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 DSEP2	2	2	40	10	50	3
DSEP-503	Discipline Specific Elective-II (Physics)	DSEP3 DSEP4	2	2	40	10	50	3
DSEP-504	Discipline Specific Elective Physics Practical-V		2	4	40	10	50	3
DSEM-505	Discipline Specific Elective-I (Mathematics)	DSEM1 DSEM2	2	2	40	10	50	3
DSEM-506	Discipline Specific Elective-II (Mathematics)	DSEM3 DSEM4	2	2	40	10	50	3
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 DSEE2: Digital Signal Processing	2	2	40	10	50	3
*DSEE-509	Discipline Specific Elective-II (Electronics)	DSEE3: Electronic Communication DSEE4: Electronic Instrumentation	2	2	40	10	50	3
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: SECP2	2	2	40	10	50	3
DSEP-602	Discipline Specific Elective-III(Physics)	DSEP5 DSEP6	2	2	40	10	50	3
DSEP-603	Discipline Specific Elective-IV(Physics)	DSEP7 DSEP8	2	2	40	10	50	3
DSEP-604	Discipline Specific Elective (Physics Practical-VI)		2	4	40	10	50	3
DSEM-605	Discipline Specific Elective-III (Mathematics)	DSEM5 DSEM6	2	2	40	10	50	3
DSEM-606	Discipline Specific Elective-IV (Mathematics)	DSEM7 DSEM8	2	2	40	10	50	3
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 DSEE6: Verilog and FPGA based System Design	2	2	40	10	50	3
*DSEE-609	Discipline Specific Elective-IV (Electronics)	DSEE7: Introduction to C and its programming DSEE8: Modern Communication Systems	2	2	40	10	50	3
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	PSO1	PSO2	PSO3
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 π 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 multimetre, CRO and function generator.
3. To design various circuits on bread board using desecrate 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 clement.
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 Thevnin 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	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	--	--	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	**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

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, 1st 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-lV

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	**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

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 E1ectronics &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	**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	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 inputand 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	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

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	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
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	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

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 II 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	**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	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**	**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

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. Schafer, “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**	**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

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^{th} 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	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

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	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

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; 2ndedition. 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	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

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

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, Wirelerss 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	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. 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 arithmatic 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.