# Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

## Name of Program: Bachelor of Technology in Electronics & Communication with Specialization in IOT

| SUBJECT CODE | Category | SUBJECT NAME | TEACHING & EVALUATION SCHEME | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | THEORY | | | PRACTICAL | | Th | T | P |
| | | | END SEM University Exam | Two Term Exam | Teachers Assessment* | END SEM University Exam | Teachers Assessment* | | | |
| ML301 | EC | Environment and Energy Studies | 60 | 20 | 20 | 0 | 0 | 3 | 0 | 0 |

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; Q/A – Quiz/Assignment/Attendance, MST Mid Sem Test.

Course Educational Objectives: The students will be able to:

1. To understand sources of information required for addressing environmental challenges
2. To identify a suite of contemporary tools and techniques in environmental informatics
3. To apply literacy, numeracy and critical thinking skills to environmental problem-solving

Course Outcomes: The students should be able to:

1. Apply the principles of ecology and environmental issues that apply to air, land and water issues on a global scale.
2. Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.
3. Demonstrate ecology knowledge of a complex relationship between predators, prey, and the plant community.

**Unit I**

**Environmental Pollution and Control Technologies:** Environmental Pollution & Control: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and industrial pollution, Ambient air quality standards. Water pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid Waste management composition and characteristics of e - Waste and its management. Pollution control technologies: Wastewater Treatment methods: Primary, Secondary and Tertiary.

**Unit II**

**Natural Resources:** Classification of Resources: Living and Non - Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problem, Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, Land resources: Forest resources, Energy resources: growing energy needs, renewable energy source, case studies..

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**Unit III**

**Ecosystems:** Definition, Scope and Importance ecosystem. Classification, Structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Energy flow in the ecosystem, Biogeochemical cycles, Bioaccumulation, ecosystem value, devices and carrying capacity, Field visits.

**Unit IV**

**Biodiversity and its Conservation:** Introduction - Definition: genetic, species and ecosystem diversity. Bio-geographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - . Biodiversity at global, National and local levels. - . India as a megadiversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, manwildlife conflicts; Conservation of biodiversity: In-situ and Exsitu conservation. National biodiversity act.

**Unit V**

**Environmental Policy, Legislation & EIA:** Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan(EMP)

**Suggested Readings:**


1. Agarwal, K.C.,(latest edition).Environmental Biology, Bikaner :Nidi Pub. Ltd.,
2. Brunner R.C.(latest edition) Hazardous Waste Incineration, McGraw Hill Inc.
3. Clank R.S. .,(latest edition. Marine Pollution, Clanderson Press Oxford (TB).
4. Environmental Encyclopedia, Jaico Pub. Mumbai,
5. De A.K(latest edition) Environmental Chemistry, Wiley Wastern Ltd.
6. ErachBharucha(2005).Environmental Studies for Undergraduate Courses by for University Grants Commission.
7. R. Rajagopalan(2006).Environmental Studies. Oxford University Press.
8. M. AnjiReddy(2006).Textbook of Environmental Sciences and Technology. BS Publication.
9. Richard T. Wright(2008).Environmental Science: towards a sustainable future PHL Learning Private Ltd. New Delhi.
10. Gilbert M. Masters and Wendell P. Ela .(2008).Environmental Engineering and science. PHI Learning Pvt Ltd.
11. Daniel B. Botkin& Edwards A. Keller(2008).Environmental Science Wiley INDIA edition.
12. Anubha Kaushik(2009), Environmental Studies. New age international publishers.


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| BTEC302 | EC | Network Analysis & Synthesis | 60 | 20 | 20 | 30 | 20 | 3 | 1 | 2 | 5 |

**Legends**: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Clas given that no component shall exceed more than 10 marks.

**Course Educational Objectives (CEOs):**
Being one of the fundamental courses of Electronics stream its prime objective is to make the studen capable of analyzing given electrical network composed by passive element and some active elemen To make the students learn how to synthesize an electrical network from a given impedance/admittanc function.

**Course Outcomes (COs):**
After completion of this course the students are expected to be able to demonstrate followin knowledge, skills and attitudes:

1. Apply the fundamental concepts in solving and analyzing different Electrical networks.
2. Select appropriate and relevant technique for solving the Electrical network in different conditions.
3. Apply mathematics in analyzing and synthesizing the networks in time and frequency domain.
4. Estimate the performance of a particular network from its analysis.

**Syllabus**

**UNIT I** **9 Hrs**

**Network Theorems:** Preliminaries of Electrical elements R, L, C, and circuits; Kirchhoff's laws Basi elements: Voltage and current sources, Linearity of elements, Power and energy in electrical element Circuit Analysis Methods: Nodal analysis, Mesh analysis, Circuit Theorems: Thevenin's theorem Norton's theorem, Maximum power transfer theorem, Superposition theorem, Reciprocity theorem.

**UNIT II** **8 Hrs**

**Transient Analysis:** Source free RL and RC circuits, Elementary function unit step, unit ramp, uni impulse function and synthesis from source free parallel and series RLC circuit, complete response o the RLC circuit, lossless LC circuit.

**UNIT III** **8 Hrs**

**Frequency Domain Analysis:**. The phasor concept, sinusoidal steady state analysis; Resonance Network theorem in ac domain. AC circuit power analysis, Laplace transform: Application in circui analysis, frequency response of simple passive filters.

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**UNIT IV**

**Two Port Networks:** Z, Y, h and ABCD parameters, analysis of interconnected (magnetically couple **9 Hrs** two port networks. Transfer function, immitance function.

**UNIT V**

**Network Synthesis:** Positive real function, Hurwitz polynomial LC, RL, RC, and RLC network syn- **10 Hr** thesis, Foster and Cauer network realization, Brune's method, Synthesis-Coefficient.

**Text Books:**


1. M.E. Van Valkenburg, Network Analysis, Pearson Education India; 3rd edition. 2015.
2. S P Ghosh A K Chakraborty, Network Analysis & Synth. Tata McGraw-Hill Education, 7st editic 2015.
3. Franklin F. Kuo, Network analysis and synthesis, Wiley publication, 2nd Edition 2013.


**References:**


1. Gordon J. Alexander and Matthew N.O. Sadiku, Fundamentals of Electric Circuits, McGraw-Hi Education; 5th edition. 2013
2. Jack Ellsworth Kemmerly and William H. Hayt, Engineering Circuit Analysis, McGraw-Hi Education; 8th edition. 2013
3. Pen-Min Lin and Raymond A DeCarlo, Linear Circuit Analysis, Oxford university press, 2nd editio 2012
4. http://www.nptelvideos.in/2012/11/networks-and-systems.html


**List of Experiments:**

1. Introduction of Simulation software Tina-TI.
2. To verify Thevenin's Theorem and Norton's Theorem.
3. To verify Superposition Theorem and Reciprocity Theorem.
4. To verify Maximum Power Transfer Theorem.
5. To determine Open Circuit and Short Circuit parameters of a Two Port Network.
6. To determine A, B, C, D parameters of a Two Port Network.
7. To determine h-parameters of a Two Port Network.
8. To find Frequency Response of RLC Series Circuit RLC parallel Circuit.
9. To determine resonance and 3dB frequencies.
10. To determine charging and discharging times of Capacitors.

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| | | | END SEM University Exam | Two Term Exam | Teachers Assessment* | END SEM University Exam | Teachers Assessment* | | | | |
| BTEC303 | EC | Electronic Measurement & Instrumentation | 60 | 20 | 20 | 30 | 20 | 3 | 1 | 2 | 5 |

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***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

**Course Educational Objectives (CEOs):**
Student will be able to identify the different latest measurement techniques available for specific engineering applications, understand the errors in measurements and their rectification and also understand the construction and working of different types of Analog and Digital Instruments.

**Course outcomes**

1. An ability to understand the different types of Analog and Digital Instruments.
2. An ability to define the errors and their elimination.
3. An ability to measure different quantities like voltage, current, resistance etc
4. An ability to understand principle and working of various instruments.
5. An ability to operate different measuring instruments like Multimeter, CRO, DSO, Transducers etc

**Syllabus**

**UNIT I** **9 Hrs**

Principles of Measurements – Principles of Measurement, Static/dynamic characteristics of measurement systems, Types of Errors, Statistical analysis, Measurement of resistance, inductance and capacitance – Wheatstone's bridge, Maxwell's bridge, Hay's bridge, De Sauty's bridge, Schering Bridge Wien's bridge, Wagner's earth connection, Q meter.

**UNIT II** **8 Hrs**

Analog and Digital Measuring Instruments – Comparison of Analog & Digital techniques, Analog Instruments – DC ammeters, Multirange voltmeter, AC voltmeter using Rectifiers – Half wave and full wave, Chopper type, Peak responding and True RMS voltmeters, Series and Shunt Type Ohmmeter, Digital Instruments – Digital voltmeter, Multimeter.

**UNIT III** **9 Hrs**

Oscilloscopes – Introduction, CRT, Principle of signal display, Dual Trace & Dual Beam Oscilloscopes, Measurement of voltage, frequency and phase by CRO, Sampling Oscilloscope, Storage Oscilloscope – Analog and Digital Storage Oscilloscopes, DSO Applications.

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**UNIT IV** **10 Hrs**

Transducers – Introduction, Electrical transducers, Resistive transducer, Resistive Strain gauges, Resistance thermometer, Inductive transducer, LVDT & RVDT, Thermistor, Piezoelectric transducer, Photoelectric transducer, Photovoltaic transducer, Temperature transducers-RTD, Thermocouple.

**UNIT V** **9 Hrs**

Signal Generators & A/D, D/C Converters – Sine Wave Generator, Sweep Frequency Generator, Function Generator, Pulse and Square wave Generator,
D/A conversion – Variable Resistance network, Binary Ladder, R/2R ladder DAC, A/D conversion – Successive approximation method, Flash type and dual slope,

**Text Books:**

1. H. S. Kalsi, "Electronic Instrumentation", Tata McGraw Hill Publishing Company Ltd., Third Edition, 2017.
2. A.K.Sawhney, "Electronic Instrumentation", Dhanapat Rai & Sons, 2013.

**References:**

1. Albert.D. Helfrick and William. D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", Pearson education, 2016.
2. A.J.Bouwens, "Digital Instrumentation", McGraw Hill, 1986.

**List of Experiment:**

1. To study and test the operation of different types of Ammeters and Voltmeters.
2. To learn the technique of measurement of Inductance by using Maxwell's bridge.
3. To learn the technique of measurement of Inductance by using Hay's bridge.
4. To learn the technique of measurement of Capacitance by using Schering's bridge.
5. Learning the techniques of measurement of Q Factor by using Q Meter.
6. Demonstration of Cathode Ray Oscilloscope.
7. To study the use of CRO for measurements
8. To learn the construction and operation of LVDT.
9. To study Load measurement using Strain Gauge.
10. Study of Function Generator.

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| | | | END SEM University Exam | Two Term Exam | Teachers Assessment* | END SEM University Exam | Teachers Assessment* | | | | |
| BTEC305 | EC | Electronic Circuits | 60 | 20 | 20 | 30 | 20 | 3 | 1 | 2 | 5 |

**Legends**: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

**Course Educational Objectives (CEOs):**
The objective of this course is to- Use abstractions to analyze and design simple electronic circuits and also design and construct circuits, take measurements of circuit behavior and performance, compare with predicted circuit models and explain discrepancies.

**Course Outcomes (COs):**
Students who are successful in this course will be able to:
1. Understand the basic physics of carrier transport in bulk semiconductors and real device structures.
2. Understand the fundamentals of operation of the main semiconductor electronic devices.
3. Understand the basic parameters of electronic devices, their performance, and limiting factors.
4. Understand the basic principles of electronic device.

## Syllabus:

**UNIT I** **9 Hrs.**

**Physical Electronics:** Electrons and holes in semiconductors, Carrier Statistics, Energy bands i intrinsic and extrinsic silicon; Mechanism of current flow in a semiconductor; Carrier transpor diffusion current, drift current, mobility and resistivity; Generation and recombination of carrier Poisson and continuity equations, Hall Effects.

**UNIT II** **10 Hrs**

**PN junction diode:** PN junction diode in forward and reverse bias, temperature dependence of V characteristics, diode resistances, diode junction capacitance. Types of diodes: Zener Diode, Varact Diode, Tunnel Diode, PIN Diode, Schottky Diode, LED and Photo Diodes, Switching characteristics diode.

**Bipolar junction transistor:** Construction, basic operation, current components and equations, CI CE and CC configuration, input and output characteristics, Early effect, Region of operations: activ cut-off and saturation region. BJT as an amplifier. Ebers-Moll model, Power dissipation in transist (Pd, max rating), Photo transistor.

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**UNIT III** **9 Hrs.**

**Transistor biasing circuits and analysis:** Introduction, various biasing methods: Fixed bias, Self bias, Voltage Divider bias, Collector to base bias, Load-line analysis: DC and AC analysis, Operating Point and Bias Stabilization and Thermal Runaway. Transistor as a switch.

**UNIT IV** **10 Hrs.**

**Small Signal analysis:** Small signal Amplifier, Amplifier Bandwidth, Hybrid model, analysis of transistor amplifier using h-parameter, Multistage Amplifier: Cascading amplifier, Boot-strapping Technique, Darlington amplifier and cas-cade amplifier, coupling methods in multistage amplifier, Low and high frequency response, Hybrid $\pi$ model, Current Mirror circuits.

**Large Signal analysis and Power Amplifiers**: Class A, Class B, Class AB, Class C, Class D, Transformer coupled and Push-Pull amplifier

**UNIT V** **10 Hrs.**

**FET:** JFET- Construction, n-channel and p-channel transistors, drain and transfer characteristics, parameters, Equivalent model and voltage gain, analysis of FET in CG, CS and CD configuration. Enhancement and Depletion MOSFET drain and transfer Characteristics.

**Uni-junction Transistor (UJT):** UJT - Principle of operation, characteristics, UJT relaxation oscillator, PNPN Diode and its characteristics,

**Thyristors**: Silicon controlled rectifier: V-I characteristics, DIAC and TRIAC, Thyristors parameters and applications.

**Text Books:**

1. Boylestad and Nashelsky: Electronic Devices and Circuit Theory, Pearson Education, 2013.
2. Sedra and Smith: Microelectronics, Oxford Press, 2015.

**References:**

1. Ben G. Streetman, Sanjay Bannerjee, Solid State Electronic Devices, 2006.
2. Graham Bell: Electronic Devices and Circuits, PHI, 2008.
3. Millman and Halkias: Integrated electronics, TMH, 2017.
4. Donald A Neamen: Electronic Circuits Analysis and Design, 2006.
5. Robert F. Pierret, Semiconductor Device Fundamentals, 2006.

**List of Experiments:**

1. To determine and analyze the V-I characteristics of PN Junction diode.
2. To determine and analyze the V-I characteristic of Zener diode and its load regulation capability.
3. To design clipper and clamper circuits.
4. To determine input and output characteristics of transistor amplifiers in CE configurations.
5. To determine input and output characteristics of transistor amplifiers in CC configurations.
6. To determine input and output characteristics of transistor amplifiers in CB configurations.
7. To determine the frequency response of CE amplifier, direct coupled and RC coupled amplifier.
8. To determine Drain and Transfer Characteristics of JFET Amplifier.
9. To determine Drain and Transfer Characteristics of MOSFET Amplifier.
10. To determine characteristics of class A and B power amplifiers.

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| BTECIOT301 | EC | Introduction to IOT & Embedded Systems | 60 | 20 | 20 | 30 | 20 | 2 | 0 | 2 | 3 |

**Legends**: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

**Course Educational Objectives (CEOs):**
This course deals with Introduction of Embedded system and various aspects such as devices, platform and Technologies of Internet of Things (IOT).

**Course Outcomes (COs):**
After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes
The students will be able to
1. Understand the basics of Embedded System and IOT.
2. Get the knowledge of various IOT Devices and Technologies.
3. Understand the concepts of various IOT platforms, its barriers and Applications.

**Syllabus :**

**UNIT-I** **8 Hrs.**
**Background:** Background and Introduction of Embedded system, Basic Embedded System and its architecture, Major Application area and purpose of Embedded System, concepts of IOT and Basic Architecture of IOT.

**UNIT-II** **9 Hrs.**
**IOT Devices:** various types of Amplifiers, Commonly used amplifier ICs, Analog to Digital converter (ADC) and Digital to Analog converter (DAC), Relays, Display, Switches, Actuators, overview of various sensors such as Light, Temperature, Weight, Gas sensor, Ultra Sonic, Light (LDR, Photo Diode)

**UNIT-III** **9 Hrs.**
**IOT Technologies**: GPS, GSM, GPRS, RFID, Bluetooth, Zigbee, Introduction to Arduino and Raspberry-Pi.

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**UNIT-IV** **9 Hrs.**

**IOT Platforms:** Wearable, Embedded, Cloud. Internet & Networking: Knowledge of networking, IP address, MAC address, routers, servers, cloud, client, webpage.

**UNIT-V** **10 Hrs.**

**Application of IOT:** IOT Adoption barrier: Complexity, Security, Privacy & Trust. Networks and Communication, Overview of serial communication, Processes, Data Management, Device Level Energy Issues, IoT Related Standardization.

**Text Books:**

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything",1st Edition, Apress Publications, 2013

**References:**

1. Shibu K. V., "Introduction to Embedded Systems", TMH, 2009.
2. John Vetelino, Aravind Reghu, Introduction to Sensors, 1st edition, CRC Press, 2010.

**List of Experiments:**

1. Identify embedded systems features
2. Identify components, concepts and design methodologies
3. Interpret data-sheets, documentation and specifications
4. Design, build and troubleshoot an embedded control system
5. Practice on modelling, analysis and design of control systems
6. Practice on real-time programming and operating systems
7. Evaluate system performance

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| BTEC307 | EC | PCB Designing Lab | 0 | 0 | 0 | 30 | 20 | 0 | 0 | 4 | 2 |

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## Syllabus

Overview and Study of the key features and applications of the software LIVEWIRE & DIPTRACE. Applications of the software in the field of Electronic Circuits and Digital Electronics. Design, Optimization, simulation and verification of Electronic circuits. Realization and verification of various digital electronic circuits. To design PCB for the various Electronics and Digital Circuits.

**Experiment List**

| E.N. | Aim |
|---|---|
| 1. | To Familiarize with Livewire |
| 2. | To Design and Simulate Basic Electronic Circuits |
| 3. | To Familiarize with PCB Wizard |
| 4. | To Design Basic Electronics Circuits PCB |
| 5. | To Familiarize with DipTrace |
| 6. | To Design the Basic Electronic Circuits and PCB Layouts using DipTrace |
| 7. | To Design PCB for Diode Based Circuits |
| 8. | To Design PCB for Transistor Based Circuits |
| 9. | To Design PCB for Digital Gates |
| 10. | To Design PCB for Digital Circuits |

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