

## Kurukshetra University Kurukshetra

### Scheme of Examinations & syllabus for B.Sc. Non-Medical Programme for the subject of Electronics under choice based credit system (CBCS)

w.e.f.2020-21 in phased manner

#### Semester-I

Paper Code	Course opted	Nomenclature	Credits	Hours/ week	Marks			Duration of Exam in hour
					Ext.	Int.	Total	
AECC-101	AECC Course-I English/Environmental Studies	English or Environmental Studies	2	2	40	10	50	3
DSCP-102	Core Course-I (Physics)		3	3	60	15	75	3
DSCP-103	Core Course-II (Physics)		3	3	60	15	75	3
DSCP-104	Core Course (Physics Practical-I)		2	4	40	10	50	3
DSCM-105	Core Course-I (Mathematics)		3	3	60	15	75	3
DSCM-106	Core Course-II (Mathematics)		3	3	60	15	75	3
DSCM-107	Core Course (Mathematics Practical-I)		2	4	40	10	50	3
DSCE-108	Core Course-I (Electronics)	Electronic Devices and Circuits-I	3	3	60	15	75	3
DSCE-109	Core Course-II (Electronics)	Network Analysis	3	3	60	15	75	3
DSCE-110	Core Course (Electronics Practical-I)	Practicals	2	4	40	10	50	3
		Total	26	32	520	130	650	

## Semester-II

Paper Code	Course opted	Nomenclature	Credits	Hours/week	Marks			Duration of Exam in hour
					Ext.	Int.	Total	
AECC-201	AECC Course-II English/Environmental Studies	English or Environmental Studies	2	2	40	10	50	3
DSCP-202	Core Course-III (Physics)		3	3	60	15	75	3
DSCP-203	Core Course-IV (Physics)		3	3	60	15	75	3
DSCP-204	Core Course (Physics Practical-II)		2	4	40	10	50	3
DSCM-205	Core Course-III (Mathematics)		3	3	60	15	75	3
DSCM-206	Core Course-IV (Mathematics)		3	3	60	15	75	3
DSCM-207	Core Course (Mathematics Practical-II)		2	4	40	10	50	3
DSCE-208	Core Course-III (Electronics)	Electronic Devices and Circuits-II	3	3	60	15	75	3
DSCE-209	Core Course-IV (Electronics)	Digital Electronics	3	3	60	15	75	3
DSCE-210	Core Course (Electronics Practical-II)	Practicals	2	4	40	10	50	3
		Total	26	32	520	130	650	

### Semester-III

Paper Code	Course opted	Nomenclature	Credits	Hours/week	Marks			Duration of Exam in hour
					Ext.	Int.	Total	
SEC-301	Skill Enhancement Course-I	SECE1: Computer Fundamental	2	2	40	10	50	3
DSCP-302	Core Course-V (Physics)		3	3	60	15	75	3
DSCP-303	Core Course-VI (Physics)		3	3	60	15	75	3
DSCP-304	Core Course (Physics Practical-III)		2	4	40	10	50	3
DSCM-305	Core Course-V (Mathematics)		3	3	60	15	75	3
DSCM-306	Core Course-VI (Mathematics)		3	3	60	15	75	3
DSCM-307	Core Course (Mathematics Practical-III)		2	4	40	10	50	3
DSCE-308	Core Course-V (Electronics)	Op-amp and Linear Integrated Circuits	3	3	60	15	75	3
DSCE-309	Core Course-VI (Electronics)	Combinational and Sequential Circuits	3	3	60	15	75	3
DSCE-310	Core Course (Electronics Practical-III)	Practicals	2	4	40	10	50	3
AECC-311	Hindi/Sanskrit		2	2	40	10	50	3
		Total	28	34	560	140	700	

### Semester-IV

Paper Code	Course opted	Nomenclature	Credits	Hours / week	Marks			Duration of Exam in hour
					Ext.	Int.	Total	
SEC-401	Skill Enhancement Course-II	SECP	2	2	40	10	50	3
DSCP-402	Core Course-VII (Physics)		3	3	60	15	75	3
DSCP-403	Core Course-VIII (Physics)		3	3	60	15	75	3
DSCP-404	Core Course (Physics Practical-IV)		2	4	40	10	50	3
DSCM-405	Core Course-VII (Mathematics)		3	3	60	15	75	3
DSCM-406	Core Course-VIII (Mathematics)		3	3	60	15	75	3
DSCM-407	Core Course (Mathematics Practical-IV)		2	4	40	10	50	3
DSCE-408	Core Course-VII (Electronics)	Sinusoidal Oscillators and Multivibrators	3	3	60	15	75	3
DSCE-409	Core Course-VIII (Electronics)	Advanced Digital Electronics	3	3	60	15	75	3
DSCE-410	Core Course (Electronics Practical-IV)	Practicals	2	4	40	10	50	3
		Total	26	32	520	130	650	

### Semester-V

Paper Code	Course opted	Nomenclature	Credits	Hours / week	Marks			Duration of Exam in hour
					Ext.	Int.	Total	
SEC-501	Skill Enhancement Course-III	SECE3: Basic Electrical Engineering & Skills	2	2	40	10	50	3
DSEP-502	Discipline Specific Elective-I (Physics)	DSEP1	2	2	40	10	50	3
		DSEP2						
DSEP-503	Discipline Specific Elective-II (Physics)	DSEP3	2	2	40	10	50	3
		DSEP4						
DSEP-504	Discipline Specific Elective Physics Practical-V		2	4	40	10	50	3
DSEM-505	Discipline Specific Elective-I (Mathematics)	DSEM1	2	2	40	10	50	3
		DSEM2						
DSEM-506	Discipline Specific Elective-II (Mathematics)	DSEM3	2	2	40	10	50	3
		DSEM4						
DSEM-507	Discipline Specific Elective (Mathematics Practical-V)		2	4	40	10	50	3
*DSEE-508	Discipline Specific Elective-I (Electronics)	DSEE1: Microprocessor Architecture and Programming with 8085	2	2	40	10	50	3
		DSEE2: Digital Signal Processing						
*DSEE-509	Discipline Specific Elective-II (Electronics)	DSEE3: Electronic Communication	2	2	40	10	50	3
		DSEE4: Electronic Instrumentation						
DSEE-510	Discipline Specific Elective(Electronics Practical-V)	Practicals	2	4	40	10	50	3
		Total	20	26	400	100	500	

\* DSEE - A student can opt any two theory paper.

### Semester-VI

Paper Code	Course opted	Nomenclature	Credits	Hours per week	Marks			Duration of Exam in hour
					Ext.	Int.	Total	
SEC-601	Skill Enhancement Course-IV	SECE4:	2	2	40	10	50	3
		SECP2						
DSEP-602	Discipline Specific Elective-III(Physics)	DSEP5	2	2	40	10	50	3
		DSEP6						
DSEP-603	Discipline Specific Elective-IV(Physics)	DSEP7	2	2	40	10	50	3
		DSEP8						
DSEP-604	Discipline Specific Elective (Physics Practical-VI)		2	4	40	10	50	3
DSEM-605	Discipline Specific Elective-III (Mathematics)	DSEM5	2	2	40	10	50	3
		DSEM6						
DSEM-606	Discipline Specific Elective-IV (Mathematics)	DSEM7	2	2	40	10	50	3
		DSEM8						
DSEM-607	Discipline Specific Elective(Mathematics Practical-VI)		2	4	40	10	50	3
*DSEE-608	Discipline Specific Elective-III (Electronics)	DSEE5: Interfacing Peripheral Devices and Applications of 8085	2	2	40	10	50	3
		DSEE6: Verilog and FPGA based System Design						
*DSEE-609	Discipline Specific Elective-IV (Electronics)	DSEE7: Introduction to C and its programming	2	2	40	10	50	3
		DSEE8: Modern Communication Systems						
DSEE-610	Discipline Specific Elective(Electronics Practical-VI)	Practicals	2	4	40	10	50	3
		Total	20	26	400	100	500	
		Grand Total	146	182	2920	730	3650	

\* DSEE - A student can opt any two theory paper.

**Note: Each credit equals one hour/week for theory & two hours/week for practical teaching load.**

## Programme Outcomes (POs) for Three Year B.Sc. Programme (Course Electronics)

PO1	Knowledge	Capable of demonstrating comprehensive disciplinary knowledge gained during course of study
PO2	Communication	Ability to communicate effectively on general and scientific topics with the scientific community and with society at large
PO3	Problem Solving	Capability of applying knowledge to solve scientific and other problems
PO4	Individual and Team Work	Capable to learn and work effectively as an individual, and as a member or leader in diverse teams, in multidisciplinary settings'
PO5	Investigation of Problems	Ability of critical thinking, analytical reasoning and research based knowledge including design of experiments, analysis and interpretation of data to provide conclusions
PO6	Modern Tool usage	Ability to use and learn techniques, skills and modern tools for scientific practices
PO7	Science and Society	Ability to apply reasoning to assess the different issues related to society and the consequent responsibilities relevant to the professional scientific practices
PO8	Life-Long Learning	Aptitude to apply knowledge and skills that are necessary for participating in learning activities throughout the life
PO9	Environment and Sustainability	Ability to design and develop modern systems which are environmentally sensitive and to understand the importance of sustainable development.
PO10	Ethics	Apply ethical principles and professional responsibilities in scientific practices
PO11	Project Management	Ability to demonstrate knowledge and understanding of the scientific principles and apply these to manage projects

## Programme Specific Outcomes (PSOs) for Three Year B.Sc. Programme (Course Electronics)

PSO1	Students will be able to acquire the basic understanding of the electronic components, principles, working and applications of the electronic devices.
PSO2	Explore technical knowledge in diverse areas of Electronics and experience an environment conducive in cultivating skills for successful career, entrepreneurship and higher studies.
PSO3	Students will acquire experimental skills, research aptitude in the area of electronics that will make them capable of contributing to the academic as well as industrial growth of the country.



**Semester-I to VI**  
**Course: B.Sc.**  
**Subject: Electronics**  
**Instruction for the Examiners**

1. Syllabus in each Theory Paper in each semester is divided in 4 units.
  - i. A student is required to attempt 5 questions in all.
  - ii. Question No 1 is compulsory, consisting of short answer type questions based on all the 4 units.
  - iii. Two questions will be set from each unit. A student is required to attempt one question from each unit.
  - iv. All questions carry equal marks.
2. Use of simple calculator is permissible.
  - i. Instructions should be imparted using SI system of units. Familiarity with CGS system of units should also be ensured.
3. Distribution of Marks: 60\*+15\*  
Each theory question paper will be of 60 marks of 3 hours duration and 15 marks in each theory paper are to be awarded through internal assessment in each semester.
4. Work load – three hours per week per theory paper.
5. Practical classes to be conducted during odd as well as even semester.
6. The Practical examination will be held at the end of each semester in one sitting of 3 hours.
7. A candidate is required to perform minimum 6 experiments out of the list provided during course of study in each semester.
8. Distribution of Marks: 40\*+10\*  
Each practical examination in each semester will be of 40 marks of 3 hours duration and 10 marks in each practical paper are to be awarded through internal assessment in each semester.
  1. Paper Practical – 40 Marks of 3 Hours duration
  2. Lab Record: 10
  3. Experiments: 20
  4. Viva/Voce: 10
9. Maximum 10 students in one group of practical during course of study and also in examination.

**Note: Each credit equals one hour/week for theory teaching load.**

**Each credit equals two hours/week for practical teaching load.**

**Semester-I**  
**Course: B.Sc.**  
**Subject: Electronics**  
**Paper No : DSCE-108**  
**Nomenclature: -Electronic Devices and Circuits-I**

Programme	Course Credit	Theory Hours per week	Internal Assessment Marks	External Examination Marks	Maximum Marks	End Term Examination Time
B.Sc.	3	3	15	60	75	3 Hours

**Course Objective:** The objectives of teaching this paper are

1. To make the students familiar with the concepts of physics involved in the working of various electronic devices like PN Diode, Zener Diode and Bipolar Junction Transistor (BJT).
2. To make the students understand various applications of PN junction Diode and Transistor.

**Course Outcome:** After the end of this paper, the students will be able

1. To understand the physics behind the semiconductors.
2. To understand the construction, working & applications of various semiconductor diodes and transistors.
3. To understand various configurations of transistor and their equivalent circuits.

**Mapping of Course Outcomes to Program Outcomes:**

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02	PS03
CO1	3	3	2	3	2	-	3	--	2	2	3	3	3	2
CO2	3	3	3	3	3	3	3	--	--	2	3	3	3	2
CO3	3	3	3	3	3	3	3	2	2	2	3	3	3	2

**Unit -I**

**Introduction to Semiconductors:** - Intrinsic and Extrinsic semiconductors, Energy Band diagram, drift and diffusion currents in semiconductors (Basic idea only), Junction diode and its characteristics, Space charge capacitance and diffusion capacitance (Basic idea only), Zener diode, Voltage Regulation using Zener Diode (Basic Idea), shunt and series clipping circuit., clamping circuit.

**Unit-II**

**Rectifiers:** - HWR, FWR, Bridge FWR, calculation of rectifier parameters.  
 Filter circuits: L, C, LC (Calculation of ripple factor for capacitor filter only), Voltage multiplier Circuit.

**Unit -III**

**Bipolar Junction Transistor:** - Potential curves in unbiased and biased transistor, Transistor current components, Early effect, Static Characteristics of CB & CE configuration, active, cut off and

saturation regions. Transistor current gains (Alpha, Beta, and Gama)

#### **Unit-IV**

**Transistor Model:** - Transistor as an Amplifier, Ebers-moll model of transistor, Hybrid-Model of transistor, Emitter follower, calculation of transistor amplifier parameters using h-model, comparison of transistor amplifier configuration, Millers – theorem and its dual

#### **Reference Books:**

1. Integrated Electronics by Millman and Halkias.
2. Basic Electronics and Linear Circuits by NN Bhargava, DC Kulshreshtha (TTTI)
3. Electronics Devices and Circuit by Allen Mottershead

**Semester –I**  
**Course: B.Sc.**  
**Subject: Electronics**  
**Paper No : DSCE-109**  
**Nomenclature: -Network Analysis**

Programme	Course Credit	Theory Hours per week	Internal Assessment Marks	External Examination Marks	Maximum Marks	End Term Examination Time
B.Sc.	3	3	15	60	75	3 Hours

**Course Objective:** The objective of teaching this paper is to make

1. the students familiar with various network theorems
2. the students familiar with Two-Port Networks

**Course Outcome:** After the end of this paper, the students will be able to

1. Understanding and apply Mesh and Nodal analysis in electronic circuits.
2. Understand different network theorems and their applications in analyzing electronic circuits.
3. Understand different types of two-port networks and parameters. Also they will be able to analyze their performance.

**Mapping of Course Outcomes to Program Outcomes:**

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO2	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO3	3	3	2	3	3	3	3	--	--	--	3	3	3	2

**Unit-I**

**Network Theorems-I:** -Concept of voltage and current sources, Kirchoff's Voltage Law, Kirchoff's Current Law, Mesh Analysis, Nodal Analysis, Source Transformation Technique, Star-Delta Transformation, Superposition Theorem, Examples and problems of each topic.

**Unit-II**

**Network Theorems-II:** -Thevenin's Theorem, **Norton's** Theorem, Reciprocity Theorem, Maximum Power Transfer Theorem, Duals and Duality, Millman's Theorem, examples and problems of each topic.

**Unit -III**

**Two-port Network-I:** -Open Circuit Impedance(Z) Parameters, Short Circuit Admittance (Y) Parameters, Transmission(ABCD) Parameters, Inverse Transmission (A'B'C'D') Parameters, Hybrid(H) Parameters, Inverse Hybrid(g) Parameters, Inter Relationships of different parameters.

## Unit –IV

**Two-port Network-II:** -Conversion of Parameters, Dependent sources (CCCS, VCVS, VCCS, CCVS), Inter Connection of Two – Port Networks, T and  $\pi$  Representation, Terminated Two-Port Networks, Lattice Networks, Image Parameters

### Reference Books:

1. Circuits and Networks by A. Sudhakar, Shyammohan
2. Network Analysis, Publication Khanna by G.K. Mithal
3. Network Analysis, Publication Pearson India by M.E. Van Valkenburg

## Semester-I

Paper Code: DSCE-110

Core Course (Electronics Practical-I)

Programme	Course Credit	Practical Hours per week	Internal Assessment Marks	External Examination Marks	Maximum Marks	End Term Examination Time
B.Sc.	2	4	10	40	50	3 Hours

### Course Objectives

The objective of teaching this practical paper is

1. To learn the use of various electronic equipment used for analysis of basic analog circuits.
2. To learn the operation of multimeter, CRO and function generator.
3. To design various circuits on bread board using discrete components.
4. To learn the functioning of wave shaping circuits.
5. To Analyze and interpret experimental data.

### Course Outcome

After the end of this paper, the students will be able

1. To operate various equipment used in the design and analysis of basic electronic circuits.
2. To Design electronics circuits based on semiconductor devices and passive components.
3. To present the experimental results and conclusions in the form of written report in clear and concise manner.

### Mapping of Course Outcomes to Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	3	3	--	--	2	3	3	3	2
CO2	3	3	2	3	3	3	3	--	--	--	3	3	3	3
CO3	3	3	2	3	3	3	3	--	--	3	3	3	3	2

**Note:** A candidate is required to perform minimum 6 experiments out of the list provided during course of study in this semester.

1. To study the V-I characteristics of PN junction diode.
2. To study the zener diode as voltage regulator.
3. To study half wave voltage multiplier circuits using diode.
4. To study HWR and FWR and measurement of ripple factor with and without C filter.
5. To study diode as shunt clipping element.
6. To study diode as clamping element.
7. Study of CB characteristics and calculation of H parameter from graph.
8. Study of CE characteristics and calculation of H parameter from graph.
9. Measurement of voltage, Time period and phase-shift using CRO.
10. Measurement of resistance value using colour codes and multimeter. Also design and verify the potential divider arrangement using resistances.
11. To verify maximum power transfer theorem for DC network.
12. To study the application of Superposition theorem.
13. To study the application of Thevenin theorem.
14. To study the application of Norton theorem.
15. To study RC circuit as integrating and differentiating circuits.

**Semester-II**  
**Course: B.Sc.**  
**Subject: Electronics**  
**Paper No : DSCE- 208**  
**Nomenclature: - Electronic Devices and Circuits –II**

Programme	Course Credit	Theory Hours per week	Internal Assessment Marks	External Examination Marks	Maximum Marks	End Term Examination Time
B.Sc.	3	3	15	60	75	3 Hours

**Course Objective:** The objectives of teaching this paper are

1. To make the students understand the concept of operating point and its stability of a transistor.
2. To impart knowledge to students about Multistage Amplifier and its Frequency Response.
3. To make the students familiar with the working of JFET and MOSFET transistors and their characteristics.

**Course Outcome:** After the end of this paper, the students will be able

1. To bias the transistor properly using a suitable biasing circuit.
2. To understand and analyze the circuits of the Amplifiers.
3. To understand the difference between FET and BJT transistors and their working.

**Mapping of Course Outcomes to Program Outcomes:**

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO2	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO3	3	3	2	3	3	3	3	--	--	--	3	3	3	2

**Unit-I**

**Transistor Biasing Techniques-I:** -Why Bias a Transistor, Selection of Operating Point, need for Bias Stabilization, Requirement of a Biasing Circuit, Different Biasing Circuits: Fixed-Bias Circuit, Collector-to-base Bias Circuit.

**Unit-II**

**Transistor Biasing Techniques-II:** - Bias Circuit with Emitter Resistor, Voltage Divider Biasing Circuit, Emitter-Bias Circuit, and Gain of a multi-stage amplifier.

**Unit-III**

**Coupling Techniques:** - How to couple two stages, Resistance-Capacitance Coupling, Transformer Coupling, Direct Coupling, Frequency Response Curve of an RC-Coupled Amplifier of two stage: Fall of Gain in Low-frequency Range, fall in gain of high Frequencies, Bandwidth of an amplifier.

#### **Unit-IV**

**Field Effect Transistor:** - Junctions Field Effect Transistor, Qualitative Description of JFET, Drain and transfer characteristics of JFET, FET small signal low frequency model, CS & CD low frequency model, MOSFET -Depletion and enhancement and their drain & transfer characteristics, CMOS (Basic idea).

#### **Reference Books:**

1. Basic Electronics and Linear Circuits by NN Bhargava, D C Kulshreshtha
2. Integrated Electronics by Millman and Halkian
3. Electronics Devices and Circuit by Allen Mottershead



**Semester-II**  
**Course: B.Sc.**  
**Subject-Electronics**  
**Paper No : DSCE- 209**  
**Nomenclature:-Digital Electronics**

Programme	Course Credit	Theory Hours per week	Internal Assessment Marks	External Examination Marks	Maximum Marks	End Term Examination Time
B.Sc.	3	3	15	60	75	3 Hours

**Course Objective:** The objectives of teaching this paper are

1. To make the students familiar with various number systems and their inter-conversion.
2. To acquaint the students with basic logic gates, Boolean algebra and hardware minimization techniques used while designing digital circuits.
3. To impart knowledge to students about various logic families and arithmetic combinational circuits.

**Course Outcome:** After the end of this paper, the students will be able

1. To convert a number from one system to another number system.
2. To design a digital circuit with optimized hardware required.
3. To understand various logic families and combinational circuits.

**Mapping of Course Outcomes to Program Outcomes:**

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO2	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO3	3	3	2	3	3	3	3	--	--	--	3	3	3	2

**Unit-I**

**Number Systems:** - Binary, Octal, Hexadecimal number system and base conversions, Binary Arithmetic operations, 1's and 2's complement representation and their arithmetic, Binary codes-BCD, Grey, cyclic, Error detecting and correcting codes, ASCII, EBCDIC, BCD addition.

**Unit-II**

**Logic Gates and Boolean Algebra:** -Logic Level: Positive and Negative logic level, Logic Gates: AND, OR, NOT, XOR, XNOR, NOR, NAND (Definition, Symbols & Truth table).

Boolean Algebra: Postulates, Duality Principle, De Morgan's Law, Simplification of Boolean Identities, Standard SOP & POS Forms, Simplification using K-map (upto 4 variables), don't care condition, implementation of SOP & POS form using NAND and NOR Gate.

**Unit III**

**Logic families:** - Unipolar & Bipolar Logic families, characteristics of Digital IC's (fan in, fan out, propagation delay, Noise Margin, level of Gating), RTL (NOR), DTL (NAND), TTL (NAND), CMOS Logic gate (NAND, NOR).

## **Unit-IV**

**Combinational Circuit:**-Design principle of combinational circuit: Half adder, full adder, half subtractor, full subtractor, Railway track switching system, common light switching for a group of flats, Parity Generator.

### **Reference Books:**

1. Digital Electronics by R.P. Jain
2. Digital Computer Electronics by Aalbert Paul Malvino.

## Semester-II

Paper Code: DSCE-210

Core Course (Electronics Practical-II)

Programme	Course Credit	Practical Hours per week	Internal Assessment Marks	External Examination Marks	Maximum Marks	End Term Examination Time
B.Sc.	2	4	10	40	50	3 Hours

### Course Objectives

The objective of teaching this practical paper is

1. To learn the use of various electronic equipment used for analysis of basic analog & digital circuits.
2. To designing various circuits on bread board using discrete components & IC.
3. To Analyze and interpret experimental data.

### Course Outcome

After the end of this paper, the students will be able

1. To operate various equipment used in the design and analysis of basic analog & digital circuits.
2. To Design electronics circuits based on semiconductor devices and passive components.
3. To present the experimental results and conclusions in the form of written report in clear and concise manner.

### Mapping of Course Outcomes to Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02	PS03
CO1	3	3	2	3	3	3	3	--	--	2	3	3	3	2
CO2	3	3	2	3	3	3	3	--	--	2	3	3	3	2
CO3	3	3	2	3	3	3	3	--	--	3	3	3	3	3

**Note:** A candidate is required to perform minimum 6 experiments out of the list provided during course of study in this semester.

1. Study of fixed bias arrangement for transistors.
2. Study of voltage divider biasing arrangement for transistors.
3. Study of two stage R-C coupled transistor amplifier.
4. Study of JFET characteristics.
5. Design of basis logic gates using discrete components.
6. Study of DTL NAND gate.
7. Study of TTL NAND gate.
8. Digital trainer using AND, OR & NOT gates.
9. Digital trainer using NAND gates.
10. Design a half adder using IC 7400.
11. Design a full adder using two half adders.
12. Study of parity generator/checker.

**Semester-III**  
**Course: B.Sc**  
**Subject: Electronics**  
**Paper No: DSCE-308**  
**Nomenclature: - Op-amp and Linear Integrated Circuits**

Programme	Course Credit	Theory Hours per week	Internal Assessment Marks	External Examination Marks	Maximum Marks	End Term Examination Time
B.Sc.	3	3	15	60	75	3 Hours

**Course Objective:** The objectives of teaching this paper are

1. To make the students familiar with various amplifiers.
2. To acquaint the students with basic differential amplifier and their applications.
3. To impart knowledge to the students about various steps used in fabricating IC.
4. To understand the working principle of various regulated power supplies and their applications.

**Course Outcome:** After the end of this paper, the students will be able

1. To use operational amplifier in different application based circuits.
2. To know how integrated circuits are used to reduce the complex circuitry.
3. To use regulated power supply in various electronic equipments.

**Mapping of Course Outcomes to Program Outcomes:**

CO's	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
CO1	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO2	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO3	3	3	2	3	3	3	3	--	--	--	3	3	3	2

**Unit-I**

**Operational Amplifier- I:**

Double ended differential Amplifier, differential gain, Common-mode gain, CMRR, ideal operational amplifier, Basic Concept of Feedback in Op-amp, Inverting & non-inverting configuration, Summing amplifier, Difference amplifier.

**Unit-II**

**Operational Amplifier- II:**

Error sources in OP-Amp: Offset Voltages, input bias Current, input offset current, scalar multiplier, Division and Multiplication, effect of error sources on inverting, non-inverting configuration, integrating circuit, differentiating circuit, 1<sup>st</sup> order active filter using op-amp: LPF, HPF, Band Pass Filter.

### Unit-III

#### I.C. Fabrication Technology:

Basics of Integrated Circuit Technology, Monolithic fabrication technique, Different Fabrication Processes: Crystal growth, epitaxial growth, Oxidation, Masking and Etching, Diffusion of Impurities, Metallization, Transistors for Monolithic Circuits (NPN & PNP), Monolithic Diodes, Integrated Resistors, Classification of ICs (SSI, MSI, LSI and VLSI).

### Unit-IV

#### Regulated Power Supply:

Principle of voltage regulation, Zener diode shunt regulator, BJT shunt regulator and BJT series voltage regulator, power supply regulation using op-amp, load regulation, short circuit protection, current regulation using op. amp., Block Diagram of three terminal IC regulator(78xx, 79xx,), Boosted power supply

**Ref:** 1) Electronics for Scientist & Engineers by Vishwanathan, Mehta

2) Op-amp and Linear Integrated Circuit by Ramakant A Gayakward

3) Integrated Electronics by Millman&Halkias

4) Electronic Devices and Circuits Discrete and Integrated by Y N Bapat.

**Semester-III**  
**Subject: Electronics**  
**Paper No: DSCE-309**  
**Nomenclature:-Combinational and Sequential Circuits**

Programme	Course Credit	Theory Hours per week	Internal Assessment Marks	External Examination Marks	Maximum Marks	End Term Examination Time
B.Sc.	3	3	15	60	75	3 Hours

**Course Objective:** The objectives of teaching this paper are

1. To make the students familiar with various combinational and sequential circuits.
2. To acquaint the students with various types of counters and registers.

**Course Outcome:** After the end of this paper, the students will be able

1. To design various combinational circuits used for many applications in digital system.
2. To design any counter circuit for a specific use.
3. To understand various types of registers and the applications of registers to store the digital data.

**Mapping of Course Outcomes to Program Outcomes:**

CO's	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
CO1	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO2	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO3	3	3	2	3	3	3	3	--	--	--	3	3	3	2

**UNIT -I**

**Combinational Circuits:** Multiplexers, Demultiplexer, Decoder, Encoder, Parity bit generator and checker, Code Converter: BCD to Seven Segment, BCD to Cyclic Code, Binary to Decimal, Binary to Gray, Binary to Excess-3, Application of combinational circuit: adder circuit using Multiplexers, Boolean expression implementation using Multiplexer, Boolean expression implementation using Demultiplexer

**UNIT -II**

**Sequential Circuits :** Basic Sequential circuit, Asynchronous and Synchronous circuits, RS FF and JK Flip Flop, Race Around Condition, Master Slave JK flip flop, T and D Flip Flop, Excitation Table, Conversion of Flip Flop, State Diagram.

### **UNIT -III**

**Counters:** Asynchronous Binary Counters, Asynchronous Mod-N Counter, Synchronous counter: Design principle of Modulo- N Counters, UP-Down counters, Decade Counter, BCD Counter.

### **Unit IV**

**Registers:** Shift Registers, Serial-in serial out (SISO), Serial-in-parallel out (SIPO), parallel-in-serial-out (PISO) parallel-in-parallel-out (PIPO), Bi-directional shift register, Applications of shift register: Ring counter, Johnson Counter, Time delay, Sequence Generator

#### **Reference Books:**

- 1) Digital Electronics & Micro computers - R. K. Gaur (4 th edition)
- 2) Modern Digital Electronics - R.P. Jain (4th edition)
- 3) Digital Principles and Applications by Leach Donald, Malvino AP (6 th Edition)
- 4) Digital fundamentals by R.P. Jain & Floyd.

### Semester-III

Paper Code: DSCE-310

Core Course (Electronics Practical-III)

Programme	Course Credit	Practical Hours per week	Internal Assessment Marks	External Examination Marks	Maximum Marks	End Term Examination Time
B.Sc.	2	4	10	40	50	3 Hours

#### Course Objectives

The objective of teaching this practical paper is

1. To learn the use of various ICs used in digital and analog circuits.
2. To design various combinational and sequential circuits on bread board using ICs.
3. To learn the functioning of operational amplifier.
4. To Analyze and interpret experimental data.

#### Course Outcome

After the end of this paper, the students will be able

1. To implement various combinational and sequential circuits.
2. To implement application oriented circuits using Op-amp IC 741.
3. To present the experimental results and conclusions in the form of written report in clear and concise manner.

#### Mapping of Course Outcomes to Program Outcomes:

CO's	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
CO1	3	3	2	3	3	3	3	--	--	2	3	3	3	3
CO2	3	3	2	3	3	3	3	--	--	2	3	3	3	2
CO3	3	3	2	3	3	3	3	--	--	3	3	3	3	2

**Note:** A candidate is required to perform minimum 6 experiments out of the list provided during course of study in this semester.

1. Study of different type of analog and digital IC's: functions, pin diagram, block diagram of 741, 7400, 7402, 7404, 7408, 7432, 7474, 7476, 7490, 74153, 74155.
2. Operational amplifier as (1) Unity gain buffer (2) Inverting amplifier (3) Non-inverting amplifier.
3. Operational amplifier as: (1) Summing amplifier (2) Difference amplifier.
4. Measurement of offset voltage, bias currents & CMRR of an operational amplifier.
5. To design a Schmitt Trigger circuit using Operational Amplifier.
6. Study and design of an integrating circuit using op-amp IC 741.
7. To study a 4:1 Multiplexer.
8. To study a 1:4 De- Multiplexer.
9. Code Converter.
10. To verify the functionality of J-K, D and T Flip-Flops using 7400 and 7476 ICs.
11. Ripple Binary Counter
12. MOD-N Counter (Synch/Asynch)
13. Up-Down Counter (Synch/Asynch)



## Semester-IV

Course: B.Sc

Subject: Electronics

Paper No: DSCE-408

### Nomenclature: - Sinusoidal Oscillators and Multivibrators

Programme	Course Credit	Theory Hours per week	Internal Assessment Marks	External Examination Marks	Maximum Marks	End Term Examination Time
B.Sc.	3	3	15	60	75	3 Hours

**Course Objective:** The objectives of teaching this paper are

1. To make the student familiar with classification of amplifiers and feedback concept.
2. To make the students familiar with various amplifiers and their efficiency.
3. To acquaint the students with the design concepts of oscillators and multivibrators.

**Course Outcome:** After the end of this paper, the students will be able

1. To use the feedback concept as per the requirement of the circuit.
2. To understand various types of amplifiers and their applications.
3. To use oscillators and multivibrators in various applications depending on frequency and shape of waveforms.

### Mapping of Course Outcomes to Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO2	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO3	3	3	2	3	3	3	3	--	--	--	3	3	3	2

### Unit-I

**Amplifiers & Feedback:** Classification of Amplifiers (voltage, current, Transconductance, Transresistance amplifier), Feedback concept, calculation of transfer gain in degenerative and regenerative feedbacks, Feedback topologies, Effect of negative feedback on gain, Non-linear distortion, Frequency response, Effect of negative voltage shunt feedback on input and output resistance, Effect of negative voltage series feedback on input and output resistance, Effect of negative current shunt feedback on input and output resistance, Effect of negative current series feedback on input and output resistance.

### Unit-II

**Power Amplifiers:** Basic Circuit and working only of: Class A large scale amplifier, push pull amplifier, transformer coupled amplifier, Class B amplifier, Class AB amplifier, Darlington-pair, efficiency.

### Unit-III

**Oscillators:** Principle of oscillations, condition for sustained oscillation (Barkhausen criterion), stability of oscillator, Principle, working and frequency calculation of RF oscillators (Hartley oscillator,

Colpitts oscillator, crystal oscillator) and AF Oscillators (Wien Bridge oscillator, R-C Phase-shift oscillator)

#### **Unit- IV**

**Multivibrators:** Astable Multivibrator, Bistable Multivibrator, Monostable Multivibrator using BJT, Silicon controlled Rectifier (SCR), Triac, Diac, Triangular waveform generator, Schmitt Trigger, 555 Timer: Block diagram of 555 and its application as Astable & Monostable Multivibrator.

- Ref:**
- 1) Basic Electronics Solid state by B.L. Theraja.
  - 2) Opamp and linear circuits by Ramakant A Gayakward.
  - 3) Electronics for Scientist & Engineers by Vishvanathan& Mehta.

**Semester-IV**  
**Course: B.Sc**  
**Subject: Electronics**  
**Paper No.: DSCE-409**  
**Nomenclature: - Advance Digital Electronics**

Programme	Course Credit	Theory Hours per week	Internal Assessment Marks	External Examination Marks	Maximum Marks	End Term Examination Time
B.Sc.	3	3	15	60	75	3 Hours

**Course Objective:** The objectives of teaching this paper are

1. To make the student familiar with Digital to analog conversion and analog to digital conversion.
2. To make the students familiar with various memory and their parameters.
3. To acquaint the students with the design concepts of Programmable Logic devices.

**Course Outcome:** After the end of this paper, the students will be able

1. To use the DAC and ADC as per the requirement of the circuit.
2. To understand various types of memory and their applications.
3. To understand and implement different types of digital electronic circuits using programmable logic devices and FPGA.

**Mapping of Course Outcomes to Program Outcomes:**

CO's	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
CO1	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO2	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO3	3	3	2	3	3	3	3	--	--	--	3	3	3	2

**Unit -I**

**Digital to Analog conversion:** DAC conversion, Types of DAC conversion, Weighted Resistor Type DAC, R-2R Ladder Type DAC, The Switched Current source type DAC, The Switched Capacitor type DAC, DAC accuracy and resolution

**Unit II**

**Analog to Digital Conversion:** ADC conversion, Types of ADC conversion, The Counter Type ADC, The Tracking type ADC, Flash type ADC, The Successive Approximation ADC, ADC accuracy and resolution

**Unit III**

**Memories:** Parameters of memory, Volatile and non volatile memories, Memory organization & operation, ROM, PROM, EPROM, EEPROM, RAM (Static and dynamic), Expanding the size of memory, Content addressable memory/ associative memory,

#### **Unit IV**

**Programmable Logic Devices (PLDs):**Introduction, ROM as a PLD, Programmable Logic Array(PLA), Programmable Array Logic(PAL), Features of PLD, Complex Programmable Logic Devices(CPLDs), Field Programmable Gate Array(FPGA).

#### **Reference Books:**

1. Modern Digital Electronics - R.P. Jain
2. Digital Principles and Applications by Leach Donald, Malvino AP (6 th Edition)

## Semester-IV

Paper Code: DSCE-410

Core Course (Electronics Practical-IV)

Programme	Course Credit	Practical Hours per week	Internal Assessment Marks	External Examination Marks	Maximum Marks	End Term Examination Time
B.Sc.	2	4	10	40	50	3 Hours

### Course Objectives

The objective of teaching this practical paper is

1. To learn the use of various ICs used in digital and analog circuits.
2. To design various oscillators and DAC circuits on bread board using ICs.
3. To learn the functioning of oscillators and multivibrators.
4. To Analyze and interpret experimental data.

### Course Outcome

After the end of this paper, the students will be able

1. To design various low frequency and high frequency oscillator circuits.
2. To implement application oriented circuits using timer IC 555.
3. To implement DAC and analyse its characteristics.
4. To present the experimental results and conclusions in the form of written report in clear and concise manner.

### Mapping of Course Outcomes to Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02	PS03
CO1	3	3	2	3	3	3	3	--	--	2	3	3	3	2
CO2	3	3	2	3	3	3	3	--	--	2	3	3	3	2
CO3	3	3	2	3	3	3	3	--	--	2	3	3	3	2
CO4	3	3	2	3	2	3	3			3	3	3	3	3

**Note:** A candidate is required to perform minimum 6 experiments out of the list provided during course of study in this semester.

1. Study of different type of analog and digital IC's: functions, pin diagram, block diagram of 555, 7476,4001,4011,4081,4071,4077,4009.
2. To study the design of Hartley oscillator & measure its frequency.
3. To study the design of Colpitt's oscillator & measure its frequency.
4. To study the design of Phase shift oscillator & measure its frequency.
5. To study the design of Wein bridge oscillator & measure its frequency.
6. To study and design Astable multivibrator using IC 555.
7. To study and design Monostable multi vibrator using IC 555.
8. To design a transistorized astable multivibrator and measure its frequency.
9. Study of characteristic of UJT.
10. To design saw tooth wave generator using UJT.
11. To design a 4-bit weighted type DAC and measure its resolution.
12. To design a 4-bit ladder type DAC and measure its resolution.

## Semester-V

Course: B.Sc.  
Subject: Electronics  
Paper No: SEC-501

### Nomenclature: Basic Electrical Engineering & Skills

Programme	Course Credit	Theory Hours per week	Internal Assessment Marks	External Examination Marks	Maximum Marks	End Term Examination Time
B.Sc.	2	2	10	40	50	3 Hours

**Course Objective:** The objectives of teaching this paper are

1. To make the student familiar with ac fundamental, concept of magnetic & A.C. circuits.
2. To make the students familiar with balanced three phase systems and electrical machines.
3. To acquaint the students with the single phase transformer and electrical installations.

**Course Outcome:** After the end of this paper, the students will be able

1. To understand the basic fundamentals of electrical & magnetic circuits.
2. To analyze the different types of ac circuits.
3. To understand the concepts of three phase systems and electrical installations.

### Mapping of Course Outcomes to Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02	PS03
CO1	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO2	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO3	3	3	2	3	3	3	3	--	--	--	3	3	3	2

### Unit-I

**AC Fundamentals:** Sinusoidal periodic voltage/current signal, instantaneous and peak values, polar & rectangular form of representation of impedances and phasor quantities. Addition & subtraction of two or more phasors/ AC signals using component resolution method. RMS and average values of general, full wave and half wave rectified sinusoidal wave.

**Concept of magnetic circuits:** Fleming's RH & LH Rule, RH Screw rule, Relation between MMF & Reluctance. Hysteresis & Eddy current phenomenon.

### Unit-II

**A.C. Circuits:** Behavior of various components fed by A.C. source (steady state response of pure R, pure L, pure C, RL, RC, RLC series with waveforms of instantaneous power, voltage & current on simultaneous time axis scale and corresponding phasor diagrams), power factor, active, reactive & apparent/Complex power. Frequency response (Tuning) of RLC Series & standard Parallel (RL || C) ckts. including resonance, cut-off frequency & bandwidth. Generation of single phase AC (working of single coil dynamo with slip rings).

### **Unit-III**

**Balanced Three Phase Systems** (qualitative analysis only): Generation of alternating 3- phase emf. Advantages of 3 phase over single phase power system, 3-phase balanced circuits and neutral point, derivation of voltage relations and current relations in star and delta connections.

**Electrical Machines:** Principles of generating and motoring.

### **Unit-IV**

**Single Phase Transformer** (qualitative analysis only): Basic Principle, construction & Phasor diagram at ideal, no load and on resistive load practical conditions. Types of Losses in transformers.

**Electrical Installations:** Basic idea of Fuse, Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Earthing, Solid and stranded cable. Conduit. Cable trays. Basic idea regarding Electric shock and hazards, Shock protection and first aid treatment.

#### **Reference Books:**

1. Basic Electrical Engg. by S.K. Sahdev, Pearson Education (Text).
2. Electrical Engg. Fundamentals by Rajendra Prasad, PHI Pub.
3. Electrical Engg. Fundamentals: by Bobrow, Oxford Univ. Press.
4. A textbook on Power System Engg. by Chakrabarty, Soni & Gupta by Dhanpat Rai & Co. Pub.

**Semester-V**  
**Course: B.Sc.**  
**Subject: Electronics**  
**Paper No.: DSEE-508**  
**Nomenclature: -DSEE1: Microprocessor Architecture and Programming with 8085**

Programme	Course Credit	Theory Hours per week	Internal Assessment Marks	External Examination Marks	Maximum Marks	End Term Examination Time
B.Sc.	2	2	10	40	50	3 Hours

**Course Objective:** The objectives of teaching this paper are

1. To make the student familiar with concept of simple as possible computer.
2. To make the students familiar with various instructions used in SAP-1 & SAP-2 Computer.
3. To acquaint the students with the design concepts of 8 bit microprocessor and working of microprocessor 8085.
4. To familiarize the students with 8085 architecture and programming.

**Course Outcome:** After the end of this paper, the students will be able

1. To understand the concept of SAP -1 and SAP-2 computer.
2. To understand various instructions used for low level programming.
3. To analyze given problem and write programs using 8085 assembly language.

**Mapping of Course Outcomes to Program Outcomes:**

CO's	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
CO1	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO2	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO3	3	3	2	3	3	3	3	--	--	--	3	3	3	3

**UNIT-I**

Simple Idea of three state switch & three state bus ,SAP-I (Simple as Possible) Computer, Architecture, Instruction Set, Programming SAP-1, Fetch Cycle, Execution Cycle

**UNIT-II**

SAP-II Architecture, Instruction set of SAP –II Computer (Memory Reference instructions, Register Instructions, Jump and Call instructions, and Logic instructions) Machine Cycle and Instruction Cycle, Addressing Modes, Instruction Types.

**UNIT-III**

Delay Calculations, SAP-III programming Model, MOV & MVI, arithmetic instructions, increments, decrements and rotates, logic instructions, Arithmetic and logical immediates, jump instructions, extended register instructions, indirect instructions, stack instructions



## **UNIT-IV**

Architecture of 8085 Microprocessor, Pin Description of 8085, Instruction set of 8085, Fetching and Executing Instructions, Idea of fetch execute overlap.

### **Reference Books:**

1. Digital Computer Electronics- A P Malvino (2nd Edition)
2. Microprocessor Architecture, programming and application with the 8085 by R S Gaonkar
3. Fundamentals of Microprocessors and Microcontrollers by B.RAM

**Semester-V**  
**Course: B.Sc**  
**Subject: Electronics**  
**Paper No.: DSEE-508**  
**Nomenclature: -DSEE2: Digital Signal Processing**

Programme	Course Credit	Theory Hours per week	Internal Assessment Marks	External Examination Marks	Maximum Marks	End Term Examination Time
B.Sc.	2	2	10	40	50	3 Hours

**Course Objective:** The objectives of teaching this paper are

1. To make the student familiar with concept of signals.
2. To make the students familiar with DTFT and DFT .
3. To acquaint the students with the types of digital filters.

**Course Outcome:** After the end of this paper, the students will be able

1. To understand the concept of signals and Z-transforms.
2. To understand various design of IIR and FIR filters.
3. To understand and compute DFT and IDFT.

**Mapping of Course Outcomes to Program Outcomes:**

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02	PS03
CO1	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO2	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO3	3	3	2	3	3	3	3	--	--	--	3	3	3	2

**Unit- I**

Elementary Discrete –time Signals, Basic operations on Sequences, Classification of Discrete-time signals, Introduction to Discrete-time Systems

**Unit- II**

Introduction to Z-transforms, advantages of Z-transform, relation between DTFT and Z-transform, Z-transform and ROC of finite duration sequences, properties of ROC, properties of Z-transform and Inverse Z-transform

**Unit- III**

Introduction to Discrete-Time Fourier Transform and its inverse, relation between DFT and Z-transform, comparison between DTFT and DFT, computation of DFT & IDFT, circular convolution, properties of DFT, Radix-2 DIT FFT

## Unit- IV

Types of digital filters, design of IIR filters (approximation of derivatives, Impulse Invariant Transformation, Bilinear transformation method) design of FIR filters (using rectangular window, Hanning Window, frequency sampling technique), Structures for realization of IIR systems, Structures of realizations of FIR systems.

### Reference Books:

1. A. Anand Kumar, "Digital Signal Processing", Second Edition, PHI Learning Private Limited.
2. A.V. Oppenheim and R. W. Schaffer, "Discrete Time Signal Processing", Prentice Hall, 1989.
3. S. Salivahanan, "Digital Signal Processing", McGraw Hill, Fourth Edition.
4. L. R. Rabiner and B. Gold, "Theory and Application of Digital Signal Processing", Prentice Hall, 1992.
5. J. R. Johnson, "Introduction to Digital Signal Processing", Prentice Hall, 1992.

**Semester-V**  
**Course: B.Sc**  
**Subject: Electronics**  
**Paper No.: DSEE-509**  
**Nomenclature:- DSEE3: Electronic Communication**

Programme	Course Credit	Theory Hours per week	Internal Assessment Marks	External Examination Marks	Maximum Marks	End Term Examination Time
B.Sc.	2	2	10	40	50	3 Hours

**Course Objective:** The objectives of teaching this paper are

1. To make the student familiar with modulation & demodulation.
2. To make the students familiar with AM, FM and pulse modulation.
3. To acquaint the students with the Digital Modulation Techniques.

**Course Outcome:** After the end of this paper, the students will be able

1. To understand and explain amplitude modulation & demodulation.
2. To explain frequency modulation and demodulation.
3. To understand and explain various pulse and digital modulation techniques.

**Mapping of Course Outcomes to Program Outcomes:**

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02	PS03
CO1	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO2	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO3	3	3	2	3	3	3	3	--	--	--	3	3	3	2

**UNIT-I**

**Modulation & demodulation :** Principle of modulation , amplitude modulation ,percent modulation ,upper & lower side frequencies ,upper & lower side bands, mathematical analysis of a modulated carrier wave, power relations in an AM wave, simple idea about different forms of amplitude modulation. A) DSB-SC B) SSB-TC C) SSBSC, amplitude modulating amplifier circuit , AM generation plate , and grid modulated system,.

**UNIT-II**

**Frequency modulation:** Frequency modulation , FM Sidebands, modulation index and number of side bands, mathematical expression for FM wave, Demodulation, diode detector for AM signals.FM detector , Limited and phase shift detectors, comparison between AM & FM.

**UNIT-III**

**Pulse Analog Modulation:** Channel capacity, Sampling theorem, PAM, PDM, PPM modulation and detection techniques, Multiplexing, TDM and FDM.

**Pulse Code Modulation:** Need for digital transmission, Quantizing, Uniform and Non-uniform Quantization, Quantization Noise, Companding, Coding, Decoding, Regeneration.

## UNIT –IV

**Digital Modulation Techniques:** Block diagram of digital transmission and reception, Information capacity, Bit Rate, Baud Rate and M-ary coding. Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), Binary Phase Shift Keying (BPSK) and Quadrature Phase Shift Keying (QPSK)

### Reference Books:

1. Kennedy, George & Davis, Bernard / "Electronic Communication Systems" / Tata McGraw-Hill / 4thEd.
2. Modem Analog & Digital Communication Systems : B.P. Lathi; Oxford Univ. Press.
3. Communication Systems S. Haykin, John Willy & Sons.
4. Taub, Herbert & Schilling, Donald L. / "Communication Systems" / Tata McGraw-Hill
5. Electronic Communication systems: Fundamentals through Advanced (4<sup>th</sup> ed.) Wayne Tomasi, Prentice Hall

**Semester-V**  
**Course: B.Sc.**  
**Subject: Electronics**  
**Paper No.: DSEE-509**  
**Nomenclature:- DSEE4: Electronic Instrumentation**

Programme	Course Credit	Theory Hours per week	Internal Assessment Marks	External Examination Marks	Maximum Marks	End Term Examination Time
B.Sc.	2	2	10	40	50	3 Hours

**Course Objective:** The objectives of teaching this paper are

1. To make the student familiar with accuracy and precision.
2. To make the students familiar with lock-in-amplifier, virtual instrumentation and transducers.

**Course Outcome:** After the end of this paper, the students will be able

1. To understand the concept of accuracy and PLL.
2. To use the Audrino microcontroller and interfacing with lab view.
3. To use various transducers.

**Mapping of Course Outcomes to Program Outcomes:**

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO2	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO3	3	3	2	3	3	3	3	--	--	--	3	3	3	2

**UNIT-I**

Accuracy and precision, Significant figures, Error and uncertainty analysis, Shielding and grounding, Electromagnetic Interference, DC measurement-ammeter, voltmeter, ohm meter, AC measurement, Digital voltmeter systems (integrating and non-integrating). Digital Multimeter: Block diagram principle of measurement of I, V, C. Accuracy and resolution of measurement.

**UNIT-II**

**Lock-in-amplifier:** Basic Principles of phase locked loop (PLL), Phase detector (XOR & edge triggered), Voltage Controlled Oscillator (Basics, varactor), lock and capture. Basic idea of PLL IC (565 or 4046). Lock-in-amplifier, Idea of techniques for sum and averaging of signals.

**UNIT-III**

Introduction of virtual instrumentation, Interfacing techniques (RS 232, GPIB, USB), Idea about Audrino microcontroller and interfacing software like lab View

## UNIT-IV

Classification of transducers, Basic requirement/characteristics of transducers, Active and Passive transducers, Resistive (Potentiometer- Theory, temperature compensation & applications), Capacitive (variable air gap type), Inductive (LVDT) & piezoelectric transducers. Measurement of temperature (RTD, semiconductor IC sensors), Light transducers (photo resistors & photovoltaic cells).

### **Reference Books:**

1. W.D. Cooper and A. D. Helfrick, Electronic Instrumentation and Measurement Techniques, Prentice Hall (2005).
2. E.O. Doebelin, Measurement Systems: Application and Design, McGraw Hill Book fifth Edition 2003
3. David A. Bell, Electronic Devices and Circuits, Oxford University Press (2015).
4. Alan S. Morris, "Measurement and Instrumentation Principles", Elsevier (Butterworth Heinmann-2008).
5. S. Rangan, G. R. Sarma and V. S. Mani, Instrumentation Devices and Systems, Tata Mcgraw Hill (1998).
6. Introduction to measurements and instrumentation, 4th Edn., Ghosh, PHI Learning

## Semester-V

Paper Code: DSEE-510

### Discipline Specific Elective (Electronics Practical-V)

Programme	Course Credit	Practical Hours per week	Internal Assessment Marks	External Examination Marks	Maximum Marks	End Term Examination Time
B.Sc.	2	4	10	40	50	3 Hours

#### Course Objectives

The objective of teaching this practical paper is

1. To be familiar with computational tools like MATLAB etc.
2. To Analyze and interpret experimental data.
3. To understand and write program using 8085 assembly language.

#### Course Outcome

After the end of this paper, the students will be able

1. To use computational tools like MATLAB etc.
2. To analyze given problem and write programs using 8085 assembly language.
3. To present the experimental results and conclusions in the form of written report in clear and concise manner.

#### Mapping of Course Outcomes to Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	3	3	--	--	2	3	3	3	2
CO2	3	3	2	3	3	3	3	--	--	2	3	3	3	2
CO3	3	3	2	3	3	3	3	--	--	2	3	3	3	2

Note: A candidate is required to perform minimum 6 experiments out of the list provided during course of study in this semester.

1. (a) Addition of Two 16 Bit Numbers (b) Subtraction of two 16 Bit numbers on Microprocessor-Kit.
2. Multibyte Addition/Subtraction of two numbers by repetitive addition/subtraction on Microprocessor-kit.
3. Division of two 8-Bit numbers by repetitive subtraction on microprocessor-Kit.
4. Multiplication of Two 8-Bit Numbers on Microprocessor –Kit.
5. Find the smallest/largest number from a give series of numbers on Microprocessor-Kit.
6. To sort a given series of unsigned numbers in Ascending/ descending order on Microprocessor-kit.
7. Check even parity/add parity of binary number on microprocessor-Kit.
8. Generation & plot of unit sample sequence, unit step, ramp function, discrete time sinusoidal sequence over given intervals (MATLAB).
9. Given  $x[n]$ , write program to find  $X[z]$  (MATLAB).
10. Discrete Fourier Transform and its properties (MATLAB).
11. Fast Fourier Transform and its properties (MATLAB).
12. Design of a digital IIR Butterworth filter for low pass and high pass (MATLAB).
13. Design of digital FIR filters using windows (MATLAB).



## Semester-VI

Course: B.Sc

Subject: Electronics

Paper No.: DSEE-608

**Nomenclature:- DSEE5: Interfacing Peripheral Devices and Applications of 8085**

Programme	Course Credit	Theory Hours per week	Internal Assessment Marks	External Examination Marks	Maximum Marks	End Term Examination Time
B.Sc.	2	2	10	40	50	3 Hours

**Course Objective:** The objectives of teaching this paper are

1. To make the student familiar with the concept of interrupts.
2. To make the students familiar with interfacing technique using PPI 8255 and Programmable Interval Timer 8253.
3. To acquaint the students with the design concept DMA.

**Course Outcome:** After the end of this paper, the students will be able

1. To understand the use of interrupts used in microprocessor 8085.
2. To understand the interfacing of IC 8255 as well as interfacing & programming of 8253.
3. To analyze given problem and write programs using 8085 assembly language.

**Mapping of Course Outcomes to Program Outcomes:**

CO's	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
CO1	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO2	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO3	3	3	2	3	3	3	3	--	--	--	3	3	3	2

### UNIT-I

Interrupt: Methods of Input/output operations, Data transfer Schemes, software Interrupts, Hardware interrupts, Interrupt control circuits, Interrupt instructions.

### UNIT-II

Programmable Peripheral Interface 8255: operational modes of 8255, control word format for 8255, programming in Mode 0, programming in Mode 1, programming in Mode 2, BSR mode.

### UNIT-III

Programmable Interval Timer 8253: Block diagram of 8253, control word format for 8253, Interfacing & programming of 8253, Programming of 8253 in various modes.

## UNIT-IV

Direct Memory Access Controller 8257: Block diagram, Programming of 8257, Applications to illustrate the use of Microprocessor in:

1. Traffic light
2. Temperature control
3. Stepper Motor control
4. Washing machine control.

### **Reference Books:**

1. Digital Computer Electronics- A P Malvino (2nd Edition)
2. Microprocessor Architecture, programming and application with the 8085 by R S Gaonkar
3. Fundamentals of Microprocessors and Microcontrollers by B.RAM

**Semester-VI**  
**Course: B.Sc**  
**Subject: Electronics**  
**Paper No.: DSEE-608**  
**Nomenclature:- DSEE6: Verilog and FPGA based System Design**

Programme	Course Credit	Theory Hours per week	Internal Assessment Marks	External Examination Marks	Maximum Marks	End Term Examination Time
B.Sc.	2	2	10	40	50	3 Hours

**Course Objective:** The objectives of teaching this paper are

1. To make the student familiar with designing of combinational & Sequential circuit using HDL.
2. To make the students familiar with designing of programmable logic devices using FPGA based system.
3. To acquaint the students with the concepts of Verilog.

**Course Outcome:** After the end of this paper, the students will be able

1. To understand the design of various circuits using HDL.
2. To understand the concept of digital circuit design and basics of Verilog HDL.
3. To understand programmable logic devices using FPGA.

**Mapping of Course Outcomes to Program Outcomes:**

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02	PS03
CO1	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO2	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO3	3	3	2	3	3	3	3	--	--	--	3	3	3	2

### UNIT-I

**Digital logic design flow , Review of combinational circuits , Combinational building**

**blocks:** multiplexors, demultiplexers, decoders, encoders and adder circuits. Review of sequential circuit elements: flip-flop, latch and register.

### UNIT-II

**Finite state machines:** Mealy and Moore. Other sequential circuits: shift registers and counters.

FSMD (Finite State Machine with Datapath) : design and analysis. Microprogrammed control.

Memory basics and timing. Programmable Logic devices

### UNIT-III

**Evolution of Programmable logic devices :** PAL, PLA and GAL. CPLD and FPGA

Architectures, Placement and routing, Logic cell structure, Programmable interconnects,

Logic blocks and I/O Ports, Clock distribution in FPGA. Timing issues in FPGA design.

Boundary scan.

## UNIT-IV

**Verilog HDL:** Introduction to HDL , Verilog primitive operators and structural Verilog Behavioral Verilog, Design verification. Modeling of combinational and sequential circuits (including FSM and FSMD) with Verilog Design examples in Verilog.

### **Reference Books:**

1. LizyKurien and Charles Roth. *Principles of Digital Systems Design and VHDL*. Cengage Publishing. ISBN-13: 978-8131505748
2. Palnitkar, Samir, *Verilog HDL*. Pearson Education; Second edition (2003).
3. Ming-Bo Lin. *Digital System Designs and Practices: Using Verilog HDL and FPGAs*. Wiley India Pvt Ltd. ISBN-13: 978-8126536948
4. Zainalabedin Navabi. *Verilog Digital System Design*. TMH; 2nd edition. ISBN-13: 978-0070252219
5. Wayne Wolf. *FPGA Based System Design*. Pearson Education.
6. S. K. Mitra, *Digital Signal processing*, McGraw Hill, 1998
7. VLSI design, Debaprasad Das, 2nd Edition, 2015, Oxford University Press.

**Semester-VI**  
**Course: B.Sc**  
**Subject: Electronics**  
**Paper No.: DSEE-609**

**Nomenclature:- DSEE7: Introduction to C and its programming**

Programme	Course Credit	Theory Hours per week	Internal Assessment Marks	External Examination Marks	Maximum Marks	End Term Examination Time
B.Sc.	2	2	10	40	50	3 Hours

**Course Objective:** The objectives of teaching this paper are

1. To make the student familiar with high level programming language C.
2. To make the students familiar with entering input data , writing output data, functions, concept of arrays and pointers in C language.

**Course Outcome:** After the end of this paper, the students will be able

1. To understand the C fundamentals.
2. To understand various data types used for programming and will be able to write programs.
3. To analyze given problem and write programs using high level programming language C.

**Mapping of Course Outcomes to Program Outcomes:**

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02	PS03
CO1	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO2	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO3	3	3	2	3	3	3	3	--	--	--	3	3	3	2

**UNIT-I**

**C. Fundamentals:** The character set, identifiers & keywords, data types, constants, variables& arrays declaration, expressions statements, symbolic constants. Operators and expressions: Arithmetic operators, unary operators, relational and logical operators, assignment operators, conditional operators.

**UNIT-II**

**Data input and output:** Entering input data- The scanned function, Writing output data- The print function. Control statements: While statement, Do-while statement, for statement, If-else statement, switch statement, break statement, continue statement.

**UNIT-III**

**Function:** Defining a Function, Accessing a Function, passing arguments to a Function, specify arguments, data types.

## UNIT-IV

**Arrays:** Defining an Array, processing an Array, Passing arrays to a function, Multidimensional arrays, arrays and strings. **Pointers:** Fundamentals, pointer declaration, passing pointers to a function, pointers and one dimensional array, operations on pointers.

### Reference Books:

1. Schaum's Outline series: Theory and problems of programming with C by Byron
2. Let Us C by Yashavant Kanetkar

**Semester-VI**  
**Course: B.Sc**  
**Subject: Electronics**  
**Paper No.: DSEE-609**

**Nomenclature:- DSEE8: MODERN COMMUNICATION SYSTEMS**

Programme	Course Credit	Theory Hours per week	Internal Assessment Marks	External Examination Marks	Maximum Marks	End Term Examination Time
B.Sc.	2	2	10	40	50	3 Hours

**Course Objective:** The objectives of teaching this paper are

1. To make the student familiar with the concept of antenna.
2. To make the students familiar with wireless communication and Cellular System Fundamentals.
3. To acquaint the students with 2G, 3G, 4G and 5G networks.

**Course Outcome:** After the end of this paper, the students will be able

1. To understand the use of antenna and its parameters.
2. To understand the wireless communication systems, wireless networks and cellular system.
3. To understand the different internet generations.

**Mapping of Course Outcomes to Program Outcomes:**

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02	PS03
CO1	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO2	3	3	2	3	3	3	3	--	--	--	3	3	3	2
CO3	3	3	2	3	3	3	3	--	--	--	3	3	3	2

**UNIT-I**

**Antenna & its Parameters:** Antenna as an element of wireless communication system, Types of Antennas, Antenna parameters: Radiation pattern (polarization patterns, Field and Phase patterns), Field regions around antenna, Radiation intensity, Beam width, Gain, Directivity, Polarization, Bandwidth, Efficiency and Antenna temperature.

**UNIT-II**

**Wireless communication Systems:** History of wireless communication, Wireless Generation and Standards, Cellular and Wireless Systems, Current Wireless Systems, Cellular Telephone Systems, Wide Area Wireless Data Services, Broadband Wireless Access, Satellite Networks, Examples of Wireless Communication Systems.

### UNIT-III

**Wireless Networks:** Second Generation (2G) Cellular Networks, Third Generation (3G) Wireless Networks, Wireless Local Loop (WLL), Wireless Local Area Networks (WLANs), Bluetooth and Personal Area Networks (PANs). Idea about Wi-Fi, 4G and LTE, 5G

### UNIT-IV

**Cellular System:** Cellular Concept and Cellular System Fundamentals, Frequency Reuse, Channel Assignment Strategies, Handoff strategies, Interference and System Capacity, Trunking and Grade of Service. Improving Coverage & Capacity in Cellular Systems, Cell Splitting and Sectoring, Cellular Systems design Considerations (Qualitative idea only).

#### **Reference Books:**

1. Ballanis, Antenna Theory, John Wiley & Sons, (2003) 2nd Ed.
2. Jordan and Balmain, E. C., Electro Magnetic Waves and Radiating Systems, PHI, 1968 Reprint (2003) 3rd Ed.
3. Andrea Goldsmith, Wireless communications, (2015) Cambridge University Press
4. D. Tse and P. Viswanathan, Fundamentals of Wireless Communication, (2014) Cambridge University Press.
5. Wireless communication and Networks, Upena Dala, 2015, Oxford University Press.
6. Antenna and Wave Propagation, Yadava, PHI Learning.
7. Haykin S. & Moher M., Modern Wireless Communication, Pearson, (2005) 3rd Ed.



## Semester-VI

Paper Code: DSEE-610

Discipline Specific Elective (Electronics Practical-VI)

Programme	Course Credit	Practical Hours per week	Internal Assessment Marks	External Examination Marks	Maximum Marks	End Term Examination Time
B.Sc.	2	4	10	40	50	3 Hours

**Course Objective:** The objectives of teaching this paper are

1. To make the student familiar with high level programming language C.
2. To understand the implementation of basic circuits in VHDL.
3. To understand the applications of microprocessor 8085.

**Course Outcome:** After the end of this paper, the students will be able

1. To analyze given problem and write programs using high level programming language C.
2. To perform experiments related to FPGA
3. To use how to analyze, interpret and present the results of experiments.

### Mapping of Course Outcomes to Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02	PS03
CO1	3	3	2	3	3	3	3	--	--	2	3	3	3	2
CO2	3	3	2	3	3	3	3	--	--	2	3	3	3	2
CO3	3	3	2	3	3	3	3	--	--	2	3	3	3	2

Note: A candidate is required to perform minimum 6 experiments out of the list provided during course of study in this semester.

1. Computer Programming in C using if, else, for, while statements.
2. Computer Programming in C using arrays and pointers.
3. Write a C program to reverse the array (the array must be taken as input).
4. Generate a time delay through software on Microprocessor-Kit.
5. Write a C program to swap two numbers using pointers.
6. Program to generate Square and triangular waves using Microprocessor-Kit.
7. Program to generate Sine wave using Microprocessor-Kit.
8. Programming of arithmetic combinational circuits using verilog and realization of their truth table.
9. Programming of multiplexer and demultiplexer circuits using verilog and realization of their truth table.
10. Programming of various flip-flops using verilog and realization of their truth table.
11. Programming of counters using verilog and realization of their truth table.

**Kurukshetra University, Kurukshetra**  
**(Established by the State Legislature Act XII of 1956)**  
**('A+' Grade, NAAC Accredited)**

॥ योगस्थः कुरु कर्माणि ॥  
समबुद्धि व योगयुक्त होकर कर्म करो  
(Perform Actions while Stead fasting in the State of Yoga)



**Scheme of Examination and Syllabus of Bachelor of Science (B.Sc.)  
Programme (Course: Electronic Equipment Maintenance) (CBCS)  
in Phased Manner**

**DEPARTMENT OF ELECTRONIC SCIENCE**

CBCS CURRICULUM (2020-21)

Program Name: Bachelor of Science (B.Sc.) Programme  
**(Course: Electronic Equipment Maintenance)**  
(CBCS)

(For the Batches Admitted From 2020-2021)

**Programme Outcomes (POs) for Three Year B.Sc. Programme  
(Course: Electronic Equipment Maintenance)**

PO1	Knowledge	Capable of demonstrating comprehensive disciplinary knowledge gained during course of study.
PO2	Communication	Ability to communicate effectively on general and scientific topics with the scientific community and with society at large.
PO3	Problem Solving	Capability of applying knowledge to solve scientific and other problems.
PO4	Individual and Team Work	Capable to learn and work effectively as an individual, and as a member or leader in diverse teams, in multidisciplinary settings.
PO5	Investigation of Problems	Ability of critical thinking, analytical reasoning and research based knowledge including design of experiments, analysis and interpretation of data to provide conclusions.
PO6	Modern Tool usage	Ability to use and learn techniques, skills and modern tools for scientific practices.
PO7	Science and Society	Ability to apply reasoning to assess the different issues related to society and the consequent responsibilities relevant to the professional scientific practices.
PO8	Life-Long Learning	Aptitude to apply knowledge and skills that are necessary for participating in learning activities throughout the life.
PO9	Environment and Sustainability	Ability to design and develop modern systems which are environmentally sensitive and to understand the importance of sustainable development.
PO10	Ethics	Apply ethical principles and professional responsibilities in scientific practices.
PO11	Project Management	Ability to demonstrate knowledge and understanding of the scientific principles and apply these to manage projects.

**Programme Specific Outcomes (PSOs) for Three Year B.Sc. Programme  
(Course: Electronic Equipment Maintenance)**

PSO1	Students will be able to acquire the techniques & skills for the basic understanding of the principles and working of various Electronic Equipment and their repair & maintenance.
PSO2	Ability to explore technical knowledge in diverse areas of Electronics and experience an environment in cultivating the skills for a successful career in repair & maintenance of any Equipment, entrepreneurship as also the higher studies.
PSO3	Ability to design & perform electronic experiments as well as to analyze & suggest effective solutions.

**SCHEME OF EXAMINATION AND SYLLABI**  
**for**  
**B.Sc. Programme (Course: ELECTRONIC EQUIPMENT & MAINTENANCE)**  
**under**  
**Choice Based Credit System (CBCS) w.e.f. 2020-21 in Phased Manner**

Sem- ester	Course	Paper Code	Nomenclature	Credits	Workload /Hrs/week	Exam. Duration (Hrs)	Intern al Marks	Externa l Marks	Total Marks
							Max.	Max.	
1	CC-EEM -1	EEM-101	Principles of Electronics-I	3	3	3	15	60	75
		EEM-102	Electronic Devices, Components and Assemblies-I	3	3	3	15	60	75
		EEM -103	Practical-I	2	4	3	-	50	50
<b>TOTAL</b>				<b>08</b>	<b>10</b>	<b>-</b>	<b>30</b>	<b>170</b>	<b>200</b>
2	CC-EEM -2	EEM -201	Principles of Electronics-II	3	3	3	15	60	75
		EEM -202	Electronic Devices, Components and Assemblies- II	3	3	3	15	60	75
		EEM -203	Practical-II	2	4	3	-	50	50
<b>TOTAL</b>				<b>08</b>	<b>10</b>	<b>-</b>	<b>30</b>	<b>170</b>	<b>200</b>
3	CC-EEM -3	EEM -301	Operational Principles of Audio and Video Systems	3	3	3	15	60	75
		EEM -302	Microprocessor 8085 & Interfacing	3	3	3	15	60	75
		EEM - 303	Practical-I	2	4	3	-	50	50
<b>TOTAL</b>				<b>08</b>	<b>10</b>	<b>-</b>	<b>30</b>	<b>170</b>	<b>200</b>
4	CC-EEM -4	EEM -401	Advanced Digital Electronics	3	3	3	15	60	75
		EEM -402	8051 : Programming & Applications	3	3	3	15	60	75
		EEM -403	Practical-II	2	4	3	-	50	50
<b>TOTAL</b>				<b>08</b>	<b>10</b>	<b>-</b>	<b>30</b>	<b>170</b>	<b>200</b>
5	**DSE-EEM-5	DSE-EEM-501 (ELECTIVE-I)	Electronic Instrumentation	2	2	3	10	40	50
			Computer Hardware & Maintenance-I						
		DSE-EEM-502	Consumer Electronics	2	2	3	10	40	50
			Transducers and Sensors						
		EEM-503	Skill Development MOOC/SWAYAM Course	2	2	3	-	50	50
	EEM-504	Major Project	2	4	3	-	50	50	
<b>TOTAL</b>				<b>08</b>	<b>10</b>	<b>-</b>	<b>20</b>	<b>180</b>	<b>200</b>
6	**DSE-EEM -6	DSE-EEM-601 (ELECTIVE- II)	Electronic Equip. Maintenance	2	2	3	10	40	50
			Computer Hardware & Maintenance-II						
		DSE-EEM - 602	Biomedical Equip. Maintenance	2	2	3	10	40	50
			Embedded Systems & Robotics						

	EEM -604	Practical	2	4	3	-	50	50
<b>TOTAL</b>			<b>06</b>	<b>08</b>	<b>-</b>	<b>20</b>	<b>130</b>	<b>150</b>
<b>TOTAL CREDITS/MARKS</b>			<b>46</b>	<b>58</b>	<b>-</b>	<b>160</b>	<b>990</b>	<b>1150</b>

**\*\* DSE (Discipline Specific Elective).**

**Important Instructions:-**

1. A student can opt for one paper out of the list of elective papers provided against each paper code for respective semester.
2. One credit equivalent to 1 hour of teaching/2 hours of Practical work.
3. One credit equivalent to 25 marks.
4. Teaching workload will be calculated on the basis of teaching contact hours of the course.
5. The Practical examination will be held at the end of odd and even semester in one session of three hours duration.
6. For Practical/Project work, a maximum of 15 students are allowed in one group during course of study and also in Examination.
7. During Practical Examination, a candidate is required to perform one experiment from the prescribed list of experiments.
8. Distribution of Marks in Practical Examination B.Sc. I, II, III, IV & VI Semester):
  - I. Internal Marks: 10
  - II. Experiment Performed: 15
  - II. Lab Record: 10
  - IV. Viva/Voce : 15
9. Distribution of Marks in Major Project (Paper EEM-504) of B.Sc. V Semester:
  - I. Internal Marks: 10
  - II. Project Developed: 15
  - II. Project Report: 10
  - III. Viva Voce: 15

<b>Course Code: CC-EEM -1</b>	<b>Course Name: PRINCIPLES OF ELECTRONICS – I</b>
<b>Paper Code: EEM-101</b>	
<b>Type:</b> Core Course (CC) <b>Course Credits:</b> 03 <b>Contact Hours:</b> 03 hours/week. <b>Examination Duration:</b> 3 Hours <b>Mode:</b> Lecture <b>External Maximum Marks:</b> 60 <b>Internal Maximum Marks:</b> 15	<b>Instructions For Paper Setter:</b> Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

**Course Objectives:** The aim of this course is to familiarize with fundamental concepts of digital electronics and designing of logic circuits.

**Course Outcomes (CO):** At the end of this course, the students will be able to:

<b>CO1</b>	Familiarize with the different number systems, basic concepts and laws of Boolean algebra.
<b>CO2</b>	Understand the fundamental concepts of logic gates, logic families and the abilities of reducing the Boolean expressions.
<b>CO3</b>	Learn minimization techniques in simplifying the hardware requirements of digital circuits.
<b>CO4</b>	Understand the concepts of combinational and sequential circuits utilized in the different digital circuits and systems.

**CO-PO Mapping Matrix for Course Code: CC-EEM -1**

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

**CO-PSO Mapping Matrix for Course Code: CC-EEM -1**

COs	PSO1	PSO2	PSO3
<b>CO1</b>	3	3	2
<b>CO2</b>	2	3	3
<b>CO3</b>	3	3	2
<b>CO4</b>	2	3	3

### Unit-I

**Number Systems:** Introduction to Decimal, Binary, Octal, Hexadecimal Number Systems and their inter-conversions; BCD codes, Excess-3 codes, Gray codes, Cyclic codes, code conversions; BCD Arithmetic, parity, binary arithmetic (addition, Subtraction, multiplication, division), 1's and 2's compliments and 9's and 10's compliments.

### Unit-II

**Boolean Algebra:** Postulates & theorems of Boolean algebra, Duality Principal, De-Morgan's Theorem.  
**Logic Gates:** Positive and Negative Logic, Basic Logic Gates: AND, OR, NOT (symbol, truth-table, circuit diagram, working); NAND, NOR, EX-OR, EX-NOR (symbol, truth table).

**Minimization Techniques:** Reduction of Boolean expressions using Boolean Identities, SOP and POS form of Boolean functions, Karnaugh Map simplifications, implementations of SOP and POS form using NAND and NOR gates.

### Unit-III

**Digital Logic Families:** Characteristics (fan in, fan out, noise margin, propagation delay, power dissipation), Bipolar and unipolar logic families and their comparison, Characteristics of digital ICs, Resistor Transistor logic (RTL), Diode Transistor logic (DTL), High Threshold Logic (HTL), Transistor Transistor logic (TTL), Schottky TTL, MOS & CMOS, Emitter Coupled Logic (ECL).

### Unit-IV

**Combinational circuits:** Half adder, Full adder, Half Subtractor, Full Subtractor, 8421 adders, Parallel Binary Adder, 1's & 2's complement Adder/Subtractor, Excess-3 adder, Digital Comparator, Multiplexer, Demultiplexer.

**Basic Sequential circuit:** Asynchronous and Synchronous circuits, Flip-Flops (RS, JK, MS-JK, D and T-type), Shift Register, Applications of shift register: Ring counter, Time delay, Sequence Generator.

### References:

1. Digital Electronics by R.P. Jain
2. Digital Computer Electronics by A. P. Malvino

<b>Course Code: CC-EEM-1</b>	<b>Course Name: ELECTRONIC DEVICES, COMPONENTS AND ASSEMBLIES - I</b>
<b>Paper Code: EEM-102</b>	
<b>Type:</b> Core Course (CC) <b>Course Credits:</b> 03 <b>Contact Hours:</b> 03 hours/week. <b>Examination Duration:</b> 3 Hours <b>Mode:</b> Lecture <b>External Maximum Marks:</b> 60 <b>Internal Maximum Marks:</b> 15	<b>Instructions For Paper Setter:</b> Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

**Course Objectives:** The aim of this course is to familiarize with fundamental concepts of basic electronic devices and circuits.

**Course Outcomes (CO):** At the end of this course, the students will be able to:

<b>CO1</b>	Familiarize with the concepts of various passive & active components and their characteristics.
<b>CO2</b>	Understand the working principles of various electronics circuits.
<b>CO3</b>	Understand the mechanism and basic principle of working of popular measuring instruments.
<b>CO4</b>	Understand the mechanism of various electronic devices and measuring instruments and equip the design of analog circuits based on these electronic devices.

<b>CO-PO Mapping Matrix for Course Code: CC-EEM -1</b>											
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>
<b>CO1</b>	3	3	2	3	3	2	2	2	2	3	2
<b>CO2</b>	3	2	3	3	3	2	2	2	2	2	2
<b>CO3</b>	2	3	3	3	2	2	2	2	1	1	1
<b>CO4</b>	3	2	2	2	3	3	3	3	3	2	2

<b>CO-PSO Mapping Matrix for Course Code: CC-EEM -1</b>			
<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	3	3	2
<b>CO2</b>	2	3	3
<b>CO3</b>	3	3	3
<b>CO4</b>	2	2	2

### **Unit-I**

**Passive Components:** Resistors, Capacitors, Inductors, Transformers, Relays, Fuses(their types & applications).

**Introduction to Semiconductors:** Energy Band Diagram, Conductors, Semiconductors, Insulators, Intrinsic and Extrinsic Semiconductors (P&N), currents in semiconductors, Diffusion Junction, Depletion Layer, Barrier Potential.

**Junction Diodes:** Rectifying diode, Forward and reverse bias characteristics, Zener Diodes, Varactor Diode, Light Emitting Diode, Photodiode and Phototransistors (qualitative only).

### **Unit-II**

**Rectifiers:** Half wave, Full wave, Bridge (calculation of ripple factor and rectification efficiency), Filters (L, C, LC,  $\pi$ ), Clipping and Clamping circuits.

**Zener diode regulator:** circuit diagram and explanation for load and line regulation, disadvantages of Zener diode regulator.

**Bipolar Junction Transistor:** Basic working principle, Input and Output Characteristics of CB & CE configurations, Biasing, Operating point, Load line, thermal runaway, stability and stability factor, Stabilization of Operating Point, Collector to Base bias, Voltage Divider bias and Emitter bias (+VCC & -VEE bias), circuit diagrams and their working.

### **Unit-III**

**Amplifiers:** Classification of amplifiers, Class-A, B, AB and C Amplifiers, Cascading of Amplifiers, RC Coupled amplifiers. Properties of amplifiers (distortion, noise, thermal noise, shot noise, noise figure). Feedback in Amplifiers: Feedback concept, transfer gain with feedback, Effect of Negative Feedback on amplifiers performance. Transistor as a switch (circuit and working), Darlington pair and its applications.

### **Unit-IV**

**Field Effect Transistors:** JFET, basic working principle, I/O Characteristics, pinch off Voltage, parameters, MOSFET, basic working principle, Characteristics.

**Measuring Instruments:** Regulated power supply, Analogue Multimeter, Digital Multimeter, Cathode Ray Oscilloscope, Function Generator (functional block diagram, basic working principle, measuring quantities).

### **References:**

1. Basic Electronics and Linear Circuits by Bhargava & Kulshreshtha (TTTI)
2. Integrated Electronics by Millman and Halkias

<b>Course Code: CC-EEM -1</b>	<b>Course Name: PRACTICAL - I</b>	
<b>Paper Code: EEM-103</b>		
<b>Type: Core Course (CC);</b>	<b>Course Credits: 02;</b>	<b>Contact Hours: 04 hours/week;</b>
<b>Examination Duration: 3 Hours;</b>	<b>Mode: Lab. Work</b>	
<b>External Maximum Marks: 40;</b>	<b>Internal Maximum Marks: 10</b>	

**Course Objectives:** The aim of this course is to learn the practical aspects of Theory Papers.

**List of Experiments:** (Minimum 6 experiments are to be performed in a semester)

**Basic Analog & Digital Electronics - I**

1. Practical use of:
  - (a) Multimeter (measurement of voltage, current, resistance).
  - (b) Oscilloscope (voltage and frequency measurement).
2. Study of Electronic Components:
  - (a) Resistor (study the types, colour coding, potential divider arrangement).
  - (b) Capacitors (study the types).
3. P-N Junction Diode (study V-I Characteristics).
4. Study of PN diode as wave clipping element.
5. Study of Zener Diode as a voltage regulator.
6. Study of Transistors (manual study, CB/CE/CC Characteristics, parameters).
7. Familiarization with Breadboard, IC types, pin number, testing, IC Manual.
8. Verification of truth tables for two input AND, OR, NOT gates.
9. Design DTL & TTL NAND Gate using discrete components & verify its truth table.
10. Study of Half Adder and Full Adder.
11. Study of 4:1 multiplexer.
12. Study of JK, D, T type flip-flops.



<b>Course Code: CC-EEM -2</b>	<b>Course Name: PRINCIPLES OF ELECTRONICS – II</b>
<b>Paper Code: EEM-201</b>	
<b>Type:</b> Core Course (CC) <b>Course Credits:</b> 03 <b>Contact Hours:</b> 03 hours/week. <b>Examination Duration:</b> 3 Hours <b>Mode:</b> Lecture <b>External Maximum Marks:</b> 60 <b>Internal Maximum Marks:</b> 15	<b>Instructions For Paper Setter:</b> Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

**Course Objectives:** The aim of this course is to familiarize with networks and their analysis.

**Course Outcomes (CO):** At the end of this course, the students will be able to:

<b>CO1</b>	Understand the basic concepts on RLC circuits and their steady states and transients behaviour.
<b>CO2</b>	Learn the concepts of circuit analysis on the basis of KCL and KVL.
<b>CO3</b>	Gain the knowledge in analyzing networks on the basis of various network theorems in real world applications.
<b>CO4</b>	Understand the concepts of various parameters of a two-port network and their interconversions.

<b>CO-PO Mapping Matrix for Course Code: CC-EEM -1</b>											
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>
<b>CO1</b>	3	3	2	3	3	2	2	2	2	1	2
<b>CO2</b>	3	2	3	3	1	2	2	3	2	2	2
<b>CO3</b>	2	3	3	3	2	2	3	2	1	1	2
<b>CO4</b>	3	2	2	2	3	3	2	3	3	2	3

<b>CO-PSO Mapping Matrix for Course Code: CC-EEM -1</b>			
<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	2	2	2
<b>CO2</b>	2	2	2
<b>CO3</b>	2	3	3
<b>CO4</b>	2	3	3

### Unit-I

**DC Transient Analysis:** RC Circuit- Charging and discharging with initial charge, RL Circuit with Initial Current, Time Constant, RL and RC Circuits with sources, DC Response of Series RLC Circuits.

**Power in AC Circuits:** Instantaneous Power, Average Power, Reactive Power, Power Factor.

**Sinusoidal Circuit Analysis:** for RL, RC and RLC Circuits, Resonance in Series and Parallel RLC Circuits, Frequency Response of Series and Parallel RLC Circuits, Quality (Q) Factor and Bandwidth.

**Passive Filters:** Low Pass, High Pass, Band Pass and Band Stop.

### Unit-II

**Circuit Analysis:** Source Transformation, Kirchhoff's Current Law (KCL), Kirchhoff's Voltage Law (KVL), Node Analysis, Mesh Analysis, Star-Delta Conversion.

### Unit-III

**Network Theorems:** Principle of Duality, Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Reciprocity Theorem, Millman's Theorem, Maximum Power Transfer Theorem.

### Unit-IV

**Two Port Networks:** Impedance Parameters, Admittance Parameters, Hybrid Parameters, Inverse Hybrid Parameters, Transmission Parameters, Inverse Transmission Parameters, Transformation of parameters.

### References:

1. Networks and Systems by D. Roy Choudhary
2. Network Analysis, Publication Pearson India By M.E. Van Valkenburg
3. Circuits and Networks by A. Sudhakar and Shyam Mohan

<b>Course Code: CC-EEM -2</b>	<b>Course Name: ELECTRONIC DEVICES, COMPONENTS AND ASSEMBLIES - II</b>
<b>Paper Code: EEM- 202</b>	
<b>Type:</b> Core Course (CC) <b>Course Credits:</b> 03 <b>Contact Hours:</b> 03 hours/week. <b>Examination Duration:</b> 3 Hours <b>Mode:</b> Lecture <b>External Maximum Marks:</b> 60 <b>Internal Maximum Marks:</b> 15	<b>Instructions For Paper Setter:</b> Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

**Course Objectives:** The aim of this course is to learn the operation of power devices & linear integrated circuits and their applications.

**Course Outcomes (CO):** At the end of this course, the students will be able to:

<b>CO1</b>	Understand the working principle of various power devices and their applications.
<b>CO2</b>	Know the technicalities of operational amplifiers and their applications in designing various circuits.
<b>CO3</b>	Know the technicalities of IC Regulators and their applications as voltage regulators.
<b>CO4</b>	Understand the design concepts of oscillators, multivibrators and active filters.

<b>CO-PO Mapping Matrix for Course Code: CC-EEM -1</b>											
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>
<b>CO1</b>	3	3	2	3	3	2	2	2	2	1	2
<b>CO2</b>	3	2	3	3	1	2	2	3	2	2	2
<b>CO3</b>	2	3	3	3	2	2	3	2	1	1	2
<b>CO4</b>	3	2	2	2	3	3	2	3	3	2	3

<b>CO-PSO Mapping Matrix for Course Code: CC-EEM -1</b>			
<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	3	3	2
<b>CO2</b>	2	3	3
<b>CO3</b>	3	3	3
<b>CO4</b>	2	2	2

### Unit-I

**Power Control Devices:** Four Layer Diode (PNPN), Silicon Controlled Rectifier (SCR), Triac, Diac (Principle, Characteristics and Applications).

**Unijunction Transistor:** Basic Working Principle, Characteristics, intrinsic standoff ratio, Applications as aswitch and as time base generator.

### Unit-II

**Operational Amplifiers:** Basic idea of an OPAMP with black box concept, emittercoupled differential amplifier, transfer characteristics of a differential amplifier, IC 741 various parameters, offset error voltages and currents, temperature drift of input offset voltage and current, inverting and non-inverting amplifiers, virtual ground, summing, difference, integrator, differentiator.

### Unit-III

**Power Supplies:** Regulated power supply, transistorizedseries and shunt regulated power supply, block diagram of IC 723, regulated supply using IC 723, three terminal regulator ICs, IC based power supply study.

### Unit-IV

**Oscillators:** Positive Feedback, Barkhausen criteria, Phase-Shift Oscillators, WeinBridge Oscillators, Hartley's and Colpitt's Oscillators, Crystal Oscillators.

**Timer IC 555:** Block diagram and operation, applications as Monostable & Astable Multivibrators.

**Active Filters:** Ist order low pass, high pass and Band pass Butterworth filters

### References:

1. Integrated Electronics by Millman and Halkias
2. Op-Amp and Linear Integrated Circuits by R. A. Gyakward

<b>Course Code: CC-EEM -2</b>	<b>Course Name: PRACTICAL - II</b>	
<b>Paper Code: EEM-203</b>		
<b>Type:</b> Core Course (CC);	<b>Course Credits:</b> 02;	<b>Contact Hours:</b> 04 hours/week;
<b>Examination Duration:</b> 3 Hours;	<b>Mode:</b> Lab. Work	
<b>External Maximum Marks:</b> 40;	<b>Internal Maximum Marks:</b> 10	

**Course Objectives:** The aim of this course is to learn the practical aspects of Theory Papers.

**List of Experiments: (Minimum 6 experiments are to be performed in a semester)**

**Basic Analog & Digital Electronics - II**

1. To study RC low pass and high pass filter and measurement of cut-off frequency from graph.
2. To study RC components as integrating and differentiating circuits.
3. Study of Superposition Theorem (Verification and Application).
4. Study of Maximum Power Transfer Theorem for DC network (Verification).
5. Design power controller using SCR/Diac/Triac.
6. Study UJT characteristic and design UJT as relaxation Oscillator and calculate its frequency of oscillation.
7. Measurement of offset voltage, bias currents & CMRR of an operational amplifier.
8. Operational amplifier as (1) unity gain buffer (2) inverting amplifier (3) Non-inverting amplifier.
9. Operational amplifier as (1) summing amplifier (2) difference amplifier.
10. Investigate the use of an op-amp as an Integrator and Differentiator.
11. Design and testing of oscillators (any two):  
(a) RC-phase shift (b) Wein Bridge (c) Hartley (d) Colpitt
11. Study of Monostable and Astable multivibrator using IC 555.
12. Study the frequency response of 1st and 2nd order active High pass/Low pass filter.

<b>Course Code: CC-EEM -3</b>	<b>Course Name: OPERATIONAL PRINCIPLES &amp; AUDIO AND VIDEO SYSTEMS</b>
<b>Paper Code: EEM- 301</b>	
<b>Type:</b> Core Course (CC) <b>Course Credits:</b> 03 <b>Contact Hours:</b> 03 hours/week. <b>Examination Duration:</b> 3 Hours <b>Mode:</b> Lecture <b>External Maximum Marks:</b> 60 <b>Internal Maximum Marks:</b> 15	<b>Instructions For Paper Setter:</b> Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

**Course Objectives:**To understand working mechanism of various types of Audio-Video Equipment.

**Course Outcomes (CO):** At the end of this course, the students will be able to:

<b>CO1</b>	Familiarize with the superheterodyne receiver and its different sections.
<b>CO2</b>	Understand the fundamental concepts of audio systems and their recording mechanisms.
<b>CO3</b>	Learn working mechanism of a TV Receiver and its various sections.
<b>CO4</b>	Learn the technicalities of common audio & video equipment.

**CO-PO Mapping Matrix for Course Code: CC-EEM -1**

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

**CO-PSO Mapping Matrix for Course Code: CC-EEM -1**

COs	PSO1	PSO2	PSO3
<b>CO1</b>	2	2	3
<b>CO2</b>	2	3	3
<b>CO3</b>	2	3	3
<b>CO4</b>	2	2	3

### Unit-I

**Superheterodyne Receivers:** Principles, advantages, block diagram, RF input and coupling AF coupling arrangements, RF amplifiers, mixer, local oscillator, IF amplifier, detector, audio amplifier, loud speaker, power requirements.

**High Fidelity & Stereophony:** High Fidelity, Stereophony and Monophony (difference), Ideal & Practical Stereo System, Quadraphonic sound system, stereophonic recording on Disc and Reproduction, block diagram of stereo recording on disc, Hi-Fi stereo reproducing system, Stereo Controls, Troubleshooting of Stereo Amplifier.

### Unit-II

**Television Receiver:** schematic block diagram and functions of different sections, Analysis of TV Picture:Gross structure, Image continuity, number of scanning lines, flicker, fine structure.

**Composite Video Signal:** Video Signal dimensions, Horizontal & Vertical synchronous details, vestigial sideband transmission.

**Video Detector:** video signal detection (Basic idea), basic video detector, video detector requirements.

### Unit-III

**Video Section Fundamentals:** Video amplifiers, Transistor video amplifier, contrast control methods, Direct coupled video amplifier, Advantages of AGC, various AGC systems, merits of keyed AGC system.

### Unit-IV

**Deflection Oscillators:** Deflection current waveform, generation of driving voltage waveform, Requirements of vertical deflection stage (in brief).

**Sound System:** Sound signal separation, sound take off circuits, audio O/P state.

**RF Tuner:** Tuner operation and its functions, various sections of VHF tuner.

**Video IF Amplifier:** Video IF Section, IF amplifier, Adjacent channel interference.

### References:

1. Radio Engineering by G.K.Mithal
2. Monochrome TV and Colour TV by R.R.Gulati.
3. Principles of communication by George Kennedy
4. Basic Radio and Television by S.P.Sharma.

<b>Course Code: CC-EEM -3</b>	<b>Course Name: MICROPROCESSOR 8085 &amp; INTERFACING</b>
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<b>Paper Code: EEM- 302</b>	
<b>Type:</b> Core Course (CC) <b>Course Credits:</b> 03 <b>Contact Hours:</b> 03 hours/week. <b>Examination Duration:</b> 3 Hours <b>Mode:</b> Lecture <b>External Maximum Marks:</b> 60 <b>Internal Maximum Marks:</b> 15	<b>Instructions For Paper Setter:</b> Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

**Course Objectives:** The aim of this course is to introduce with 8085 microprocessor and its programming concepts.

**Course Outcomes (CO):** At the end of this course, the students will be able to:

<b>CO1</b>	Familiarize with 8085 microprocessor architecture, instruction sets, addressing modes.
<b>CO2</b>	To learn programming techniques in 8085 microprocessor.
<b>CO3</b>	Understand the stacks and stack operations in 8085.
<b>CO4</b>	Understand the fundamental concepts of interfacing of 8085 microprocessor with input/output and memory devices.

**CO-PO Mapping Matrix for Course Code: CC-EEM -1**

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

**CO-PSO Mapping Matrix for Course Code: CC-EEM -1**

COs	PSO1	PSO2	PSO3
<b>CO1</b>	2	3	2
<b>CO2</b>	3	3	3
<b>CO3</b>	2	3	2
<b>CO4</b>	3	3	3

### Unit-I

**Microprocessor Architecture:** Microprocessor Architecture and its Operations, Fetching, decoding and execution of an Instruction, concept of Peripheral I/O and Memory Mapped I/O.

**Instruction Set of 8085:** 8085 Programming Model, Instruction Classification, Instruction and Data Format, Addressing Modes. Data Transfer Operations, Arithmetic Operations, Logic Operations, Branch Operations.

### Unit-II

**Programming Techniques:** Looping, Counting and Indexing, Additional Data Transfer and 16-bit Arithmetic Instructions, Arithmetic Operation related to Memory, Logic Operations: Rotate, Compare, Counters and Time Delays with few examples.

**Stacks and Subroutines:** Stack, Subroutine, Restart, conditional call, and return instructions; BCD Addition, BCD Subtraction, Introduction to advanced instructions and applications, multiplication, subtraction with carry.

### Unit-III

**Interrupts & Interfacing Data Converters:** 8085 Interrupt, 8085 Vectored Interrupts, Direct Memory Access, Digital-to-Analog Converter (basic concepts, D/A Converter Circuits, Interfacing 8-bit D/A Converter), Analog-to-Digital Converter (basic concepts, Successive Approximation A/D Converter, Interfacing 8-bit A/D Converter).

### Unit-IV

**Programmable Interface Devices:** 8155 Multipurpose Programmable Device (I/O ports & Timer, Interfacing 7-segment-LED), 8255 programmable peripheral interface (block diagram, modes), 8253/8254 Programmable Interval Timer (block diagram, programming 8254), 8259 Programmable Interrupt Controller (block diagram, interrupt operation and features).

### References:

1. Microprocessor Architecture, Programming & Applications with 8085 by R. S.Gaonkar.
2. Introduction to Microprocessors by A.P.Mathur.

<b>Course Code: CC-EEM -3</b>	<b>Course Name: PRACTICAL - I</b>	
<b>Paper Code: EEM-303</b>		
<b>Type: Core Course (CC);</b>	<b>Course Credits: 02;</b>	<b>Contact Hours: 04 hours/week;</b>
<b>Examination Duration: 3 Hours;</b>	<b>Mode: Lab. Work</b>	
<b>External Maximum Marks: 40;</b>	<b>Internal Maximum Marks: 10</b>	

**Course Objectives:** The aim of this course is to learn the practical aspects of Theory Papers.

**List of Experiments:** Minimum 6 experiments are to be performed in a Semesters.

**Audio/Video Systems &Advanced Digital Electronics**

1. Study of Radio Receiver testing (noting waveforms and voltages at different check points, fault finding and troubleshooting).
2. To identify various sections of a TV Receiver; to understand basic working of TV receiver and the main functions of various sections.
3. Location, Orientation and Connection of TV antenna; main faults of antenna and their rectification; knowledge of Balun unit and its replacement.
4. Study of Power supply cold tests and hot tests, voltage measurement at various points and the common faults in power supply.
5. Study of IF section testing by voltage measurement.
6. Study of Horizontal and vertical section testing.
7. Study of Audio section testing by voltage measurement.
8. Study of common faults and their rectification in a TV receiver.
9. To design the circuit of Schmitt Trigger using Op-amp IC 741 and plot its voltage waveforms.
10. To design and study the Sample and Hold Circuit.
11. To design Digital to Analog (D/A) Converter by binary weighted resistors & R-2R ladder arrangement.
12. Design an 8-bit Analog to Digital (A/D) Converter that utilizes LEDs to indicate its binary output value.

<b>Course Code: CC-EEM -4</b>	<b>Course Name: ADVANCED DIGITAL ELECTRONICS</b>
<b>Paper Code: EEM- 401</b>	
<b>Type:</b> Core Course (CC) <b>Course Credits:</b> 03 <b>Contact Hours:</b> 03 hours/week. <b>Examination Duration:</b> 3 Hours <b>Mode:</b> Lecture <b>External Maximum Marks:</b> 60 <b>Internal Maximum Marks:</b> 15	<b>Instructions For Paper Setter:</b> Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

**Course Objectives:** The aim of this course is to familiarize with some advanced concepts of digital electronics.

**Course Outcomes (CO):** At the end of this course, the students will be able to:

<b>CO1</b>	Familiarize with advanced combinational & sequential circuits, viz., code converters, and counters.
<b>CO2</b>	Understand the application aspect of timing circuits to generate various types of timing pulses/waveforms implemented in digital circuits.
<b>CO3</b>	Learn the structure of various types of memories, importance of PLA and familiarization with various types of A/D and D/A converters and their features.
<b>CO4</b>	Learn the minimization techniques in simplifying the hardware requirements of digital circuits for their role in digital system design.

**CO-PO Mapping Matrix for Course Code: CC-EEM -1**

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

**CO-PSO Mapping Matrix for Course Code: CC-EEM -1**

COs	PSO1	PSO2	PSO3
<b>CO1</b>	2	3	2
<b>CO2</b>	2	3	3
<b>CO3</b>	2	3	3
<b>CO4</b>	2	2	2

### Unit-I

**Code Converters:** Encoders and Decoders, Design of Code Converters: BCD to Seven Segment, BCD to Cyclic Code, Binary to Decimal, Binary to Gray, Binary to Excess-3.

**Counters:** Asynchronous Binary Counters, Asynchronous Mod-N Counter, Synchronous counter: Design principle of Modulo- N Counters, UP-Down counters, Decade Counter, BCD Counter.

### Unit-II

**Timing Circuits:** Applications of Logic Gates in Timing Circuits, OPAMP and its applications in Timing Circuits (OPAMP Comparator, Regenerator Comparator, Schmitt Trigger, Free Running Multivibrator, Monostable Multivibrator), Schmitt Trigger Square Wave Generator.

### Unit-III

**Memories:** Memory Organization and Operation, Expanding Memory Size, Classification and Characteristics of Memories, Sequential Memory (Static Shift Register, Dynamic Shift Register, Dynamic MOS Inverter), Read Only Memory (ROM Organization, Programming Mechanisms, , Read and Write Memory (Bipolar RAM Cell, MOS RAMs, Charge Couple Device Memory (Basic concept of CCD, Operation of CCD)

### Unit-IV

**Programmable Logic Array:** Input Buffer, AND Matrix, OR Matrix, Invert/Non-Invert Matrix, Output Buffer, Output Through FFs and Buffers, Programming PLA, Expanding Capacity, Applications of PLA  
**A/D and D/A Converters:** D/A Converters (Specifications, Weighted Resistor, R-2R Ladder), Sample and Hold Circuit, A/D Converters (Quantization and Encoding, Specifications, Parallel Comparator, Successive Approximation, Dual Slope)

### References:

1. Modern Digital Electronics by R. P. Jain
2. Integrated Electronics by Millman & Halkias
3. Digital Computer Electronics by A. P. Malvino

<b>Course Code: CC-EEM -4</b>	<b>Course Name: 8051: PROGRAMMING &amp; APPLICATIONS</b>
<b>Paper Code: EEM- 402</b>	
<b>Type:</b> Core Course (CC) <b>Course Credits:</b> 03 <b>Contact Hours:</b> 03 hours/week. <b>Examination Duration:</b> 3 Hours <b>Mode:</b> Lecture <b>External Maximum Marks:</b> 60 <b>Internal Maximum Marks:</b> 15	<b>Instructions For Paper Setter:</b> Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

**Course Objectives:** The aim of this course is to familiarize with the fundamentals of microcontroller 8051 and its programming.

**Course Outcomes (CO):** At the end of this course, the students will be able to:

<b>CO1</b>	Familiarize with the basic concepts of microcontroller 8051.
<b>CO2</b>	Understand the Interrupts, Addressing modes and Instruction set of 8051 microcontroller.
<b>CO3</b>	Learn programming techniques with 8051 microcontroller.
<b>CO4</b>	Learn the fundamental concepts of interfacing and to design basic applications being interfaced with 8051 microcontroller.

<b>CO-PO Mapping Matrix for Course Code: CC-EEM -1</b>											
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>
<b>CO1</b>	3	3	2	3	1	3	2	3	2	1	2
<b>CO2</b>	3	3	3	3	1	3	2	2	2	1	2
<b>CO3</b>	3	3	3	3	2	3	2	2	2	1	2
<b>CO4</b>	3	3	3	3	2	3	2	3	2	2	3

<b>CO-PSO Mapping Matrix for Course Code: CC-EEM -1</b>			
<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	2	3	3
<b>CO2</b>	2	3	3
<b>CO3</b>	2	3	3
<b>CO4</b>	2	3	3

### Unit-I

**Microcontroller 8051:** Introduction and block diagram of 8051 microcontroller, architecture of 8051 family (in brief), memory organization, Internal RAM/ROM memory, General purpose data memory, special purpose/function registers, external memory. Counters and timers – 8051 oscillator and clock, program counter, TCON, TMOD, timer counter interrupts, timer modes of operation. Input/output ports and circuits/configurations, serial data input/output – SCON, PCON, serial data transmission modes.

### Unit-II

**8051- Interrupts, Addressing modes and Instruction set:** Interrupts – IE, IP, time flag interrupts, serial port interrupt, external interrupts, reset, interrupt control, interrupt priority, interrupt destinations & software generated interrupts. Addressing modes, Data transfer instructions, Push and Pop and data exchange instructions, Logical Instructions, Arithmetic Instructions, simple programs in assembly language.

### Unit-III

**8051 programming in C:** Jump and call instructions – jump and call program range, jumps, calls and subroutines, interrupts and returns, simple example programs in assembly language. 8051 programming using C– Data types and time delays in 8051 C, I/O programming, logic operations, data conversion programs, accessing code ROM space and data serialization. Timer/Counter Programming in 8051– Programming 8051 timers, counter programming, programming timers 0 and 1 in 8051 C.

### Unit-III

**Interfacing with 8051:** Basic interfacing concepts and interrupts, Programming 8051 interrupts, programming Timer interrupts, programming the external hardware interrupts. Schematic diagrams and basic concepts of Interfacing of 8051 to keyboard, seven segment display, stepper motor, DAC, ADC and traffic light controller circuits.

### References:

1. 8051 Microcontroller & Embedded Systems by M.A. Mazidi, J.G. Mazidi & R.D. McKinlay.
2. The 8051 Microcontroller, architecture, programming and applications by K.J. Ayala.



<b>Course Code: CC-EEM -4</b>	<b>Course Name: PRACTICAL - II</b>	
<b>Paper Code: EEM-403</b>		
<b>Type:</b> Core Course (CC);	<b>Course Credits:</b> 02;	<b>Contact Hours:</b> 04 hours/week;
<b>Examination Duration:</b> 3 Hours;	<b>Mode:</b> Lab. Work	
<b>External Maximum Marks:</b> 40;	<b>Internal Maximum Marks:</b> 10	

**Course Objectives:** The aim of this course is to learn the practical aspects of Theory Papers.

**List of Experiments:** Minimum 6 experiments are to be performed in each of the Semesters.

**8085 Microprocessor & 8051 Microcontroller: Programming & Applications**

1. Familiarization with 8085 based microprocessor trainer kit by identifying different IC chips and their utilities. Understanding various functions of the kit, like, insertion, deletion, block-move, block-fill, examining registers/memory, single step, etc. by writing and executing simple programs for addition/subtraction of single and multibyte numbers.
2. Writing 8085 program for multiplication and division of two numbers.
3. Write 8085 program for arranging an array of data in ascending/descending order.
4. Write 8085 program for the generation of time delays of the order of 1-5 seconds and its testing by interfacing LED's to make them glow in a given sequence.
5. Study the IC Tester application on 8085  $\mu$ Pkit.
6. Study the Traffic Light Controller application of 8085  $\mu$ Pkit.
7. Familiarization with 8051 based microcontroller trainer kit. Practice in entering and executing simple programs, like addition/subtraction/smallest/largest of N 8-bit numbers.
8. Write a program on 8051 microcontroller kit to find that the given numbers is prime or not.
9. Write a program on 8051 microcontroller kit to glow the first four LEDs then next four using Timer application.
10. Use one of the four ports of 8051 for output interfaced to eight LED's. Simulate binary counter (8 bit) on LED's.
11. Design a square wave of varying duty cycles on 8051 based microcontroller trainer kit.
12. Interface stepper motor with 8051 microcontroller and write a program to move the motor through a given angle in clock wise or counter clockwise direction.