# Course Syllabus

# (Semester-I)

# Electronics and Communication Engineering and ECE-Avionics

# Batch-2025

## Basic Electronics

**Course Code:** BEECE1C02
**Course Title:** Basics of Electrical and Electronics
**Semester:** I
**Credits:** 04

**Rationale**

The goal of this course is to equip students with the knowledge of various types of dc and ac circuits, transformer, semiconductors, transistors, amplifiers. Also, the course is intended to enhance their understanding about the various operation modes of these devices.

**Course Outlines**

| Contents | No. of Lectures |
|---|---|
| **Unit - I**<br>Circuit analysis: Voltage and current sources, KVL and KCL, DC circuits Analysis. AC circuit analysis, active, reactive, and apparent power, physical meaning of reactive power, power factor. Introduction to transformers. | **8** |
| **Unit -II**<br>Semiconductors: semiconductor materials, Conductivity of insulators, metals, and semiconductors in terms of energy bands, conductivity of intrinsic semiconductors, extrinsic semiconductors: n-type and p-type semiconductors, Hall Effect in semiconductors. Mechanism in current flow: Drift and diffusion, Einstein relation. | **8** |
| **Unit – III**<br>Diode: V-I characteristics of P-N junction diode. Diode equivalent circuit, diode as a switch, diode testing. Zener and avalanche breakdown. LED and Photo diode. | **8** |
| **Unit - IV**<br>Diode Applications: Rectifiers: Half wave, center tapped and bridge full-wave, Zener diode regulator and voltage multiplier, clipping and clamping circuits. | **8** |
| **Unit - V**<br>Bipolar Junction Transistor (BJT): Junction Transistor, Current components in transistor, transistor construction, The transistor as an Amplifier, various configurations (CE, CB, CC) and characteristics (Input and Output) of BJT's configurations, cut off, saturation and active region, Early effect. JFET construction and characteristics, MOSFET construction and characteristics. | **8** |

**Course Outcomes**

At the end of the course, the student will be able to**:**

- To analyze AC and DC circuit
- To understand the basic concept of the Transformer
- To learn basic concepts of Semiconductor Devices

- Able to understand and use BJT and FET Devices.
- To analyze and design rectifiers, clippers and clamper circuits.
- Able to understand Zener diode as Voltage regulator.
- Able to understand advanced semiconductor devices.

**Text Books**


1. Introduction Electronic Devices & Circuit Theory,11/e, 2012, Pearson:Boylestad&Nashelsky
2. Electronic Principles, by Albert Paul Malvino Dr. and David J. Bates, 7/e.
3. Basic Electrical Engineering by D.P. Kothari and I.J. Nagrath, Tata McGraw Hill.


**Reference Books**


1. Integrated Electronics by Millman, Halkias and Parikh, 2/e, McGrawHill.
2. ELECTRONICS Fundamentals and Applications by Chattopadhyay and Rakshit,15/e, New Age Publishers.
3. The Art of Electronics by Paul Horowitz, Winfield Hill, 2/e, Cambridge University.
4. Electronics - Circuits and Systems by Owen Bishop, 4/e, Elsevier.
5. Electronics Fundamentals: Circuits, Devices & Applications by Thomas L. Floyd & David M. Buchla, 8/e, Pearson Education.
6. Electrical Engineering Fundamentals by V.Del Toro, PHI


**Basic Electronics Laboratory :**

**List of experiment**

1. To identify and understand various electronics components and instruments.
2. Use of oscilloscope and function generator to measure voltage, frequency and time.
3. To verify KVL and KCL theorems.
4. To study V-I characteristics of diode.
5. Study of half wave rectifier with and without capacitor filter.
6. Study of full wave rectifier with and without capacitor filter.
7. To study bridge rectifier with or without filter.
8. Zener diode as a voltage regulator
9. To study clipper circuit
10. To study clamper circuit
11 To study different transistor configuration (CE, CB and CC)

# Environmental Studies

**Course Code:** BEVS1O01
**Course Title:** Environmental Studies
**Semester:** I
**Credits:** N/A

**Rationale**

This course aims to build on conceptual understanding of students by exposing them to the basic principles behind various eco-systems and environmental processes. It will explore the interconnectedness among all the biotic and abiotic components of environment and the dynamic nature of the ecological processes in maintaining equilibrium in nature.The course has been divided into three sections, with the view to introduce students to the concepts of eco systems, natural resources and various pollutants.

**Course Outlines**

| Contents | No. of Lectures |
|---|---|
| **Unit - I**<br>Environmental Studies: Ecosystems, Bio-diversity and its Conservation (i) The Multidisciplinary Nature of Environmental Studies Definition, scope and importance of Environmental Studies. Biotic and a biotic component of environment, need for environmental awareness. (ii) Ecosystems Concept of an ecosystem, structure and function of an ecosystem, producers, consumers and decomposers, energy flow in the ecosystem, ecological succession, food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structures and function of the following ecosystem: (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries). | **8** |
| **Unit - II**<br>Renewable and Non-renewable Natural Resources: Concept and definition of Natural Resources and need for their management, Forest resources: Use and over-exploitation, deforestation, case studies, timber extraction, mining, dams and their effects on forests and tribal people. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems, Water conservation, rain water harvesting, watershed management, Mineral resources: Uses are exploitation, environmental effects of extracting and using mineral resources, case studies. Food resources: World food problems, changes causes by agriculture and over-grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Urban problems related to energy, case studies. Land resources: Land as a | **8** |

| | |
|---|---|
| resource, land degradation, man induced landslides, soil erosion and desertification. | |
| **Unit -III**<br>Environmental Pollution Definition, types, causes, effects and control measures of (a) Air pollution, (b) Water pollution, (c) Soil pollution, (d) Marine pollution, (e) Noise pollution, (f) Thermal pollution, (g) Nuclear hazards. Pollution case studies. Solid waste and its management: causes, effects and control measures of urban and industrial waste. Chemical toxicology-Terms related to toxicity, impact of chemicals (Hg, As, Cd, Cr, Pb) on environment. | **8** |

**Course Outcomes**

Upon successful completion of this course, candidates will be able to:

- Understand the concepts of Eco systems.
- To make students aware about natural resources.
- To introduce about various types of pollutions in environments and its remedies.
- To analyse various types renewable and non-renewable resources.

**Text Books**


1. E. Barucha, Textbook of Environmental Studies for Undergraduate Courses, Universities Press(India) Pvt. Ltd., 2005.
2. S. Chawla, A Textbook of Environmental Studies, McGraw Hill Education Private Limited, 2012


**Reference Books**


1. G. T. Miller, Environmental Science, Thomas Learning, 2012.
2. W. Cunningham and M. A. Cunningham, Principles of Environment Science: Enquiryand Applications,
3. Tata McGraw Hill Publication, N. Delhi, 2003.
4. R. Rajagopalan, Environmental Studies: From Crisis to Cure, 2nd Edition, Oxford University Press, 2011.
5. A.K. De, Environmental Chemistry, New Age Int. Publ. 2012,
6. Kaushik and C.P. Kaushik, Perspectives in Environment Studies, 4th Edition, New Age International Publishers,2013.
7. Environmental Engineering by Gerard Kiely, Tata McGraw-Hill Publishing Company Ltd., New Delhi,2010

**Innovation and Entrepreneurship**

**Course Code:** BECE1C01
**Course Title:** Innovation and Entrepreneurship
**Semester:** I
**Credits:** 01

**Rationale**

The study enables to advance the skills of students in customer development, customer validation, competitive analysis, and iteration while utilizing design thinking and process tools to evaluate in real-world problems with a well- defined business plan and projects.

**Course Outline**

| **Contents** |
| --- |
| 1. Idea generation & Prototype Development<br>2. Technological and Non technological<br>3. Innovation and process<br>4. Entrepreneurship<br>5. Social Innovation and Entrepreneurship<br>6. Intellectual Property Right (IPR) & Patents<br>7. Commercialization of Innovations<br>8. Startup and Venture development<br>9. Innovation and Startup ecosystem<br>10. Pre-incubation and Incubation Stages<br>11. Entrepreneurial opportunities, attitude, traits and tendencies.<br>12. Investment, Angel, VC fund system<br>13. Govt. Schemes and funding support to ideas, innovations, and startup<br>14. Current trends, development and general awareness on Innovation and startup. |

**COURSE OUTCOMES**

Upon successful completion of the course the student will be able to:

1. Recognize the potential an idea has for creating value and identify suitable ways of making the most out of it
2. Understand the role of the entrepreneur in the new enterprise creation process.
3. Explore and experiment with innovative approaches.
4. Critique a plan for implementing entrepreneurial activities in a globalized and competitive environment being mindful of the social, ethical and culture issues.
5. Assess the consequences of ideas that bring value and the effect of entrepreneurial action on the target community, the market, society and the environment

**Text Books:**

1. Dr. Gupta and Dr. Srinivasan, Entrepreneurship development in India.
2. Vasant Desai, Dynamics of Entrepreneurial Development and Management.
3. M.W.Deshpande, Entrepreneurship of small Scale Industries
4. D.L. Saxon and RW Smilor (eds), The Art and Science of Entrepreneurs

**Reference Books:**

1. Venkateshwara Rao and Udai Pareek,(Eds)Developing Entrepreneurship-A Handbook
2. Raja Gopal, Agriculture Business and Entrepreneurship
3. H.Sadhak, industrial development in Backward Regions in India
4. Ravi J. Mathai, Rural Entrepreneurship A Frame Work in Development Entrepreneurship –A Handbook

**Mathematics For Electronics/ Avionics Engineers**

**Course Code:** BMAT1C01
**Course Title**: Mathematics For Electronics/ Avionics Engineers
**Semester:** I
**Credits:** 03

**Rationale**

To familiarize with the important tools and theorems of calculus and differential equations is essential in all the branches of engineering. It will also develop the in-depth knowledge of Fourier series and Fourier Transform in a comprehensive manner.

**Course Outlines**

| **Contents** |
|---|
| **Unit - I**<br>**Ordinary Differential Equation Of First Order First Degree And First Order Higher Degree:** Reorientation of differential equation first order first degree, Exact differential equation and Integrating factors, first order higher degree odes, solvable for p, y and x, Clairaut's equation. |
| **Unit - II**<br>**Application Of Differential Equation (Mathematical Modelling):** Modelling of Real-world problems, particularly Engineering Systems, Electrical network models (RL & RC circuit), the spread of epidemic (SI, SIS, SIR), Newton's Law of cooling, Single compartment modelling. |
| **Unit -III**<br>**Infinite Series:** Introduction, Positive term series, Comparison test, Cauchy's root test, D'Alembert's test, Raabe's test, Logarithmic test, Integral test, Gauss's test, Series with arbitrary terms, Rearrangement of terms. |
| **Unit - IV**<br>**Fourier Series:** Definition, Fourier Series with Arbitrary Period, In Particular Periodic Function With Period $2\pi$. Fourier Series of Even and Odd Functions, Half Rang Fourier Series. |
| **Unit - V**<br>**Fourier Integral And Transform :** Fourier Integral Theorem, Fourier Sine and Cosine Integral Complex Form of Integral, Inversion Formula for Fourier Transforms, Fourier Transforms of the derivative of a Function. |

**Course Outcomes**

Upon successful completion of this course, candidates will be able to:

- Learn various methods of solving ordinary differential equations of the first order and their importance in engineering problems
- Develop mathematical models through ordinary differential equations of the first order
- Describe the convergence and divergence of infinite series and analyse the Fourier integral and Fourier transform of a function

- Familiarise with special functions to evaluate some proper and improper integrals using beta and gamma functions
- Develop the basic concept of linear algebra for electronics engineering problems.

**Text Books**


1. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Narosa Publishing House, 2016, Fifth Edition.
2. Calculus and Analytic Geometry, George B. Thomas and Ross L. Finney, Pearson, 2020, Ninth Edition.


**Reference Books**


1. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley and Sons, 2015, Eighth Edition.
2. Advanced Engineering Mathematics, Dennis G. Zill, Jones & Bartlett Learning, 2018, Sixth Edition
3. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2012, Forty-second Edition.

**Basics of Professional Communication**

**Course Code:** BENG1O01

**Course Title:** Basics of Professional Communication

**Semester:** I

**Credits:** 04 **(L-3, T-0, P-2)**

**Rationale**

The goal of this course is to prepare engineering students with the individual and collaborative technical writing, presentation, and research skills necessary to be effective technical communicators in academic and professional environments.

**Course Outlines**

| **Contents** |
|---|
| **Unit-I**<br>Grammar Principles (Correction of sentences, Concord) and Vocabulary Building (synonyms and antonyms) - Idioms and Phrasal verbs, patterns of use and suggestions for effective employment in varied contexts.<br>Effective Sentence Construction - Strategies for bringing variety and clarity in sentences, removing ambiguity, editing long sentences for brevity and clarity. |
| **Unit - II**<br>Reported speech - Contexts for use of reported speech, its impact on audiences and readers, active and passive voice, reasons for preference forpassive voice in scientific English.<br>Paragraph-writing - Definition of paragraph, types, features of a good paragraph, unity of theme, coherence, linking devices, direction, patterns of development. |
| **Unit -III**<br>Note-making – Definition, the need for note-making, its benefits, various noteformats, like tree diagram, block or list notes, tables, etc.<br>Letter-Writing - Its importance in the context of other channels of communication,qualities of effective letters, types- personal & official letters for various purposes,<br>emphasis on letter of application for jobs, cover letter and resume types, examples and exercises. |
| **Unit - IV**<br>Reading techniques - Definition- Skills and sub-skills of reading, Skimming andScanning, their uses and purposes, examples and exercises.<br>Reading Comprehension - Reading silently and with understanding, process of comprehension, types of comprehension questions (technical paper reading,patents). |
| **Unit - V**<br>Features of Technical English - Description of technical objects and process, Report-Writing - definition, purpose, types, and structure, formal and informal reports, stages in developing report, proposal, progress and final reports examples<br>and exercises. |
| Book Reviews - Oral and written review of a chosen novel/play/movie, focus on appropriate vocabulary and structure, language items like special vocabulary andidioms used. |

**Course Outcomes**

Upon successful completion of this course, candidates will be able to:

- Understand basic grammar principles
- Write clear and coherent passages
- Write effective letters for job application and complaints
- Prepare technical reports and interpret graphs
- Enhance reading comprehension
- Comprehend English speech sound system, stress and intonation

**Text books**

1. English for Engineers and Technologists (Combined edition, Vol. 1 and 2) Orient Blackswan 2010.
2. Ashraf, M Rizvi. Effective Technical Communication. Tata McGraw-Hill, 2006

**Reference books**

1. Meenakshi Raman and Sangeetha Sharma. Technical Communication: Principles and Practice 2nd Edition, Oxford University Press, 2011.

**Language laboratory**

1. English Sound System - vowels, consonants, Diphthongs, phonetic symbols using dictionary to decode phonetic transcription, Received Pronunciation, its value and relevance, transcription of exercises.
2. Stress and Intonation - word and sentence stress, their role and importance in spoken English
3. Intonation in spoken English - definition, patterns of intonation, falling, rising, etc., use of intonation in daily life-exercises
4. Introducing one in formal and social contexts- Role plays, their uses indeveloping fluency and communication in general.
5. Oral presentation - definition, occasions, structure, qualities of a good presentation with emphasis on body language and use of visual aids.
6. Listening Comprehension - Challenges in listening, good listening traits, some standard listening tests, practice and exercises.
7. Debate/ Group Discussions - concepts, types, Do's and don'ts, intensive practice.

**Software**

1. Clear Pronunciation – Part-1 Learn to Speak English.
2. Clear Pronunciation – Part-2 Speak Clearly with Confidence
3. Study Skills
4. English Pronunciation

**Computer Programming**

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**Course Code: BCSE1C02**

**Course Title: Computer Programming**

**Semester: I (ECE/ECE (Avionics))**

**Credits: 3 (L:2, P:1)**

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**Rationale**

In the digital era, computer programming forms the foundation for software development, system design, and intelligent automation. This course introduces students to problem-solving through structured programming using the C language. Students will gain skills in algorithm development, code structuring, data handling, and file operations. It lays a robust foundation for advanced computing courses and real-world engineering applications.

**Course Outlines**

| Topics Covered | No. of Lectures |
|---|---|
| **Unit I**<br>**Introduction to Computer Fundamentals and Programming**<br>Computer fundamentals: Basic Organization of Computer, Von-Neumann and Harvard Architecture, Hardware, software, Memory hierarchy, translator,<br>Problem solving strategies: Top-down approach, Bottom-up approach, Algorithms and its characteristics, flowcharts, Instruction and program, Lifecycle of a program, Number Systems and conversion. | 08 |
| **Unit II**<br>**Structure of C Program and Control Structures**<br>Structure of a C program, C tokens: keywords, identifiers, constants, variables, predefined input and output functions, Data types in C, Operators: Arithmetic, relational, logical, bitwise, assignment, increment/decrement, conditional<br>Decision making: if, if-else, nested if, switch-case, Looping: for, while, dowhile, Jump statements: break, continue, goto, | 08 |
| **Unit III**<br>**Arrays, Strings, and Pointers**<br>Arrays: Definition, Declaration, 1D and 2D arrays, String operations and library functions, Matrix operations, Introduction to pointers, Pointer arithmetic, Pointers and arrays, Pointers and functions, Dynamic memory allocation: malloc(), calloc(), free() | 08 |

| | |
|---|---|
| **Unit IV**<br>**Functions and Enumerated Data Structure**<br>Function: Modular approach for solving real time problems, Library function, user defined function, Declaration, Definition, Call and return, call by value, | 08 |
| call by reference, stack usage with help of debugger (postponement of decision), Scope of variables, Storage classes, Recursive functions, Recursions vs Iteration.<br><br>Structure and Union: Declaration, initialization, accessing members | |
| **Unit V**<br>**File Handling in C**<br>Types of files: Text and binary, File operations: fopen(), fclose(), fprintf(), fscanf(), fgets(), fputs(), reading and writing to files, file modes (r, w, a, etc.), working with binary files, Exception handling. | 08 |

**Course Outcomes**

Upon successful completion of this course, students will be able to:

- Understand the fundamental building blocks of C programming and problem-solving techniques.
- Develop modular and structured programs using control structures and functions.
- Handle arrays, strings, and pointers effectively in program development.
- Create and manipulate user-defined data types using structures and unions.
- Perform file operations for persistent storage and develop basic data processing programs.

**Text and Reference Books**


1. E. Balagurusamy, *Programming in ANSI C*, Tata McGraw-Hill, 8th Edition.
2. Brian W. Kernighan & Dennis M. Ritchie, *The C Programming Language*, PHI, 2nd Edition.
3. Byron Gottfried, *Programming with C*, Schaum's Outline Series, McGraw-Hill.
4. Yashavant Kanetkar, *Let Us C*, BPB Publications, 16th Edition.
5. Reema Thareja, *Programming in C*, Oxford University Press.
6. Ajay Mittal, *Programming in C – A Practical Approach*, Pearson Education.
7. Behrouz A. Forouzan, *Computer Science: A Structured Programming Approach Using C*, Cengage Learning.

**Quantum Physics for Electronics Engineers**

**Course Code :** BPHY1C01
**Course Title :** Quantum Physics for Electronics Engineers
**Semester :** 1st
**Credits :** 04
**L-T-P :** 3-0-2

**Rationale**

This course introduces first-semester B.Tech (ECE) students to the fundamental principles of quantum mechanics and their relevance in modern electronics. It emphasizes conceptual clarity, problem-solving, and direct applications in semiconductors, nanostructures, and spin-based devices.

**Course Outlines**

| Contents | No. of Lectures |
|---|---|
| **Unit I**<br>**Foundations of Quantum Ideas:** breakdown of classical physics at microscopic scale; blackbody radiation and Planck's hypothesis; photons, photoelectric effect, and Compton effect; wave–particle duality of light and matter, de Broglie hypothesis, Davisson–Germer experiment; line spectra, Rutherford and Bohr models, Franck–Hertz experiment; | 08 |
| **Unit II**<br>**Schrödinger Equation and Applications:** Time-independent Schrödinger equation and probability interpretation; superposition principle, group velocity, uncertainty principle, operators, normalization, and expectation values; stationary states and energy quantization; particle in a box; extension to 2D and 3D boxes (qualitative); infinite and finite potential wells relevant to semiconductor heterostructures. | 08 |
| **Unit III**<br>**Quantum Systems in Electronics:** Free particles and wave packets; potential steps and barriers; reflection, transmission, and tunnelling phenomena; scanning tunnelling microscope (STM); simple harmonic oscillator and its quantized features; quantum wells and nanostructures in electronic devices. | 08 |
| **Unit IV**<br>**Angular Momentum and Spin:** Angular momentum and quantization; Stern–Gerlach experiment and magnetic moment; operators, eigenvalues and eigenstates, uncertainty relations; spin states and Zeeman effect (qualitative); hydrogen atom model with qualitative discussion of energy levels | 08 |
| **Unit V**<br>**Atoms and Electronic Structure:** Hydrogen-like atoms and orbital quantization; spectroscopic notation; Pauli exclusion principle and identical particles; introduction to multi-electron atoms; relation of atomic structure to semiconductor band theory and electronic materials. | 08 |

**Course Outcomes (COs)**

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

CO1: Explain the limitations of classical physics and the origin of quantum concepts.
CO2: Apply Schrödinger's equation to basic systems such as particle in a box and finite wells.
CO3: Analyze quantum tunnelling phenomena and relate them to semiconductor devices.
CO4: Describe angular momentum, spin, and magnetic effects such as Zeeman splitting.
CO5: Interpret atomic and electronic structures as the basis of semiconductor band theory.

**Text Book(s) & Reference Book(s)**

1. Modern Physics, 6th Edition, Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury
2. Introduction to Quantum Mechanics, 2nd Edition, David J. Griffiths
3. A Textbook of Quantum Mechanics, P. M. Mathews, K. Venkatesan
4. Quantum Mechanics – Theory and Applications, 3rd Edition, A. K. Ghatak, S. Lokanathan
5. Quantum Mechanics: Concepts and Applications, 2nd Edition, N. Zettili

**List of Experiments (20 hrs)**

1. **Stefan's law** (verification using a filament lamp).
2. **Photoelectric effect** (using photocell & LEDs – threshold frequency & work function).
3. **I–V characteristics of LED/Diode** (determine band gap energy).
4. **Franck–Hertz experiment (simulation/demo)** – observation of quantized energy states.
5. **Davisson–Germer experiment (simulation)** – electron diffraction and wave nature.
6. **Hall Effect** – carrier concentration in semiconductors.
7. **Spectral lines of hydrogen/mercury lamp** – verification of Bohr model (Balmer series).
8. **Solar Cell Characteristics** – V–I curve and efficiency (connects to photoelectric concept).
9. **Diffraction of Light** – using single slit/double slit or grating (analogy for electron diffraction).
10. **X-ray Diffraction (demo/data analysis)** – basic introduction to crystal structure.