accompanying lab is designed to provide practical hands-on experience with microcontoller software applications and interfacing techniques	
8	Outline syllabus		CO Mapping
	Unit 1		
	A	Write a program using 8051 and verify- c) Addition of two 8-bit numbers. d) Addition of two 16-bit numbers (with carry).	CO1
	B	Write a program using 8085 and verify- b) Subtraction of two 8-bit numbers. c) Subtraction of two 16-bit numbers (with borrow).	CO1

	C	Write a program using 8085 and verify- c) Largest/smallest of two 8-bit numbers. d) Largest/smallest of two 10 numbers.	CO1
	Unit 2		
	A	Write a program using 8085 and verify- c) Multiplication of two 8-bit numbers by rotation. d) Multiplication of two 8-bit numbers with respective addition.	CO2
	B	Write a program using 8085 and verify- c) Division of two 8-bit numbers by rotation. d) Division of two 8-bit numbers with respective subtraction.	CO2
	C	a)Write a Program to interface ADC with 8051 b)Write a Program to interface DAC with 8051	CO3
	Unit 3		
	A	a)Write a program to turn 'ON' and 'OFF' LEDs connected to port 0. b)Write a Program to alternate blink LEDs connected to Port0.	CO3
	B	a)Write a Program to display 0-9 numbers on 7-segment display. b)Write a Program to interface LCD to Microcontroller and display "Sharda University" on it.	CO3
	C	Write a Program to display various characters on 8x8 LED Matrix Display.	CO3
	Unit 4		
	A	Write a Program to interface D.C. Motor to Microcontroller.	CO4
	B	Write a Program to interface Keyboard to Microcontroller.	CO4
	C	Write a Program to interface Stepper Motor to Microcontroller.	CO4
	Unit 5		
	A	1.Design a project for robo arm	CO5
	B	2.Design a project for home automation	CO5

	C	3.Design a project for temperature and light based appliances control			CO5
	Mode of examination	/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	Lab manuals			
	Other References				

Course Matriculation Matrix:

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO343.1	2	1	2	-	-	2	1	1	-	1	2	2	1	1
CO343.2	2	1	2	1	1	2	1	1	-	-	3	3	2	2
CO343.3	2	2	2	2	1	2	0	1	1	-	2	2	2	2
CO343.4	1	1	1	1	1	2	1	1	-	-	2	2	2	2
CO343.5	2	2	2	2	1	2	0	1	1	-	2	2	2	2
CO343	**2**	**2**	**2**	**2**	**1**	**5**	**1**	**1**	**1**	**1**	**3**	**3**	**2**	**2**

School: SET		**Batch : 2018-21**	
Program: B.Tech		**Current Academic Year: 2018-19**	
Branch: Hons		**Semester: 6**	
1	Course Code	ECR321	
2	Course Title	Opto-electronics	
3	Credits	4	
4	Contact Hours (L-T-P)	3-1-0	
	Course Status	COMPULSARY	
5	Course Objective	To make awareness of optical devices' applications To get knowledge on components of opto-electronics To explore knowledge on modulation and demodulation techniques To know basic knowledge on fibre cables	
6	Course Outcomes	CO1: Able to identify of basic components of optical systems CO2: Able to develop basic opto-electronics circuits CO3: Able to know features, advantages of opto-electronics CO4: Able to get knowledge on handling on fibre cable CO5: To analyse optical communication system	
7	Course Description	Opto-electronics field is one of the important futuristic subject for electrics students. There are plenty of applications of optoelectronics. This subject gives basic practical knowledge on the above.	
8	Outline syllabus		CO Mapping
	Unit 1	**Optical Elements and**	
	A	Mirrors, Lens	CO1
	B	Prisms,	CO1
	C	Retroreflectors, beamsplitters	CO1
	Unit 2	**Light Sources**	
	A	Halogen lamps, LEDs,	CO1
	B	Laser Diodes, Other laser sources	CO1
	C	List of common mistakes on handling of above	CO1
	Unit 3	**Photo Receivers or Sensors**	
	A	Photo diodes and Photo Transitors	CO1,CO2
	B	Avalanche Photo diodes and Multi element photo diodes	CO1,CO2
	C	Receiver circuits of above	CO1,CO2
	Unit 4	**Modulation and Demodulation Techniques**	
	A	Naturally modulated and Mechancally modulated	CO1,CO3
	B	Electro Opto modulators and Acoustoopto modulators	CO1,CO3

	C	Electronically modulated and Demodulation techniques			CO1,CO3
	Unit 5	**Fibre Optics**			
	A	Fibre Cables			CO4,CO5
	B	Fibre Bundles			CO4,CO5
	C	Imaging fibers			CO4,CO5
	Mode of examination	Theory and practical			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	P racticalOpto-Electronics: An Illustrated Guide for the Laboratory by Vladimir Protopopov; Sringer Publication			
	Other References				

Course Matriculation Matrix:

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO321.1	2	1	2	-	-	2	1	1	-	1	2	2	1	1
CO321.2	2	1	2	1	1	2	1	1	-	-	3	3	2	2
CO321.3	2	2	2	2	1	2	0	1	1	-	2	2	2	2
CO321.4	1	1	1	1	1	2	1	1	-	-	2	2	2	2
CO321.5	1	1	1	1	1	2	1	1	-	-	2	2	2	2
CO321	**2**	**2**	**2**	**1**	**1**	**2**	**2**	**1**	**1**	**1**	**3**	**3**	**3**	**2**

School: SET		**Batch: 2018-21**	
Program: BSc		**Current Academic Year:2018**	
Branch:HONS			
1	Course Code	EPR321	
2	Course Title	Opto-electronics Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory	
5	Course Objective	• Students should realize different optical components principle • Students should familiar with components of optical sources • Students should able to knowledge of opto modulators and demodulators tecqniques	
6	Course Outcomes	CO1: Able to setup optical components CO2: Able to practice different semiconductor based opto electronics devices CO3: Discover techniques of opto-electronics sensors CO4: Able to construct opto modulators and demodulators CO5: To analyse optical communication system	
7	Course Description	It is an extension of the theory subject. This practice about handling of optical components and understanding working of optical components. The course also gives knowledge about the opto-electronic circuits. So, students can get practical knowledge of opto-electronic devices.	
8	Outline syllabus		CO Mapping
	Unit 1	**Based on Optical Components**	
	A	Mirror and lens based experiment	CO1
	B	Prism based experiment	CO1
	C	Beam splitter based experiment	CO1
	Unit 2	**Light source components**	
	A	Characteristics of LED	CO2
	B	Characteristics of LASER Diode	CO2
	C	Characteristics of lamp source	CO2
	Unit 3	**Light Sensors**	
	A	Characteristics of photo diode	CO2,CO3
	B	Characteristics of photo transistor	CO2,CO3
	C	Characteristics of Photo multiplier	CO2,CO3
	Unit 4	**Opto Fibre, Modulators & Demodulators**	
	A	Characteristics of opto fibre	CO2,CO4
	B	Modulator and Demodulator Exp1	CO2,CO4
	C	Modulator and Demodulator Exp2	CO2,CO4
	Unit 5	**Fibre Optics**	
	A	Practical on Fibre Cables	CO4,CO5

	B	Practical on Fibre Bundles			CO4,CO5
	C	Practical on Imaging fibers			CO4,CO5
	Mode of examination	Practical & Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	Refer lab manuals			
	Other References				

Course Matriculation Matrix:

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO321.1	2	1	2	-	-	2	1	1	-	1	2	2	1	1
CO321.2	2	1	2	1	1	2	1	1	-	-	3	3	2	2
CO321.3	2	2	2	2	1	2	0	1	1	-	2	2	2	2
CO321.4	1	1	1	1	1	2	1	1	-	-	2	2	2	2
CO321.5	1	1	1	1	1	2	1	1	-	-	2	2	2	2
CO321	**2**	**2**	**2**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**3**	**3**	**2**	**2**

DEPARTMENTAL ELECTIVE

School: SET		**Batch : 2018-21**	
Program: BSc		**Current Academic Year:**	
Branch:Hons		**Semester:5/6**	
1	Course Code	ECR016	
2	Course Title	PLC SCADA with Hydraulic and Pneumatic Systems	
3	Credits	4	
4	Contact Hours (L-T-P)	3-1-0	
	Course Status	DE1	
5	Course Objective	1. Students should able to explore their knowledge on PLC programming and interfacings 2. Students should able to explore their knowledge on SCADA 3. Students should able to explore their knowledge on interfacing of PLC with hydraulic and pneumatic circuits	
6	Course Outcomes	CO1: Describing basic architecture and components of PLC, SCADA, hydraulics and pneumatics CO2:Practicing of PLC program techniques, logics and uploading of program CO3:Practicing and creating of SCADA program techniques and PLC communication protocols CO4:Design and develop of hydraulic & pneumatic components, circuits and exploring knowledge on PLC interfacing CO5: To analyse Hydraulic Components with PLC	
7	Course Description	Robotics Control techniques has evolved overtime. The developments of high performance control techniques have been done using PLC and SCADA in industries. Hydraulic and pneumatic system plays important rols on developing of industry based robotics systems. This subject gives experience about different techniques handled industries using the PLC, SCADA with hydraulic and pneumatic systems	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Introduction to PLC, SCADA and Applications; Types of PLCs; Manufacturers of PLCs and SCADA; Introduction to programming Techniques;	CO1
	B	Definition of protocol, Introduction to Open System Interconnection (OSI) model,Communication standard (RS232, RS485)	CO1

	C	Hydraulic System and its components; Pneumatic System and its components;			CO1
	Unit 2	**PLC Programming**			
	A	Review of digital numberings, logical gates; PLC project creations			CO2
	B	Introduction to ladder programming components; Input / Output configuration and types; Input / Output files;			CO2
	C	Programming of timers, counters, control systems like PID etc			CO2
	Unit 3	**SCADA Programming and PLC Protocols**			
	A	SCADA project creation			CO2, CO3
	B	Different types of animations			CO2,CO3
	C	Foundation Fieldbus, Devicenet, Profibus, Controlnet, IndustrialEthernet , Modbus (ASCII/RTU) and HART Protocol			CO2,CO3
	Unit 4	**Hydraulic Systems**			
	A	Hydraulic pressure regulator systems and its components			CO2,CO4
	B	Hydraulic actuator systems and its components,			CO2,CO4
	C	Hydraulic circuits			CO2,CO4
	Unit 5	**Interfacing of Hydraulic Components with PLC**			
	A	Pneumatic pressure regulator systems and its components ,			CO2,CO5
	B	Pneumatic actuator systems and its component,			CO2,CO5
	C	Pneumatic circuits			CO2,CO5
	Mode of examination				
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. PLCs &SCADA : Theory and Practice By Rajesh Mehra 2. Hydraulics and Pneumatics: A technician's and engineer's guide By Andrew Parr			
	Other References				

Course Matriculation Matrix:

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C.016.1	1	1	1	1	1	1	-	1	-	-	2	1	1	1
C.016.2	2	2	2	2	3	2	-	2	1	1	3	2	2	2
C.016.3	3	3	3	2	3	3	1	2	1	1	3	3	3	3
C.016.4	3	3	3	3	3	3	-	2	-	-	2	3	3	3
C.016.5	3	3	3	3	3	3	-	2	-	-	2	3	3	3
CO.016	3	3	3	2	3	3	1	2	1	1	3	3	3	3

School: SET		**Batch : 2018-21**	
Program: B.Sc		**Current Academic Year: 2018-19**	
Branch:Hons		**Semester: 5/6**	
1	Course Code	ECR018	
2	Course Title	Power electronics	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	DE4	
5	Course Objective	1. Understanding of modern power semiconductor devices, their strengths, and their switching and protection techniques 2. Ability to analyze various important topologies of power converter circuits for specific types of applications including controlled and uncontrolled rectifiers, DC-DC converters and inverters 3. Ability to understand and analyze the qualities of waveforms at input and output ends of these converters	
6	Course Outcomes	On successful completion of this course students will be able to CO1: Summarize the principles of operation of power electronic converters CO2: Analyse controlled rectifier circuits. CO3: Analyse the operation of DC-DC choppers. CO4: Analyse the operation of voltage source inverters. CO5: Analyse the Inverter Techniques	
7	Course Description	Power electronics is the application of solid-state electronics for the control and conversion of electrical power. During the course it is taught that how in modern system the conversion is performed with semiconductor switching device such as SCR, MOSFET, IGBT, and GTO.	
8	Outline syllabus		CO Mapping
	Unit 1	**Power Semiconductor Devices**	
	A	Thyristors : Silicon Controlled Rectifiers (SCR's) , BJT, power MOSFET, power IGBT, TRIAC and their characteristics	CO1
	B	Gate characteristics of SCR, turn on and turn off methods.	CO1
	C	Series and parallel operation of SCRs, line commutation and forced commutation circuits.	CO1
	Unit 2	**Phase Controlled Converters**	
	A	Principle of phase control, circuit, waveform and analysis of single phase half wave and full wave line commutated converters with R, RL,RLE load.	CO2
	B	Circuit, waveform and analysis of three pulse and six pulse converters with R and RL load.	CO2

	C	Operation of dual converter.			CO2
	Unit 3	**Choppers**			
	A	Principle of operation, time ratio control and current limit control strategies			CO3
	B	Circuit, operation and analysis of Step down and step up choppers.			CO3
	C	Types of choppers: A, B, C, D and E choppers.			CO3
	Unit 4	**Inverters**			
	A	Principle of operation of single phase inverter, basic series inverter bridge inverter.			CO4
	B	Three phase Inverter: 120^0 and 180^0 mode, circuit,			CO4
	C	Operation and analysis.			CO4
	Unit 5	**Inverter Techniques**			
	A	Voltage control techniques for inverters			CO4,CO5
	B	VSI & CSI			CO4,CO5
	C	Comparison of VSI & CSI			CO4,CO5
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	Rashid M.D., " Power Electronics", Prentice Hall, 1993			
	Other References	1. Bose B.K., "Power Electronics and AC drives", Prentice Hall, 2. Sen P.C., "Power Electronics", TataMc.Graw Hill,. 3. Singh M.D., Kanchandani K.B., ''Power Electronics'', Tata McGraw-Hill.			

Course Matriculation Matrix:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C018.1	2	1	1	1	1	-	1	-	-	2	-	1	1	2
C018.2	2	1	-	-	1	2	-	-	-	-	2	2	1	1
C018.3	2	2	1	2	1		-	1	-	2	-	2	2	1
C018.4	2	-	-	1	1	2	1	-	-	-	-	2	1	2
C018.5	2	-	-	1	1	2	1	-	-	-	-	2	1	2
CO018	2	1	1	1	1	1	1	1		1	1	2	2	2

School: SET		**Batch: 2018-21**	
Program: BSc		**Current Academic Year:2018**	
Semester		**5/6**	
Branch:Hons			
1	Course Code	EPR017	
2	Course Title	Electronic Circuits and PCB Design Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	DE2	
5	Course Objective	1.To design basic electronic circuits 2.To design basic PCB design for basic electronic circuits 3.To get knowledge different PCB layers and their use 4.To know the process of PCB manufacturing	
6	Course Outcomes	CO1:Able understand the flow of current and potential differences in electronic circuits CO2:Able to do design of basic electronic circuits in optimum space CO3:Able to design PCBs for different electronic circuits CO4:Able to know process of PCB manufacturing CO5:Able to know process of Small Signal amplifier	
7	Course Description	This course explains about basic design and development of PCBs for different types of circuits. It is also gives idea about different types of manufacturing techniques PCB	
8	Outline syllabus		CO Mapping
	Unit 1	**Circuits Design**	
	A	Half wave Rectifier – without and with shunt capacitance filter	CO1
	B	Centre tapped full wave rectifier – without and with shunt capacitance filter	CO1
	C	Zener diode as voltage regulator – load regulation	CO1
	Unit 2	**BJT and small signal models**	
	A	Design and study of voltage divider biasing	CO2
	B	Designing of an CE based amplifier of given gain	CO2
	C	Designing of an Two stage amplifier of given gain	CO2
	Unit 3	**PCB Design Basics**	
	A	Manual PCB fabrication 1 for rectifier	CO3
	B	Manual PCB fabrication 2 for Zener regulator	CO3
	C	Manual PCB fabrication 3 for an amplifier	CO3
	Unit 4	**Software Based Tools**	
	A	Developing circuit 1 and its PCB layout using software	CO4
	B	Developing circuit 2 using its PCB software	CO4

	C	Developing circuit 3 using its PCB software			CO4
	Unit 5	**Small Signal amplifier**			
	A	Developing circuit of Small signal CE amplifier: circuit, working			CO5
	B	Developing circuit of Frequency response, re model for CE configuration,			CO5
	C	Developing circuit of derivation for Av, Zin and Zout.			CO5
	Mode of examination	Practical & Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	Refer lab manuals			
	Other References				

Course Matriculation Matrix:

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO017.1	3	2	2	1	-	2	-	2	-	-	2	2	1	2
CO017.2	2	3	3	3	2	2	-	2	-	-	3	2	3	3
CO017.3	3	3	2	2		2	-	2	-	-	3	2	2	3
CO017.4	2	2	2	1	2	1	-	-	-	-	2	3	2	2
CO017.5	2	2	2	1	2	1	-	-	-	-	2	3	2	2
CO017	3	3	3	3	1	2		2			3	3	2	3

School: SET		**Batch: 2018-21**	
Program: BSc		**Current Academic Year:2018**	
	Semester	**5/6**	
Course Code	ECR019		
2	Course Title	**Electrical Machines**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	DE3	
5	Course Objectives	1. understanding of operation principles of electrical machines. 2. ability to analyse different electrical machines. 3. ability to analyse performance characteristics of ac machines.	
6	Course Outcomes	CO1: Acquire knowledge about the fundamental principles and classification of electromagnetic machines CO2: Analyse the differences in operation of different dc machine configurations. CO3: define, analyse and solve problem based on Three-phase Induction machine CO4: Analyze the construction and characteristics and application of various type of electrical machines.	
7	Course Description	This course examines the basic theory, characteristics, construction operation and application of rotating electrical machines. It includes the study of direct current motors, direct current generators, transformers, alternators, synchronous motors, polyphase induction motors and single phase motors.	
8	Outline syllabus		CO Mapping
	Unit 1		
	A	**DC Machines:** Basic constructional features and physical principles involved in electrical machines, armature winding (ac and dc), lap and wave connections, different types of pitches	CO1, CO2
	B	**D.C. Generators:** Construction and principles of operation, brief idea about armature reaction and commutation, E.M.F. Equation, Methods of excitation, and Characteristics of Self excited and separately (Shunt, Compound and Series) excited generators, Losses and efficiency, applications.	CO1, CO2
	C	**D.C. Motors:** Comparison of generator and motor action &interchangeability, principle of operation, significance of back EMF, maximum power, Torque and speed relation, Characteristics of series, shunt and Compound excited motors & applications, losses & efficiency, necessity of motor starters, Three point starter,	CO1, CO2

		Speed control of DC motors, electronic speed control of DC motors, electric braking			
	Unit 2				
	A	**Transformers:** Types of transformers, Transformer Construction, EMF equation, No load operation, operation under load, Phasor diagram,			CO4
	B	Equivalent circuit of transformer, Transformer Losses, Voltage regulation, condition for maximum efficiency, All day efficiency, Short circuit and open circuit tests, Auto transformers.			CO4
	C	**Polyphase Circuits**: Polyphase circuits, three phase transformers, delta-delta and delta –Y Connection			CO4
	Unit 3				
	A	**Poly Phase Induction Motors:** General constructional features, Types of rotors, Rotating magnetic field (Ferrari's Principle),			CO3, CO4
	B	Induction motor as a generalized transformer, equivalent circuit, Production of torque, Slip,			CO3, CO4
	C	Split phase motors, capacitor start motors, capacitor start & run motors, Reluctance Motor, Stepper Motor, Single phase a.c. series motors, Universal motor.			CO3, CO4
	Unit 4				
	A	**Synchronous Machines**: Brief construction details of three phase synchronous generators,			CO1, CO4
	B	E.M.F. equation, Principle of operation of synchronous motor, methods of starting,			CO1, CO4
	C	factors for failure to start, applications, comparison of synchronous and induction motor			CO1, CO4
	Unit 5				
	A	**Single Phase Motors:** Single phase induction motors, Construction, principle of operation based on starting methods,			CO3, CO5
	B	Torque equation, Torque-slip characteristics,			CO3, CO5
	C	Speed control of Induction motor. Comparison with DC motor			CO3, CO5
	Mode of examination	Theory/Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1.B.L. Thareja, A.K. Thareja, A Textbook of Electrical Technology-Vol-II, S.Chand			

		2. J.B. Gupta, Electrical Technology (Electrical Machines), Katsons	
	Other References	1.I. J. Nagrath and D. P. Kothari, Electrical Machines, Tata McGraw Hill 2. G. Mc. Pherson, An introduction to Electrical Machines & Transformers, John Wiley & Sons 3. H. Cotton, Advanced Electrical Technology, CBS Publishers and Distributors, New Delhi	

Course Matriculation Matrix:

COs	PO1	PO2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C.019.1	3	3	2	2							1	2	2	
C.019.2	3	3	2	2							1	2	2	
C.019.3	3	3	2	2							1	2	2	
C.019.4	3	3	2	2							1	2	2	3
C.019.5	3	3	2	2							1	2	2	3
co.019	3	3	2	2							1	2	2	3

Program: B.Sc.		Current Academic Year: 2018	
Branch:Hons.		**Semester: 5/6**	
1	Course Code	ECR021	
2	Course Title	Digital Signal Processing	
3	Credits	4	
4	Contact Hours (L-T-P)	3-1-0	
	Course Status	DE1	
5	Course Objective	• The objective of DSP is usually to measure, filter and/or compress continuous real-world analog signals. • This course is the mathematical manipulation of an information signal to modify or improve it in some way. • It is characterized by the representation of discrete time, discrete frequency, or other discrete domain signals by a sequence of numbers or symbols.	
6	Course Outcomes	CO1:Learn to represent real world signals in digital format and understand transform-domain (Fourier and z-transforms) representation of the signals; CO2:To apply the linear systems approach to signal processing problems using high-level programming language; CO3: Introduce applications of linear filters and their real-time implementation challenges. CO4: To develop the understanding about the mathematics behind signal processing, for communications, control of systems, biomedical signal processing, seismic data processing, digital image processing etc. CO5: To develop the understanding about the FFT	
7	Course Description	Digital Signal Processing (DSP) is concerned with the representation, transformation and manipulation of signals on a computer. After half a century advances, DSP has become an important field, and has penetrated a wide range of application systems, such as consumer electronics, digital communications, medical imaging and so on. With the dramatic increase of the processing capability of signal processing microprocessors, it is the expectation that the importance and role of DSP is to accelerate and expand. Discrete-Time Signal Processing is a general term including DSP as a special case. This course will introduce the basic concepts and techniques for processing discrete-time signal on a computer. By the end of this course, the students should be able to understand the most important principles in DSP.	
8	Outline syllabus		CO Mapping
	Unit 1	**Discrete Time systems**	
	A	Discrete sequences, linear coefficient difference equation,	CO1, CO2
	B	Representation of DTS, LSI Systems. Stability and causality,	CO1, CO2

	C	frequency domain representations and Fourier transform of DT sequences.			CO1, CO2
	Unit 2	**Z-Transform**			
	A	Definition and properties, Inverse Z Transform and stability. Parsevals Theorem and applications.			CO1, CO2,CO3
	B	signal flow graph, its use in representation and analysis of Discrete Time Systems.			CO1, CO3
	C	Techniques of representations. Matrix generation and solution for DTS evaluations.			CO1, CO2,CO3
	Unit 3	**Discrete Fourier Transform**			
	A	DFT assumptions and Inverse DFT. Matrix relations, relationship with FT and its inverse,			CO2,CO3
	B	Circular convolution, DFT theorems,			CO1, CO2,CO3
	C	DCT. Computation of DFT.			CO2, CO3
	Unit 4	**Digital Filters**			
	A	Analog filter review. System function for IIR and FIR filters,			CO3, CO4
	B	Network representation. Canonical and decomposition networks. IIR filter realization methods and their limitations. FIR filter realization techniques.			CO3, CO4
	C	Discrete correlation and convolution; Properties and limitations.			CO3, CO4
	Unit 5	**FFT**			
	A	FFT Algorithms and processing gain, Discrimination,			CO2, CO5
	B	Interpolation and Extrapolation. Gibbs phenomena.			CO2, CO5
	C	FFT of real functions interleaving and resolution Improvement. Word length effects.			CO2, CO5
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	A.V. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice Hall, 1989.			
	Other References	John G. Proakis and D.G. Manolakis, Digital Signal Processing: Principles, Algorithms and Applications, Prentice Hall, 1997.			

Course Matriculation Matrix:

COs	PO1	PO2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C.021.1	3	3	2	2							1	2	2	
C.021.2	3	3	2	2							1	2	2	
C.021.3	3	3	2	2							1	2	2	
C.021.4	3	3	2	2							1	2	2	3
C.021.5	3	3	2	2							1	2	2	3
CO.021	3	3	2	2							1	2	2	3

SET		**Batch : 2018-2222**	
B.Tech		**Current Academic Year: 2018-2019**	
ECP363		**Semester: 5/6**	
1	Course Code	ECP021	
2	Course Title	Digital Signal Processing Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	DE1	
5	Course Objective	• To understand the concept of sampling and reconstruction of signals. • To implement various transforms (DFT, FFT and Z transform) in MATLAB and understand the concepts of these transforms. • To design and implement the various structures of FIR and IIR systems. • To design and implement FIR and IIR filters.	
6	Course Outcomes	CO1: To implement the concept of sampling and reconstruction. CO2: To implement DFT and FFT. CO3: To implement and understand the difference between linear and circular convolution. CO4: To implement the system function of a system using MATLAB. CO5: To develop the understanding about the FFT	
7	Course Description	This course includes the implementation of sampling and reconstruction of signals, DFT and FFT. It also focuses on implementation of system functions and the concepts of linear convolution. Implementation of various structures and design of IIR and FIR filters are also covered in this course.	
8	Outline syllabus		CO Mapping
	Unit 1	a-b) To understand the sampling theorem through the sampling and reconstruction of signals. c) To obtain DFT and IDFT of a sequence	**C01 ,CO2**
	Unit 2	a) To implement the FFT algorithm. b) To obtain the FFT of given 1-D signal and plot.	**CO2**
	Unit 3	a) To verify linear and circular convolution. b) To implement a system function and to plot the pole zero plot for same.	**CO3,C04**
	Unit 4	a-c) To obtain direct realization of FIR and IIR filters.	**CO4**

	Unit 5	To obtain projects on FFT			
	Mode of examination	Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	1.G. Proakis and D.G. Manolakis, "Digital Signal Processing, Principals, Algorithms, and Applications", Pearson Education.			
	Other References	1. A. Y. Oppenhein and R. W. Schater, "Digital Signal Processing", PHI 2. 2.A. Y. Oppenhein, R. W. Schater and J. R. Buck, "Discrete Time Signal Processing", PHI			

COURSE ARTICULATION MATRIX

COs	PO1	PO2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C.021.1	3	3	2	2							1	2	2	
C.021.2	3	3	2	2							1	2	2	
C.021.3	3	3	2	2							1	2	2	
C.021.4	3	3	2	2							1	2	2	3
C.021.5	3	3	2	2							1	2	2	3
C021	**3**	**3**	**2**	**2**							**1**	**2**	**2**	**3**

School: SET		**Batch : 2018-22**	
Program: bsc		**Current Academic Year: 2018-19**	
Branch:robotics		**Semester:5/6**	
1	Course Code	ECR023	
2	Course Title	EMBEDDED SYSTEMS AND ROBOTICS	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	DE3	
5	Course Objective	To train thestudents for finding right microcontroller for a particular application and to program it. They will also be taught interfacing of different input/output devices with microcontrollers. An introduction of robotics of real time systems and development robotic system will be taught	
6	Course Outcomes	CO1:Basic architecture of embedded systems and its components CO2:Develop programs of embedded systems using instruction set and embedded C CO3:Construct interfacing & building techniques of embedded systems CO4:Getting knowledge of robotics sensors and transducers CO5:Developing interfacing circuits for robotics applications	
7	Course Description	The aim of the subject is to explore the fun of electronics in small applications. This subject makes to do small projects based on AVR microcontroller. It is basic controller which used in the Embedded Systems. The subject will be explained with open source software with simulation. So, students can enjoy the reality of the embedded system virtually. The subject is very useful to do their microcontroller based projects using AVR and others. Scoring of marks is very easy in the subject because of fun in the subject.	
8	Outline syllabus		CO Mapping
	Unit 1	**Review of Microcontrollers Architecture**	
	A	RISC Architecture, data memory and programming memory of AVR	CO1
	B	The general purpose registers status register and program counter register in AVR	CO1
	C	Addressing Modes of AVR instructions, review of assembly programming, pin diagram	CO1
	Unit 2	**Basics of Embedded C Programming**	CO2
	A	Introduction to embedded C programming, open source tools, debugging, HEX file and flash programmers	
	B	Data types and time delay, Logic operations	CO2
	C	Data coversion, data serialization, memory allocation	CO2
	Unit 3	**Programming of Microcontrollers using Embedded C**	
	A	Programming of input/output port, timers, interrupts	CO3

	B	Programming of serial port, ADC, and interfacing of LCD			CO3
	C	SPI protocol and I2C protocol, RTC			CO3
	Unit 4	**Introduction of Robotics**			
	A	History of robotics, Classification of robotics Basic components of robotics			CO4
	B	Sensors –actuators & drive systems – Control Systems,			CO4
	C	Degree of freedom, electrical power management (battery)			CO4,CO5
	Unit 5	**Techniques and components for Robotics**			
	A	DC motor and stepper motor interfacings,			CO4,CO5
	B	PWM for velocity control, position encoders, position control interrupts, infrared sensors and receivers,			CO4,CO5
	C	ultrasonic range sensors, line follower system, Case study of Robotic Arm and Hexpod Robot			CO4,CO5
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	Muhammad Ali Mazidi, AVR Microcontroller and Embedded Systems: Using Assembly and C, Pearson Education			
	Other References	S.R. Deb and S. Deb, “Robotics Technology and Flexible Automation”, Second edition, McGraw Hill, 2011			

Course Matriculation Matrix:

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2	PSO 3
C023. 1	3	3									1	2	2	
C023. 2	3	3	3	2							1	1		
C023. 3	3		3	3							1	2	3	
C023. 4	3	2									1	1		2
C023. 5	3			3							1		2	3
CO02 3	3	2	1	2							1	1	1	1

School: SET		**Batch :** 2018-2022	
Program: B.Tech		**Current Academic Year:** 2018-2019	
Branch: EEE		**Semester: 5/6**	
1	Course Code	EEE321	
2	Course Title	Control Systems	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	DE2	
5	Course Objective	Control Systems is the study of the analysis and regulation of the output behaviors of dynamical systems subject to input signals. The concepts and tools discussed in this course can be used in a wide spectrum of engineering disciplines. The emphasis of this course will be on analysis and feedback controller design methods for linear time-invariant systems.	
6	Course Outcomes	CO1:Apply transfer function models, signal flow graphs and block diagram algebra to obtain the transfer function of a given system CO2: Obtain system response in time domain CO3: Design a closed-loop control system to satisfy dynamic performance specifications using frequency response CO4:Analyse closed-loop control systems for stability and steady-state performance CO5: Design simple feedback controllers and compensators to meet desired performance specifications	
7	Course Description	This course shall introduce the fundamentals of modeling and control of linear time invariant systems. The course will be useful for students from major streams of engineering to build foundations of time/frequency analysis of systems as well as the feedback control of such systems.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction to Control Problem**	
	A	Feedback Control: open-loop and closed-loop systems, benefits of feedback, block diagram algebra	CO1
	B	Mathematical models of physical systems, signal flow graph	CO1
	C	Transfer function models of linear time-invariant systems	CO1
	Unit 2	**Time Response Analysis**	

	A	Standard test signals, time response of first order systems for standard test inputs			CO2
	B	Time response of second order systems for standard test inputs			CO2
	C	Design specifications for second-order systems based on the time-response			CO2
	Unit 3	**Frequency Response Analysis**			
	A	Introduction and frequency domain specifications			CO3
	B	Correlation between frequency domain and time domain.			CO3
	C	Polar plot and Bode plot			CO3
	Unit 4	**Stability of Control Systems**			
	A	Concept of stability			CO4
	B	Characteristic equation, location of roots in s plane for stability, Routh Hurwitz criterion.			CO4
	C	Root-locus technique. Construction of root-loci			CO4
	Unit 5	**Modern Control System**			
	A	Lag, lead, lag-lead compensator and their performance criteria			CO5
	B	Concepts of state variables and state space model.			CO5
	C	Solution of state equations, concept of controllability and observability.			CO5
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. K. Ogata, "Modern Control Engineering", Prentice Hall, 1991. 2. M. Gopal, "Control Systems: Principles and Design", McGraw Hill Education, 1997.			
	Other References	1. I. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International, 2009 2. B. C. Kuo, "Automatic Control System", Prentice Hall, 1995.			

Course Matriculation Matrix:

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO321.1	3	3	2	1	-	-	-	-	-	-	-	-	2	1	-	2
CO321.2	2	3	2	2	-	-	-	-	-	-	-	-	3	-	-	1
CO321.3	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-	1
CO321.4	2	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
CO321.5	2	1	2	3	3	-	-	-	-	-	-	-	-	-	-	2
CO321	**3**	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**--**	**-**	**1**	**1**	**-**	**2**

School: SET		**Batch:** 2018-2022	
Program: B.Tech		**Current Academic Year:** 2018-2019	
Branch:EEE		**Semester:5/6**	
1	Course Code	EEP321	
2	Course Title	Control System Laboratory	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	DE2	
5	Course Objective	1. An understanding of the methodology for modeling mechanical,electrical, and other types of dynamic systems using both time domainand frequency domain analysis. 2. An understanding of the fundamental analytical methods and tools used in control system design. 3. Ability to design feedback controllers and compensators to meet desired performance specifications.	
6	Course Outcomes	CO1:Understand the modeling of linear-time-invariant systems using transfer function models, signal flow graphs and block diagram algebra CO2: Understandthe concept of stability and its assessment for linear-time invariant systems. CO3: To obtain system response in both time domain and frequency domain CO4:Analyze dynamic systems for their stability and performance CO5: To obtain and analyze the state space representation of a system	
7	Course Description	This course shall introduce the fundamentals of modeling and control of linear time invariant systems. The course will be useful for students from major streams of engineering to build foundations of time/frequency analysis of systems as well as the feedback control of such systems.	
8	Outline syllabus		CO Mapping
	Unit 1	**Practical based Feedback Systems**	
		To determine the speed-torque characteristics of an AC Servomotor	CO1
		To study synchro transmitter and receiver pair and obtain output versus input characteristics	CO1
		To control the speed of an AC motor using TRIAC	CO1
	Unit 2	**Practical related to time response analysis**	
		Time domain analysis and error analysis of first order control system using MATLAB	CO3
		Time domain analysis and error analysis of second order control	CO3

		system using MATLAB			
	Unit 3	**Practical related to frequency response analysis**			
		Frequency domain analysis and error analysis of first order control system using MATLAB			CO3
		Frequency domain analysis and error analysis of second order control system using MATLAB			CO3
	Unit 4	**Practical related to Stability**			
		Stability analysis using Bode Plot of Linear Time Invariant system using MATLAB			CO2,CO4
		Stability analysis using Root Locus Technique of Linear Time Invariant system using MATLAB			CO2,CO4
	Unit 5	**Practical related to State Space Analysis**			
		To obtain state space representation of a given system using MATLAB.			CO5
		To transform a given state space model to transfer function and vice versa using MATLAB			CO5
	Mode of examination	Practical			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	1. M. Gopal, "Control Systems: Principles and Design", McGraw Hill , 1997.			
	Other References	1. K. Ogata, "Modern Control Engineering", Prentice Hall, 1991.			

Course Matriculation Matrix:

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO321.1	3	3	2	1	-	-	-	-	-	-	-	-	2	1	-	2
CO321.2	2	3	2	2	-	-	-	-	-	-	-	-	3	-	-	1
CO321.3	3	2	1	1	3	-	-	-	-	-	-	-	-	2	-	1
CO321.4	2	3	2	2	-	-	-	-	-	-	-	-	1	2	-	2
CO321.5	2	1	2	3	3	-	-	-	-	-	-	-	-	1	-	2
CO321	3	3	2	2	1								1	1		2