SRI KRISHNA ARTS AND SCIENCE COLLEGE

An Autonomous College Affiliated to Bharathiar University
Re-Accredited by NAAC with 'A' Grade
Coimbatore -641 008, Tamil Nadu, India.

CBCS & OBE

Scheme of Instruction and Syllabus for

B.Sc. Electronics and Communication Systems

Effective from the Academic Year 2019-20 and onwards

DEPARTMENT OF ELECTRONICS AND COMMUNICATION SYSTEMS

SRI KRISHNA INSTITUTIONS
COIMBATORE

SRI KRISHNA ARTS AND SCIENCE COLLEGE
KNOWLEDGE LOVE & SERVICE
KUNIAMUTHUR (PO)
COIMBATORE - 641 008

SRI KRISHNA ARTS AND SCIENCE COLLEGE
COIMBATORE - 641008

DEPARTMENT OF ELECTRONICS AND COMMUNICATION SYSTEMS

I. Vision

The vision of the college FITNESS FOR PURPOSE is achieved by

- Preparing students for placements both during and outside the course work
- Strengthening the research activities in the departments
- Encouraging the consultancy and extension services involving students and faculty
- Creating a brand equity and brand image by carrying out activities with the motto ‘KNOWLEDGE, LOVE AND SERVICE’

II. Mission

The mission of the college is to prepare both boys and girls for the pressing demands of tomorrow keeping in mind the need to shape and mould a generation of young men and women with knowledge, character, true and genuinely cultivated spirit of service and far-reaching imagination.

III. Program Educational Objectives (PEOs)

The graduates of the Sri Krishna Arts and Science College will

PEO 1: Take an active role and participate in their continuous professional development including graduate studies when appropriate to their career goals

PEO 2: Maintain ethical and professional standards in their careers

PEO 3: Practice the domain knowledge in the application oriented discipline

IV. Program Outcomes (POs)

The graduates of the Sri Krishna Arts and Science should have

PO 1: An ability to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, and sustainability

PO 2: An ability to function on multidisciplinary teams

PO 3: An understanding of professional and ethical responsibility

PO 4: An ability to communicate effectively

PO 5: A recognition of the need for, and an ability to engage in life-long learning

PO 6: A knowledge of contemporary issues

PO7: An ability to apply the acquired knowledge in Electronics and Communication Systems

V. Graduate Attributes/Skills

The graduates of Sri Krishna Arts and Science College provided opportunity to develop

GA 1: Communication Skills

GA 2: Conceptual Skills

GA 3: Analytical Skills

GA 4: Competitive Skills

GA 5: Managerial Skills

GA 6: Technical Skills

VI. Mapping of PEOs, POs and GAs

PEO-PO Mapping

PEOs	Program Objectives (POs)						
	3 - High Correlation; 2 - Medium Correlation; 1-Low Correlation						
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
PEO 1	3	2	1	3	3	3	2
PEO 2	3	2	3	3	2	3	3
PEO 3	2	3	2	2	2	3	3

PO-GA Mapping

POs	Graduate Attributes (GAs)					
	3 - High Correlation; 2 - Medium Correlation; 1- Low Correlation					
	GA1	GA2	GA3	GA4	GA5	GA6
PO 1	3	2	3	3	3	2
PO 2	3	2	3	3	3	2
PO 3	1	3	3	2	1	1
PO 4	3	2	3	3	2	2
PO 5	2	2	2	1	1	2
PO 6	2	3	2	3	2	3
PO 7	2	3	3	3	1	3

SRI KRISHNA ARTS AND SCIENCE COLLEGE

An Autonomous College affiliated to Bharathiar University
Coimbatore - 641 008, Tamil Nadu, India.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION SYSTEMS

SCHEME OF EXAMINATION – CBCS PATTERN

Programme: B.Sc. Electronics and Communication Systems
(Effective from the Academic Year 2019-20)

Curriculum Structure, Credits & Marks Distribution

Part	Course Type	Number of Courses	Credits per Course	Total Credits	Marks	Semester
I	Tamil/Hindi/ Malayalam/ French	2	3	6	200	I & II
II	English	2	3	6	200	I & II
III	Discipline Specific Courses (DSC)		4-6	96	2200	I to VI
	Discipline Specific Elective Courses (DSE)	4				IV to VI
	Generic Elective Courses (GEC)	4	4	16	400	I to IV
IV	Ability Enhancement Compulsory Courses (AECC)	2	2	4	100	I & II
	Skill Enhancement Courses (SEC)	4	3	12	400	III & VI
V	Non Credit Courses (NCC)	3	-	-	-	IV to VI
	Non CGPA Credit Course (NCCC) Any one MOOC offered in SWAYAM/NPTEL online portal	1	3	3	-	I to VI
Total				**143**	**3500**	

Semester I

Course Code	Course Title	T/P	Ins. Hrs/ Week	MAP Code	Examination				Credits
					Dur. Hrs	CIA	ES	Total Marks	
19TLU01 19HLU01 19MLU01 19FLU01	Tamil-I/ Hindi-I/ Malayalam-I/ French-I	T	5	A	3	25	75	100	3
19ELU01	**English-I** English for Excellence	T	5	A	3	25	75	100	3
19ECU01	**DSC-I** Basic Electronics and Network Analysis	T	6	C	3	25	75	100	5
19ECU02	**DSC Practical-I** Basic Electronics Lab	P	3	L	3	20	30	50	2
19ECU03	**DSC Practical-II** Network Analysis Lab	P	3	L	3	20	30	50	2
19GEU07	**GEC-I** Mathematics - I	T	6	I	3	25	75	100	4
19AEU01	**AECC-I** Environmental Studies	T	2	C	-	50	-	50	2
Total			**30**					**550**	**21**

Semester II

Course Code	Course Title	T/P	Ins. Hrs/ Week	MAP Code	Examination				Credits
					Dur. Hrs	CIA	ES	Total Marks	
19TLU02 19HLU02 19MLU02 19FLU02	Tamil-II/ Hindi-II/ Malayalam-II/ French-II	T	5	A	3	25	75	100	3
19ELU02	**English-II** Campus to Corporate	T	5	A	3	25	75	100	3
19ECU04	**DSC-II** Electronic Devices and Circuits	T	6	C	3	25	75	100	5
19ECU05	**DSC Practical-III** Electronic Devices Lab	P	3	L	3	20	30	50	2
19ECU06	**DSC Practical-IV** Electronic Circuits Lab	P	3	L	3	20	30	50	2
19GEU08	**GEC-II** Mathematics - II	T	6	I	3	25	75	100	4
19AEU02A 19AEU02B 19AEU02C 19AEU02D 19AEU02E 19AEU02F 19AEU02G 19AEU02H 19AEU02I 19AEU02J 19AEU02K	**AECC-II: Elective** General Awareness/ Human Rights/ Women's Rights/ Yoga for Human Excellence/ Indian Culture and Heritage/ Introduction to Cyber Security/ Consumer Protection/ Constitution of India/ Waste Management/ Basic Tamil/ Advanced Tamil	T	2	C	-	50	-	50	2
Total			**30**					**550**	**21**

Semester III

Course Code	Course Title	T/P	Ins. Hrs/ Week	MAP Code	Examination				Credits
					Dur. Hrs	CIA	ES	Total Marks	
19ECU07	**DSC-III** Communication Electronics	T	5	C	3	25	75	100	5
19ECU08	**DSC-IV** Integrated Circuits and Instrumentation	T	5	C	3	25	75	100	4
19ECU09	**DSC-V** Digital Electronics and VHDL	T	5	C	3	25	75	100	4
19ECU10	**DSC Practical-V** Linear Integrated Circuits Lab	P	3	L	3	20	30	50	2
19ECU11	**DSC Practical-VI** Digital Electronics and VHDL Lab	P	3	L	3	20	30	50	2
	GEC-III								
19GEU38	C Programming and Data Structures	T	4	D	3	15	45	60	3
19GEU39	C Programming and Data Structures Lab /	P	2	M	2	15	25	40	1
19GEU40	Python Programming	T	4	D	3	15	45	60	3
19GEU41	Python Programming Lab	P	2	M	2	15	25	40	1
	SEC-I Non Major Elective Course (EDC)	-	3	-	-	100	-	100	3
Total			**30**					**600**	**24**

Semester IV

Course Code	Course Title	T/P	Ins. Hrs/ Week	MAP Code	Examination				Credits
					Dur. Hrs	CIA	ES	Total Marks	
19ECU12	**DSC-VI** Microwave and Fiber Optic Communication Systems	T	5	C	3	25	75	100	5
19ECU13	**DSC-VII** 8051 Microcontroller and Applications	T	5	D	3	25	75	100	4
19ECU14	**DSC Practical-VII** Communication Electronics Lab	P	3	L	3	20	30	50	2
19ECU15	**DSC Practical-VIII** 8051 Microcontroller and Applications Lab	P	3	M	3	20	30	50	2
	DSE-I								
19ECU16A	Programmable Logic Controller/	T	5	D	3	25	75	100	4
19ECU16B	Biomedical Instrumentation	T	5	D	3	25	75	100	4
	GEC-IV								
19GEU44	Internet and Java Programming	T	4	D	3	15	45	60	3
19GEU45	Internet and Java Programming Lab /	P	2	M	2	15	25	40	1
19GEU36	DBMS	T	4	D	3	15	45	60	3
19GEU37	DBMS Lab	P	2	M	2	15	25	40	1
19SEU02	**SEC-II** English for Competitive Examination	T	3	C	3	100	-	100	3
Total			**30**					**600**	**24**

Semester V

Course Code	Course Title	T/P	Ins. Hrs/ Week	MAP Code	Examination				Credits
					Dur. Hrs	CIA	ES	Total Marks	
19ECU17A	**DSE-IET** Industrial Exposure Training	-	8-10 Weeks	O	-	50	150	200	8
	OR								
19ECU17B 19ECU17C	**DSE-II & III** Internet of Things Artificial Intelligence	 T T	 5 5	 C C	 3 3	 25 25	 75 75	 100 100	 4 4
	AND								
19ECU18	**DSC-VIII** Embedded Systems with PIC	T	6	D	3	25	75	100	5
19ECU19	**DSC-IX** Robotics and Arduino Programming	T	5	H	3	25	75	100	4
19ECU20	**DSC Practical-IX** Embedded Systems with PIC Lab	P	3	M	3	20	30	50	2
19ECU21	**DSC Practical-X** Robotics and Arduino Programming Lab	P	3	M	3	20	30	50	2
19SEU01	**SEC-III** Mathematics for Competitive Examination	T	3	I	3	100	-	100	3
19ECU22	**NCC-I** On-line Test	-	-	-	2	-	-	Pass	-
19ECU23A 19ECU23B 19ECU23C 19ECU23D	**NCC-II: Elective** Industrial Internship Training/ Mini Project/ Spoken Tutorial/ Drive Through Course	-	-	-		-	-	Completed	-
Total			**30**					**600**	**24**

Semester VI

Course Code	Course Title	T/P	Ins. Hrs/ Week	MAP Code	Examination				Credits
					Dur. Hrs	CIA	ES	Total Marks	
19ECU24	**DSC-X** Modern Communication Systems	T	5	H	3	25	75	100	5
19ECU25	**DSC-XI** Computer Networks	T	5	H	3	25	75	100	4
19ECU26	**DSC-XII** Industrial and Power Electronics	T	5	D	3	25	75	100	4
19ECU27	**DSC Practical-XI** Industrial and Power Electronics Lab	P	3	M	3	20	30	50	2
19ECU28	**DSC Practical-XII** Modern Communication Systems Lab	P	3	L	3	20	30	50	2
19ECU29	**DSE-IV** Project (Dissertation)	-	6	N	-	25	75	100	6
19ECU30A 19ECU30B	**SEC-IV: Elective** Mobile Application Development / PC Hardware and Troubleshooting	T T	3 3	H D	3 3	25 25	75 75	100 100	3 3

19NCU01A 19NCU01B 19NCU01C 19NCU01D 19NCU01E 19NCU01F 19NCU01G	**NCC-III: Extension Activities - Elective** National Service Scheme / National Cadet Corps / Youth Red Cross / Red Ribbon Club / Rotaract Club / Sports / Association Activities	-	-	-	-	-	-	Completed	-
	Non CGPA Credit Course (NCCC) Any one **MOOC** offered in SWAYAM/NPTEL online portal	-	-	-	-	-	-	Completed	3
Total			**30**					**600**	**26+3**
Total								**3500**	**140+3**

Descriptions and Regulations

1. **Discipline Specific Courses (DSC)**

These courses are to be studied compulsorily by the students as a core requirement. The students are required to take DSCs across six semesters. The courses designed under this category aim to cover the basics that a student is expected to imbibe in the particular discipline. The students should study minimum of 12 courses in this category.

DSC Theory	DSC Practical
1. Basic Electronics and Network Analysis	1. Basic Electronics Lab
2. Electronic Devices and Circuits	2. Network Analysis Lab
3. Communication Electronics	3. Electronic Devices Lab
4. Integrated Circuits and Instrumentation	4. Electronic Circuits Lab
5. Digital Electronics and VHDL	5. Linear Integrated Circuits Lab
6. Microwave and Fiber Optic Communication Systems	6. Digital Electronics and VHDL Lab
7. 8051 Microcontroller and Applications	7. Communication Electronics Lab
8. Embedded Systems with PIC	8. 8051 Microcontroller and Applications Lab
9. Robotics and Arduino Programming	9. Embedded Systems with PIC Lab
10. Modern Communication Systems	10. Robotics and Arduino Programming Lab
11. Computer Networks	11. Industrial and Power Electronics Lab
12. Industrial and Power Electronics	12. Modern Communication Systems Lab

2. **Discipline Specific Elective Courses (DSE)**

Discipline Specific Elective courses offered under the main discipline of study which may be specialized or advanced or supportive to the discipline of study. A student will choose four DSE courses related to his/her subject in the IV, V and VI semesters.

1. DSE-I (Any one)
   a) Programmable Logic Controller
   b) Biomedical Instrumentation

2-3. IET (or) any two DSE courses

Industrial Exposure Training (IET): Students can opt for Industrial Exposure Training during fifth semester for a period of 8-10 weeks; in such case two courses, DSE-II & DSE-III will be exempted. Marks for the Industrial Exposure Training will be given based on the report and viva-voce examination conducted by the Department.

DSE-II & DSE-III

a) Internet of Things

b) Artificial Intelligence

4. Project (Dissertation)

During the sixth semester students should undertake a project work and submit the report. A guide will be allotted to each group of students (not exceeding four members in a group) by the Department. The project should be demonstrated at the time of viva-voce examination.

Internal Evaluation & Marks

CIA - 25 Marks

(First Review - 10 Marks, Second Review - 10 Marks & Work Dairy – 5 Marks)

External Evaluation & Marks

ES - 75 Marks (Dissertation - 50 Marks & Viva-voce - 25 Marks)

3. Generic Elective Courses (GEC)

Generic Elective Courses are the inter-disciplinary courses with an intention to seek exposure beyond discipline of choice. The students are required to study four of them during the first and second year.

1. Mathematics - I
2. Mathematics - II
3. a) C Programming and Data Structures
   b) C Programming and Data Structures Lab
4. a) Python Programming
   b) Python Programming Lab
5. a) Internet and Java Programming
   b) Internet and Java Programming Lab
6. a) DBMS
   b) DBMS Lab

The list of GECs offered by ECS Department

Offered to	SEM	Course Code	Course Title	T/ P	Ins. Hrs/ Week	MAP Code	Examination				Credits
							Dur. Hrs	CIA Marks	ES Marks	Total Marks	
B.Sc. (Cog)	III	19GEU47	Physics for Computer Science	T	5	H	3	25	75	100	4
B.Sc. (IT) B.Sc. (CT) B.Sc. (CS) B.Sc. (CSA) B.Sc. (SS) B.Sc. (Cog) BCA	IV	19GEU48	Embedded Systems	T	5	H	3	25	75	100	4
		19GEU49	Robotics and Applications	T	5	H	3	25	75	100	4
		19GEU50	PC Hardware	T	5	H	3	25	75	100	4

4. Ability Enhancement Compulsory Courses (AECC)

An Undergraduate Programme degree may be awarded if a student completes TWO Ability Enhancement Compulsory Courses during semester I and II. These courses aim to enhance the knowledge on Environmental Education and multidimensional understanding of the various topics for the sustainable development of India.

1. Environmental Science
2. Elective Course (Any One)
   - General Awareness
   - Human Rights
   - Women's Rights
   - Yoga for Human Excellence
   - Indian Culture and Heritage
   - Introduction to Cyber Security
   - Consumer Protection
   - Constitution of India
   - Basic Tamil
   - Advanced Tamil

5. Skill Enhancement Courses (SEC)

Skill Enhancement Courses are value-based and/or skill-based and should contain theory/lab/hands-on training/fieldwork, etc to enhance students' employability. A student shall have to study FOUR courses during Semester III to IV (one course in each semester).

1. Extra Departmental Course (EDC)

   Extra Departmental Course is an inter-disciplinary elective course designed to facilitate horizontal movement. Students shall choose any one compulsory EDC offered by other Departments in the third semester.

The EDC offered by ECS Department

Course Code	Course Title	T/P	Ins. Hrs/ Week	Map Code	CIA Marks	ES Marks	Total Marks	Credits
19SEC09	PC Hardware, Installation and Troubleshooting	T	3	D	100	-	100	3

2. English for Competitive Examination
3. Mathematics for Competitive Examination
4. Value Added Courses: (Department shall offer value added courses based on their expertise, specialization, requirements, scope and need.)
   a) Mobile Application Development /
   b) PC Hardware and Troubleshooting

6. Non Credit Courses (NCC)

Non Credit Courses are intended for students who want to gain general knowledge, learn a new skill, upgrade existing skills, enrich their understanding of a wide range of topics, or develop personal interests. A student shall have to take THREE courses during Semester V and VI.

1. On-line Test
   Online Test will be conducted at the end of the fifth semester. Hundred multiple choice questions will be asked from core courses.
2. Industrial Internship Training / Mini Project/ Spoken Tutorial/ Drive Through Course
   Students individually or with maximum of four members per batch should take up either Industrial internship or Mini Project for a period of fifteen days during the IV semester summer vacation. The report will be evaluated and viva-voce examination will be conducted during fifth semester by the Department. Otherwise, they have to complete one Spoken Tutorial or a Drive Through Course suggested by the Department.
3. Extension Activities: National Service Scheme / National Cadet Corps / Youth Red Cross / Red Ribbon Club / Rotaract Club / Sports / Association Activities

7. Non CGPA Credit Courses (NCCC)

These courses are intended to bring out and promote the self-learning initiative of the students – where their own motivation is what drives them to complete the course and not external compulsions. This fosters the habit of keeping oneself updated always by means of self-study. It gives the students the opportunities to explore new areas of interest and earn additional credits. Students can take any number of courses under this cafeteria system, three credits will be given on completion of each course. The credits will not be taken for CGPA calculation.

1. Compulsory Non CGPA Credit Course
   Any one MOOC shall be completed anytime during the programme, offered in SWAYAM/NPTEL online portal under MHRD, Govt. of India. The course must be of minimum 4 weeks duration.
2. Additional Non CGPA Credit Courses
   a) MOOC: Apart from completing one compulsory MOOC, students can take any number of online courses offered in SWAYAM/NPTEL online portal and earn additional credits. When a student take

more number of online courses, the first course will be taken for compulsory MOOC and for the subsequent MOOCs additional credits will be given in the same semester upon clearing the exam and submitting certificate at least 15 days before the release of semester examination results.

b) Additional Credit Courses (ACC): The College will release list of additional credit courses of self-study nature during every semester. Upon clearing the exam three additional credits will be given for each ACC.

*****

Bloom's Taxonomy Levels and Verbs

I. Remembering	II. Understanding	III. Applying	IV. Analyzing	V. Evaluating	VI. Creating
Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers.	Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas.	Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations.	Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria.	Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.
Choose Define Describe Draw Find How Identify Label List Locate Match Name Omit Recall Recognize Record Recite Reproduce Relate Select Show Spell State Tell Underline What When Where Which Who Why Write	Choose Classify Compare Convert Contrast Demonstrate Describe Determine Differentiate Discriminate Discuss Explain Express Extend Give Identify Illustrate Infer Interpret Locate Outline Practice Pick Predict Recognize Relate Rephrase Restate Respond Review Restate Select Simulates Show Summarize Tell Translate Use of	Apply Build Calculate Carry out Classify Choose Construct Demonstrate Develop Dramatize Employ Execute Experiment with Generalize Identify Illustrate implement Interpret Initiate Interview Make use of Manipulate Modify Model Organize Operate Operationalize Plan Practice Produce Relate Schedule Select Solve Translate Use Utilize	Advertise Analyze Appraise Assume Categorize Classify Calculate Correlate Criticize Compare Conclusion Contrast Discover Dissect Diagnose Deduce Debate Detect Determine Diagram Differentiate Draw Distinguish Divide Examine Estimate Evaluate Explain Function Identify Inference Infer Inspect Inventory Investigate Inspect List Motive Predict Relations Relate Simplify Solve Subdivide Survey Take part Test for Theme	Agree Appraise Assess Award Choose Compare Conclude Criteria Criticize Decide Deduct Defend Determine Disprove Discuss Estimate Evaluate Explain Importance Influence Interpret Judge Justify Mark Measure Opinion Perceive Prioritize Prove Rate Recommend Revise Rule on Select Score Support Test Value Verify	Adapt Arrange Assemble Build Change Choose Combine Compile Compose Construct Collect Create Delete Design Develop Discuss Elaborate Estimate Formulate Happen Imagine Improve Invent Manage Make up Maximize Minimize Modify Original Originate Plan Prepare Predict Propose Reconstruct Set-up Solution Solve Suppose Synthesize Systematize Test Theory

(Anderson, L. W. and Krathwohl, D. R., et al (Eds.) (2001) A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives. Allyn & Bacon. Boston, MA)

MODULAR ASSESSING PANEL

PERCENTAGE OF COMPONENTS FOR EACH COURSE

COURSE PANEL

S. No.	Modules	Language Concepts	Language Usage	Theory-Concepts	Theory-Applications	Theory-Skill Based	Theory-Programming	Theory-Analytics	Theory-Technology	Problem-Concepts	Problem-Analysis	Practical-Programming	Practical-Experiments	Practical-Applications	Project	Training
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	ICIA-Test	20	20	20	20	20	20	20	20	20	20	20	20	20		
2	IICIA-DIA	10	10	10	10	10	10	10	10	10	10					
3	Model Exam	30	30	30	30	30	30	30	30	30	30	20	20	20		
4	Class Presentation	10	10		10	10		10	10						60	
5	Technical Presentation/ Demonstration			10		10	10	10		10		20	20		20	60
6	Attendance											20	20	20		
7	Group Assignments			10		10				10						
8	Group-Mini project				10			10								
9	Case study					10					10					
10	Group discussion	10	10					10								20
11	Writing skills	10	10	10			10									
12	Simulation exercises						10		10	10	10		20			
13	Poster Presentation/Flow charts/Miniatures/Protocols	10	10	10	10		10		10	10	10	20		20	20	20
14	SSA/self-support assignment (Upcoming technical)				10				10		10			20		
CIA Marks		**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Programme	Course Code	Title
B.Sc (ECS)	19ECU01	Basic Electronics and Network Analysis

Preamble: This course provides students with a basic understanding of an electricity and electronics. It enables students to solve basic problems related to AC and DC circuits with various theorems and methods.

Expected level of output : Conceptual Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in elements of electronics

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Identify and define basic terms and concepts which are needed for electronic science.	Remembering	Conceptual	Writing skills
CO2	Recognize basic electronic components used for different electronic functions.	Understanding	Conceptual	Technical Presentation
CO3	Understand basic concepts of DC and AC circuit behavior.	Understanding	Conceptual	Writing Skills
CO4	Demonstrate the problem solving skills and proficiency in circuit analysis.	Applying	Technical	Poster Presentation/ Charts
CO5	Express the basic structure, properties and working principles of P-N junction circuit elements.	Analyzing	Analytical	Group Assignment

Modular Assessment Code : C (Theory-Concepts)

Course Inputs:

Unit	Description	Text Book	Chapter	Instructional Hours	COs
I	**Fundamentals of Electricity** Structure of solids; Structure of atoms	A	2	2	CO1
	Electron orbits; Distribution of electrons in atoms; Valance electrons; Ionized atoms; Energy level diagram	A	2	3	
	Energy bands; Insulators, Conductors and Semiconductors	A	2	2	
	Nature of electricity; Unit of charge; Free electrons; Electric current	B	1	1	
	Electric potential; Potential difference; Concept of EMF and potential difference	B	1	1	
	Resistance and its factors; Resistivity; Conductance	B	1	1	
	Ohm's Law; Electric power; Electrical energy	B	1	1	
	Temperature co-efficient of resistance	B	1	1	
II	**Passive Circuit Elements** **Resistor:** Resistor specifications; Classification of resistors; Fixed resistors; Variable linear resistors; Non-linear resistors	A	7	3	CO2 CO3

	Color code resistance designation; Resistors in series and parallel	A	7	2	
	Inductors: Faraday's laws of electromagnetic induction; Lenz's law; Types of inductors; Fixed and variable inductors; Inductance of a coil; Energy stored in inductor	A	7	3	
	Mutually couple coils; Q factor of an inductors; Inductors in series and parallel	A	7	2	
	Capacitors: Capacitor specifications; Classification of capacitors; Fixed and variable capacitors	A	7	2	
	Energy stored in a capacitor; Capacitors in series and parallel	A	7	1	
III	**DC Circuit Analysis** Open circuits; Short circuits; Kirchhoff's Laws	B	2	1	CO3 CO4
	Network terminology; Maxwell's mesh current method; Node voltage method	B	3	3	
	Superposition theorem; Thevenin's theorem	B	3	3	
	Norton's theorem; Maximum power transfer theorem	B	3	3	
	Millman's theorem; Reciprocity theorem	B	3	2	
	Simple problems	B	3	2	
IV	**AC Fundamentals** Sinusoidal alternating voltage and current; AC terminology: Cycle, Time period, Frequency, Amplitude, Average value, RMS value, Phase, Phase difference, Phasor diagram of sinusoidal quantities	B	15	2	CO3 CO4
	AC circuits with resistance only; AC circuits with inductance only; AC circuits with capacitance only	B	15	3	
	RL series circuit; RC series circuit; RLC series circuit	B	16	3	
	Resonance in series circuit; Resonance in parallel circuit	B	16 & 18	2	
	Transformer; EMF equation; Voltage transformation ratio	B	20	1	
V	**Semiconductors** Types of semiconductors: Intrinsic and Extrinsic semiconductors; P-type and N-type Semiconductors	A	10	3	CO2 CO5
	Majority and minority charge carriers; Hall effect	A	10	1	
	PN junction; Biasing the PN junction	A	11	2	
	PN junction diode; V-I characteristics; Diode current equation	A	12	2	
	Zener diode; V-I characteristics	A	13	2	
	Light Emitting Diode (LED); LED voltage drop and current	A	13	1	
	Revision			5	
	Total Hours			**66**	

Note: 80% Theory; 20% Problems
CIA: 25 Marks; **End Semester:** 75 Marks

Text Books:

A. R.S.Sedha, "*A Text Book of Applied Electronics"*, S.Chand & Company Pvt. Ltd., Reprint 2014.
B. V.K. Mehta, Rohit Mehta, "*Principles of Electrical Engineering and Electronics"*, S.Chand & Company Ltd., Reprint 2013.

References:

A. Sangeeta Chaudhary, *"Principles of Electronics"*, Laxmi Publications, First Edition, 2015.
B. Bernard Grob, *"Basic Electronics"*, McGraw-Hill, Eighth Edition, 1997.
C. Malvino, Albert Paul, "*Electronic Principles"*, Tata McGraw Hill, Sixth Edition, 2004.
D. David A.Bell, *"Electric Circuits and Electronic Devices"*, Oxford University Press, Third Impression, 2010.
D. http://nptel.ac.in/video.php?subjectId=117103063
E. http://nptel.ac.in/courses/117106101/

Programme	Course Code	Title
B.Sc (ECS)	**19ECU02**	**Basic Electronics Lab**

Preamble: This course focuses to design, construct and take measurement of basic electronic circuits, and compare the experimental results with theoretical concepts in the laboratory.

Expected level of output : Practical Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in elements of electronics

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Explain the concepts and responses of basic electronic circuits.	Understanding	Conceptual	Simulation Exercises
CO2	Understand the VI characteristics of semiconductor devices.	Understanding	Technical	Technical Presentation
CO3	Develop the ability to design and analyze electronic circuits.	Applying	Technical	Technical Presentation

Modular Assessment Code : L (Practical - Experiments)
Course Inputs:

Any 9 Experiments

Exp.	Name of the Experiment	
1	Determining value of resistors and ceramic capacitors	
2	Verification of Ohm's Law	
3	Temperature Coefficient of Resistance	
4	Resistors in Series and Parallel	
5	Capacitors in Series and Parallel	
6	LDR characteristics	
7	Measurement of AC signal parameters using CRO	
8	Measurement of reactance in RC circuit	
9	Series resonance circuit	
10	Parallel resonance circuit	
11	V-I Characteristics of PN junction diode	
12	V-I Characteristics of Zener diode	
	Repeat/Revision	**6**
	Total Hours	**33**

CIA: 20 Marks; **End Semester:** 30 Marks

Note: Practical Classes to be arranged in Electronic Circuits Lab
Essential Equipments: Power Supply, Function Generator, CRO and Multi-meter.

Programme	Course Code	Title
B.Sc (ECS)	**19ECU03**	**Network Analysis Lab**

Preamble: This laboratory course is designed to provide the students with the knowledge to use networks theorems for circuit analysis. In addition, the students will learn how to compare theoretical predictions with experimental results.

Expected level of output : Practical Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in elements of electronics

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Test circuits, analyze data and compare measured performance to theory.	Understanding	Conceptual	Simulation Exercises
CO2	Demonstrate network theorems using electronic components.	Applying	Technical	Technical Presentation
CO3	Troubleshoot and repair simple electric circuits.	Evaluating	Technical	Technical Presentation

Modular Assessment Code : L (Practical - Experiments)
Course Inputs:

Any 9 Experiments

Exp.	Name of the Experiment	
1	Verification of Kirchhoff's Voltage Law (KVL)	
2	Verification of Kirchhoff's Current Law (KCL)	
3	Verification of Voltage Division Rule	
4	Verification of Current Division Rule	
5	Mesh Current Analysis in DC circuit	
6	Node Voltage Analysis in DC circuit	
7	Verification of Super position theorem	
8	Verification of Maximum power transfer theorem	
9	Verification of Thevenin's theorem	
10	Verification of Norton's theorem	
11	Verification of Millman's theorem	
12	Verification of Reciprocity theorem	
	Repeat/Revision	**6**
	Total Hours	**33**

CIA: 20 Marks; **End Semester:** 30 Marks

Note: Practical Classes to be arranged in Electronic Circuits Lab
Essential Equipments: Power Supply, Ammeter, Voltmeter and Multi-meter

Programme	Course Code	Title
B.Sc (ECS)	19ECU04	Electronic Devices and Circuits

Preamble: This course builds the knowledge-base on the physics of semiconductors as related to the characteristics and design of solid-state electronic devices. It provides fundamental knowledge on basic electronic circuits.

Expected level of output : Conceptual Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in basic electronic components

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Acquire a basic knowledge in solid state electronics including BJT, FET, MOSFET and Thyristors.	Understanding	Conceptual	Writing skills
CO2	Understand the functionality of power supply and regulator circuits.	Understanding	Conceptual	Group Assignment
CO3	Design and verify the amplifier and oscillator circuits.	Applying	Technical	Technical Presentation
CO4	Develop the ability to analyze electronic circuits using discrete components.	Analyzing	Analytical	Poster Presentation/ Charts
CO5	Troubleshoot and redesign the electronic circuits.	Analyzing	Analytical	Technical Presentation

Modular Assessment Code : C (Theory-Concepts)

Course Inputs:

Unit	Description	Text Book	Chapter	Instructional Hours	COs
I	**Bipolar Junction Transistor (BJT)** Construction and Operation of BJT	A	14	2	CO1
	BJT circuit configurations; Comparison of CB, CE and CC configurations	A	14	1	
	Characteristics of a transistor in CE configuration	A	15	1	
	Transistor Biasing Operating point; DC load line; Stability factor	B	29	1	
	Base resistor method; Biasing with feedback resistor; Voltage divider bias method	B	29	3	
	Small Signal Amplifiers Classification of amplifiers; Transistor as an amplifier; CE transistor amplifier	A	16	3	
	Two-stage RC coupled amplifier; Frequency response of RC coupled amplifier; Applications	A	18	2	
II	**Field Effect Transistor (FET)** Types of FET; Construction of JFET; Operation of JFET	A	16	2	CO1
	Characteristics of JFET	A	16	1	
	MOSFETs: Types of MOSFET; Construction and working of D-MOSFET; Characteristics of D-MOSFET	A	16	4	

	Construction and working of E-MOSFET; Characteristics of E-MOSFET	A	16	3	
III	**Thyristors** Types of Thyristors; Silicon Controlled Rectifier (SCR); SCR construction; SCR operation	A	17	3	CO1 CO4
	VI characteristics of SCR	A	17	1	
	TRIAC: TRIAC construction; TRIAC operation	A	17	2	
	VI characteristics of TRIAC; Applications	A	17	2	
	Unijunction Transistor (UJT): Basic construction; UJT operation; VI characteristics of UJT; UJT Relaxation Oscillator	A	17	3	
	DIAC: DIAC construction; VI characteristics of DIAC	A	17	2	
IV	**Power Supply** Half-wave rectifier	B	28	1	CO2 CO4
	Full-wave rectifier: Centre-tap full-wave rectifier, Full-wave bridge rectifier	B	28	2	
	DC output voltage; Ripple factor; Efficiency	B	28	2	
	Filter circuits: Types of filter circuits	B	28	2	
	Regulated Power Supply; Zener diode regulator	-	-	2	
	IC voltage regulators: Fixed voltage regulators	-	-	3	
	Adjustable voltage regulators	-	-	1	
V	**Power Amplifiers** Classification of power amplifiers; Class-A amplifier; Class-B amplifier	A	22	3	CO3 CO4 CO5
	Class-B push-pull amplifier; Class C amplifier	A	22	2	
	Feedback Amplifiers Principle of feedback amplifiers	A	29	1	
	Oscillators Classification of oscillators; Barkhausen criterion	A	31	1	
	Hartley and Colpitts oscillators	A	31	3	
	RC-Phase shift, Wein Bridge and Crystal oscillators	A	31	2	
	Revision			5	
	Total Hours			**66**	

Note: 80% Theory; 20% Problems
CIA: 25 Marks; **End Semester:** 75 Marks

Text Books:

A. R.S. Sedha, "*A Text Book of Applied Electronics"*, S.Chand & Company Pvt. Ltd., Reprint 2014.
B. V.K. Mehta, Rohit Mehta, "*Principles of Electrical Engineering and Electronics"*, S.Chand & Company Ltd., Reprint 2013.

References:

A. Robert.L.Boylstedand Louis Nashelsky, *"Electronic Devices and Circuit Theory",* Pearson Education, Ninth Edition, 2009.
B. Jacob Millman, Christos C Halkias and SatyabrataJit, *"Electron Devices and Circuits",* TataMcGraw Hill, Third Edition, 2010.
C. David A.Bell, *"Electric Circuits and Electronic Devices"*, Oxford University Press, Third Impression, 2010.
D. http://nptel.ac.in/courses/117107095/
E. http://nptel.ac.in/courses/117107095/36

Programme	Course Code	Title
B.Sc (ECS)	19ECU05	Electronic Devices Lab

Preamble: This course is to study the characteristics of various electronic devices and design of various electronic circuits like rectifier, power supply, etc.

Expected level of output : Practical Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in Electronic circuits

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Understand the working and operational characteristics of Semiconductor devices.	Understanding	Conceptual	Simulation Exercises
CO2	Verify practically the response of various special purpose electronic devices.	Applying	Technical	Technical Presentation
CO3	Design and evaluate the rectifiers, power supply and filters.	Evaluating	Technical	Technical Presentation

Modular Assessment Code : L (Practical - Experiments)

Course Inputs:

Any 9 Experiments

Exp.	Name of the Experiment	
1	Transistor Characteristics in CE Mode	
2	JFET Characteristics	
3	SCR Characteristics	
4	SCR Turn Off using LC Circuit	
5	AC Voltage Controller using TRIAC and DIAC	
6	UJT Characteristics	
7	UJT as Relaxation Oscillator	
8	Half Wave Rectifier	
9	Full Wave Rectifier (Center-tap)	
10	Bridge Rectifier	
11	DC Regulated Power Supply using Zener Diode	
12	DC Regulated Power Supply using ICs	
	Repeat/Revision	**6**
	Total Hours	**33**

CIA: 20 Marks; **End Semester:** 30 Marks

Note: Practical Classes to be arranged in Electronic Circuits Lab
Essential Equipments: Power Supply, Function Generator, CRO and Multi-meter.

Programme	Course Code	Title
B.Sc (ECS)	19ECU06	Electronic Circuits Lab

Preamble: This course is designed to provide an experience in design, construct, analysis and test the basic electronic circuits.

Expected level of output : Practical Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in Electronic circuits

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Learn about biasing of BJTs.	Understanding	Technical	Simulation Exercises
CO2	Understand the frequency response of amplifiers.	Understanding	Technical	Technical Presentation
CO3	Design and evaluate the oscillators.	Applying	Technical	Technical Presentation

Modular Assessment Code : L (Practical - Experiments)

Course Inputs:

Any 9 Experiments

Exp.	Name of the Experiment	
1	Transistor Biasing - Base Resistor Method	
2	Transistor Biasing with Feedback Resistor	
3	Transistor Biasing - Voltage-divider Bias Method	
4	Diode Based Clipping and Clamping Circuits	
5	Frequency Response of CE Transistor Amplifier	
6	Two-stage RC Coupled Amplifier	
7	FET Amplifier	
8	Class-B Push-Pull Amplifier	
9	Hartley Oscillator	
10	Colpitts Oscillator	
11	RC-Phase Shift Oscillator	
12	Crystal Oscillator	
	Repeat/Revision	**6**
	Total Hours	**33**

CIA: 20 Marks; **End Semester:** 30 Marks

Note: Practical Classes to be arranged in Electronic Circuits Lab
Essential Equipments: Power Supply, Function Generator, CRO and Multi-meter.

Programme	Course Code	Title
B.Sc (ECS)	19ECU07	Communication Electronics

Preamble: This course covers fundamental concepts of communication systems, which are essential for the understanding of advanced communication systems.

Expected level of output : Conceptual Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in electronic circuits and basic mathematics

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Learn the basic concepts of electromagnetic wave radiation and propagations.	Remembering	Conceptual	Group Assignment
CO2	Understand important and fundamental antenna engineering parameters and terminology.	Understanding	Conceptual	Writing skills
CO3	Understand AM, FM and PM communication systems.	Understanding	Conceptual	Poster Presentation/ Charts
CO4	Apply the essential facts about single sideband modulation for radio communications systems.	Applying	Technical	Technical Presentation
CO5	Design and analyze performance of the Super Heterodyne receiver.	Analyzing	Analytical	Technical Presentation

Modular Assessment Code : C (Theory-Concepts)

Course Inputs:

Unit	Description	Text Book	Chapter	Instructional Hours	COs
I	**Radiation and Propagation of Waves** Fundamentals of EM Waves; Reflection; Refraction; Interference of EM waves	A	10	2	CO1
	Ground wave propagation; Sky wave propagation; Space wave propagation	A	10	3	
	Virtual height; Critical frequency; MUF; Skip distance	A	10	3	
	Duct propagation; Tropospheric scatter propagation	A	10	2	
II	**Antennas** Electromagnetic radiations; Elementary doublet	A	9	1	CO2
	Current and voltage distributions; Resonant antennas, Radiation patterns and length calculations	A	9	2	
	Non-resonant antennas; Antenna gain and Effective radiative power; Antenna resistance	A	9	2	
	Bandwidth, Beam width and Polarization; Grounded and ungrounded antennas	A	9	1	
	Effect of Antenna height; Selection of Feed point; Antenna Couplers; Impedance matching with stubs and other devices	A	9	2	
	Dipole arrays; Yagi-Uda antenna; Parabolic antenna ; Horn and Loop antenna; Helical antenna	A	9	2	

III	**Modulation Techniques** Introduction to communication systems; Elements of communication systems; Need for modulation	A	1	2	CO3 CO4
	Electromagnetic spectrum and typical applications; Terminologies in communication systems; Basics of signal representation and analysis	A	1	3	
	Amplitude modulation (AM) AM Techniques; Frequency spectrum of AM wave; Time domain Representation of AM wave; Power Relations in the AM wave	A	3	3	
	Sideband Modulation Technique Generation of DSBC signal: Balanced Modulator	A	3	1	
	Generation of SSB signal: Filter method, Phase shift method; Third method	A	3	3	
	Vestigial Sideband Modulation Technique	A	3	1	
IV	**Angle Modulation Techniques** Frequency modulation; Phase modulation; Comparison of frequency and phase modulation	A	4	2	CO3
	Frequency Modulation (FM) Mathematical representation; Frequency spectrum of the FM wave; Pre-emphasis and De-emphasis	A	4	3	
	Generation of FM: Direct and Indirect methods	A	4	2	
	Comparison of FM and AM	A	4	1	
V	**Receiver** Super Heterodyne Receiver	A	7	2	CO5
	RF section and its characteristics; Sensitivity; Selectivity; Image frequency and its rejection; Adjacent channel selectivity	A	6	3	
	Spurious response; Tracking	B	6	2	
	AGC; Double conversion receiver	B	6	2	
	Revision			5	
	Total Hours			**55**	

Note: 100% Theory
CIA: 25 Marks; **End Semester:**75 Marks

Text Books:

A. Kennedy and Davis, "*Electronic Communication Systems*", Tata McGraw Hill, Fifth Edition, 2011.
B. Dennis Roddy and John Coolen, "*Electronic Communication*", PHI, Fourth Edition, 2008.

References:

A. Louis E. Frenzel, *"Principles of Electronic Communication Systems"*, McGraw-Hill Education, 3 edition, 2007.
B. S. L. Gupta, V. Kumar, *"A Hand book of Electronics"*, Pragati Prakashan, 38th Edition, 2012.
C. Anoksingh & A.K. Chhabra, "*Principles of Communication Engineering*", S.Chand & Company Ltd, Sixth Edition, 2007.
D. NIIT, "*Basics of Electronic Communication",* Prentice Hall India Pvt. Ltd, 2004.
E. http://nptel.ac.in/courses/117102059/

Programme	Course Code	Title
B.Sc (ECS)	19ECU08	Integrated Circuits and Instrumentation

Preamble: This course provides the knowledge on linear integrated circuits and electronic instruments. It enables the students to analyze the characteristics of operational amplifiers.

Expected level of output : Conceptual Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in basic electronic components and devices

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Understand the various IC fabrication process.	Understanding	Conceptual	Poster Presentation/ Charts
CO2	Describe the characteristics, linear and nonlinear application of operational amplifier.	Understanding	Conceptual	Writing skills
CO3	Develop the ability to analyze and design the Timer and PLL based linear circuits.	Analyzing	Analytical	Technical Presentation
CO4	Understand the concepts and working principles of electronic instruments.	Understanding	Conceptual	Group Assignment
CO5	Understand the basic manufacturing processes related to electronic products	Understanding	Conceptual	Group Assignment

Modular Assessment Code : C (Theory-Concepts)

Course Inputs:

Unit	Description	Text Book	Chapter	Instructional Hours	COs
I	**IC Fabrication Technology** Fundamentals of Monolithic IC technology; Basic planar process; Wafer preparation; Epitaxial growth	A	1	2	CO1
	Oxidation; Photolithography; Diffusion of impurities; Isolation techniques	A	1	3	
	Metallization; Monolithic transistors; Integrated resistors; Integrated capacitors	A	1	3	
	Integrated Inductors; Thin and Thick film technology	A	1	2	
II	**Operational Amplifier** Ideal Op-amp; Op-amp parameters; Inverting and Non-inverting amplifier; Differential amplifier	A	2	2	CO2
	Adder and Subtractor; Instrumentation Amplifier	A	3,4	2	
	Voltage to Current converter; Current to Voltage converter	A	4	2	
	Differentiator; Integrator	A	4	2	
	Comparator; Application: Zero crossing detector	A	5	1	
	Active Filters: First order low-pass, high-pass and band-pass filters	A	7	2	

III	**Timer** Functional block diagram of 555 timer; Mono-stable operation; Applications: Linear ramp generator; Pulse width modulator	A	8	3	CO3
	Astable operation; Applications: FSK Generator; Schmitt trigger	A	8	2	
	Phase locked loop PLL Basic principles; Phase detector/comparator; Voltage Controlled Oscillator	A	9	3	
	PLL Applications: Frequency multiplier/division; AM detection	A	9	2	
IV	**Electronic Instruments** Electronic Voltmeter; Electronic Ammeter; Electronic Multi-meter	B	-	3	CO4
	Oscilloscope: Block diagram, Frequency Measurement, Phase angle and Time delay measurement	B	-	2	
	Digital Storage Oscilloscopes (DSOs)	B	-	1	
	Function Generator; Audio Frequency Signal Generation	B	-	2	
	Wave Analyzer; Spectrum Analyzer: Block diagram, Applications	B	-	2	
V	**Instrument Design and Manufacturing Techniques** Grounding; Shielding	C	10	2	CO5
	Elements of Design: Product life cycle; Circuit design; Circuit layout	C	10	2	
	Assembly and inspection; Testing and calibration	C	11	1	
	Power distribution; Wiring and cabling; Enclosures	C	11	2	
	Integrated testing; Documentation	C	11	2	
	Revision			5	
	Total Hours			**55**	

Note: 100% Theory
CIA: 25 Marks; **End Semester:** 75 Marks

Text Books:

A. D. Roy Choudhury and Shahil B Jain, *"Linear Integrated Circuits",* New Age International Publishers, Second Edition, 2004.
B. Albert D. Helfrick, William D. Cooper, *"Modern Electronic Instrumentation and Measurement Techniques",* Prentice Hall of India, 2006.
C. M. M. S. Anand, *"Electronic Instruments and Instrumentation Technology"*, PHI Learning Pvt. Ltd., 2005.

References:

A. Ramakant.A Gayakwad, *"Op-Amp and Linear Integrated circuits"*, PHI Learning Private limited, 2009.
B. T.R Ganesh Babu, B.Suseela, "*Linear Integrated Circuits",* Scitech Publications Pvt. Ltd., Third Edition, 2010.
C. H.S.Kalsi, *"Electronic Instrumentation",* Tata McGraw Hill Publication Company Limited, Sixth Reprint, 2006.
D. J.B.Gupta, *"A course in electronic and electrical measurements and instrumentation",* S.K Kataria & Sons, 13th Edition, 2008
D. http://nptel.ac.in/courses/117107094/8
E. http://nptel.ac.in/courses/117106030/

Programme	Course Code	Title
B.Sc (ECS)	19ECU09	Digital Electronics and VHDL

Preamble: This course will familiarize students with the fundamental knowledge on number systems, combinational logic circuits and sequential logic circuits. It will provide students an overview of the VHDL language.

Expected level of output : Conceptual Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in number systems and computer fundamentals

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Recall the different number systems.	Remembering	Conceptual	Poster Presentation/ Charts
CO2	Understand the Boolean expressions and Logic gates.	Understanding	Conceptual	Group Assignment
CO3	Analyze the Combinational building blocks.	Analyzing	Analytical	Technical Presentation
CO4	Gain the capability of implementing various counters, registers and flip-flop based systems.	Analyzing	Analytical	Poster Presentation/ Charts
CO5	Describe the operation of ADC and DAC circuits.	Understanding	Conceptual	Writing skills

Modular Assessment Code : C (Theory-Concepts)

Course Inputs:

Unit	Description	Text Book	Chapter	Instructional Hours	COs
I	**Number Systems** Binary, Decimal, Octal and Hexadecimal numbers; Conversion	A	1	4	CO1
	Floating point representation of numbers; Arithmetic Operations	A	1	2	
	Negative binary numbers using 1's and 2's complements; Binary Coded Decimal (BCD)	A	1	2	
	Codes Weighted codes and Non-Weighted codes; Error detecting codes; Error correcting codes; Alphanumeric codes	A	1	3	
II	**Boolean Algebra** Boolean logic operations, Basic laws of Boolean algebra; DeMorgan's theorem; Sum of Products and Product of Sums; Karnaugh map (Four variables)	A	2	4	CO2
	Logic Gates OR, AND, NOT, NAND, NOR, EX-OR and EX-NOR gates, NAND and NOR as universal gates	A	3	3	
	HDL for Digital Circuits Introduction to VHDL programming, VHDL Coding for Logic gates	A	13	3	

III	**Combinational Logic Circuits** Half adder; Full adder; Half Subtractor; Full Subtractor; Parallel binary adder; 4-bit binary adder/ Subtractor; BCD adder	A	4	3	CO3
	Multiplexer; De-multiplexer; Decoders; Encoders	A	5	3	
	Parity generators/checkers; Binary-to-Gray code converter; Gray-to-Binary code converter; Magnitude comparator	A	5	3	
	VHDL code for combinational logic circuits	A	13	2	
IV	**Sequential Logic Circuits** **Flip-Flops** S-R Flip-flop, Clocked S-R Flip-flop, D Flip-flop and T Flip-flop	A	6	3	CO4
	J-K Flip-flop; Master-slave Flip-flops; Applications of Flip-flops	A	6	2	
	Counters Asynchronous / Ripple counter; Decade counter; Up-down counter; Synchronous counter; Design of Synchronous MOD-N counters	A	7	3	
	Registers Shift Registers and its types	A	8	1	
V	**D/A Converters** Resistive divider network; Binary ladder network; D/A converter specifications	B	10	3	CO5
	A/D Converters Simultaneous type; Counter type; Successive approximation type	B	10	3	
	Single and dual-slope type; A/D converter specifications	B	10	3	
	Revision			5	
	Total Hours			**55**	

Note: 80% Theory; 20% Problems
CIA: 25 Marks; **End Semester:** 75 Marks

Text Books:

A. S. Salivahanan, S. Arivazhagan, "*Digital Electronics"*, Vikas Publishing House Pvt. Ltd., First Edition, 2010.
B. Anil. K. Maini, "*Digital Electronics"*, Wiley Publications, First Edition, 2008.

References:

A. Donald Leach, Albert Malvino and GoutamSaha, Digital Principles and Applications", McGraw-Hill Education India, Seventh Edition, 2010.
B. Bhasker. J, "*A VHDL Primer*", PHI Learning Pvt. Ltd, Third Edition, 2008.
C. M. Morris Mano, *"Digital Design"*, Prentice-Hall of India, Third Edition, 2005.
D. http://nptel.ac.in/courses/117106086/

Programme	Course Code	Title
B.Sc (ECS)	19ECU10	Linear Integrated Circuits Lab

Preamble: This course provides the basic knowledge in the selection of integrated circuits, study of its specifications and functionality, and design of practical applications.

Expected level of output : Practical Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge of Electronic Devices and Circuits Analysis

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Demonstrate an understanding of fundamentals of integrated circuits.	Understanding	Conceptual	Simulation Exercises
CO2	Design an application with the use of integrated circuits.	Applying	Technical	Technical Presentation
CO3	Learn how to apply troubleshooting and problem solving skills to resolve linear integrated circuit issues.	Evaluating	Technical	Technical Presentation

Modular Assessment Code : L (Practical - Experiments)

Course Inputs:

Any 9 Experiments

Exp.	Name of the Experiment	
1	Inverting and Non-inverting Amplifier using Op-Amp	
2	Adder and Subtractor using Op-Amp	
3	Integrator and Differentiator using Op-Amp	
4	Comparator using Op-amp	
5	Active Low Pass and High Pass Filters using Op-Amp	
6	Monostable and Astable Multivibrators using IC 555	
7	Schmitt Trigger using Op-Amp	
8	Frequency Multiplier using PLL	
9	Current to Voltage and Voltage to Current Converter using Op-Amp	
10	Peak Detector using Op-Amp	
11	Instrumentation Amplifier using Op-Amp	
12	Precision Rectifiers using Op-Amp	
	Repeat/Revision	**6**
	Total Hours	**33**

CIA: 20 Marks; **End Semester:** 30 Marks

Note: Practical Classes to be arranged in Electronic Circuits Lab
Essential Equipments: Power Supply, Function Generator, CRO and Multi-meter.

Programme	Course Code	Title
B.Sc (ECS)	19ECU11	Digital Electronics and VHDL Lab

Preamble: This course focuses to design and construct the basic digital electronic circuits and to become familiar with the VHDL programming.

Expected level of output : Practical Level

Department offered : Electronics and Communication Systems

Prerequisites : Basic knowledge in electronic circuits

Course Outcomes:

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

Course outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Acquire the fundamental knowledge in basic logic gates.	Understanding	Conceptual	Simulation Exercises
CO2	Design and analyze digital electronic circuits.	Applying	Technical	Technical Presentation
CO3	Develop the VHDL programming for the digital circuits.	Applying	Technical	Technical Presentation

Modular Assessment Code : L (Practical - Experiments)

Course Inputs:

Any 9 Experiments

Exp.	Name of the Experiment	
1	Verification of Logic Gates	
2	Half Adder and Full Adder	
3	Half-Subtractor and Full-Subtractor	
4	4-bit Binary to Gray and Gray to Binary Conversion	
5	4x2 Encoder and 2x4 Decoder	
6	4:1 Multiplexer and 1:4 De-multiplexer	
7	Verification of JK Flip-Flop	
8	Shift Registers and Ring Counter	
9	Logic Gates using VHDL	
10	Half Adder and Full Adder using VHDL	
11	Decoder and Encoder using VHDL	
12	Multiplexer and De-multiplexer using VHDL	
	Repeat/Revision	**6**
	Total Hours	**33**

CIA: 20 Marks; **End Semester:** 30 Marks

Note: Practical classes to be arranged in Electronic Circuits Lab and DSP Lab.
Essential Equipments: Power Supply, Function Generator and Multi-meter

Programme	Course Code	Title
B.Sc (ECS)	19ECU12	Microwave and Fiber Optic Communication Systems

Preamble: The course aims to provide students with a broad understanding of microwaves and microwave active devices. It will also explain the RADAR and fiber optic communication systems.

Expected level of output : Conceptual Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in basic electronic systems

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Understand the theory of microwave and fiber optic communication.	Understanding	Conceptual	Writing skills
CO2	Discuss the working of microwave amplifiers, oscillators and devices.	Understanding	Conceptual	Poster Presentation/ Charts
CO3	Design and analyze the microwave amplifiers, oscillator and devices.	Analyzing	Analytical	Technical Presentation
CO4	Understand the basics of Radar technology.	Understanding	Conceptual	Poster Presentation/ Charts
CO5	Describe the different characteristics of optical fiber.	Understanding	Conceptual	Group Assignment

Modular Assessment Code : C (Theory-Concepts)

Course Inputs:

Unit	Description	Text Book	Chapter	Instructional Hours	COs
I	**Introduction to Microwaves** Microwave region and Band designations; Advantages of Microwaves; Applications of Microwaves	A	2	2	CO1
	Maxwell's equation: Ampere law; Faraday law; Gauss law	A	2	2	
	Wave equation	A	2	2	
	Types of wave guides	A	4	1	
	Propagation of TEM waves; TE and TM modes	A	4	1	
	Propagation of TE and TM modes in rectangular waveguides	A	4	2	
	Circular waveguides; Advantages, disadvantages and application of Circular waveguides	A	4	2	
II	**Microwave Amplifiers and Oscillators** Microwave tubes; Two cavity Klystron	A	8	2	CO2 CO3
	Multi cavity Klystron; Reflex Klystron	A	8	2	
	Travelling Wave Tube (TWT)	A	8	2	
	Magnetron; Applications	A	8	2	
III	**Microwave Devices** Microwave transistors	B	9	1	CO2 CO3

	Gallium Arsenide (GaAs) metal semiconductor FET	A	9	1	
	Varactor Diode; Schottky diode	A	9	2	
	Principle of Operation and application of tunnel diode	A	9	1	
	Principle of operation of Gunn diode, Applications and Advantages of Gunn diode	A	9	2	
	MASER principle; Applications	A	9	2	
IV	**RADAR** Introduction; Block diagram; Classification	A	11	2	CO4
	Radar range equation; Factors affecting the range of a radar receiver	A	11	2	
	Line pulse modulator; PPI (Plane Position Indicator)	A	11	2	
	Moving Target Indicator (MTI); FM CW Radar; Applications	A	11	3	
	Laser Radar	-	-	1	
V	**Optical Fiber Communication** Evolution of fiber optic system; Elements of an optical fiber communication link; Advantages of optical fiber communication	B	1& 2	3	CO5
	Fiber types; Total internal reflection; Acceptance angle; Numerical Aperture	B	2	2	
	Fiber optical sources: LED structure; Laser diode structure	B	3	3	
	Optical detectors: PIN diode; Avalanche photo diode	B	4	3	
	Revision			5	
	Total Hours			**55**	

Note: 90% Theory, 10% Problems
CIA: 25 Marks; **End Semester:** 75 Marks

Text Books:

A. M. Kulkarni, *"Microwave and Radar Engineering",* Umesh Publications, Fifth Edition, 2014.
B. Sathyamurthy, Jayanthy Daniel, Nisha Lawrence, "*Optical communication",* Sams Publishers, First Edition, 2009.

References:

A. Samuel Y.Liao, *"Microwave Devices and Circuits",* Prentice Hall, Third Edition, 2005.
B. Sen.A.K, Bhattacharya.A.B, *"Radar system and Radio aids to Navigation",* Khanna Publications, Fifteenth Edition, 2002.
C. Skolnik, Merrill I. *"Radar Handbook",* McGraw-Hill Education; Third Edition, 2008.
D. Maini.A.K, *"Microwave and RADAR principles and applications",* Hanna Publishers, Second Edition, 2001.
E. Keiser G, *"Optical Fiber Communication Systems",* Tata McGraw Hill, 4th Edition, 2010.
F. http://nptel.ac.in/courses/117101002/

Programme	Course Code	Title
B.Sc (ECS)	19ECU13	8051 Microcontroller and Applications

Preamble: This course provides a broad and systematic introduction to microcontroller based system design. It explores the hardware architecture, programming and applications of 8051 Microcontroller.

Expected level of output : Conceptual and Application Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in Digital Electronics and C Programming

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Recall and apply a basic concept of digital fundamentals to Microcontroller based system	Remembering	Conceptual	Poster Presentation/ Charts
CO2	Understand the basic concepts and working principles of 8051 Microcontroller	Understanding	Conceptual	Class Presentation
CO3	Familiarize with the assembly level and embedded C programming using 8051	Understanding	Conceptual	SSA
CO4	Analyze the properties of Microcontroller	Analyzing	Analytical	Class Presentation
CO5	Formulate appropriate computing solution and apply it to the Microcontroller based real-time applications	Applying	Technical	Group Mini Project

Modular Assessment Code : D (Theory-Applications)

Course Inputs:

Unit	Description	Text Book	Chapter	Instructional Hours	COs
I	**8051 Architecture and Memory organization** Definition of Basic Terminologies: Digital Computer; CPU; ALU; Control Unit; Memory; RAM; ROM; Peripherals; Input; Output; Microprocessor; Microcontroller	A	1	2	CO1 C02
	Bit; Byte; Nibble; Word; Instruction; Mnemonics; Program; Machine Language; Assembly Language; Low level Language; High Level Language; Assembler; Compiler; Interpreter; Simulator; Integrated Development Environment (IDE)	A	1	2	
	Microcontrollers for Embedded Systems; Criteria for choosing microcontroller	A	1	1	
	Overview of 8051 family	A	1	1	
	Architecture of 8051	A	1	2	
	8051 Memory organization: Program memory; RAM allocation; SFR	A	2	2	
II	**Instruction Set and Addressing Modes** Flag bits and PSW register	A	2	1	CO2 CO3
	Program counter; Instruction Fetching, Decoding and Execution concepts	A	2	1	
	8051instruction set: Data transfer instructions; Arithmetic instructions	A	6	3	

	Logical instructions; Boolean and Branching instructions	A	4&6	3	
	Addressing modes	A	5	2	
III	**ALP & Embedded C Programming** Introduction to ALP: Data types and Assembler directives; Simple data transfer programs	A	2&6	2	CO3
	Unsigned addition and subtraction	A	6	1	
	Unsigned multiplication and division	A	6	1	
	Counting and Looping techniques; Addition of array of data	A	6	1	
	Introduction to Embedded C: C data types and operators for 8051; Simple data transfer, arithmetic and logical programs using C	A	7	3	
	I/O port programming: single bit operations in ALP and C	A	7	1	
	Time delay programming and delay calculation in ALP and C	A	7	2	
IV	**8051Peripherals and Interrupts** **Timers:** Basic registers of timer; Programming 8051 timer and counter	A	9	2	CO4
	UART: Serial communication registers; 8051connectionto RS232; 8051serialcommunication programming	A	10	3	
	8051 interrupts: Interrupt registers	A	10	1	
	Programming timer interrupts; Programming external hardware interrupts; Programming serial communication interrupts	A	11	4	
V	**Real World Applications** I/O Interfacing: Key, LEDs	A	12	1	CO5
	LCD Interfacing	A	12	1	
	Hex key board interfacing	A	12	1	
	ADC Interfacing; Sensor interfacing; DAC Interfacing	A	13	3	
	Relay interfacing	A	16&17	1	
	Interfacing DC motor and Stepper motor	A	16&17	2	
	Revision			5	
	Total Hours			**55**	

Note: 70% Theory; 30% Programs
CIA: 25 Marks; **End Semester:** 75 Marks

Text Book:

A. Muhammad Ali Mazidi, Janice GillispieMazidi and Rolin D. McKinlay, *"The 8051 Microcontroller and Embedded Systems using Assembly and C"*, Pearson, Second Edition, 2008.

References:

A. Manish K Patel, *"The 8051 Microcontroller Based Embedded Systems",* McGraw Hill Education, 2014.
B. A.P. Godse, D.A. Godse, *"Microprocessor and Microcontroller"*, Technical Publications Pune, First Edition, 2007.
C. http://nptel.ac.in/courses/117104072/
D. http://nptel.ac.in/courses/108105102/23

Programme	Course Code	Title
B.Sc (ECS)	19ECU14	Communication Electronics Lab

Preamble: This course aims to experimentally study the concepts of communication electronics by designing the circuits and to become familiar with various output wave forms.

Expected level of output : Practical Level

Department offered : Electronics and Communication Systems

Prerequisites : Basic knowledge in electronic principles

Course Outcomes:

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

Course outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Verify the characteristics of various electronic communication circuits practically.	Applying	Technical	Technical Presentation
CO2	Understand the need and the basics of antenna.	Analyzing	Analytical	Simulation Exercises
CO3	Apply the knowledge on design techniques and study the performance behavior of communication systems.	Applying	Technical	Technical Presentation

Modular Assessment Code : L (Practical - Experiments)

Course Inputs:

Any 9 Experiments

Exp.	Name of the Experiment	
1	Amplitude Modulation and Demodulation	
2	Frequency Modulation	
3	Frequency Demodulation	
4	DSB-SC modulation and demodulation	
5	SSB-SC modulation and Demodulation (Phase Shift method)	
6	VCO using IC 555	
7	RF Amplifier	
8	IF Tuned Amplifier	
9	Characteristics of Mixer Circuit	
10	Pre-emphasis and De-emphasis Circuits	
11	Balanced modulator	
12	Study of Super Heterodyne Receiver	
	Repeat/Revision	**6**
	Total Hours	**33**

CIA: 20 Marks; **End Semester:** 30 Marks

Note: Practical Classes to be arranged in Electronic Communication Lab

Essential Equipments: Power Supply, Communication trainers and Multi-meter.

Programme	Course Code	Title
B.Sc (ECS)	19ECU15	8051 Microcontroller and Applications Lab

Preamble: This course introduces students to the 8051 MCU assembly language and embedded C programming. It gives a practical training of interfacing the peripheral devices with the 8051 microcontroller.

Expected level of output : Practical Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in Logic Circuit Design

Course Outcomes:

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

Course outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Understand the 8051 microcontroller and its programming with assembly and C.	Understanding	Technical	Poster Presentation /Chart
CO2	Enrich their knowledge with hands on experiments and project based learning.	Applying	Technical	Poster Presentation /Chart
CO3	Troubleshoot interactions between software and hardware.	Analyzing	Analytical	SSA

Modular Assessment Code : M (Practical - Applications)

Course Inputs:

Any 9 Experiments

Exp.	Name of the Experiment	
1	Arithmetic Operations	
2	Logical Operations	
3	Sum of N numbers	
4	Square Wave Generation	
5	KEY and LED Interface	
6	Solid-State Relay Interface	
7	DC Motor Control	
8	LCD Interface	
9	Object Counter using Interrupt	
10	Stepper Motor Interface	
11	Serial Port Interface using RS232	
12	Distance Measurement using Ultrasonic Sensor	
	Repeat/Revision	**6**
	Total Hours	**33**

CIA: 20 Marks; **End Semester:** 30 Marks

Note: Practical Classes to be arranged in Microprocessor and Microcontroller Lab

Essential Equipments : Power Supply, Function Generator, 8051 Programmer, CRO and Multi-meter

Essential Software : MCU 8051 IDE and 8051 Programming software

Programme	Course code	Title
B.Sc (ECS)	19ECU16A	Programmable Logic Controller

Preambles: This course develops the functional design, hardware configuration, programming and applications of Programmable Logic Controllers (PLC).

Expected level of output : Conceptual and Application Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in digital logic circuits

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Describe the function of various hardware components of a programmable logic controller.	Understanding	Conceptual	Poster Presentation /Chart
CO2	Know the PLC ladder logic and basic programming concepts.	Understanding	Conceptual	Class Presentation
CO3	Demonstrate the operation of logic circuits by programming in the programmable logic controller.	Applying	Technical	SSA
CO4	Apply PLC Timers and Counters for the control of industrial processes.	Applying	Technical	Class Presentation
CO5	Use a PLC in order to monitor and control industrial processes.	Applying	Technical	Group Mini Project

Modular Assessment Code : D (Theory-Applications)

Course Inputs:

Unit	Description	Text Book	Chapter	Instructional Hours	COs
I	**Programmable Logic Controller** Controllers; Hardware	A	1	1	CO1
	Internal Architecture of a PLC	A	1	1	
	Input Devices: Mechanical switches; Proximity switches; Photoelectric sensors and switches; Temperature sensors	A	2	2	
	Position/Displacement sensors; Strain gauges; Pressure sensors; Liquid level detectors; Fluid flow measurement; Smart sensors	A	2	3	
	Output Devices: Relay; Directional control valves; Motors; Stepper motors	A	2	2	
	Examples of PLC applications	A	2	1	
II	**I/O Processing** Input units; Output units	A	4	1	CO1 CO2
	Signal conditioning; Remote connections	A	4	2	
	Processing Inputs; I/O Addresses	A	4	2	
	Ladder and Functional Block Programming Ladder diagrams	A	5	2	
	Logic functions; Latching; Multiple outputs	A	5	2	
	Functional blocks	A	5	1	

III	**PLC instructions** Relay type instructions	B	5	1	CO2 CO3
	Instruction addressing; Branch instructions; Internal relay instructions	B	5	2	
	Programming Examine IF closed and Examine IF open instructions; Modes of operation	B	6	2	
	Converting relay schematics into PLC ladder programs; Writing a ladder logic program directly from a narrative description	B	6	2	
	Program examples: Lamp and Valve operation program, Location of stop switches, Motorized door, Filling operation	A & B	5 & 6	3	
IV	**PLC Timer and Counter** Timer Instructions: ON-Delay timer instructions; OFF-Delay timer instructions	B	7	3	CO3 CO4
	Counter instructions: UP Counter; Down Counter	B	8	3	
	Allen-Bradley SLC-500 PLC Instructions: Program control instructions; Data manipulation instructions; Math instructions	B	9	4	
V	**Applications of PLC** Simple sequence control concepts; Automatic packing mechanism	C	-	3	CO5
	Automatic control of warehouse door; Automatic lubricating oil supplier	C	-	2	
	Conveyor belt motor control; Bottle label detection	C	-	3	
	Ball sorter mechanism	C	-	2	
	Revision			5	
	Total Hours			**55**	

Note: 80% Theory; 20% Programs
CIA: 25 Marks; **End Semester:** 75 Marks

Text Books/Manuals:

A. W. Bolton, *"Programmable Logic Controllers",* Fifth Edition, Elsevier India Pvt. Ltd., New Delhi, 2011.
B. Frank D. Petruzella, "*Programmable Logic Controllers*", Tata McGraw Hill, Third Edition, 2010.
C. http://www.pacontrol.com/download/OMRON-PLC-Programming.pdf

References:

A. Siemens "*PLC Handbook*"
B. Allen-Bradley "*PLC Handbook*"
C. http://www.nptel.ac.in/courses/112102011/11

Programme	Course Code	Title
B.Sc (ECS)	19ECU16B	Biomedical Instrumentation

Preamble: This course is to provide the fundamental knowledge of Biomedical Instrumentation and the science associated with the measurement of biological variables.

Expected level of output : Conceptual and Application Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in biological systems and instrumentation

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Understand the basic signals in the field of biomedical and explain the role of bio-potential electrodes.	Understanding	Conceptual	Poster Presentation/ Charts
CO2	Know the various medical equipments and their technical aspects.	Understanding	Conceptual	Class Presentation
CO3	Understand medical diagnosis and therapy.	Understanding	Conceptual	Class Presentation
CO4	Analyze the position of biomedical instrumentation in modern hospital care.	Analyzing	Analytical	SSA
CO5	Explore the application of scientific methods to the complex biomedical signals.	Evaluating	Technical	Group Mini Project

Modular Assessment Code : D (Theory-Applications)

Course Inputs:

Unit	Description	Text Book	Chapter	Instructional Hours	COs
I	**Human Physiological systems** Cells and their structure; Transport of potentials; Bio-electric potentials	A	1	3	CO1
	Bio-potential Electrodes Design of medical instruments; Components of Bio medical instrument system; Electrodes; Half cell potential; Purpose of the electrode paste	A	2	4	
	Types of electrode: Microelectrode, Depth and Needle electrodes, Surface electrode	A	2	3	
II	**Bio Potential Recorders** Characteristics of the recording system; Electrocardiography: Origin of cardiac action potential; ECG lead configurations; ECG recording setup	A	4	4	CO2
	Practical considerations for ECG recording; Echocardiography	A	4	2	
	Electroencephalography (EEG): Origin of EEG; Brain waves; Placement of electrodes; Recording setup	A	4	4	

III	Electromyography EMG Recording setup; Determination of conduction velocities in motor nerves	A	4	2	CO2 CO4 CO5
	Electroretinography (ERG)	A	4	1	
	Electrooculography (EOG)	A	4	2	
	Blood pressure measurement; Blood flow meter (Doppler method)	B	6	2	
	Audio meter	B	17	1	
	X- ray machine	B	19	2	
IV	**Pace makers** Energy requirements to excite heart muscle; Methods of stimulation, Different modes of operation	A	5	3	CO2 CO4 CO5
	Defibrillators Different types of defibrillator; AC defibrillator; DC defibrillator	A	5	3	
	Heart-Lung Machine Mechanical function of the heart; Model of the heart lung machine	A	5	2	
	Kidney machine Dialysis; Hemodialysis; Peritoneal Dialysis	A	5	2	
V	**Surgical Diathermy** Short wave diathermy; microwave diathermy; Ultrasonic diathermy	A	6	3	CO3 CO5
	Ventilators	A	6	1	
	Anesthesia machine	A	6	1	
	Computers in medicine; Endoscopes	A	10	2	
	Computer tomography (CT Scan); Magnetic Resonance Imaging (MRI Scan)	A	10	3	
	Revision			5	
	Total Hours			**55**	

Note: 100% Theory
CIA: 25 Marks; **End Semester:** 75 Marks

Text Books:

A. M. Arumugam, *"Biomedical Instrumentation",* Anuradha Publications, Reprint, 2009.
B. R. S. Khandpur, *"Handbook of Biomedical Instrumentation"*, McGraw-Hill Education, Third Edition, 2014.

Reference Book:

A. Joseph J.Carr, John M. Brown, *"Introduction to Biomedical Equipment Technologies",* Fourth Edition, Pearson Education.
B. Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, *"Biomedical Instrumentation and Measurements",* Prentice Hall India Learning Private Limited, Second Edition, 1990.

Programme	Course code	Title
B.Sc (ECS)	19ECU17B	Internet of Things

Preamble: The course introduces the concepts of Internet of Things to build IoT applications.

Expected level of output : Conceptual and Application Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in computer networks and microcontrollers

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Understand the concepts of Internet of Things.	Understanding	Conceptual	Writing Skills
CO2	Understand the basic design principles for IoT.	Understanding	Conceptual	Group Assignment
CO3	Understand how enterprises plan for IoT deployment in networks.	Understanding	Conceptual	Group Assignment
CO4	Acquire skills on IoT Systems like Python Packages and Raspberry pi.	Understanding	Conceptual	Technical Presentation
CO5	Implement basic IoT applications on embedded platform.	Applying	Technical	Poster Presentation/ Charts

Modular Assessment Code : C (Theory-Concepts)

Course Inputs:

Unit	Description	Text Book	Chapter	Instructional Hours	COs
I	**Introduction to Internet of Things** Definition and Characteristics of IoT; Physical Design of IoT	A	1	2	CO1
	Logical Design of IoT; IoT Enabling Technologies	A	1	3	
	IoT Levels and Deployment Templates	A	1	2	
	Domain Specific IoTs: Home Automation, Smart Cities, Industry Automation	A	2	3	
II	**Design Principles for Connected Devices** IoT/M2M systems layers and designs standardization; Communication technologies	B	2	2	CO2
	Data enrichment, Data consolidation and device management at gateway	B	2	2	
	Design Principles for Web Connectivity Web communication protocols for connected devices; Message communication protocols for connected devices	B	3	3	
	Web connectivity for connected-devices network using gateway, SOAP, REST, HTTP, RESTful and WebSockets	B	3	3	
III	**Internet Connectivity Principles** Internet connectivity; Internet based communication; IP addressing in the IoT; Media access control	B	4	2	CO3

	Application layer protocols: HTTP; HTTPS; FTP; Telnet and others	B	4	3	
	Data Acquiring, Organizing, Processing and Analytics Data acquiring and storage; Organizing the data; Transactions, Business processes, Integration and enterprise systems	B	5	4	
	Analytics; Knowledge acquiring, Managing and storing processes	B	5	2	
IV	**IoT Systems-Logical Design using Python** Python Data Types and Data Structures; Control Flow; Functions	A	6	3	CO4
	Python Packages of Interest for IoT: JSON, XML, HTTPLib & URLLib, SMTPLib	A	6	2	
	IoT Physical Devices and Endpoints An IoT Device; Raspberry Pi; About the Board; Linux on Raspberry Pi	A	7	3	
	Raspberry Pi Interfaces; Programming Raspberry Pi with Python	A	7	3	
V	**Business Models and Processes Using IoT** Business models and business model innovation	B	11	1	CO5
	Value creation in the internet of things; Business model scenarios for IoT	B	11	3	
	IoT Case Studies IoT applications for smart homes, Environment monitoring and agriculture	B	12	3	
	Smart city streetlights control	B	12	1	
	Revision			5	
	Total Hours			**55**	

Note: 100% Theory
CIA: 25 Marks; **End Semester:** 75 Marks

Text Books:

A. Arshdeep Bahga, Vijay Madisetti, *"Internet of Things: A Hands-On Approach"*, Orient Blackswan Pvt. Ltd., First edition, 2015.
B. Raj Kamal, *"Internet of things Architecture and design principles"*, McGraw Hill Education Pvt. Ltd., First edition, 2017.

References:

A. Hanes David, Salgueiro Gonzalo, Grossetete Patrick, Barton Rob, Henry Jerome, *"IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things"*, Pearson Education, First edition, 2017.
B. RajkumarBuyya, Amir VahidDastjerdi, *"Internet of Things Principles and Paradigms"*, Elsevier-Todd Green, 2016.
C. Pethuru Raj, Anupama C. Raman, *"The Internet of Things Enabling Technologies, Platforms, and Use Cases"*, CRC Press-Taylor & Francis Group, 2017.
D. Charles Bell, *"MySQL for the Internet of Things"*, Apress, First edition, 2016.
E. http://nptel.ac.in/courses/106105166/

Programme	Course Code	Title
B.Sc (ECS)	19ECU17C	Artificial Intelligence

Preamble: This course introduces the field of Artificial Intelligence (AI), as well as the basic concepts and techniques that are used within the field.

Expected level of output : Conceptual Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in electronics and computer applications

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Understand Artificial Intelligence (AI) and its basic concepts and methods.	Understanding	Conceptual	Writing Skills
CO2	Implement agents using search algorithms.	Understanding	Conceptual	Group Assignment
CO3	Explain basic concepts, methods and theories of machine learning algorithms.	Analyzing	Analytical	Group Assignment
CO4	Identify appropriate AI methods to solve a given problem.	Analyzing	Analytical	Technical Presentation
CO5	Implement methods to solve problems using Natural Language Processing.	Understanding	Conceptual	Poster Presentation/ Charts

Modular Assessment Code : C (Theory-Concepts)

Course Inputs:

Unit	Description	Text Book	Chapter	Instructional Hours	COs
I	**Introduction** Artificial Intelligence (AI); Components of AI; History of AI; Development of AI	A	1	3	CO1
	Knowledge and Knowledge-Based systems; AI in the future; Applications of AI	A	1	2	
	Logic and Computation Classical concepts; Computational logic; First-order logic; Symbol tableau	A	1	2	
	Resolution; Unification; Predicate Calculus in problem-solving	A	1	3	
II	**Heuristic Search** Search-based problems; Informed search; Evaluating functions and ordered research	A	3	3	CO2
	Water jug problem using breadth search	A	3	2	
	Search in Game Playing AND/OR graph; Minimax problem	A	4	2	
	Alpha-beta search; Puzzle solving algorithm	A	4	3	
III	**Knowledge Representation** Structure of an RBS; Merits and demerits; Types of rules; Semantic nets	A	6	2	CO1 CO2

	Frames; Conceptual graphs; Conceptual dependency; Script	A	6	3	
	Automated Reasoning Default reasoning; Model-based reasoning; Case-based reasoning	A	7	3	
	Multimodal reasoning; Truth maintenance system	A	7	2	
IV	**Machine Learning** A general view; Knowledge acquisition process	A	9	2	CO3 CO4
	Automatic knowledge acquisition; Machine learning	A	9	3	
	Analogical reasoning; Explanation based learning	A	9	2	
	Inductive learning; Knowledge acquisition tools	A	9	3	
V	**Natural Language Processing** Computational model of language; Syntactic structure and analysis	A	15	3	CO4 CO5
	Case: Grammar; Grammar Types	A	15	2	
	Natural language processing problems; Knowledge-based system approaches	A	15	3	
	Machine translation; Divergence	A	15	2	
	Revision			5	
	Total Hours			**55**	

Note: 100% Theory
CIA: 25 Marks; **End Semester:** 75 Marks

Text Book:

A. R.B.Mishra, *"Artificial Intelligence"*, PHI Learning Private Limited, 2011.

References:

A. Elaine Rich, Kevin Night, Shivashankar B Nair, *"Artificial Intelligence"*, Tata McGraw Hill, Fifth reprint, 2010.
B. Deepak Khemani, *"Artificial Intelligence"*, Tata McGraw Hill Education, 2013.
C. Dan W. Patterson, *"Introduction to Artificial Intelligence and Expert Systems"*, PHI, 2013.
D. http://nptel.ac.in/courses/106105077/

Programme	Course Code	Title
B.Sc (ECS)	19ECU18	Embedded Systems with PIC

Preamble: This course will provide an exposure on 8-bit PIC microcontroller, various advanced protocols and interfacing of different peripherals with PIC microcontroller.

Expected level of output : Conceptual and Application Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in basic microcomputer system

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Understand the fundamentals of embedded systems.	Remembering	Conceptual	Poster Presentation/ Charts
CO2	Understand the architecture of PIC microcontroller.	Understanding	Conceptual	Poster Presentation/ Charts
CO3	Write the assemble language and C programs.	Applying	Technical	SSA
CO4	Use the on-chip peripherals like I/O ports, timers, USART and ADC of PIC MCU.	Applying	Technical	Class Presentation
CO5	Demonstrate the design and implementation of embedded systems with PIC microcontroller.	Applying	Technical	Group Mini Project

Modular Assessment Code : D (Theory-Applications)

Course Inputs:

Unit	Description	Text Book	Chapter	Instructional Hours	COs
I	**Embedded Systems** Embedded Systems vs General Computing Systems	A	1	1	CO1
	History of Embedded Systems; Classification of Embedded Systems	A	1	1	
	Major application areas; Purpose of Embedded Systems	A	1	1	
	Elements of an Embedded Systems: System Core; Memory	A	2	3	
	Sensors and Actuators; Communication Interface; Other system components	A	2	2	
	Embedded system design flow	-	-	1	
II	**PIC Microcontrollers** CISC and RISC Architectures	B	2	1	CO2
	PIC Microcontroller Families; Architecture of PIC16F877A	B	2	3	
	Arithmetic Logical Unit (ALU); Status Register	B	2	1	
	Memory Organization: Program memory, Data memory, EEPROM Data Memory	B	3	2	
	Register File Structure: General purpose register file, Special function register file	B	3	2	
	PCL and PCLATH; Stack; Oscillators; Reset Options	B	3	2	
	PIC16F877A Pin diagram and description	-	-	1	

III	**Instruction Set and Programming** Structure of Instructions; Addressing Modes	B	4	2	CO3
	Midrange PIC MCU Instruction Set: Data transfer instructions, Arithmetic and Logic instructions, Control transfer instructions, Bit manipulation instructions	B	4	4	
	Assembler Directives; Organization of a Program in Assembler Language	B	4	2	
	Arithmetic and Logic operations using ALP	B	4	2	
	Embedded C Fundamentals Structure of C Programs	C	1	1	
	Components of a C Program: Variables; Constants; Comments; Functions; Operators; Control Statements	C	1	3	
IV	**Parallel Input and Output** Basic schematic for a I/O pin; TRIS Register	B	5	1	CO4 CO5
	Port A; Port B; Port C; Port D; Port E	B	5	3	
	Programs: Blinking of the LEDs; Keypad Interfacing	B	5	2	
	Seven Segment Display Interfacing; LCD Interfacing with PIC MCU	B	5	2	
	Timer Timer0 Module; Timer1 Module; Timer2 Module	B	6	3	
	PWM using CCP module	B	6	2	
V	**Interrupts** Interrupt sources and Associated registers	B	7	3	CO4 CO5
	Serial Input and Output USART Serial Port: Asynchronous Mode; Synchronous Mode	B	8	4	
	Serial reception and transmission through HyperTerminal	B	8	1	
	10-Bit A/D Converter Module Architecture of A/D converter in PIC; A/D conversion timing; A/D conversion module programming	B	9	3	
	On/Off temperature controller using on-chip ADC	B	9	2	
	Revision			5	
	Total Hours			**66**	

Note: 80% Theory; 20% Programs
CIA: 25 Marks; **End Semester:** 75 Marks

Text Books:

A. Shibu.K.V, "*Introduction to Embedded Systems"*, Tata McGraw-Hill Education Private Limited, 2009.
B. Fernando E. Valdes-Perez, Ramon Pallas-Areny, "*Microcontrollers Fundamentals and Applications with PIC"*, CRC Press (Taylor & Francis Group), 2009.
C. Richard Barnett, Larry O'Cull, Sarah Cox, "*Embedded C Programming and the Microchip PIC"*, Thomson Delmar Learning, 2004.

References:

A. John B. Peatman, *"Design with PIC Microcontrollers",* Pearson Education Asia, 2002.
B. Jivan Parab, Santosh A. Shinde, Vinod G.Shelake, Rajanish K.Kamat, Gourish M. Naik, *"Practical Aspects of Embedded System Design using Microcontrollers",* Springer Science + Business Media, 2008.
C. http://nptel.ac.in/courses/117104072/

Programme	Course Code	Title
B.Sc (ECS)	19ECU19	Robotics and Arduino Programming

Preamble: This course focuses on the topics in robotics that relate to fundamentals, actuators, grippers, and sensors of robot systems. This course will also explain how to use Arduino to operate lights, motors, and sensors for making a robot.

Expected level of output : Conceptual and Application Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in instrumentation and microcontrollers

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Understand the basic concepts of robots.	Understanding	Conceptual	Poster Presentation/ Charts
CO2	Identify the drives and end effectors of robot systems.	Understanding	Conceptual	Class Presentation
CO3	Familiarize with the most common robot sensors.	Understanding	Conceptual	Poster Presentation/ Charts
CO4	Explore the open source development platform (Arduino).	Applying	Technical	Simulation Exercises
CO5	Develop simple robot control systems using Arduino.	Applying	Technical	SSA

Modular Assessment Code : H (Theory-Technology)

Course Inputs:

Unit	Description	Text Book	Chapter	Instructional Hours	COs
I	**Introduction to Robotics** History; Laws of Robotics; Robot definition	A	1	2	CO1
	Robot usage rules; Applications	A	1	1	
	Robot subsystems: Motion subsystem; Recognition subsystem; Control subsystem	A	1	3	
	Classification of Robots: Cartesian Robot; Cylindrical Robot; Spherical Robot; Articulated Robot	A	2	3	
II	**Actuators** Classification of Actuators; Electric Actuators: Stepper motor	A	3	2	CO2
	DC Motors; Servo motor; Selection of motors	A	3	2	
	Solenoids; Relays; Solid state switches	-	-	2	
	Hydraulic Actuators; Pneumatic Actuators	A	3	2	
	Grippers Mechanical Grippers; Magnetic Grippers	A	3	2	
	Vacuum Grippers; Adhesive Grippers; Selection of grippers	A	3	1	

III	**Sensors and Vision Systems** Sensor Classification; Internal Sensor; Position Sensors: Encoder, Potentiometer; LVDT	A	4	3	CO3
	Velocity Sensors: Tachometer, Hall-effect sensor	A	4	1	
	Accelerometer and Gyroscope sensors	-	-	1	
	Force Sensors: Strain-gauge sensor; Piezoelectric sensor	A	4	1	
	External sensors; Contact type; Noncontact type: Proximity sensor, Semiconductor displacement sensor	A	4	2	
	Vision; Elements in a vision sensor; Steps in a vision system	A	4	2	
VI	**Electronics for Robot** The Arduino platform; Functional block diagram of Arduino	B	-	1	CO4
	Arduino family of boards; Pin function of Arduino UNO	B	-	1	
	Fundamentals of Arduino Programming; Keywords; Inbuilt functions; Libraries; Arduino Boot loader	B	-	2	
	Digital GPIO programming; Working with pins as input and output; Working with PWM outputs	B	-	2	
	Working with analog inputs using on-chip ADC; Serial communication between Arduino hardware and PC	B	-	2	
	Arduino interrupt programming	B	-	1	
V	**Robot Programming using Arduino** Blinking of LED; Key interfacing	C	-	1	CO5
	DC motor direction control; DC motor speed control using PWM; Servo motor control	C	-	2	
	Interfacing LCD; Interfacing IR sensor; Interfacing Ultrasonic sensor; Tone generation	C	-	3	
	Line follower Robot; Obstacle avoider Robot; Self balancing Robot	C	-	3	
	PC control Robot; Wireless Robot	C	-	2	
	Revision			5	
	Total Hours			**55**	

Note: 80% Theory; 20% Programs
CIA: 25 Marks; **End Semester:** 75 Marks

Text Books:

A. Subir Kumar Saha, *"Introduction to Robotics"*, McGraw-Hill Education, Second Edition, 2014.
B. Michael McRoberts, *"Beginning Arduino"*, Second Edition, Apress, 2013.
C. John-David Warren, Josh Adams, Harald Molle, *"Arduino Robotics"*, Apress, 2011.

References:

A. Mikell Groover, Mitchell Weiss, Roger Nagel, Nicholas Odrey, Ashish Dutta, *"Industrial Robotics: Technology - Programming and Applications",* Tata McGraw-Hill Education, Second Edition (Special Indian Edition), 2012.
B. R.Mittle, I.Nagrath, *"Robotics and Control"*, Tata McGraw-Hill Education, 2003.
C. S.R. Deb, *"Robotics Technology and Flexible Automation"*, Tata McGraw Hill, Second Edition.
D. http://nptel.ac.in/courses/112103174/39

Programme	Course Code	Title
B.Sc (ECS)	19ECU20	Embedded Systems with PIC Lab

Preamble: This laboratory course is teaching students to design the PIC microcontroller-based embedded systems. Assembly and C languages are used in MCU Programming for various applications.

Expected level of output : Practical Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in assembly and C programming

Course Outcomes:

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

Course outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Design an embedded system with PIC microcontroller.	Applying	Technical	Poster Presentation /Chart
CO2	Trouble shoot microcontroller based electronic systems/products.	Analyzing	Analytical	Poster Presentation /Chart
CO3	Improve employability and entrepreneurship capacity due to knowledge up gradation on recent trends in embedded system design.	Applying	Technical	SSA

Modular Assessment Code : M (Practical - Applications)

Course Inputs:

Any 9 Experiments

Exp. No	Name of the Experiment	
1	Arithmetic Operations	
2	Four Bit Binary Counter	
3	LCD Interfacing	
4	Matrix Keyboard Interface	
5	Motion Detector using PIR	
6	Interfacing Proximity Sensor using Interrupt	
7	LED Flashing using On-chip Timer	
8	Servo Motor Control using PWM	
9	Frequency Measurement	
10	Wireless Relay Control using Bluetooth	
11	Temperature Measurement	
12	Interfacing Hall Effect Sensor	
	Repeat/Revision	**6**
	Total Hours	**33**

CIA: 20 Marks; **End Semester:** 30 Marks

Note: Practical classes to be arranged in DSP Lab

Essential Equipments : Power Supply, CRO, Multi-meter, and PIC Programmer.

Essential Software : MPLAB IDE, Complier, and PICKIT2/3 Software.

Programme	Course Code	Title
B.Sc (ECS)	19ECU21	Robotics and Arduino Programming Lab

Preamble: This course aims to demystify the Arduino hardware and software through hands-on work in the laboratory and gives the knowledge on creating simple robots.

Expected level of output : Practical Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in microcontroller and its programming

Course Outcomes:

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

Course outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Learn the Arduino programming language and IDE.	Understanding	Conceptual	Poster Presentation /Chart
CO2	Construct the circuits necessary for connecting sensors and actuators to the Arduino.	Applying	Technical	Poster Presentation /Chart
CO3	Design and construct the robots.	Applying	Technical	SSA

Modular Assessment Code : M (Practical - Applications)

Course Inputs:

Any 9 Experiments

Exp. No	Name of the Experiment	
1	Blinking of LEDs	
2	Moving Message Display on LCD	
3	Tone Generation	
4	Speed Control of DC Motor	
5	Position Control of Servo Motor	
6	Proximity Detector	
7	Accelerometer Interface	
8	Obstacle Avoiding Robot using Ultrasonic Sensor	
9	Line-following Robot	
10	Wireless Controlled Robot	
11	Self-balancing Robot	
12	Pick and Place Robot	
	Repeat/Revision	**6**
	Total Hours	**33**

CIA: 20 Marks; **End Semester:** 30 Marks

Note: Practical classes to be arranged in DSP Lab

Essential Equipments : Power Supply, CRO, Multi-meter and Arduino Board.

Essential Software : Arduino IDE.

Programme	Course Code	Title
B.Sc (ECS)	19ECU24	Modern Communication Systems

Preamble: This course will provide students with the fundamental concepts, principles, and advanced techniques to understand the various modern communication systems.

Expected level of output : Conceptual and Analytical Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in basic communication systems

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Understand the basic elements of digital communication systems.	Understanding	Conceptual	Poster Presentation/ Charts
CO2	Demonstrate an understanding of various digital modulation and demodulation techniques.	Understanding	Conceptual	SSA
CO3	Analyze the performance of modulation and demodulation techniques in pulse communication.	Analyzing	Analytical	Simulation Exercises
CO4	Understand the concepts of wireless transmission, telecommunication systems and satellite communication.	Understanding	Conceptual	Poster Presentation/ Charts
CO5	Identify and solve basic communication problems.	Applying	Technical	Class Presentation

Modular Assessment Code : H (Theory-Technology)

Course Inputs:

Unit	Description	Text Book	Chapter	Instructional Hours	COs
I	**Digital Modulation Techniques** Types of digital modulation; Design features; Bit rate and Baud rate	A	9	1	CO2 CO5
	ASK; ASK modulator; Coherent and Non-Coherent ASK demodulator; Advantage and disadvantages	A	9	2	
	FSK; BFSK modulator; Coherent and Non-Coherent BFSK demodulator; Advantage and disadvantages	A	9	2	
	PSK; BPSK; BPSK modulator; Coherent BPSK demodulator	A	9	2	
	Differential BPSK; DPSK modulator; DPSK demodulator; Comparison of BPSK and DPSK	A	9	2	
	QPSK; QPSK modulator; Coherent QPSK demodulator	A	9	2	
II	**Pulse Modulation Techniques** Sampling theorem; Classification of pulse modulation techniques	A	7	2	CO3 CO5
	Generation and demodulation of PAM signals	A	7	1	
	Generation and demodulation of PWM signals	A	7	1	

	Generation and demodulation of PPM signals	A	7	2	
	PCM; Quantization of signals; Quantization error	A	7	3	
	Differential Pulse Code Modulation; Delta Modulation; Adaptive Delta Modulation	A	7	2	
III	**Wireless Transmission** Signals; Antennas; Signal propagation	B	2	1	CO4 CO5
	Multiplexing; FDM; TDM	B	2	2	
	Frequency hopping spread spectrum; Cellular systems	B	2	2	
	Medium access control; Motivation for a specialized MAC	B	3	2	
	SDMA; FDMA	B	3	2	
	TDMA; CDMA; Comparison	B	3	2	
IV	**Telecommunication Systems** Global System for Mobile (GSM): Mobile services; System architecture	B	4	2	CO4
	Localization and calling; Security	B	4	2	
	Handover; Basic classes of handover	B	4	2	
	Digital Enhanced Cordless Telecommunication (DECT); System architecture; Protocol architecture	B	4	2	
V	**Satellite Communication** Frequency Allocations for Satellite Services; Kepler's I,II,II laws; Orbital parameters	C	-	2	CO4
	Orbital perturbations, station keeping	C	-	1	
	Geo stationary and non Geo-stationary orbits	C	-	1	
	Earth station technology; Transponders	C	-	2	
	Down-link design, up-link design	C	-	2	
	Introduction to VSAT systems	C	-	1	
	Revision			5	
	Total Hours			**55**	

Note: 100% Theory
CIA: 25 Marks; **End Semester:** 75 Marks

Text Books:

A. T.L. Singal, *"Analog and Digital Communications"*, Tata McGraw Hill education Pvt. Ltd, 2012.
B. Jochen Schiller, *"Mobile Communications"*, Dorling Kindersley (India) Pvt. Ltd, 2009.
C. Dennis Roddy, *"Satellite Communications",* MGraw Hill, Millan, Fourth edition, 2013.

References:

A. William C.Y. Lee, "*Mobile Cellular Telecommunication"*, Second Edition, McGraw Hill Publications, 1995.
B. George Kennedy, Bernard Davis, SRM Prasanna, *"Electronic Communication System"*, Tata McGraw Hill education Pvt. Ltd, Fifth Edition, 2012.
C. D.C. Agarwal, "Satellite communication", Khanna publishers, Third Edition, 1995
D. http://nptel.ac.in/courses/117101051/
E. http://nptel.ac.in/courses/117105077/

Programme	Course Code	Title
B.Sc (ECS)	19ECU25	Computer Networks

Preamble: This course is to provide students with an overview of the concepts and fundamentals of data communication, various types of computer networks and their protocols.

Expected level of output : Conceptual and analytical Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in Computer Systems

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Understand the fundamental concepts of computer networking.	Understanding	Conceptual	Poster Presentation/ Charts
CO2	Enumerate the layers of the OSI model and TCP/IP, and explain the functions of each layer.	Understanding	Conceptual	SSA
CO3	Identify the different types of network topologies and protocols.	Understanding	Conceptual	Class Presentation
CO4	Identify the different types of network devices and their functions within a network.	Understanding	Conceptual	Class Presentation
CO5	Expertise in basic protocols of computer networks such as the design, implement and maintenance of individual networks.	Applying	Technical	Simulation Exercises

Modular Assessment Code : H (Theory-Technology)

Course Inputs:

Unit	Description	Text Book	Chapter	Instructional Hours	COs
I	**Data Communications** Components; Data flow; Networks: Physical structures; Categories of Networks; Protocols and Standards	B	1	2	CO1 CO5
	Guided media Twisted pair cable; Coaxial cable; Fiber optic cable	B	7	2	
	Unguided media Radio waves; Microwaves; Infrared ray	B	7	2	
	Reference Models OSI reference model; TCP/IP reference model; Comparison of OSI & TCP/IP reference model	A	1	2	
	Example Networks The Internet; The ARPANET; NSFNET; Architecture of the Internet	A	1	3	
II	**Data Link Layer** Design issues; Framing; Error control; Flow control	A	3	3	CO2 CO3 CO5
	Error detection and correction codes	A	3	2	
	Example Data Link Protocols Packet over SONET; Asymmetric digital subscriber Loop	A	3	2	

III	**Medium Access Sub layer** Channel allocation problem; Multiple Access Protocols: Pure ALOHA, Slotted ALOHA	A	4	2	CO2 CO3 CO4
	CSMA with Collision Detection; Collision free protocols	A	4	3	
	Broadband Wireless Comparison of 802.16 with 802.11and 3G; The 802.16 MAC sub layer protocol; The 802.16 frame structure	A	4	3	
	Repeaters, Hubs, Bridges, Switches, Routers and Gateways	A	4	2	
IV	**Network Layer** Design issues, Routing algorithms: Broadcast routing	A	5	2	CO2 CO3
	Multicast routing, Any cost routing	A	5	2	
	Congestion control algorithms Approaches to congestion control; Traffic aware routing	A	5	3	
	The Network Layer in The Internet IPV4; IP address; Subnets; IPV6	A	5	3	
	Internet Control Protocols ICMP; ARP; ICMPV6	A	5	2	
V	**Transport Layer** Service provided to the upper layers; Transport service primitives	A	6	2	CO2 CO3 CO4
	UDP: Introduction to UDP; TCP:TCP service model; TCP protocol; TCP/IP protocol	A	6	2	
	Application Layer Domain Name System (DNS): DNS Namespace; Name servers	A	7	2	
	Electronic Mail: Architecture; User agent; SMTP; POP and IMAP; FTP	B	26	2	
	WWW Architecture; HTTP: HTTP Transaction; Proxy servers; HTTPS	B	27	2	
	Revision			5	
	Total Hours			**55**	

Note: 100% Theory
CIA: 25 Marks; **End Semester:** 75 Marks

Text Books:

A. Tannenbaum, D. Wetherall, *"Computer Networks",* Prentice Hall, Pearson, Fifth Edition, 2010.
B. Behrouz A. Forouzan, *"Data Communications and Networking",* Tata McGraw-Hill, Fourth Edition, 2000.

References:

A. AchyutGodbole, "*Data Communication and Networks"*, TMH, 2007.
B. Uyless Black, "*Computer Networks Protocols, Standards, and Interfaces"*, Second Edition, PHI.
C. Andrew S. Tanenbaum, "*Computer Networks"*, PHI, Fourth Edition, 2010.
D. https://www.cse.iitk.ac.in/users/dheeraj/cs425/

Programme	Course Code	Title
B.Sc (ECS)	19ECU26	Industrial and Power Electronics

Preamble: This course presents analysis and control methods of power electronics circuits, converting and controlling of electric power by using semiconductor switching power devices.

Expected level of output : Conceptual and Application Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in electronic devices and circuits

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Acquire knowledge about various power semiconductor devices.	Understanding	Conceptual	Poster Presentation/ Charts
CO2	Identify basic requirements for power electronics based design applications.	Understanding	Conceptual	SSA
CO3	Analyze different power converters and control with their applications.	Analyzing	Analytical	Class Presentation
CO4	Design and develop various power electronic circuits for industrial applications.	Applying	Technical	Group Mini Project
CO5	Troubleshoot power electronics circuits.	Applying	Technical	SSA

Modular Assessment Code : D (Theory-Applications)

Course Inputs:

Unit	Description	Text Book	Chapter	Instructional Hours	COs
I	**Power Devices and its Applications in Power Control** Power Transistors: MOSFET; IGBT	A	2	2	CO1
	Types of power electronic circuits; Thyristor turn-on methods	A	1 & 4	2	
	Thyristor protection: Design of Snubber circuits	A	4	1	
	Over voltage protection; Over current protection; Gate protection	A	4	2	
	UPS; HVDC; Types of HVDC link	A	11	2	
	Static switches; Static circuit breakers	A	11	2	
II	**Converters and Commutation Techniques** Principle of phase-controlled converter; Single phase full converters	C	10	2	CO2 CO3
	Single-phase dual converters	C	10	1	
	Principle of Three-phase half-wave converters; Three-phase full converters	C	10	2	
	Introduction to Commutation: Class A, Class B, Class C, Class D, Class E and Class F	A	5	4	
III	**Inverters and Cycloconverters** Inverters: Operating principle; Single-phase bridge inverter	A	8	2	CO2 CO3

	Three-phase bridge inverter; Three-phase 180° mode VSI	A	8	2	
	Pulse width modulated inverters: Single-pulse modulation; Multiple-pulse modulation	A	8	2	
	Sinusoidal-pulse Modulation(SPWM); Realization of PWM in single phase bridge inverters	A	8	2	
	Cycloconverters: Single-phase Cycloconverters	C	11	1	
	Three-phase Cycloconverters	C	11	2	
IV	**Choppers** DC Choppers; Principle of Chopper operation	A	4	2	CO2 CO3
	Step-up Choppers; Types of Chopper circuits	A	4	2	
	Switching regulators: Buck regulator	A	5	1	
	Boost regulator; Buck-Boost regulator	A	5	2	
	Uninterruptible power supply (UPS)	A	-	1	
V	**Thyristors Industrial Applications** Temperature control: Phase-control circuits for temperature regulation; Illumination control: Illumination control using SCR	B	7	3	CO4 CO5
	Automatic street lighting circuit using LDR and SCR; Emergency light using SCR	B	7	2	
	Automatic water level indicator using SCR; Automatic battery charger using SCR	B	7	2	
	Burglar alarm circuit using SCR; Flip-flop circuit using SCR	B	7	2	
	Battery operated inverter circuit using power transistor; SCR-UJT operated timer circuit	B	7	2	
	Revision			5	
	Total Hours			**55**	

Note: 100% Theory
CIA: 25 Marks; **End Semester:** 75 Marks

Text Books:

A. P. S. Bimbhra, "*Power Electronics",* Khanna Publishers, Fourth Edition, 2011.
B. S. K. Bhatacharya, S. Chattejee, *"Industrial Electronics and Control",* Tata McGraw Hill, Reprint 2011.
C. Muhammad Rashid, *"Power electronics, Circuits, Devices & Applications",* Prentice Hall Edition, Third Edition, 2004.

References:

A. Gyanendra K. Mithal, "*Industrial and Power Electronics"*, Khanna Publishers, 19th Edition, 2001.
B. http://nptel.ac.in/courses/108101038

Programme	Course Code	Title
B.Sc (ECS)	19ECU27	Industrial and Power Electronics Lab

Preamble: This course aims at obtaining characteristics of power electronic devices with practical design, measurement and applications.

Expected level of output : Practical Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in Power Electronic Devices

Course Outcomes:

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

Course outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Elucidate the basic operation of various power electronic devices.	Understanding	Conceptual	Poster Presentation /Chart
CO2	Analyze the response of power electronic circuits.	Analyzing	Analytical	SSA
CO3	Design, develop and troubleshoot the power control circuits for various industrial applications.	Applying	Technical	Poster Presentation /Chart

Modular Assessment Code : M (Practical - Experiments)

Course Inputs:

Any 9 Experiments

Exp.	Name of the Experiment	
1	Burglar Alarm	
2	Power Inverter	
3	Automatic Street Light Controller	
4	Emergency Lamp	
5	Thyristor Chopper	
6	Triggering of SCR by R, C and DIAC	
7	Commutation Techniques (self and complementary)	
8	Speed Control of DC Motor using SCR and UJT	
9	TRIAC Flasher	
10	Fan Regulator using TRIAC	
11	Design of Snubber Circuit	
12	Full Wave Rectifier using SCR	
	Repeat/Revision	**6**
	Total Hours	**33**

CIA: 20 Marks; **End Semester:** 30 Marks

Note: Practical Classes to be arranged in Electronic Circuit Lab.
Essential Equipments: Power Supply, Function Generator, CRO and Multi-meter.

Programme	Course Code	Title
B.Sc (ECS)	19ECU28	Modern Communication Systems Lab

Preamble: This course is to improve the students' ability in understanding the concepts of digital modulation and demodulation techniques.

Expected level of output : Practical Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in digital communication techniques

Course Outcomes:

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

Course outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Know the working of digital communication systems.	Understanding	Conceptual	Simulation Exercises
CO2	Identify and analyze the major components used in digital communication systems.	Analyzing	Analytical	Technical Presentation
CO3	Design and demonstrate the electronic circuits, to carry out modulation and demodulation experiments.	Applying	Technical	Technical Presentation

Modular Assessment Code : L (Practical - Experiments)

Course Inputs:

Any 9 Experiments

Exp.	Name of the Experiment	
1	Signal Sampling and Reconstruction	
2	Modulation and Demodulation of PAM	
3	Modulation and Demodulation of PWM	
4	Modulation and Demodulation of PPM	
5	Amplitude Shift Keying	
6	Frequency Shift Keying	
7	Binary Phase Shift Keying	
8	Differential Phase Shift Keying	
9	Time Division Multiplexing	
10	Frequency Division Multiplexing	
11	Study of PCM	
12	Study of QPSK	
	Repeat/Revision	**6**
	Total Sessions	**33**

CIA: 20 Marks; **End Semester:** 30 Marks

Note: Practical Classes to be arranged in Electronic Communication Lab
Essential Equipments: Power Supply, Function Generator, DSO, Communication trainers and Multi-meter.

Programme	Course Code	Title
B.Sc (ECS)	19ECU30A	Mobile Application Development

Preamble: This course will introduce students to develop and enhance programming skills by focusing upon issues, techniques and applications for mobile platform.

Expected level of output : Conceptual and Application Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in basic programming languages

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Describe the basic components of an Android application.	Understanding	Conceptual	Poster Presentation/ Charts
CO2	Define the lifecycle methods of Android application components.	Understanding	Conceptual	Class Presentation
CO3	Describe the basics of event handling in Android.	Understanding	Conceptual	SSA
CO4	Understand the interaction between user interface and underlying application infrastructure.	Understanding	Conceptual	Simulation Exercises
CO5	Implement Android applications using an Android Software Development Kit (SDK).	Applying	Technical	Simulation Exercises

Modular Assessment Code : H (Theory-Technology)

Course Inputs:

Unit	Description	Text Book	Chapter	Instructional Hours	COs
I	**Introduction** Mobile Application Programming; Different Platforms; Architecture and working of Android	A	1	2	CO1
	Android Development Environment Android; Advantages and Future of Android	A	1	1	
	Android Development Tools The Android Virtual Device Manager; Android SDK Manager; The Android Emulator	A	2	1	
	The Dalvik Debug Monitor Service; The Android Debug Bridge; The Hierarchy Viewer and Lint Tool; Monkey and Monkey Runner	A	2	2	
II	**Creating Applications and Activities** Application Manifest File; Resources: Styles and Themes; Drawables; Layouts; Animations; Menus	A	3	3	CO1 CO2
	Building User Interfaces (UI) Fundamental Android UI Design; Layouts; Fragments	A	3	2	
	Buttons; Menus; Dialogs; Graphics Resources: Introducing the Drawables; Implementing Images; Core Drawable Subclasses	A	3	2	

III	Using Bitmap; PNG; JPEG; GIF Images in Android; Creating Animation in Android	A	4	2	CO1 CO3
	Handling User Interface (UI) Events: An Overview of UI Events in Android; Listening for and Handling Events; Handling UI Events via the ViewClass	A	4	2	
	Event Callback Methods; Handling Click Events; Touch screen Events; Keyboard Events; Context Menus	A	4	2	
IV	**Content Providers** An Overview of Android Content Providers; Defining a Content Provider; Working with a Database	A	5	1	CO4 CO5
	Intents and Intent Filters: Intent; Implicit Intents; Explicit Intents	A	5	2	
	Intents with Activities; Intents with Broadcast Receivers	A	5	1	
	Attaching Actions; Issuing Notification Android Notification Examples	A	5	2	
V	**Location-Based Services** Selecting a Location Provider; Proximity Alerts; Map-Based Activities	A	13	2	CO4 CO5
	Bluetooth Communications; Network and Internet Connectivity	A	16	2	
	Managing Wi-Fi; Transferring Data Using Wi-Fi Direct	A	16	2	
	Revision			2	
	Total Hours			**33**	

Note: 100% Theory
CIA: 25 Marks; **End Semester:** 75 Marks

Text Book:

A. Reto Meier *"Professional Android 4 Application Development",* Wiley Publications, 2013.

References:

A. Thomas Duffy, "*Programming with Mobile Applications: Android, iOS, and Windows Phone 7"*, Cengage Learning publications, 2013.
B. http://nptel.ac.in/courses/106106147/10

Programme	Course Code	Title
B.Sc (ECS)	19ECU30B	PC Hardware and Troubleshooting

Preamble: This course is useful as it equips students with basic knowledge about personal computers. The students will also learn about PC hardware and software, maintenance and troubleshooting of PC systems.

Expected level of output : Conceptual and Application Level

Department offered : Electronics and Communication Systems

Prerequisites : Basic knowledge in computer fundamentals

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Describe the different hardware components inside and connected to a computer.	Understanding	Conceptual	Poster Presentation/ Charts
CO2	Understand the requirement of both hardware and software to work for a PC.	Understanding	Conceptual	Class Presentation
CO3	Learn how display adapters and serial interface works.	Understanding	Conceptual	SSA
CO4	Install/connect associated peripherals.	Applying	Technical	Poster Presentation/ Charts
CO5	Diagnose and troubleshoot microcomputer systems hardware and software, and other Peripheral equipments.	Analyzing	Analytical	Group-mini Project

Modular Assessment Code : D (Theory-Applications)

Course Inputs:

Unit	Description	Text Book	Chapter	Instructional Hours	COs
I	**Microcomputer System & Its Peripherals** Introduction; Computer organization; Memory	A	1	1	CO1
	Arithmetic and Logic unit; Control unit; Microprocessor; Operating system and its types	A	1	2	
	Peripheral devices; Keyboard; Mouse	A	2	1	
	Scanner; CD-ROM drive; Monitor	A	2	1	
	Printer: Laser printer; Inkjet printer	A	2	1	
II	**PC Hardware** Hardware; BIOS; DOS interaction; The PC family: OG and NG; PC hardware	A	3	2	CO2
	Inside the System Box SMPS; Motherboard; Motherboard components; Motherboard logic	A	3	2	
	Front panel controls; Floppy disk controller; Hard disk controller; Post sequence	A	3	2	
	BIOS set up; Sound card and MIDI	A	3	1	
III	**Display Adapters** CRT display; CRT controller	A	11	1	CO3
	Color Graphics Adapter (CGA) CGA circuit description	A	11	2	

	Second generation graphics adapters; New trends in display controllers; Display adapters; Device interface	A	11	2	
	USB Serial Interface	A	12	1	
IV	**Installation and Preventive Maintenance** System Configuration; Pre-Installation planning; Installation practice	A	13	2	CO4
	Routine checks; PC Assembling and Integration	A	13	1	
	BIOS setup; Standard CMOS setup	A	13	1	
	Advanced chipset features setup; Preventive Maintenance; Problem causes	A	13	2	
V	**Troubleshooting** Computer faults; Nature and types of faults; Troubleshooting tools	A	14	2	CO5
	Bus faults; Faults elimination process	A	14	1	
	Systematic Troubleshooting Symptoms, Observation and Analysis	A	14	2	
	Fault Diagnosis; Fault rectification	A	14	1	
	Revision			2	
	Total Hours			**33**	

Note: 100% Theory
CIA: 25 Marks**; End Semester:** 75 Marks

Text Book:

A. B. Govindarajalu, *"IBM PC and Clones",* Tata McGraw Hill, Second Edition, 2010.

References:

A. D. Balasubramanian, *"Computer Installation and servicing",* Second Edition, 2010.
B. Kai Hwang, *"Advanced Computer Architecture",* Tata McGraw Hill, 2008.

Generic Elective Courses (GE) Offered by ECS Department

Programme	Course Code	Title
B.Sc (IT /CT/CS/CSA/SS/Cog.)/ BCA	19GEU48	Embedded Systems

Preamble: This course is designed to understand the embedded controller architecture and programming language. This course is to make students aware of maintaining microcontroller based equipments/systems.

Expected level of output : Conceptual and Application Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in Digital Electronics

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Understand the fundamentals of embedded systems, different components of 8051 microcontroller.	Understanding	Conceptual	Poster Presentation/ Charts
CO2	Know the instruction set and addressing modes of 8051.	Understanding	Conceptual	Class Presentation
CO3	Write and execute assembly language programs and embedded C programs for the given applications.	Analyzing	Analytical	SSA
CO4	Familiar with programming environment (IDE) used to develop embedded systems.	Understanding	Conceptual	Simulation Exercises
CO5	Interface microcontroller with external hardware circuitry/Peripheral.	Analyzing	Analytical	Class Presentation

Modular Assessment Code : H (Theory-Technology)

Course Inputs:

Unit	Description	Text Book	Chapter	Instructional Hours	COs
I	**8051 Architecture** Digital Computer; CPU; ALU; Control Unit; Address Bus; Data Bus; Control Signals; Memory; Peripherals; Microprocessor; Microcontroller	A	1	2	CO1
	Instruction; Mnemonics; Program; Low level Language; High Level Language; Assembler; Compiler; Interpreter; Simulator; Integrated Development Environment (IDE)	A	1	2	
	Microcontrollers for Embedded Systems; Criteria for choosing microcontroller	A	1	1	
	Overview of 8051 family; Architecture of 8051	A	1	2	
	Registers; 8051 Memory organization: RAM allocation; Program memory	A	2	2	
	Flag bits and PSW register	A	2	1	
II	**Instruction Set and Addressing Modes** 8051instruction set: Data transfer instructions	A	2	3	CO2
	Arithmetic, Logical and Boolean instructions	A	6	4	
	Branching instructions	A	4&6	2	
	Addressing modes	A	5	1	
III	**Assembly language Programming** Introduction to ALP: Data types and assembler directives	B	5-9	1	CO3

	Unsigned Arithmetic operations: Addition of 8 bit data, Subtraction of 8 bit data, Multiplication of 8 bit data, Division of 8 bit data.	B	5-9	2	
	Logical operations: Demorgan's theorem, Verification of Boolean functions	B	5-9	2	
	Counting and looping techniques: Addition of an array of data, Block data transfer, Larger of two numbers, Smaller of two numbers	B	5-9	3	
	Time delay programming and delay calculation in ALP, Square wave generation	B	5-9	2	
IV	**Embedded C Programming** Introduction to Embedded C: C data types and operators for 8051	A	7	1	CO3 CO4
	Arithmetic and logical operations using C	A	7	2	
	I/O port programming: Single bit operations in C	A	7	2	
	IDE and Simulation Tools Introduction to Keil micro vision; Project wizard; Text file; Debugging; Creating hex files	C	-	1	
	Introduction to Simulation software; Familiarization of library tools	C	-	1	
	Project wizard; Editor window; Component selection	C	-	1	
	Wiring of circuit diagram; Loading hex file in to software; Simulation, simple designs	C	-	1	
V	**Real World Applications** I/O Interfacing: Key; LED and LCD Interfacing	A	12	3	CO3 CO5
	ADC Interfacing; Sensor interfacing; DAC Interfacing	A	13	3	
	Relay interfacing	A	16&17	1	
	Interfacing stepper motor and DC motor	A	16&17	2	
	Traffic light control, Automatic water level monitoring	-	-	2	
	Revision			5	
	Total Hours			**55**	

Note: 70% Theory; 30% Programs
CIA: 25 Marks; **End Semester:** 75 Marks

Text Books/Manuals:

A. Muhammad Ali Mazidi, Janice GillispieMazidi and Rolin D. McKinlay, *"The 8051 Microcontroller and Embedded Systems using Assembly and C"*, Pearson, Second edition, 2008.
B. Manish K Patel, *"The 8051 Microcontroller Based Embedded Systems"*, TataMcGraw-Hill Education, 2014.
C. User manuals of PROTEUS, OrCAD.

References:

A. D. KarunaSagar, *"Microcontroller 8051"*, Narosa Publishing House, 2011.
B. A.P. Godse, D.A. Godse, *"Microprocessor and Microcontroller"*, Technical Publications, First Edition, 2007.
C. http://nptel.ac.in/courses/106108100/
D. http://nptel.ac.in/courses/117104072/

Programme	Course Code	Title
B.Sc (IT /CT/CS/CSA/SS/Cog.)/ BCA	19GEU49	Robotics and Applications

Preamble: This course focuses on the fundamentals, actuators, grippers, and sensors of robot systems and it also explains how to use Arduino to operate lights, motors, and sensors for making a robot.

Expected level of output : Conceptual and Application Level

Department offered : Electronics and Communication Systems

Prerequisites : Knowledge in instrumentation and microcontrollers

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Understand the basic concepts and types of robots.	Understanding	Conceptual	Poster Presentation/ Charts
CO2	Identify the drives and end effectors of robot systems.	Understanding	Conceptual	Class Presentation
CO3	Familiarize with the most common robot sensors.	Understanding	Conceptual	SSA
CO4	Explore the open source development platform (Arduino).	Applying	Technical	Class Presentation
CO5	Develop simple robot control systems using Arduino.	Applying	Technical	Simulation Exercises

Modular Assessment Code : H (Theory-Technology)

Course Inputs:

Unit	Description	Text Book	Chapter	Instructional Hours	COs
I	**Introduction to Robotics** History; Laws of Robotics; Robot definition	A	1	2	CO1
	Robot usage rules; Applications	A	1	1	
	Robot subsystems: Motion subsystem; Recognition subsystem; Control subsystem	A	1	3	
	Classification of Robots: Cartesian Robot; Cylindrical Robot; Spherical Robot; Articulated Robot	A	2	3	
II	**Actuators** Classification of Actuators; Electric Actuators: Stepper motor	A	3	2	CO2
	DC Motors; Servo motor; Selection of motors	A	3	2	
	Solenoids; Relays; Solid state switches	-	-	2	
	Hydraulic Actuators; Pneumatic Actuators	A	3	2	
	Grippers Mechanical Grippers; Magnetic Grippers	A	3	2	
	Vacuum Grippers; Adhesive Grippers; Selection of grippers	A	3	1	
III	**Sensors and Vision Systems** Sensor Classification; Internal Sensor; Position Sensors: Encoder, Potentiometer; LVDT	A	4	3	CO3

	Velocity Sensors: Tachometer, Hall-effect sensor	A	4	1	
	Accelerometer and Gyroscope sensors	-	-	1	
	Force Sensors: Strain-gauge sensor; Piezoelectric sensor	A	4	1	
	External sensors; Contact type; Noncontact type: Proximity sensor, Semiconductor displacement sensor	A	4	2	
	Vision; Elements in a vision sensor; Steps in a vision system	A	4	2	
VI	**Electronics for Robot** The Arduino Platform; Functional block diagram of Arduino	B	-	1	CO4
	Arduino family of boards; Pin function of Arduino UNO	B	-	1	
	Fundamentals of Arduino Programming; Keywords; Inbuilt functions; Libraries; Arduino Boot loader	B	-	2	
	Digital GPIO programming; Working with pins as input and output; Working with PWM Outputs	B	-	2	
	Working with Analog Inputs using on-chip ADC; Serial Communication between Arduino hardware and PC	B	-	2	
	Arduino Interrupt Programming	B	-	1	
V	**Robot Programming using Arduino** Blinking of LED; Key interfacing	C	-	1	CO5
	DC motor direction control; DC motor speed control using PWM; Servo motor control	C	-	2	
	Interfacing LCD; Interfacing IR sensor and Ultrasonic sensor; Tone generation	C	-	3	
	Line follower Robot; Obstacle avoider Robot; Self balancing Robot	C	-	3	
	Wireless Robot; PC control Robot	C	-	2	
	Revision			5	
	Total Hours			**55**	

Note: 100% Theory
CIA: 25 Marks; **End Semester:** 75 Marks

Text Books:

A. Subir Kumar Saha, *"Introduction to Robotics"*, McGraw-Hill Education, Second Edition, 2014.
B. Michael McRoberts, *"Beginning Arduino"*, Second Edition, Apress, 2013.
C. John-David Warren, Josh Adams, HaraldMolle, *"Arduino Robotics"*, Apress, 2011.

References:

A. MikellGroover, Mitchell Weiss, Roger Nagel, Nicholas Odrey, Ashish Dutta, *"Industrial Robotics: Technology - Programming and Applications",* Tata McGraw-Hill Education, Second Edition (Special Indian Edition), 2012.
B. R.Mittle, I.Nagrath, *"Robotics and Control"*, Tata McGraw-Hill Education, 2003.
C. S.R. Deb, *"Robotics Technology and Flexible Automation"*, Tata McGraw Hill, Second Edition.
D. http://nptel.ac.in/courses/112103174/39

Programme	Course Code	Title
B.Sc (IT /CT/CS/CSA/SS/Cog.)/ BCA	19GEU50	PC Hardware

Preamble: This course equips students with basic knowledge about personal computers. The students can learn about PC hardware and software, maintenance and troubleshooting of PC systems.

Expected level of output : Conceptual and Application Level

Department offered : Electronics and Communication Systems

Prerequisites : Basic knowledge in computer fundamentals

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Describe the different hardware components inside and connected to a computer	Understanding	Conceptual	Poster Presentation/ Charts
CO2	Understand the requirements of computer hardware and software to work.	Understanding	Conceptual	Class Presentation
CO3	Learn how display adapters and serial interface cards works	Understanding	Conceptual	SSA
CO4	Install/connect associated peripherals	Applying	Technical	Poster Presentation/ Charts
CO5	Diagnose and troubleshoot microcomputer systems hardware and software, and other Peripheral equipment.	Analyzing	Analytical	Simulation Exercises

Modular Assessment Code : H (Theory-Technology)

Course Inputs:

Unit	Description	Text Book	Chapter	Instructional Hours	COs
I	**Microcomputer System & Its Peripherals** Introduction; Computer organization; Memory	A	1	1	CO1
	Arithmetic and Logic unit; Control unit; Microprocessor; Operating system and its types	A	1	2	
	Peripheral devices ; Keyboard; Mouse and trackball	A	2	2	
	Scanner; CD-ROM drive; CRT monitor	A	2	2	
	Printer; Functions; Characteristics; Dot matrix impact printer	A	2	2	
	Laser printer, Inkjet printer	A	2	1	
II	**PC Hardware** Hardware; BIOS; DOS interaction; The PC family: OG and NG; PC hardware; OG	A	3	2	CO2
	Inside the System Box SMPS; Motherboard; Motherboard components; Motherboard logic	A	3	3	
	Front panel controls; Floppy disk controller; Hard disk controller; Post sequence	A	3	3	
	BIOS set up; Sound card and MIDI	A	3	2	

III	**Display Adapters** CRT display; CRT controller	A	11	2	CO3
	Color graphics adapter (CGA) CGA circuit description	A	11	2	
	Second generation graphics adapters; New trends in display controllers; Display adapters; Device interface	A	11	2	
	Serial Interfaces Data communication fundamentals; RS-232 interface	A	12	2	
	Serial port in original PC; USB; Firewire (IEEE 1394)	A	12	2	
IV	**Installation and Preventive Maintenance** System configuration; Pre-Installation planning; Installation practice	A	13	2	CO4
	Routine checks; PC Assembling and Integration	A	13	2	
	BIOS setup; Standard CMOS setup	A	13	3	
	Advanced chipset features setup; Preventive maintenance	A	13	2	
	Problem causes; How DOS gets Control; DOS: The Resource Manager	A	13	2	
V	**Troubleshooting** Computer faults; Nature and types of faults; Troubleshooting tools	A	14	2	CO5
	Bus faults; Faults elimination process	A	14	1	
	Systematic Troubleshooting Symptoms, Observation and analysis	A	14	2	
	Fault diagnosis; Fault rectification	A	14	2	
	Virus; Data recovery tools from DOS	A	14	2	
	Revision			5	
	Total Hours			**55**	

Note: 100% Theory
CIA: 25 Marks; **End Semester:** 75 Marks

Text Book:

A. B. Govindarajalu, *"IBM PC and Clones",* Tata McGraw Hill, Second Edition, 2010.

References:

A. D. Balasubramanian, *"Computer Installation and servicing"*, Second Edition, 2010.
B. Kai Hwang, *"Advanced Computer Architecture",* Tata McGraw Hill, 2008.
C. http://nptel.ac.in/courses/106106092/3
D. http://nptel.ac.in/courses/106106144/3

Extra Departmental Course (EDC) Offered by ECS Department

Programme(s)	Course Code	Title
Except B.Sc (ECS)	19SEC09	PC Hardware, Installation and Troubleshooting

Preamble: This course covers the fundamentals of computer hardware and software. The students will also learn about assembling, installation, and troubleshooting of computer systems.

Expected level of output : Conceptual and Application Level

Department offered : Electronics and Communication Systems

Prerequisites : Basic knowledge in computer fundamentals

Course Outcomes:

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

Course Outcome	Description	Bloom's Taxonomy Level	Skill	Capstone Evaluation
CO1	Understand the basic computer system and its components.	Understanding	Conceptual	Poster Presentation/ Charts
CO2	Identify and analyze the computer hardware.	Understanding	Conceptual	SSA
CO3	Learn how display adapters and serial interface works.	Understanding	Conceptual	Class Presentation
CO4	Install, configure, and remove software and hardware.	Applying	Technical	Poster Presentation/ Charts
CO5	Diagnose and troubleshoot microcomputer systems hardware and software, and other Peripheral equipments.	Analyzing	Analytical	Group-Mini Project

Modular Assessment Code : D (Theory-Applications)

Course Inputs:

Unit	Description	Text Book	Chapter	Instructional Hours	COs
I	**PC System** Introduction; Functional blocks; System unit; Display unit	A	1	2	CO1 CO2
	Inside PC Motherboard; BIOS; CMOS-RAM	A	2	1	
	Motherboard types; Processors; Chipsets	A	2	1	
	On-Board Memory PC's Memory organization	A	3	1	
	Memory packaging**;** I/O Ports; USB port	A	3	1	
II	Floppy Disk Drive and Controller	A	5	2	CO2
	Hard Disk Drive and Controller	A	6	2	
	MMX; Multimedia extensions	A	7	2	
III	**Input and Output Devices** Keyboard; Mouse; Scanner	A	8	1	CO3
	Digital Camera ; Laser Printer	A	8 & 11	1	

	Monitors and Display Adapters Display; Video basics; VGA monitors	A	9	2	
	Digital display technology; LCD, LED	A	9	2	
	PC Installation	A	12	2	
IV	**Fundamental to Operating Systems** MS-DOS Programming	-	-	2	CO4
	Installation of OS: Erasing existing installations (clean install); Hard drive partitions and file systems; Installing OS; Product activation; Upgrade OS	-	-	2	
V	**Troubleshooting and Servicing** POST; Troubleshooting the motherboard	A	13	1	CO5
	Troubleshooting the keyboard	A	13	1	
	Troubleshooting the disk devices	A	13	1	
	Troubleshooting the printer	A	13	1	
	Maintenance Diagnostic Software; Data Security	A	14	2	
	Computer and Communication Networking Modem; Internet	A	15	1	
	Revision			2	
	Total Hours			**33**	

Note: 100% Theory
CIA: 100 Marks

Text Book:

A. D. Balasubramanian, "*Computer Installation and servicing*", Tata McGraw Hill Education Pvt. Ltd., Second Edition, 2005.

References:

A. Govindarajalu, *"IBM PC and Clones",* Tata McGraw Hill, Second Edition, 2002.
B. http://nptel.ac.in/courses/106106092/3
C. http://nptel.ac.in/courses/106106144/3

Annexure – I

Skill Enhancement Courses - Extra Departmental Courses (EDC)											
Offering Department	Course Code	Course Title	T/ P	Ins. Hrs/ Week	MAP Code	Examination				Credits	No of Seats
						Dur Hrs	CIA	ES	Total Marks		
Languages	19SEC01	Aalumai Thiran	T	3	C	-	100	-	100	3	60
Languages	19SEC02	Spoken Hindi	T	3	C	-	100	-	100	3	60
English	19SEC03	Mass Communication	T	3	C	-	100	-	100	3	60
Computer Science	19SEC04	Web Designing	T+P	3	M	-	100	-	100	3	120
Computer Science & Applications	19SEC05	User Interface Design	T	3	C	-	100	-	100	3	120
Software Systems	19SEC06	Animation Techniques	T+P	3	M	-	100	-	100	3	60
Information Technology	19SEC07	Multimedia	T+P	3	M	-	100	-	100	3	120
Computer Technology	19SEC08	Corel Draw	T+P	3	M	-	100	-	100	3	120
Bioscience	19SEC10	Diabetic Management	T	3	C	-	100	-	100	3	60
Bioscience	19SEC11	Clinical Laboratory Techniques	T	3	C	-	100	-	100	3	60
Bioscience	19SEC12	Bio Entrepreneurship	T	3	C	-	100	-	100	3	60
Bioscience	19SEC13	Basic Bio Informatics	T	3	C	-	100	-	100	3	60
Costume Design & Fashion	19SEC14	Basic Cosmetology	P	3	M	-	100	-	100	3	30
Costume Design & Fashion	19SEC15	Embellishment and Accessory Designing	P	3	M	-	100	-	100	3	30
CSHM	19SEC16	Basic Cooking Techniques	T	3	C	-	100	-	100	3	30
CSHM	19SEC17	Dining Etiquettes	T	3	C	-	100	-	100	3	30
Commerce PA	19SEC18	Personal Financial Services	T	3	C	-	100	-	100	3	120
Commerce	19SEC19	Accounting Software	P	3	M	-	100	-	100	3	100
Commerce BPS & CM	19SEC20	Marketing Systems	T	3	C	-	100	-	100	3	120
Commerce CA & BA	19SEC21	Neuro Marketing	T	3	C	-	100	-	100	3	190
Commerce AF & BI	19SEC22	Strategic Franchising	T	3	C	-	100	-	100	3	120
BBA & ISM	19SEC23	Executive Development	T	3	E	-	100	-	100	3	60
BBA CA	19SEC24	Entrepreneurship and Project Management	T	3	C	-	100	-	100	3	120
BBA CA	19SEC25	Business Ethics and Culture	T	3	C	-	100	-	100	3	60
Mathematics	19SEC26	Financial Mathematics	T	3	J	-	100	-	100	3	60

Mathematics	19SEC27	Vital Statistics	T	3	J	-	100	-	100	3	60
Sports	19SEC28	Physical Training	T	3	M	-	100	-	100	3	44
BBA CA	19SEC29	Modern World History	T	3	C	-	100	-	100	3	7
BBA CA	19SEC30	Art of the Modern World	T	3	C	-	100	-	100	3	7
Bioscience	19SEC31	Introductory Biology – I	T	3	C	-	100	-	100	3	7
Bioscience	19SEC32	Introductory Biology Lab I	P	3	L	-	100	-	100	3	7
Bioscience	19SEC33	Principles of Chemistry I	T	3	C	-	100	-	100	3	7
Bioscience	19SEC34	Principles of Chemistry I Lab	P	3	L	-	100	-	100	3	7
English	19SEC35	World Literature II – Modern	T	3	C	-	100	-	100	3	7
English	19SEC36	US History to 1877	T	3	C	-	100	-	100	3	7
English	19SEC37	Critical Trends and Issues in Recent World History	T	3	C	-	100	-	100	3	7
Psychology	19SEC38	Psychology as Life skill	T	3	C	-	100	-	100	3	60
BCA	19SEC39	Spread Sheet Lab	P	3	M	-	100	-	100	3	120
BBA & ISM	19SEC40	Human Resource Management	T	3	C	-	100	-	100	3	3