 B.Sc.

[Mathematics, Electronics, Computer Science]

 ELECTRONICS [3 YEARS]

Syllabus and Scheme

2024-2025(Onwards)

BOARD OF STUDIES

[PHYSICAL SCIENCES]

St. Francis de Sales College [Autonomous]

Electronics City P.O. Bengaluru 560100 Karnataka, INDIA

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# Members of Board of Studies

|  |  |  |
| --- | --- | --- |
| Sl. No | Name  | Designation |
| 1 | Ms Maya Mathew, Asst. Professor of Electronics, Department of Physical Sciences &MathematicsSt. Francis de Sales College (Autonomous), Bengaluru | Chairperson |
| 2 | Dr. B. Chaluvaraju, Associate Professor ,Department of Mathematics, Bangalore University, Bengaluru | University Nominee |
| 3 | Dr. Manoj B, Professor& Head,Department of Physics and Electronics, Chirst(Deemed to be University),Bengaluru | External Subject Expert- Physics |
| 4 | Dr. B Gunapriya , Associate Professor of Electrical and Electronics Engineering ,New Horizon College of Engineering(VTU), Bengaluru | External Subject Expert-Electronics |
| 5 | Dr. Athimoolam Arunachalampillai, Associate Director, Amgen Inc.Bengaluru | Subject Expert in Chemistry& Industry Expert |
| 6 | Mr. Chella Pandian Pitchai, Global Head, DEI, Biocon Biologics, Bengaluru | Industry Expert |
| 7 | Mr. Sanju Joseph, Project Manager, WIPRO Technologies, UK | Alumni Representative |
| 8 | Ms. Sonima Mohan, Asst. Professor of Physics, Department of Physical Sciences &MathematicsSt. Francis de Sales College (Autonomous), Bengaluru | Member |
| 9 | Ms Umamaheswari U, Asst. Professor of Physics, Department of Physical Sciences &MathematicsSt. Francis de Sales College (Autonomous), Bengaluru | Member |
| 10 | Dr. GisaGrace Ninan, Asst. Professor of Physics, Department of Physical Sciences &MathematicsSt. Francis de Sales College (Autonomous), Bengaluru | Member |
| 11 | Dr.Savithri H. Ezhikode, Asst. Professor of Physics, Department of Physical Sciences &MathematicsSt. Francis de Sales College (Autonomous), Bengaluru | Member |
| 12 | Ms. Jenifer Sujitha, Asst. Professor of Electronics, Department of Physical Sciences &MathematicsSt. Francis de Sales College (Autonomous), Bengaluru | Member |
| 13 | Dr. Regimol George,Asst.Professor of Chemistry,Department of Physical Sciences &MathematicsSt. Francis de Sales College (Autonomous), Bengaluru | Member |
| 14 | Dr. Julia Sebastian, Asst.Professor of Chemistry,Department of Physical Sciences &MathematicsSt. Francis de Sales College (Autonomous), Bengaluru | Member |
| 15 | Dr. S H Yasmin, Asst.Professor of Chemistry,Department of Physical Sciences &MathematicsSt. Francis de Sales College (Autonomous), Bengaluru | Member |
| 16 | Sr.Rofin Mangali, Asst.Professor of Chemistry,Department of Physical Sciences &MathematicsSt. Francis de Sales College (Autonomous), Bengaluru | Member  |

PREFACE TO THE BSc 2024-2025 SYLLABUS

1



Based on the order received from the parent university (Bangalore University - given above), the Board of Studies (Physical Sciences) of St. Francis de Sales College (Autonomous), has decided to adopt the grading scheme of the parent university for its BSc(Electonics) Syllabus from 2024-2025 onwards.

# ST. FRANCIS DE SALES COLLEGE (AUTONOMOUS)

 **ABOUT THE COLLEGE**

St. Francis de Sales College (Autonomous), popularly known as SFS College, is one of the leading Institutions of Higher Education in Bengaluru, Karnataka. Founded in 2004 with the vision of Excellence, Efficiency, and Transformation, and the Mission of Love of God and Service to Humanity, the College is run by the Missionaries of St. Francis de Sales (MSFS) of the South West India Province, also known as Fransalians. The College is accredited with “A” grade by NAAC, approved by AICTE, recognized under 2(f) & 12(b) by UGC, and certified under ISO 9001:2015. Permanently affiliated to Bangalore University, the College offers several degree programs at the Bachelors, Masters, and Doctoral levels under various disciplines. In 2024, St. Francis de Sales College received the Autonomous status, and it remains as a center for quality education, equipping the students with the skills, knowledge, and values needed to excel and make a meaningful impact in the world.

#  VISION AND MISSION

##  VISION

 Excellence, Efficiency and Transformation.

##  MISSION

 Love of God and Service to Humanity.

# DEPARTMENT OF ELECTRONICS

 Electronics is a branch of science developed in recent years and became popular due to the inventions and innovative developments that took place in the semiconductor field. Today the field of electronics involves design, development, production, research, and teaching. It deals with systems by which we can communicate with one another worldwide, by which vast quantities of data are manipulated, and by which highly complex manufacturing processes are automated and with the elements used to realize them. Job potentials and self-employment opportunities are great boons given by this fascinating field of Electronics. Apart from syllabus, the department offers certificate courses in PCB designing, embedded system etc. to enable student to innovate, design and develop various projects. The department also encourages students to organize and participate in national/ international seminars, workshops and technical fests to innovate, design and develop various projects

## VISION

Create, Nurture Scientific Knowledge& Research Aptitude

 **MISSION**

Science in Service to Humanity

# BSc PROGRAM STRUCTURE

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sem**  | **Major1**(Electronics) | **Major2**(Mathematics) | **Major3(** Computer Science) | **Elective/****Optional** | **Languages** | **Compulsory** |
| 1 | 6 | 6 | 6 |  | Languages1- **3**Languages2- **3** | Compulsory 1(Constitutional Values) - **2** |
| 2 | 6 | 6 | 6 |  | Languages1- **3**Languages2- **3** | Compulsory 2 (Constitutional Values) - **2** |
| 3 | 6 | 6 | 6 | Elective 1- **2** | Languages1- **3**Languages2- **3** |  |
| 4 | 6 | 6 | 6 |  | Languages1- **3**Languages2- **3** | Compulsory 3 (Practical Knowledge/skill-1)- **2** |
| 5 | 6 | 6 | 6 |  |  | Compulsory 3 (Practical Knowledge/skill-2)- **2** |
| 6 | 6 | 6 | 6 |  |  | Compulsory 3 (Practical Knowledge/skill-3)- **2** |
| Total | **36** | **36** | **36** |  **04** |  **24** |  10  |
| Total Credit- 144 |

# BSc ELECTRONICS

# ELIGIBILITY CRITERIA

 Students who have passed PUC/ 10+2 / ITI / Diploma (Electronics / Electrical / Information Science / Medical Electronics/ Computer Science/ Telecommunications) or equivalent are eligible for opting Electronics in UG program.

# PROGRAMME STRUCTURE AND DURATION

 The programme is for Three (03) years consisting of Six Semesters altogether. A candidate shall complete his/her degree within six6) academic years from the date of his/her admission to the first semester. A Student who successfully completes Three (03) years of the programme will be awarded Bachelor’s Degree in Science with Electronics as one of the major subject by Bangalore University.

# PROMOTION

 A candidate who has obtained a minimum of 40% marks in End Semester examination and an aggregate of 40% marks in each subject shall be eligible for a pass or exemption in that subject.

# PROGRAME OUTCOME (PO)

|  |  |
| --- | --- |
| PO1 | **Disciplinary Knowledge:** To create the facilities and environment to consolidate the knowledge acquired and to motivate and inspire the students to focus on comprehensive expertise in Electronics.  |
| PO2 | **Critical Thinking and Analytical Reasoning:** To acquire the ability of critical thinking and logical reasoning and capability of recognizing and distinguishing the various aspects of real-life problems |
| PO3 | **Problem Solving Proficiency:** Apply Mathematical concepts to analyse and solve real world engineering and computational problems |
| PO4 | **Technical Expertise and Practical skills:** To gain in-depth knowledge of core principles in each subject and develop hands –on skills through practical experiments and real time Projects  |
| PO5 | **Scientific Skills and Sustainable Development :** Ability to apply quantitative reasoning skills to answer scientific questions , to address the societal issues ,analyse the impact of environmental conditions and demonstrate the knowledge and need of the sustainable development. |
| PO6 | **Higher Studies and Research:** Be prepared for higher studies or research roles in advanced fields with an understanding to integrate the interdisciplinary application of Electronics . |
| PO7 | **Intra personal skills:** Integrate intra personal skills to enhance the professional effectiveness, personal development, and ability to navigate complexities in academic and real-world context.  |
| PO8 | **Employability skills:** Students will develop the skills required for employment and demonstrate the ability to solve problems, make decisions, plan, innovate, organize information, and network with professionals in the industry. Provides opportunity to the students for getting job in industries besides academic and administrative works. |
| PO9 | **Communication Skills:** Communicates effectively on physical activities with scientific community and with the society at large scale, and write effective reports on science events and design documentation, makes effective communication skills |
| PO10 | **Information/Digital Literacy:** Utilize the techniques and modern tools for solving complex problems with an understanding of limitations |
| PO11 | **Lifelong Learning/Self-directed learning:** Develop the ability of working independently and make in depth study of domain specific subjects. Helps learners to think independently and develop computational skills for solving real world problems |
| PO12 | **Moral and Ethical Awareness:** To develop an ability to identify unethical behavior such as fabrication, falsification or misinterpretation of data and adopting objectives, unbiased and truthful actions in all aspects of life in general and their specialized subjects in particular. Develop soft skills in practicing professional ethics. |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sl.No. | Semester | Title of the Paper | Teaching Hours | Hours/ week | Examination Pattern Max. & Min. Marks /Paper | Durati on of Exam (Hours) | Total Marks / paper | Credits |
| Theory | Practical | **Theory** | **Practical** | Theory | Practical | Theory | Practical |
| Max. | Min. | IA | Max. | Min. | IA |
| 1 | **I** | 24BSC15A:Analog and Digital Electronics- I24BSC18AP:Analog and Digital Electronics-I Practical | **60** | **4** | **4** | **80** | **32** | **20** | **40** | **16** | **10** | **3** | **3** | **150** | **4** | **2** |
| 2 | **II** | 24BSC25A:Analog and Digital Electronics- II24BSC28AP:Analog and Digital Electronics-IIPractical | **60** | **4** | **4** | **80** | **32** | **20** | **40** | **16** | **10** | **3** | **3** | **150** | **4** | **2** |

 **COURSE MATRIX**

**CONTINUOUS INTERNAL ASSESSMENT**

 **THEORY**

|  |  |  |
| --- | --- | --- |
| **S.No** | **ASSESSMENT** | **MARKS** |
| 1 | Continuous Internal Assessment (C1 & C2) | 20 marks |
| 2 | End semester Examination | 80 marks |

 **PRACTICAL**

|  |  |  |
| --- | --- | --- |
| **S.No** | **ASSESSMENT** | **MARKS** |
| 1 | Continuous Internal Assessment (C1 & C2) | 10 marks |
| 2 | End Semester Examination | 40 marks |

**THEORY**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S.NO** | **ASSESSMENTS** | **COMPONENTS** | **MARKS & ATTENDANCE** | **IA MARKS** |
| 1 | Unit Test 1(25% of Syllabus) | C1 | 25 | 2.5 |
| 2 | Skill Based Activities: Case Study / Seminar / Assignment / Quiz | C2 | 10 | 5 |
| 3 | Mid Semester Examination(50%of Syllabus) | C2 | 80 | 5 |
| 4 | Unit Test 2(25% of Syllabus covered after MSE) | C1 | 25 | 2.5 |
| 5 | Attendance75.00-% - 79.99% -1 Mark80.00-% - 84.99% -2 Mark85.00-% - 89.99% -3 Mark90.00-% - 94.99% -4 Mark95.00-% - 100.99% -5 Mark | C1 | Minimum of 75% | 5 |
|  | Total |  20 |
| **PRACTICAL**  |
| **S.NO** | **ASSESSMENTS** | **COMPONENTS** | **MARKS & ATTENDANCE** | **IA MARKS** |
| 1 | Model Practical Examination | C1 |  10 | 5 |
| 2 | Attendance75.00-% - 79.99% -1 Mark80.00-% - 84.99% -2 Mark85.00-% - 89.99% -3 Mark90.00-% - 94.99% -4 Mark95.00-% - 100.99% -5 Mark | C2 | Minimum of 75% | 5 |
| **Total** |  | **10 marks** |

# GRADING SYSTEM

**Table of Conversion of % Marks to grade point:**

|  |  |
| --- | --- |
| **% Marks** | **Grade Point** |
| 96-100 | 10 |
| 91-95 | 9.5 |
| 86-90 | 9.0 |
| 81-85 | 8.5 |
| 76-80 | 8.0 |
| 71-75 | 7.5 |
| 66-70 | 7.0 |
| 61-65 | 6.5 |
| 56-60 | 6.0 |
| 51-55 | 5.5 |
| 46-50 | 5.0 |
| 41-45 | 4.5 |
| 40 | 4 |

# Final Result/Grade Description:

|  |  |  |  |
| --- | --- | --- | --- |
| **Semester/ Programme % of Marks** | **Semester GPA/ Programme/ CGPA** | **Grade Alpha Sign** | **Result/Class Description** |
| 90.1-100 | 9.01-10.00 | O | Outstanding |
| 80.1-90.0 | 8.01-9.00 | A+ | First Class Exemplary |
| 70.1-80.0 | 7.01-8.00 | A | First Class Distinction |
| 60.1-70.0 | 6.01-7.00 | B+ | First Class |
| 55.1-60.0 | 5.51-6.00 | B | High Second Class |
| 50.1-55.0 | 5.01-5.50 | C | Second Class |
| 40.0-50.0 | 4.00-5.00 | P | Pass Class |
| Below 40 | Below 4.0 | F | Re-Appear |

**EXTERNAL EVALUATION**

## THEORY

There shall be a written semester examination at the end of each semester for all theory courses of duration of 3 hours with maximum 80 marks. The question paper pattern is as follows.

|  |  |  |  |
| --- | --- | --- | --- |
| **PART** | **TYPE OF QUESTIONS** | **MARKS** | **NUMBER OF QUESTIONS TO BE ANSWERED** |
| A | Conceptual Questions | 2 |  10 OUT OF 13 |
| B | Descriptive Question  | 8 |  5 OUT OF 8 |
| C | Problem Analysis | 5 |  4 OUT OF 7 |
|  **TOTAL 80 MARKS** |

## PRACTICAL

There shall be a written semester examination at the end of each semester for all Practical courses of duration of 3 hours with maximum 40 marks. The question paper pattern is as follows.

|  |  |  |
| --- | --- | --- |
| **SL No** | **Particulars** | **Marks** |
| 1 | Write up :Circuit Diagram ,Tabular Column, Formulae |  12  |
| 2 |  Conduction, Tabulation and Result |  18 |
| 3 | Viva Voce |  05 |
| 4 | Practical Record |  05 |
|  **TOTAL 40 MARKS** |

**BLUE PRINT**

**THEORY**

**Part A : Conceptual Questions**

**2 Marks**

UNIT 1: 3 Questions

 UNIT 2: 4 Questions

 UNIT 3: 3 Questions

 UNIT 4: 3 Questions

**Total -13 Questions Marks: 10\*2=20**

**Part B : Descriptive Questions**

**8 Marks**

UNIT 1: 2 Questions

 UNIT 2: 2 Questions

 UNIT 3: 2 Questions

 UNIT 4: 2 Questions

**Total - 8 Questions Marks: 5\*8=40**

**Part C : Problem Analysis**

**5 Marks**

UNIT 1: 1 Question

 UNIT 2: 1 Question

 UNIT 3: 2 Questions

 UNIT 4: 2 Questions

**Total - 7 Questions Marks: 4\*5=20**

#  SEMESTER 1

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | 24BSC15A | **Course Title** | ANALOG AND DIGITAL ELECTRONICS –I |
| **Course Type** | Core | **Contact Hours** | 4 Hours per Week  |
| **Credit** | 4 | **Total Hrs** | 60hrs |
| **COURSE OBJECTIVE**Provide students with learning experiences that develop broad knowledge and understanding of key concepts of electronics and equip students with advanced scientific / technological capabilities for analyzing and tackling the issues and problems in the field of Electronics**COURSE OUTCOME**

|  |  |
| --- | --- |
| **CO CODE** |  **COURSE OUTCOME**  |
| **CO1** | To understand the basics of network theorems and the semiconductor diodes and its applications |
| **CO2** | Classify and analyse the working ,characteristics and applications of Transistors and amplifiers |
| **CO3** | Understand and analyse the concept of number system ,Boolean algebra and the basic gates. |
| **CO4** | To learn the working and designing of arithmetic and digital Logic Circuits . |
| **CO5** | To design / develop / manage / operation and maintenance of sophisticated electronic gadgets / systems / processes that conforms to a givenspecification within ethical and economic constraints.. |

 |
| **UNIT I** |  **15 HOURS****Chapter 1: Network Theorems**: KCL & KVL,Voltage Divider Theorem, Current Divider Theorem Superposition, Thevenin’s, Norton’s, Maximum Power Transfer and Reciprocity Theorems. DC analysis of RC circuits, AC analysis of RLC series and parallel Resonant Circuits.**Chapter 2:PN junction diode**, Zener diode: Working, characteristics and applications.Rectifiers: Half wave and Full wave rectifiers, expressions for output voltage, ripple factor and efficiency (bridge rectifier), Shunt capacitor filter.**Chapter 3: Voltage regulator**: Line and Load regulation, Zener diode as voltage regulator – circuit diagram, load and line regulation, disadvantages. Fixed and Variable IC Voltage Regulators (78xx, 79xx, LM317), Clippers and Clampers, Voltage Multipliers. SMPS block diagram.. |
| **UNIT II** |  **15 HOURS****Chapter 4: Bipolar Junction Transistor**: Types, Construction, working and configurations, characteristics in CE mode, leakage currents, Current gains α, ß and **ᵧ** and their inter-relations, dc load line and Q point.Transistor biasing: Thermal runaway, stability and stability factor. Types of biasing, Voltage Divider Bias.**Chapter 5: Amplifier**: classification, parameters, derivation for voltage and current gain of CE amplifier using re- model. Two stage RC Coupled Amplifier – circuit, working and its Frequency Response. Concept of feedback-positive and negative- advantages and disadvantages. |
| **UNIT III** |  **15 HOURS****Chapter 6: Number System**: Decimal, Binary and Hexadecimal number systems, base conversions, representation of signed and unsigned numbers. Addition, subtraction, BCD code (8421), Gray code, error checking and correction codes, ASCII codes.Positive and negative logic**Chapter 7: Boolean Albegra :**Boolean laws, Duality Theorem, De Morgan’s Theorems, SOP and POS, Minterm, Maxterm, SSOP, SPOS, Simplification of Boolean expressions, K-Map for 3 and 4 variables**Chapter 8: Logic gates**- AND, OR, NOT, NAND, NOR, XOR & XNOR. Universal property of NOR and NAND gates.. |
| **UNIT IV** |  **15 HOURS****Chapter 9: Arithmentic Logic Circuits** : Half Adder, Full Adder, Half Subtractor, Full Subtractor. 4-bit parallel binary adder, parallel adder**Chapter 10: Digital I/O Logic Circuits**: 2-bit magnitude comparator,4-bit magnitude comparator, Encoder: 4:2 encoder, decimal to BCD priority encoder (74147). Decoder: 2:4 decoder using AND gates, 3:8 decoder using NAND gates, BCD to decimal decoder(7445), BCD to 7- Segment decoder(7446), Multiplexer: 4:1 multiplexer, 1:4-De-multiplexer (logic diagram and truth table of each) |
|  |  |

|  |  |
| --- | --- |
|  **TEXT BOOKS** 1. Robert L Boylestad, “Introductory circuit analysis”, 5th edition., Universal Book 2003.
2. R S Sedha, “A Text book of Applied Electronics”, 7th edition., S. Chand and Company Ltd. 2011.
3. A.P. Malvino, “Principles of Electronics”, 7th edition, TMH, 2011.
4. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Edn., TMH, 2011.
5. Fundamentals of Digital Circuits, Anand Kumar, 2ndEdn, PHI Learning Pvt. Ltd. 2009.

**REFERENCE BOOKS** 1. Electronic devices and circuit theory by Boylestad, Robert Nashelsky, 11th Edn., Pearson, 2013.
2. David A. Bell “Electronic Devices and Circuits”, 5th Edition, Oxford University Press, 2015.
3. Thomas L. Floyd, Digital Fundamentals, Pearson Education Asia, (1994)
4. Digital Circuits and Systems, K R Venugopal and K Shyla, Tata McGraw Hill, 2011
5. Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer,PHI Learning, 2001.
6. M. Nahvi & J. Edminister, “Electrical Circuits”, Schaum’s Outline Series, TMH, 2005
7. S. A. Nasar,” Electrical Circuits”, Schaum’s outline series, Tata McGraw Hill, 2004
8. J. Millman and C. C. Halkias, “Integrated Electronics”, Tata McGraw Hill, 2001
9. A.S. Sedra, K.C. Smith, A.N. Chandorkar “Microelectronic circuits”, 6th Edn., Oxford University Press, 2014
10. J. J. Cathey, “2000 Solved Problems in Electronics”, Schaum’s outline Series, TMG, 1991.

|  |
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| TEACHING PEDOGOGY |

Formative Assessment: through Assignments /Seminar / Case Study / Project work / Reports on - visits to industries/ exhibitions/science centre’s / active participation in Electronics competitions, etc Summative Assessment: Evaluate students' ability to apply the concepts in basic analog and digital Electronics. |

##

 **SEMESTER 1**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | 24BSC18A | **Course Title** | ANALOG AND DIGITAL ELECTRONICS –IPractical |
| **Course Type** | Core | **Contact Hours** | 4Hours per Week  |
| **Credit** | 2 | **Total Hrs** | 60hrs |
| **COURSE OBJECTIVE**Provide students with learning experiences that develop broad knowledge and understanding of key concepts of electronics and equip students with advanced scientific / technological capabilities for analyzing and tackling the issues and problems in the field of Electronics**COURSE OUTCOME**

|  |  |
| --- | --- |
| **CO CODE** |  **COURSE OUTCOME**  |
| **CO1** | To construct and verify the network theorems and the semiconductor diodes characteristics and its applications  |
| **CO2** | To construct and acquire experimental skills, analysing the transistor and amplifier characteristics  |
| **CO3** | To construct and verify logic gates circuits. |
| **CO4** | To construct and verify arithmetic and digital Logic Circuits |
| **CO5** | To design / develop / manage / operation and maintenance of sophisticated electronic gadgets / systems / processes that conforms to a givenspecification within ethical and economic constraints.. |

 |

|  |  |
| --- | --- |
| Content | 1.Demonstration Experiments: Hands on Experimental Skills and Familiarization with* 1. Electronic components
	2. Resistance in series, parallel and series-parallel
	3. Capacitors and inductors in series and parallel
	4. Multimeter and LCR meter – checking of components / measurements.
	5. Voltage sources in series, parallel and series-parallel
	6. Voltage and current dividers
	7. Measurement of Amplitude, Frequency & Phase

 difference using Oscilloscope2. Verification of Thevenin’s Theorem.3. Verification of Maximum Power Transfer.4. Verification of Superposition Theorem.5. Study of the I-V Characteristics of a P-n junction diode.6. Study of the I-V Characteristics of a Zener diode7. Study of half wave rectifier without and with shunt capacitor filter.8. Study of full wave bridge rectifier without and with shunt capacitor filter.9. Study of Zener diode as a Voltage Regulator.10. Study of Clipping, Clamping and Voltage Multiplier circuits.11.Designing and testing of fixed positive and negative voltage regulators  using 78xx and 79xx series ICs.12. Designing and testing of variable voltage regulator using IC LM317.13. Study of Transistor characteristics in CE configuration.14. Study of Voltage divider bias circuit.15. Study of single stage CE amplifier.16. Study of two-stage RC-coupled CE amplifier.17. Study of Series and Parallel Resonance circuits.18.Verification of truth tables of OR, AND, NOT, NAND, NOR, XOR and  XNOR gates using respective ICs.19. Universal property of NAND and NOR gates.20. Binary to Gray and Gray to Binary code conversion and parity checker using  XOR gates IC 7486.21. 2-bit Comparator using logic gates.22.Half Adder and Full Adder Circuits.23. Half Subtractor and Full sub tractor 24..Multiplexer & Demultiplexer Circuits.25. Encoder & Decoder circuits.Using analog simulator (LT spice, Circuit Logix, NI Multisim, Circuitmake, EasyEDA, Every Circuit, PSpice, Docircuits, etc.,) |
|  | Minimum of 10 experiments using simulation and minimum 10 hands on experiments to be performed |

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | 24BSC25A | **Course Title** | ANALOG AND DIGITAL ELECTRONICS –II |
| **Course Type** | Core | **Contact Hours** | 4 Hours per Week  |
| **Credit** | 4 | **Total Hrs** | 60hrs |
| **COURSE OBJECTIVE**: Provide students with learning experiences that develop broad knowledge and understanding of key concepts of electronics and equip students with advanced scientific / technological capabilities for analyzing and tackling the issues and problems in the field of Electronics**COURSE OUTCOME**

|  |  |
| --- | --- |
| **CO CODE** |  **COURSE OUTCOME**  |
| **CO1** | Classify and analyse the working ,characteristics and applications of Special purpose diodes, Transistors and triggering devices.  |
| **CO2** | Understand, analyse and evaluate the working , characteristics, application and design of operational amplifier , Filter ,Oscillator and Timer circuits. |
| **CO3** | Understand and analyse the working , application and design of Logic families, Digital Analog converter and Sequential Logic Circuits |
| **CO4** | Understand ,analyse and evaluate the working , application and design of Registers and counters  |
| **CO5** | To design / develop / manage / operation and maintenance of sophisticated electronic gadgets / systems / processes that conforms to a givenspecification within ethical and economic constraints.. |

 |
| **UNIT I** |  **15 HOURS****Chapter 1: Special Purpose Diode**: Varactor diode, Schottky diode, Tunnel diode - LED, LCD, Solar Cell: working and applications for each.**Chapter 2: JFET**: Types, working, characteristics of n-channel JFET, parameters and their relationships, Comparison of BJT and JFET.**Chapter 3: MOSFET**: Types, working, characteristics of n-channel MOSFET CMOS – inverter, circuit and working, IGBT construction and working. **Chapter 4: UJT**: working, equivalent circuit and characteristics, intrinsic stand-off ratio, Relaxation oscillator.**Chapter 5: SCR**: working, characteristics, equivalent circuit, applications FWR controlled rectifiers**Chapter 6:Diac and Triac**: characteristics, equivalent circuit, working and applications  |
| **UNIT II** |  **15 HOURS****Chapter 7: Op-Amp**: Differential Amplifier, Block diagram of Op-Amp, Characteristics of an Ideal and Practical Op-Amp, Open and closed loop configuration, Frequency Response, CMRR, Slew Rate.**Chapter 8: Applications of Op-Amps**: Inverting and non- inverting amplifiers, Summing amplifier, Differentiator, Integrator, Logarithmic amplifier, Comparator.**Chapter 9: Filters**: First order active Low pass, High pass and Band pass Butterworth filters.**Chapter 10: Oscillators**: Barkhausen criterion for sustained oscillations, crystal oscillators**,** Phase Shift oscillator, Wien-bridge oscillator using Op-amp.**Chapter 11: IC 555Timer**: Astable and Monostable multivibrator circuits. |
| **UNIT III** |  **15 HOURS****Chapter 12: Logic Families**: Pulse characteristics, Logic Families- classification of digital ICs. Characteristics of logic families, TTL IC terminology. CMOS NAND, Comparison of TTL and CMOS families.**Chapter 13: DAC and ADC** : Digital to Analog converter with binary weighted resistor and R-2R resistor ladder network. Analog to Digital converter: Successive approximation method **Chapter 14: Sequential Logic Circuits**: Flip-Flops - SR Latch, Level and Edge Triggered concept, Clocked RS, D, JK and T Flip-Flops. Preset and Clear operations. Race-around conditions in JK Flip- Flop. Master- Slave JK Flip-Flops. Applications of Flip-Flops. |
| **UNIT IV** | **Chapter 15: Registers and Counters**: Types of Shift Registers (up to 4-bits), Applications. Ring counter, Johnson counter, Applications. Asynchronous Counters: Logic diagram, Truth table and timing diagrams of 4-bit ripple counter, modulo-n counters, 4-bit Up-Down counter, Synchronous Counter:( 4-bit), Design ofMod 3, Mod 5 and decade Counters using K-maps. **Chapter 16: Basic Computer system**: Block diagram, Input and output devices, interfacing techniques, expansion of memory, programming techniques, flowchart, types of languages. |

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| **REFERENCE BOOKS &TEXT BOOKS** |
| **TEXT BOOKS**1. R S Sedha, “A Text book of Applied Electronics”, 7th edn., S Chand and Company Ltd., 2011
2. Robert L Boylestad, “Introductory circuit analysis”, 5th edition., Universal Book 2003.
3. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edn., Prentice Hall., 2000
4. Thomas L. Floyd, Digital Fundamentals, Pearson Education Asia, 1994
5. Digital Principles and Applications, A.P. Malvino, D P Leach and Saha, 7th

Edition, TMH, 2011.**REFERENCE BOOKS**1. Electronic Devices Conventional Current Version by Thomas L. Floyd, 10th

edition, Pearson, 20181. David A. Bell “Electronic Devices and Circuits”, 5th Edition, Oxford Univesity Press, 2015
2. Operational Amplifiers and Linear ICs, David A. Bell, 3rd Edition, Oxford University Press. 2011,
3. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, PHI Learning Pvt. Ltd. 2009
4. Digital Circuits and Systems, K R Venugopal and K Shyla, Tata McGraw Hill, 2011Series, TMG, 1991.
5. Digital Circuits and systems, Venugopal, Tata McGraw Hill. 2011
6. Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, PHI Learning. 2001
7. Digital Principles, Schaum’s Outline Series, R. L. Tokheim, TMH., 1994
8. Digital Electronics, S.K. Mandal, 1st Edition, McGraw Hill., 2010.

  TEACHING PEDOGOGY Formative Assessment: through Assignments /Seminar / Case Study / Project work / Reports on - visits to  industries/ exhibitions/science centre’s / active participation in Electronics competitions, etc   Summative Assessment: Evaluate students' ability to apply the concepts in basic  analog and digital Electronics |

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 **SEMESTER II**

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| **Course Code** | 24BSC28AP | **Course Title** | ANALOG AND DIGITAL ELECTRONICS - II Practical |
| **Course Type** | Core | **Contact Hours** | 4Hours per Week  |
| **Credit** | 2 | **Total Hrs** | 60hrs |

**COURSE OBJECTIVE**:

Provide students with learning experiences that develop broad knowledge and understanding of key concepts of electronics and equip students with advanced scientific / technological capabilities for analyzing and tackling the issues and problems in the field of Electronics

**COURSE OUTCOME**

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| **CO CODE** |  **COURSE OUTCOME**  |
| **CO1** | Construct and analyse the working ,characteristics and applications of Special purpose diodes, Transistors and triggering devices.  |
| **CO2** | Construct and analyse and evaluate the working , characteristics, application and design of operational amplifier , Filter ,Oscillator and Timer circuits. |
| **CO3** | Construct and study the working , application and design of Logic families, Digital Analog converter and Sequential Logic Circuits |
| **CO4** | Construct and study evaluate the working , application and design of Registers and counters  |
| **CO5** | To design / develop / manage / operation and maintenance of sophisticated electronic gadgets / systems / processes that conforms to a givenspecification within ethical and economic constraints.. |

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| **Syllabus 60hrs** |
| Content | 1. 1. Study of JFET characteristics – determination of parameters.
2. 2. Study of single stage JFET amplifier.
3. 3. UJT characteristics and relaxation oscillator
4. 4. SCR characteristics.
5. 5. Design of inverting and non-inverting amplifier using Op-amp & study of frequency response.
6. 6. Op-amp inverting and non-inverting adder, subtractor and averaging amplifier.
7. 7. Design and study of differentiator and integrator using op-amp for different input waveforms.
8. 8. Design and study of Wien bridge oscillator using op-amp.
9. 9.Design and study of RC phase shift oscillator using op-amp.
10. 10. Design and study of first order high-pass and low-pass filters using op-amp.
11. 11. Study of Crystal oscillator using op-amp.
12. 12. Astable multivibrator using IC-555 timer.
13. 13. Monostable multivibrator using IC-555 timer
14. 15. Study of Clocked RS and D Flip-Flops using NAND gates.
15. 16. Study of Clocked JK and T Flip-Flops using NAND gates.
16. 17. Study of mod-16 asynchronous counter using JK Flip-Flop.
17. 18. Study of decade counter using JK Flip-Flop.
18. 19. Study of 4-bit Shift Register – SISO.
19. 20. Digital to Analog converter.
20. 21. Analog to Digital converter.
21. Using analog simulator (LT spice, Circuit Logix, NI Multisim, Circuitmake, EasyEDA, Every Circuit, PSpice, Docircuits, etc.,)
 |
|  | Minimum of 10 experiments using simulation and minimum 10 hands on experiments to be performed |

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**CURRICULUM ENHANCEMENT**

* + - 1. **Value Added Courses/ Certificate Courses/ Add on Courses/ Hands on Training**
* Soldering Techniques
* PCB Designing
* E- waste management
	+ - 1. **Summer Internship/ Field work/Project**
* Summer Internship
* Field work
* Project
* Circuit Analysis
	+ - 1. **Skill Development Activity/ Seminar/ Workshop/Guest Lecture**
* Electronics Club Activity
* Quiz, e -waste Dive, Electronics Fest, Project Exhibition
* Seminar
* Guest Lecture
	+ - 1. **Self Study -Online Course from Swayam /other online resources**