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# UNIVERSITY OF MYSORE

Estd. 1916

VishwavidyanilayaKaryasoudha
Crawford Hall, Mysuru- 570 005

No.AC2(S)/151/2020-21 Dated:10.10.2022

## Notification

**Sub:-** Syllabus and Examination Pattern of Electronics (UG) (III & IV Semester) with effective from the Academic year 2022-23 as per NEP-2020.

**Ref:-** 1. Decision of Board of Studies in of Electronic (UG) meeting held on 13-09-2022.
2. Decision of the Faculty of Science & Technology Meeting held on 15-09-2022.
3. Decision of the Academic Council meeting held on 23-09-2022.

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The Board of Studies in Electronic (UG) which met on 13-09-2022 has recommended & approved the syllabus and pattern of Examination of Electronics Course (III & IV Semester) with effective from the Academic year 2022-23 as per NEP -2020.

The Faculty of Science & Technology and Academic Council at their meetings held on 15-09-2022 and 23-09-2022 respectively has also approved the above said syllabus and hence it is hereby notified.

The syllabus and Examination pattern is annexed herewith and the contents may be downloaded from the University Website i.e., www.uni-mysore.ac.in.

**Draft Approved by the Registrar**

**DeputyRegistrar(Academic)**
Deputy Registrar (Academic)
University of Mysore
Mysore-570 005

**To:-**

1. All the Principal of affiliated Colleges of University of Mysore, Mysore.
2. The Registrar (Evaluation), University of Mysore, Mysuru.
3. The Chairman, BOS/DOS, in Electronics, Manasagangothri, Mysore.
4. The Dean, Faculty of Science & Technology, DoS in Earth Science, MGM.
5. The Director, Distance Education Programme, Moulya Bhavan, Manasagangotri, Mysuru.
6. The Director, PMEB, Manasagangothri, Mysore.
7. Director, College Development Council , Manasagangothri, Mysore.
8. The Deputy Registrar/Assistant Registrar/Superintendent, Administrative Branch and Examination Branch, University of Mysore, Mysuru.
9. The PA to Vice-Chancellor/ Registrar/ Registrar (Evaluation), University of Mysore, Mysuru.
10. Office Copy.

# 3rd and 4th Semesters Syllabus for B.Sc. (Basic and Honors) in Electronics

| | | | |
|---|---|---|---|
| Program Name | **BSc in Electronics** | Semester | **Third Semester** |
| Course Title | **Programming in C and Digital Design using Verilog (Theory)** | | |
| Course Code: | **DSC. ELE 3** | No. of Credits | **4** |
| Contact hours | **60 Hours** | Duration of SEA/Exam | **2 hours** |
| Formative Assessment Marks | **40** | Summative Assessment Marks | **60** |

**Course objectives:**

After completing the course, students will be able to:

- Familiarize the difference constructs of Verilog HDL.
- Understand Verilog tasks and directives.
- Impart the concepts of Verilog HDL, Data flow and behavioral models for the design of digital systems.
- Learn C language features and realize its importance with Verilog HDL.

**Unit I** **15 Hours**

**Overview of Digital design with Verilog HDL:** Evolution of CAD, essence of HDLs, typical HDL- flow, Need of Verilog HDL, trends in HDLS.

**Hierarchical Modeling Concepts:** Top- down and bottom- up design methodology, Differences between modules and module instances, parts of a simulation, design block, Stimulus block.

**Basic concepts:** Lexical Conventions, data types, system tasks, Compiler Directives.

**Modules and Ports**: Module definition, port declaration, connecting the ports, hierarchical name referencing.

[T1: 1.1, 1.3 to 1.6, 2.1 to 2.6, 3.1 to 3.3.3 and 4.1 to 4.3]

**UNIT II** **15 Hours**

**Gate level modeling:** Modeling using basic Verilog gate primitives, Description of OR, AND and NOT basic gates, rise, fall and turn - off delays, min, max and typical delays.

**Data flow modeling**: Continuous assignments, delay specifications, expressions, operators, operands, operator types.

**Behavioral Modeling:** Structured procedures, initial and always, blocking and non-blocking statements, delay control, event control, conditional statements, multiway branching, loops.

[T1: 5.1 & 5.2, 6.1 to 6.4 & 6.5.1, 6.5.2, 7.1, 7.2, 7.4, 7.5, 7.6]

**UNIT III** **15 Hours**

**Basics of C Programming**

**Overview of C**: Developing programs in C, Parts of simple C program (Sample C programs), structure of a C program, Programming Style, character Set, C tokens, key words & Identifiers, constants, variables, data types.

**Operators and Expressions**: Arithmetic, relational, logical, assignment, increment & decrement, conditional, bitwise special operators, Arithmetic expressions, Expression evaluation-Precedence and associativity, type conversions.

**Input–Output:** Non- formatted and formatted inputs and out-put function and library functions.

[T3: Ch.2, 3, 4 & 5]

**UNIT IV** **15 hours**

**Decision making, branching & looping**: if, if-else, nested if, nested if-else, switch**,** while, for, do-while, special control statement- goto, break, continue, return, and exit.

**Arrays and Strings:** Array declaration, initialization & types of arrays (one-dimensional & two- dimensional), declaring and initializing string variables, Reading strings from terminal, Writing strings to screen, Arithmetic operations on characters, Putting strings together, comparison of two strings, String-handling functions, Table of strings.

[T3: Ch.6, 7, 8 & 9]

**Course outcomes**

At the end of the course the students will be able to:

- Understand the importance of digital design using Verilog.
- Understand the designing of digital circuits using various modeling concepts.
- Understand the basic concepts of C language and write C programs for various mathematical operations.

**Text Books:**


1. Samir Palnitkar, "Verilog HDL: A guide to digital design and synthesis", Pearson education, second edition.
2. Nazeish M Botros, "HDL Programming Fundamental: VHDL and Verilog". 2009 reprint, Dreamtech press.
3. E.Balaguruswamy, "Computing Fundamentals, and C Programming", 2nd Edition.


**Reference Books:**


1. Donald E. Thomas, Philip R. Moor by, "The verilog Hardware description language", Stringer Science + Business media, LLC, Fifth edition.
2. Michael D Ciletti, "Advanced Digital Design with the Verilog HDL", person (prentice Hall), second edition.
3. Padmanabhan, Tripura Sundari, "Design through Verilog HDL." Wieley, 2016or earlier.
4. Cyril P.R., "Fundamentals of HDL", pearson/sanguine 2010.
5. Yashavant Kanetkar, "Letus C", 18th edition Authenitc guide to „C" programming language

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|---|---|---|---|
| Program Name | **BSc in Electronics** | Semester | **Third Semester** |
| Course Title | **Programming in C and Digital Design using Verilog (Practical)** | | |
| Course Code: | **DSCP. ELE 3** | No. of Credits | **2** |
| Formative Assessment Marks | **25** | Summative Assessment Marks | **25** |
| **Note: Minimum of 5 programmes to be written and executed in each section** | | | |

**Section – A: Digital Design Using Verilog**

1) Realization of gates using verilog.
2) Simplification of Boolean expressions and realization using verilog.
3) Realize Adder/Subtractor (Full/Half) circuits using verilog data flow description.
4) Realize the following code converters using verilog.
   a) Gray to Binary and vice-versa.
   b) Binary to excess 3 and vice-versa.
5) To realize 4-bit ALU using verilog.
6) To realize using verilog description: 8:1 multiplexer, 8:3 encoder.
7) To realize using verilog description: 1:8 Demultiaplexer, 3:8 decoder.
8) To realize using verilog description flip flops:
   a) JK - type (b) SR type (c) T-type (d) D-type.
9) To realize counters: Up/down (BCD & Binary) using verilog description.
10) Modeling of Universal shift registers.

**Section - B: List of C–Programs**

1) Programme to perform arithmetic operation (Addition or subtraction).
2) Programme to read radius of a circle and find area and circumference of circle.
3) Programme to read three numbers and find the biggest of three (using nested-if).
4) Programme to calculate factorial of a given number.
5) Programme to read percentage of marks and to display appropriate message.
6) Programme to check for prime number.
7) Programme to generate n-primes.
8) Programme to find roots of quadratic equation (Demonstration of switch case statement).
9) Programme to read and display matrix elements.
10) Programme to read and display array elements.
11) Find the gross salary of an employee
12) Remove all vowels from a string

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|---|---|---|---|
| Program Name | **BSc in Electronics** | Semester | **Fourth Semester** |
| Course Title | **Electronic Communication-I (Theory)** | | |
| Course Code: | **DSC. ELE 4** | No. of Credits | **4** |
| Contact hours | **60 Hours** | Duration of SEA/Exam | **2 hours** |
| Formative Assessment Marks | **40** | Summative Assessment Marks | **60** |

**Course Objectives:**

On completion of the course, Student will be able:

- To understand the communication system, principle and working of communication system, means and medium of communication.
- To understand the principle and working of different modulation and demodulation techniques.
- To understand the Principle and working of Antenna, Waveguides, Transmission lines, and RADAR
- To understand the basics of Satellite and Optical Fiber communication

**Unit-I** **15 Hours**

**Introduction:** Brief idea of frequency allocation for radio communication system. Electromagnetic communication spectrum, EM band designation and usage. Block diagram of an electronic communication system.

**Propagation of EM waves:** Introduction, Ground Wave propagation, Sky-wave propagation Space-wave propagation.

**Transmission lines:** Basic principles, characteristic impedance, losses in transmission lines, standing waves.

**Noise:** Introduction, Internal noises – Thermal agitation Noise, Shot Noise, Transit-time Noise, External noises - Atmospheric noise, Extra-terrestrial noise, Industrial noise, signal to noise ratio (S/N), noise figure.

**UNIT-II** **15 Hours**

**Modulation**: Introduction need and types of modulation.

**AM:** Representation of AM, Theory of AM, frequency spectrum of AM wave, power and current calculation, modulation by several sine waves. AM generation using Modulated transistor amplifiers.

**SSB:** Introduction, suppression of carrier - Balanced modulator, suppression of unwanted sideband - Filter system, phase shift method, vestigial sideband transmission.

**AM Receiver** – Block diagram and working of tuned radio frequency receiver and Super-heterodyne receiver and Simple diode detector.

**FM and PM:** Theory of FM and PM, frequency spectrum of FM, bandwidth, phase modulation, comparison of AM, FM and PM. FM generation using Direct method.

**FM Receiver**: Block diagram and working of Super-heterodyne receiver, Single slope FM Detector.

**UNIT-III** **15 Hours**

**Antennas:** Introduction, EM radiation, resonant and non-resonant antennas, antenna gain and effective radiated power, field intensity, antenna resistance, bandwidth, beam width, polarization, antenna with parabolic reflector. Geometry and properties of parabolic reflector.

**Waveguides:** Introduction, working principle of rectangular waveguide and circular waveguide.

**Satellite Communication**: Introduction, Kepler's Laws, Satellite Orbits, Geostationary Satellites, Attitude control, Station keeping, Antenna Look angles, Satellite classifications, Transponders(c-band). Earth station.

**UNIT-IV** **15 Hours**

**Fiber Optic Communication:** Introduction, block diagram, fiber types, cable construction, Light propagation, Optical fiber configuration: Single mode, step index fiber, multi-mode step index fiber, multimode graded index fiber, comparison, acceptance angle and cone, Numerical Aperture, **Fiber losses:** Signal degradation in optical fibers, attenuation, scattering losses, radiative losses, absorption losses, core and cladding losses. Construction, working principle, and application of LEDs and Laser diodes, PIN diodes and Avalanche-photo diodes.

**RADAR:** Block diagram and operations, range equation, block diagram and working of CW RADAR. Applications and limitations of RADAR.

**Course outcomes:**

- After studying this course, students will be able to:
- Know the basic concept of Analog Communication.
- Understand the principle of Analog Communication.
- Know the Various modulation techniques involved in radio communication before the transmission.
- Know different detection process involved in receiver.
- Basic knowledge about Satellite Communication, Optical fiber communication system and RADAR.

**Reference Books:**


1. George Kennedy, "Electronic Communication Systems," TMH, 4th Edition, 1999
2. D. Roddy and J. Coolen, "Electronic Communications," Pearson Education India, 4th Edition.
3. Tomasi, "Advanced Electronics Communication Systems," 6th Edition, Prentice Hall.
4. William Schweber, "Electronic communication systems, PHI, 4th Edition, 2002.
5. Dennis Roddy and Coolen, "Satellite Communication," 4th edition, McGraw Hill, 2006.
6. B.P. Lathi, "Modern Digital and Analog Communication Systems," 4th Edition, Oxford University Press, 2011.
7. Frenzel, "Principles of Electronic communication systems," 3rd Edition, McGraw Hill
8. S. Haykin, "Communication Systems," Wiley India, 2006.

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|---|---|---|---|
| Program Name | **BSc in Electronics** | Semester | **Fourth Semester** |
| Course Title | **Electronic Communication-I (Practical)** | | |
| Course Code: | **DSCP. ELE 4** | No. of Credits | **2** |
| Formative Assessment Marks | **25** | Summative Assessment Marks | **25** |
| **Note: Minimum of 10 Experiments are to be performed using hardware and simulation.** | | | |

List of Experiments

1. Amplitude modulator and to determine the modulation index.
2. Diode detector and to determination of signal frequency
3. RF amplifier and to determine the mid band gain and bandwidth
4. Frequency Modulator to determine the Modulation Index
5. AGC circuit for AM Detector
6. Frequency mixer and to determine the output frequency for different input frequencies
7. Class C Tuned Amplifier
8. Radiation pattern of LED
9. Frequency Multiplier
10. IF Amplifier – determination of IF from graph
11. To study the intensity variation of optical fiber
12. FM transmitter and receiver
13. To Study the Pre-Emphasis and De-Emphasis Circuit
14. To determine the numerical aperture and losses in OFC
15. Analog optic fiber link- frequency response

# 3rd and 4th Semesters Syllabus for B.Sc. (Basic and Honors) in Electronics

## Open Elective Papers

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|---|---|---|---|
| Program Name | **BSc in Electronics** | Semester | **Third Semester** |
| Course Title | **Fundamentals of Electronics. (Theory)** | No. of Credits | **3** |
| Course Code: | **OE.ELE 3.1** | Contact hours | **45 Hours** |
| Formative Assessment Marks | **40** | Summative Assessment Marks | **60** |
| **OE Paper is to be offered for the Students other than Science stream** | | | |

**Unit-I** **15 Hours**

**Passive Components:** Overview of passive components-Fabrication, Types, colour coding, and applications.

**Transformer**: Principle, construction and working, turn ratio, Types of transformers (Step up and Step down).

**Semiconductors**: Intrinsic and extrinsic semiconductors.

**Diodes**: P-N Junction theory, V-I Characteristics, Rectifiers, Clippers, and Clampers (Qualitative analysis only).

**Special diodes**: Zener diode, LED and LDR; Construction, working and applications.

**Unit-II** **15 Hours**

**Bipolar Junction Transistor (BJT):** Physical structures, modes of operations, characteristics. Transistor as an amplifier, RC- Coupled amplifier, Darlington pairs, Transistor as a switch.

**Field Effect Transistor (FET):** Physical structures and modes of operations, Characteristics.

**Electronic Instruments**: Ammeter, Voltmeter- design and construction, analog millimeter, Digital millimeter, function generator (Qualitative analysis only). Cathode Ray Tube (CRT), Cathode Ray Oscilloscope (CRO)- Block diagram.

**Digital fundamentals:** Binary numbers, signed binary numbers, binary to decimal and Decimal to Binary conversion, Binary additions, and Subtractions,

Logic gates: AND, OR and NOT gates.

**Unit-III** **15 Hours**

**Component and Device Applications:** To design and Construct at least Ten of the following circuits.

1. V –I characteristics of semiconductor diode.
2. V –I characteristics of Zener diode. Determination of breakdown voltage.
3. V –I characteristics of LED. Determination of Cut-in voltage.
4. Characteristics of LDR.
5. Half wave rectifier; with and without filter. Determination of ripple factor.
6. Full wave rectifier (Centre tap/ Bridge); With and without filter, determination of ripple factor.
7. Zener diode voltage regulator; determination of line and load regulation.

8. Clipping circuits; Positive clipper, Negative Clipper, Biased positive and negative clippers. Trace the input and output waveforms.
9. Clamper circuits: Positive clamper, Negative Clamper. Trace the input and output waveforms.
10. Input and output characteristics of a transistor in Common Emitter configuration, determine of current gain $\beta$.
11. Input and output characteristics of a transistor in common base configuration, determine the current gain $\alpha$.
12. Transistor as a switch.
13. Construct RC coupled amplifier. Plot the frequency response curve and determine the bandwidth.
14. V-I Characteristics of Common Source (CS) configuration of FET. Determine the current gain.
15. Construct an ammeter to read (0-1ma) of current.
16. Construct a voltmeter to read (0-1volt).
17. Measure Vp, Vpp and Time period of Sine and Square waves using CRO.
18. Construct OR, AND and NOT gates using diodes and transistors. Verify the truth tables.
19. Verify the truth tables OR, AND and NOT gates using Integrated Chips (ICs).
20. Construct four-bit binary adder.

**Reference Books**


1 "A Textbook of Electronics" R. S. Sedha; S Chand and Co, 3rd edition.

2 "Principles of Electronics", V K Mehta and Rohit Mehta, S Chand and Co

3 "Basic Electronics", B L Theraja, S Chand and Co, 3rd edition 2012

4 "Electronic Devices", Devid Bell, Reston Publishing Company.

5 "Electronic Devices and Circuit Theory", Pearson edition.

6 "Digital Principles and Applications", Malvino and Leach

7 "Electronics text lab manual", Paul B Zabar

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|---|---|---|---|
| Program Name | **BSc in Electronics** | Semester | **Third Semester** |
| Course Title | **Robotics (Theory)** | No. of Credits | **3** |
| Course Code: | **OE.ELE 3.2** | Contact hours | **45 Hours** |
| Formative Assessment Marks | **40** | Summative Assessment Marks | **60** |
| **OE Paper is to be offered for the Students other than Electronics stream** | | | |

**Course Objectives:**

On completion of the course students are able to:

- Understand the basic concepts of Robotics
- Understand the applications of Robots in various fields

**Unit-I** **15 Hours**

Definitions of Robots, Robotics, Motivation, A Brief History of Robotics, A Robot System, Interdisciplinary Areas in Robots, Classification of Robots, Introduction to embedded system, Understanding Embedded System, Overview of basic electronics and digital electronics. Microcontroller vs. Microprocessor, Common features of Microcontroller. Comparison between the two Different types of microcontrollers. Sensors, Classification of sensors (contact & non- contact), characteristics of sensors, Touch sensor, Position sensor, optical sensor, IR, PIR, Ultrasonic, temperature, displacement sensor.

**Unit-II** **15 Hours**

Getting Started with Programming platform of Robots: Installation of IDE, Pin configuration and architecture of Microcontroller (Atmel series/arduino), Device and platform features. Concept of digital and analog ports. Familiarizing with Interfacing Board, Introduction to Embedded C platform, Review of Basic Concepts, Arduino data types, Variables and constants , Operators , Control Statements , Arrays Functions, I/o Functions ,Pins Configured as INPUT , Pins Configured as OUTPUT, Incorporating timedelay() function, delayMicroseconds() function, millis() function , micros() function

**Unit-III** **15 Hours**

Programming different types of Robots:

1. Temperature & Humidity controlled Robot (Fan Regulation, thermostat)
2. Infra-Red signal Controlled Robot( Measuring the speed of the vehicle)
3. Ultra sonic signal operated Robot( automatic Tap system/Hand Drier/Floor drier)
4. Obstacle Follower & avoider Robot

**Course outcome:**

After completion of the course the students gets awareness of Robots and their uses in different fields.

**Reference Books**

1. Fundamentals of Robotics - D K Pratihar
2. Robotics Simplified: An Illustrative Guide to Learn Fundamentals of Robotics - Dr. Jisu Elsa Jacob, Manjunath N.
3. Introduction to Robotics - John Craig, Fourth Edition.
4. Arduino Robotics - John-David Warren and Josh Adamsduino.
5. Programming in 24 Hours - Richard Blum.
6. Getting Started with Arduino: The Open Source Electronics Prototyping Platform Book - Massimo Banzi and Michael Shiloh.

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|---|---|---|---|
| Program Name | **BSc in Electronics** | Semester | **Third Semester** |
| Course Title | **Medical Electronics (Theory)** | No. of Credits | **3** |
| Course Code: | **OE. ELE 3.3** | Contact hours | **45 Hours** |
| Formative Assessment Marks | **40** | Summative Assessment Marks | **60** |
| **OE Paper is to be offered for the Students other than Electronics stream** | | | |

**Unit-I** **10 Hours**

**Fundamental Electronics:** Amplifiers**,** Frequency response, signal generation. Different types of transducers & their selection for biomedical applications. Electrode theory, selection criteria of electrodes & different types of electrodes Bio electric amplifiers-instrumentation amplifiers isolation amplifiers-chopper stabilized amplifiers.

**Unit-II** **11 Hours**

**Introduction to Bio-medical instruments:** Origin of bio-electric signals, active & passive transducer for medical application –Electrocardiography-waveform-standard lead systems, typical ECG amplifier, EEG electrode –frequency bands – recording systems ,EMG basic principle-block diagram of a recorder.

**Unit-III** **11 Hours**

**Medical Imaging:** Nature and production od X-rays, Improving X-ray images, Computerized axial tomography, Using ultrasound in medicine, Ultrasound scanning, Magnetic resonance imaging PET and SPECT Imaging

**Unit-IV** **13 Hours**

**Biomedical Signal Processing:** Fundamentals of signal processing, digital image, transforming image, image enhancement, image Segmentation, image compression, image restoration and reconstruction of medical images. Demonstration using MATLAB.

**Course Outcome:** Students get awareness about different medical electronic equipment's.

**Reference Book**

1. Biomedical Instrumentation and measurements - L Cromwell, F J Weibell and Eapfeiffer, PHI Publications.

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|---|---|---|---|
| Program Name | **BSc in Electronics** | Semester | **Third Semester** |
| Course Title | **Application of Electronics-1 (Theory)** | No. of Credits | **3** |
| Course Code: | **OE. ELE 3.4** | Contact hours | **45 Hours** |
| Formative Assessment Marks | **40** | Summative Assessment Marks | **60** |
| **OE Paper is to be offered for the Students other than Science stream** | | | |

**Course objectives:**

- Students will be able to identify electronic components.
- Able to understand the working of biomedical equipment and power supply.

**Unit-I** **12 Hours**

**Basic Electronics:** Introduction to circuit components- Resistors, capacitors, inductor, transformer, diode and transistor; Symbols, pimples; LED and LCD display, relay, fuse, switches, wires; AC and DC applications.

**Unit-II** **13 Hours**

**Applied Electronics:** Electronic instruments: DMM, CRO, Biomedical instruments-ECG, EEG, EMG, pH meter, X-ray, sphygmomanometer, Glucometer, Digital thermometer. Sensor-OMR, MICR, Scanner, Barcode reader.

**Unit-III** **10 Hours**

**Power Supplies:** Dc power supply, Rectifiers-principle, Types of Inverter and UPS, Adopter and SMPS, Mobile chargers.

**Unit-IV** **10 Hours**

Electronic calculators- Types, Functions of Basic calculators-block diagram, Key pad using, use of calculator.

**Course outcome:** Students get awareness about different applications of electronic equipment's.

**Reference Books:**

1. Basic Electronics-Solid State – B L Theraja - S Chand and Company Ltd

2. Electronic Devices And Circuit Theory – Robert L Boylestad and Louis Nashelsky ( PHI)

| | | | |
|---|---|---|---|
| Program Name | **BSc in Electronics** | Semester | **Fourth Semester** |
| Course Title | **IOT and Applications (Theory)** | No. of Credits | **3** |
| Course Code: | **OE.ELE 4.1** | Contact hours | **45 Hours** |
| Formative Assessment Marks | **40** | Summative Assessment Marks | **60** |
| **OE Paper is to be offered for the Students other than Electronics stream** | | | |

**Course objectives:**

After studying this course, students will be able to:

- Be familiarizing with IOT applications.
- Understand the wireless technology.

**Unit-I** **12 hours**

Fundamentals of IoT: Introduction, History of IoT ,Definitions & Characteristics of IoT, IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT, Components of an IoT Solution, IoT frameworks, IoT and M2M, Open Source and Commercial Examples, Competing Standards for IoT

**Unit-II** **12 hours**

Sensors Networks : Definition, Traditional Data Storage, Analog and Digital I/O Basics, Types of Sensors, Types of Actuators, Examples and Working, IoT Development Boards: Arduino IDE and Board Types, RaspberriPi Development Kit, RFID Principles and components, Wireless Sensor Networks: History and Context, The node, Connecting nodes, Networking Nodes, WSN and IoT.

**Unit-III** **11 hours**

Wireless Technologies for IoT: WPAN Technologies for IoT: IEEE 802.15.4, Zigbee, HART, NFC, Z-Wave, BLE, Bacnet, Modbus. IP Based Protocols for IoT IPv6, 6LowPAN, RPL, REST, AMPQ, CoAP, MQTT. Edge connectivity and protocols

**Unit-IV** **10 hours**

Data Handling& Analytics: Introduction, Bigdata, Types of data, Characteristics of Big data, Data handling Technologies, Flow of data, Data acquisition, Data Storage Applications of IoT: Home Automation

**Course outcome:** Students get awareness about an internet usage.

**Reference Books**


1. Internet of Things - Vasudevan, Nagrajanand and Sundaram, Wiley India.
2. Internet of Things - Srinivasa K G, Cengage Learning, India 2017.
3. IoT fundamentals: Networking Technologies, Protocols and uses cases for the Internet of things - David Hanes, Gonzalo Salgueiro, Patrick Grosstete, Robert Barton, Jerome Henry, 1st Edition, Pearson Education.
4. IoT Fundamentals - David Hence et al, Cisco press.

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|---|---|---|---|
| Program Name | **BSc in Electronics** | Semester | **Fourth Semester** |
| Course Title | **Application of Electronics-2 (Theory)** | No. of Credits | **3** |
| Course Code: | **OE.ELE 4.2** | Contact hours | **45 Hours** |
| Formative Assessment Marks | **40** | Summative Assessment Marks | **60** |
| **OE Paper is to be offered for the Students other than Science stream** | | | |

**Course objectives:**

- Students will become familiar with applications of electronics communication instruments.
- Able to understand the concept of EDUSAT, CCTV and ATM.
- Able to understand the functioning of EVMs.

**Unit-I** **12 Hours**

**Introduction to Advanced Communication:** Radio, TV- principles, block diagram & applications; OFC applications and advantages; Embedded system – Smart card, SIM card; Mobiles- Bock diagram &applications

**Unit-II** **12 Hours**

**Advanced Electronics:** CCTV camera, ATM- principles, block diagram & applications; Electronic voting Machine (EVM) - CU, BU, VVPAT.

**Unit-III** **11 Hours**

**Application of Satellite:** Type, EDUSAT, TV & Internet-modem, Wi-Fi.

**Unit-IV** **10 Hours**

**E-waste management:** Identification, segregation, disposal.

**Reference Books:**

1. Basic Electronics-Solid State – B L Theraja - S Chand And Company Ltd.

| | | | |
|---|---|---|---|
| Program Name | **BSc in Electronics** | Semester | **Fourth Semester** |
| Course Title | **Augmented and Virtual Reality (Theory)** | No. of Credits | **3** |
| Course Code: | **OE.ELE 4.3** | Contact hours | **45 Hours** |
| Formative Assessment Marks | **40** | Summative Assessment Marks | **60** |
| **OE Paper is to be offered for the Students other than Electronics stream** | | | |

**Unit-I** 10 Hours

**Introduction to Virtual Reality**: Defining Virtual Reality, History of VR, Human Physiology and Perception, Key Elements of Virtual Reality Experience, Virtual Reality System, Interface to the Virtual World-Input & output- Visual, Aural & Haptic Displays, Applications of Virtual Reality.

**Unit-II** 10 Hours

**Augmented Reality**: Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality.

**Unit-III** 12 Hours

**The Geometry of Virtual Worlds &The Physiology of Human Vision:** Geometric Models, Changing Position and Orientation, Axis-Angle Representations of Rotation, Viewing Transformations, Chaining the Transformations, Human Eye, eye movements & implications for VR. #Exemplar/ Case Studies Sweeping coverage of eye movements

**Unit-IV** 13 Hours

**Visual Perception & Rendering and Motion & Tracking:** Visual Perception - Perception of Depth, Perception of Motion, Perception of Color, Combining Sources of Information Visual Rendering -Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions, Improving Latency and Frame Rates #Exemplar/ Case Studies Automatic stitching of panoramas in Virtual Reality. Motion in Real and Virtual Worlds-Velocities and Accelerations, The Vestibular System, Physics in the Virtual World, Mismatched Motion and Vection Tracking- Tracking 2D & 3D Orientation, Tracking Position and Orientation, Tracking Attached Bodies.

**Reference Books**


1. Computing Fundamentals and C Programming - E. Balagurusamy, Tata McGraw-Hill, 2008.
2. Augmented and Virtual Reality - Anand R, Khanna Publishing House, Delhi.
3. How to Solve by Computer - R.G.Dromey, Pearson Education, Inc, Reprint 2009.
4. Let Us C - Yashavant P. Kanetkar, Fifth Edition, Sridhara Publication, India, 2008.