Shri Sangameshwar Education Society's

Sangameshwar College, Solapur [Autonomous]

(Affiliated to Punyashlok Ahilyadevi Holkar Solapur University, Solapur)

Kannada Linguistic Minority Institute

NAAC Accredited with 'A' Grade (III Cycle CGPA 3.39)

Academic Council 3(3.3)
10th August, 2021

UG Science Programme: B.Sc.-II to be implemented from A.Y. 2021-2022

System: Choice Based Credit System (CBCS) with SGPA and CGPA

B.O.S. in: **ELECTRONICS**

Syllabus for: Discipline Specific Core Courses (DSC-C and DSC-D)

Structure and Examination for: Discipline Specific Core Courses (DSC-1C and DSC-1D)

Table-3

Semester	Course		Teaching Scheme/week			
			Course Code	Hours	Lectures	Credits
III						
	DSC-1C	Theory Paper-V: Electronics Circuits	2131309	4.8	6	4
		Theory Paper-VI: Pulse and Switching Circuits	2131310			
		Practical-II: Electronics Practical	2131423	6.4	8	4
	SEC-1	Theory Paper-I: Gr.A: Programming skill using C–I	2131319	4.8	6	2
IV	AECC-C	ENVIRONMENTAL STUDIES	2131315	3.2	4	4
	DSC-1D	Theory Paper-VII: Operational Amplifier and Applications	2131409	4.8	6	4
		Theory Paper-VIII: Sensors and Transducers	2131410			
		Practical-III: Electronics Practical	2131423	6.4	8	4
	SEC-2	Theory Paper-II: Gr. A: Programming skill using C–II	2131428	4.8	6	2

Table-4

Semester	Course		EXAMINATION			Credits
			Marks			
			CA	SEE	Total	
III	DSC-1C	Theory Paper-V: Electronics Circuits	15	35	50	2

		Theory Paper-VI: Pulse and Switching Circuits	15	35	50	2
	SEC-1	Theory Paper-I: Gr.A: Programming skill using C–I	15	35	50	2
IV	AECC-C	ENVIRONMENTAL STUDIES	15	35	50	4
	DSC-1D	Theory Paper-VII: Operational Amplifier and Applications	15	35	50	2
		Theory Paper-VIII: Sensors and Transducers	15	35	50	2
	SEC-2	Theory Paper-II: Programming skill using C–II	15	35	50	2
	DSC-1C & DSC-1D	Practical-II and III: Electronics Practical	60	140	200	8

CA: Continuous Assessment SEE: Semester End Examination

Note:

The above structure (Table-3 and Table-4) is for Sem-III and Sem-IV of the undergraduate B.Sc.-II programmes* under science faculty.

***B.Sc.-II** Select any three DSC form the four core courses opted at B.Sc.- I.

DSC: Discipline Specific Core Course AECC: Ability Enhancement Compulsory Course

SEC: Skill Enhancement Course

Passing in each course is compulsory including Environment Studies course.

SGPA/CGPA and Total Marks will be calculated excluding AECC course.

Passing in each course is compulsory. SGPA/CGPA and Total Marks will be calculated excluding AECC course.

BSc II Electronics (CBCS Pattern)

Discipline Specific Core Courses (DSC-C and DSC-D)

SEM III

Academic Council 3(3.3)
10th August, 2021

DSC-C Theory-I ELECTRONICS-V (2131309)

Title: Electronics Circuits

Marks: 50

Credits: 2 **Lectures: 36 Hours**

- **Course Objectives:**

1. To study and design transistor biasing.
2. To learn various models of transistor and its configurations.
3. To study transistorized multistage amplifiers and power amplifiers
4. To learn feedback amplifiers and various oscillators

1. Transistor Biasing (05)

DC load line, Operating point (Q), Stability factor, Methods of transistor biasing: Base fixed Bias, Emitter feedback Bias, Voltage divider bias (with mathematical treatment)

2. Transistor Models and Single stage Amplifiers (07)

Small signal low and High Frequency hybrid –π Models for BJT, Basic action of transistor amplifier, DC (Thevenin's) and AC analysis of CB, CE, CC configurations, comparison of CB, CE, CC configurations

3. Multistage and Power Amplifiers (12)

Types of coupling, RC Coupled, Transformer Coupled, Direct Coupled amplifier (Circuit description, derivation of Voltage gain, Frequency response, advantages & disadvantages, applications) Darlington pair amplifier

Power Amplifiers: Class A, Class B, Class AB and Class C amplifiers (Circuit Description, characteristics and efficiency), distortion in power amplifiers, Class B push pull amplifier, complementary-symmetry amplifier (Circuit Description, characteristics and efficiency)

Single Tuned voltage Amplifiers (Circuit Description, frequency response)

4. Feedback Amplifiers (06)

Principle of feedback amplifier, Effect of negative feedback on Gain, Bandwidth, Distortion, Noise, Input impedance and Output impedance, Types of negative feedback, Study of current series feedback circuits (CE Amplifier & Emitter Follower)

(Numerical Examples)

5. Sinusoidal Oscillators (06)

Basics of LC & RC oscillatory circuit, frequency stability, Barkhausen criterion

RC oscillators: Phase shift oscillator, Wien bridge oscillator (Without mathematical treatment)

LC oscillators: Hartley oscillator, Colpitt's oscillator (With mathematical treatment)

Piezoelectric crystal and its equivalent circuit, Pierce Crystal oscillator
(Numerical Examples)

Reference Books:

1. A text book of Applied Electronics by R. S. Sedha. S. Chand Publication.
2. Electronic Devices and Circuits by Boylstead
3. Basic Electronics (Solid State) by B. L. Theraja, S. Chand & Company Ltd.
4. Basic Electronics and Linear Circuits by N. N. Bhargaya D. C. Kulshreshtha & S. C. Gupta TMH

- **Course Outcomes:**

1. Design appropriate biasing and Q point stabilization technique for transistor amplifier
2. Interpret transistor models and configurations
3. Illustrate about BJT amplifiers and compare their performances
4. Build multistage and power amplifier
5. Build feedback amplifier and oscillator for any frequency

BSc II Electronics (CBCS Pattern)

Discipline Specific Core Courses (DSC-C and DSC-D)

SEM III

Academic Council 3(3.3)
10th August, 2021

DSC-C ELECTRONICS-VI (2131310)

Title: Pulse and Switching Circuits

Credits: 2 **Marks: 50**

Lectures: 36 Hours

- **Course Objectives:**

1. To learn wave shaping circuits and its Advantages in electronics systems
2. To understand various time base circuits
3. To study concept of multi-vibrators using transistor
4. To extend learning of multi-vibrators using various ICs

1. Wave shaping Circuits (05)

Need of wave shaping circuit,

linear wave shaping circuits: Differentiator and Integrator

Non linear wave shaping: Diode Clipping and Clamping circuits

(Series and Parallel with and without biasing)

2. Time base Circuits (03)

General features of Time base signals, Concept of RC time base circuit, Miller integrator UJT Oscillator with constant current source

3. Multi-vibrators using BJT (14)

Transistor as a switch, switching characteristics, Types of multivibrator and applications,

Astable multivibrator (collector coupled): Operation, Wave forms, Expression of output frequency.

Monostable multivibrator (collector coupled): Operation, Triggering methods, Waveforms, Expression of gate width.

Bistable Multivibrator (collector coupled): Operation, Triggering methods, Wave forms, Schmitt's Trigger: Operation, Hysterises curve (UTP, LTP), Applications (Numerical Examples)

4. IC 555 Timer (10)

IC-555 timer- Pin configuration, functional block diagram,

Astable multivibrator: Operation, wave forms, Expression for frequency and duty cycle

Monostable multivibrator: Operation, wave forms, Expression of gate width

Application of IC 555 as Sequential Timer, Battery charger, Voltage controlled Oscillator (Numerical examples)

5. Multi-vibrators using Gates (04)

Astable multivibrator using NAND gates, Monostable Multivibrator using

NAND gates and IC74121.

Reference Books

1. Pulse and Switching circuits by Millman and Taub
2. Hand book of Electronics by Sony Gupta.
3. A Text of Applied Electronics by R.S.Sedha, S. Chand Publication
4. Electronic Devices and Circuit by Boylestead
5. Linear Integrated Circuit – D. Roy Choudhari, Shail Jain (Wiley Eastern)

- **Course Outcomes:**

1. Design various wave shaping circuits for different applications
2. Apply concept of time base circuits in circuit designing
3. Design and build transistor and IC555 based multi-vibrator for various applications

BSc II Electronics (CBCS Pattern)

Discipline Specific Core Courses (DSC-C and DSC-D)

SEM IV

Academic Council 3(3.3)
10th August, 2021

DSC-D ELECTRONICS-VII (2131409)

Title: Operational Amplifier and Applications

Marks: 50

Credits: 2 **Lectures: 36 Hours**

- **Course Objectives:**

1. To learn differential amplifier
2. To study basics of Op-amp and its parameters
3. To study linear and non-linear applications of Op-amp
4. To study different oscillators using Op-amp

1. Differential Amplifier **(6)**

Need of differential amplifier, Emitter coupled differential amplifier, Operation, Common mode gain and Differential mode gain, Derivation of CMRR, Constant current bias, Current mirror bias.

2. Operational Amplifier **(8)**

Introduction, Block diagram, Equivalent circuit of op-amp, Ideal characteristics, open loop and closed loop configuration and its need,

Op-amp parameters: Output offset voltage, Input offset voltage, Input bias current, Input offset current, Input impedance, Output impedance, CMRR, Slew rate, Maximum power bandwidth, PSRR, Specifications of IC 741

3. Operational Amplifier Linear Systems **(8)**

Concept of virtual ground, Inverting amplifier, Non-inverting amplifier, Voltage follower, summing amplifier (Adder), Op-amp differential amplifier (subtractor), Differentiator, Integrator, Current to Voltage converter and Voltage to Current converter

4. Operational Amplifier Non-linear Systems **(05)**

Basic comparator, Zero-crossing detector, Regenerative comparator (Schmitt Trigger), Precision rectifier (Half wave)

5. Wave form Generators **(09)**

Oscillators - Phase shift oscillator, Wien Bridge oscillator (with mathematical treatment) Astable multivibrator, Monostable multivibrator, Triangular wave generator, Saw tooth oscillator (without mathematical treatment)

Reference Books:

1. Linear Integrated Circuit – D. Roy Choudhari, Shail Jain (Wiley Eastern Ltd.)
2. Integrated Circuit (New Edition) – K. R. Botkar

3. Integrated Electronics – Millman, Halkies (MGH)
4. Op-Amps and Linear circuits – Ramakant A. Gaikwad (PHI)
5. Operational Amplifiers and Linear ICs – Caughlin and Driscoll (PHI)
6. Design with Operational Amplifiers and Analog ICs – Franco (McGraw Hill)

- **Course Outcomes:**

1. To make DC and AC analysis differential amplifier
2. Understand basics of Op-amp and its parameters
3. To design various linear and non-linear applications of Op-amp
4. To build oscillators using Op-amp for any frequency

BSc II Electronics (CBCS Pattern)

Discipline Specific Core Courses (DSC-C and DSC-D)

SEM IV

Academic Council 3(3.3)
10th August, 2021

DSC-D ELECTRONICS-VIII (2131410)

Title: Sensors and Transducers

Marks: 50

Credits: 2 **Lectures: 36 Hours**

- **Course Objectives:**

1. To study basic performance parameters of sensors.
2. To understand various types of sensors along with their working principles and specifications
3. To learn the principle, construction and working of various actuators.

1. Fundamentals of sensors and transducers (10)

Basic needs of measurements, Block diagram of measurement system, Characteristics of measurement Systems, static characteristics, dynamic characteristics and responses, Need of system calibration.

Definition: Sensor and Transducer, Principle of transduction, Basic difference between sensor and transducer, Types of sensor, Static and Dynamic characteristics, Classification of transducers, Basic requirement of transducers,

Selection criteria for transducer. Concept of Active and Passive Sensors.

2. Resistive transducers (6)

Principle of operation, Potentiometer, Resistance pressure transducer, Resistive position transducer, Strain gauge, Temperature transducer: RTD, Thermistors.

3. Inductive transducer (5)

Principle of operation, Variable reluctance type transducer,

Differential transducer: Linear Variable Differential Transducer (LVDT) and Rotary Variable Differential Transducer (RVDT)

4. Capacitive transducer (5)

Principle of operation, Variable Area Type, Variable Air Gap type, Variable Permittivity type, Capacitor microphone.

5. Electronic Transducers and Actuators (10)

Transducers: Thermocouple, Piezoelectric transducer, Hall Effect transducers,

Photo electric transducer: LDR, Photo-voltaic cell, Photo diode, Photo transistor. Pyrometers.

Smart Sensors: Temperature sensor (LM35), LPG sensor (N26), PIR sensor.

Actuators : Electromagnetic Relay, Solenoid, Opto-couplers.

Reference Books

1. Electronic Instrumentation by K. S. Kalsi, TMH Publication.
2. Electronic Measurements by U. A. Bakshi and V. U. Bakshi, Technical Publication.
3. Hand book of Analytical Instrumentation by R. S. Khandpur, TMH Publication.
4. A Course in Electrical and Electronics Measurements and Instrumentation by AK Sawhney, Dhanpat Rai Publication.
5. Sensors and Transducers by KV Gitapathi, Center: Technical Coordination.
6. Instrumentation devices and systems, CS Rangan, JR Sharma and VSV Mani, MGH.

- **Course Outcomes**

1. Categorize and give details of sensors and transducers with examples, used for measurement of temperature, motion, position, pressure and light
2. Gain knowledge of sensor and Actuators used in instrumentation design

B.Sc.–II-Electronics (CBCS Pattern)

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Practical Course

List of Experiments for **DSC-C & DSC-D**

ELECTRONICS PRACTICAL-II AND III (2131423)

Marks: 200

Credits: 4 **Lectures: 36 Hours**

Group A

1) Designing of biasing network.
2) Study of CE amplifier (Gain, I/P & O/P impedance)
3) Study of CB amplifier (Gain, I/P & O/P impedance)
4) Study of Emitter follower (Gain, I/P & O/P impedance)
5) Study of Negative feedback amplifier (Frequency response & feedback factor)
6) Design and testing of RC Phase shift oscillator at given frequency
7) Design and testing of Wein bridge oscillator
8) Design and testing of Hartley oscillator
9) Study of Crystal oscillator (Pierce oscillator)
10) Design and testing of Colpitt's oscillator

Group B

1) Study of Miller integrator
2) Study of UJT oscillator with constant current source
3) Design and testing of Astable multivibrator using BJT
4) Design and testing of Monostable multivibrator using BJT
5) Study of Bistable multivibrator using BJT (AC & DC triggering)
6) Study of Schmitt's trigger (hysterysis curve & square wave testing)
7) Design and testing of Astable multivibrator using IC 555.
8) Design and testing of Monostable multivibrator Integrator using IC 555
9) Design and testing of Astable multivibrator using IC7400
10)Study of Monostable multivibrator using IC74121

Group C

1) Study of Op-amp parameters (any three)
2) Design and Verification of op-amp as Inverting and non inverting amplifier
3) Design and Verification of op-amp as Adder and subtractor
4) Design and Study of op-amp as voltmeter and ammeter
5) Design and study of op-amp as Schmitt's trigger
6) Design and study of Wein-bridge oscillator using op-amp
7) Design and study of Phase Shift Oscillator using op-amp
8) Design and study of Astable multivibrator using op-amp
9) Design and study of Monostable multivibrator using op-amp
10) Design and study of op-amp as integrator and differentiator

Group D

1) Determine the characteristics of Thermistors
2) Study of temperature sensor PT 100
3) Study of strain gauge (load cell)
4) Study of Light activated turn ON/OFF circuits
5) Design and study of On-off temperature controller
6) Study of LVDT for linear displacement
7) Measurement of temperature by Thermocouple
8) Measurement of displacement using capacitive transducer
9) Study of Hall Effect
10) Study use of Electromagnetic relay / Solenoid

N.B:

1) Minimum 30 experiments must be performed out of which at least seven from each group.
2) At least 6 Experiments with design calculation using C-Programming from Group A, B & C

- **Course Outcomes:**

1. Design appropriate biasing and Q point stabilization technique for transistor amplifier
2. Design & analyze different amplifier circuits
3. Build feedback amplifier
4. Design & analyze different multi-vibrator circuits
5. Design & analyze different oscillator circuits for any frequency
6. Study of op amp IC 741 characteristics
7. Build and study various Op-amp application circuits
8. Study various applications of sensors and transducers