**BVVS**

# Basaveshwar Engineering College, Bagalkote

# Department of Electronics and Communication Engineering

## Vision, Mission Statements and Values

## Vision

To achieve excellence in electronics and communication engineering through quality education and research for developing competent professionals.

## Mission

1. Foster a dynamic teaching and learning process.
2. Encourage research through innovation and collaboration.
3. Imbibe moral, ethical values and social responsibilities.

## Values

The values of the department are

1. Work is Worship
2. Ethics and Integrity
3. Empathy and Compassion
4. Indian Ethos
5. Mutual Respect

**BVVS**

# Basaveshwar Engineering College, Bagalkote

## Department of Electronics and Communication Engineering

## SWOC Analysis

## S:Strength:

1. Infrastructure
   - (i.) ICT enabled classrooms/seminar hall with good ambience.
   - (ii.) Well equipped laboratories to cater curriculum requirements.
   - (iii.) Department library with good number of titles and volumes.
   - (iv.) Scope for academic extension programmes.
2. Faculty
   - (i.) 75% of faculty with Ph.D.
   - (ii.) Faculty with minimum of 12 years teaching experience.
   - (iii.) Faculty retention ratio is 100 %.
3. Students
   - (i.) Students with academic and competitive bent of mind.
   - (ii.) 75% of the students are placed in reputed industries.
   - (iii.) 10% to 15% of the students are registering for B.E. Honours Degree.
4. Curriculum
   - (i.) Research and industry oriented adaptive curriculum.
   - (ii.) Curriculum with integrated courses.
5. Alumni
   - (i.) Alumni works in reputed organizations across the world.
   - (ii.) Alumni interactions with students and faculty to bridge the gap between campus and corporate.

## W:Weakness:

1. IPR competencies are inadequate.
2. Relatively less number of memberships in professional bodies.
3. Limited collaborative activities.
4. Less number of inter-disciplinary courses and projects.
5. Less number of industry supported laboratories/courses.
6. Inadequate number of funded projects.
7. Less scope for co-curricular and cultural activities.

## O:Opportunities:

1. Establishment of Distant Learning Center (DLC) using existing resources.
2. Participation in collaborative projects/ research work with allied institutions.
3. Fostering alumni participation in academics and placement activities.
4. Establishment of Skilling Centers for students.
5. Faculty exchange programs with academia and industry.
6. Organizing conferences.
7. Facilitating incubation centers for alumni.
8. Scope for academic extension programmes
9. Training on computer usage/ programming languages for general public.
10. Enhancing consultancy activities.

## C:Challenges:

1. To incorporate experiential teaching learning process.
2. Adapting curriculum to future industry needs.
3. Fostering collaboration to enhance research, innovation and entrepreneurship activities.
4. Attracting diversified students.
5. Strategies to strengthen the placement activities for higher packages and core companies.
6. Secure additional research grants and consultancy opportunities.
7. Enhance quality publications and file patents.

## Programme Outcomes

a) **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

b) **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

c) **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

d) **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

e) **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

f) **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

g) **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

h) **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

i) **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

j) **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

k) **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

l) **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## Programme Specific Outcomes (PSOs)

1. Analyze and design systems for electronics, communication, and signal processing applications.
2. Use domain specific tools for design, analysis, synthesis, and validation of VLSI and embeddedsystems
3. Demonstrate the conceptual knowledge with respect to architecture, design analysis and simulationof computer networking and applications

## Programme Educational Objectives (PEOs)

**PEO1:** Our graduates will be able to lead a successful career by solving complex Engineering Problems of society/industry

**PEO2:** Enable graduates to excel in academia, industry, entrepreneurship and engage in research and lifelong learning

**PEO3:** Graduates will be able to work effectively as individuals in multidisciplinary environments with high integrity, ethics, human values and societal responsibilities

**PEO4:** Graduates will be able to exhibit strong leadership, communication, and teamwork skills to succeed in dynamic professional environments and contribute to the global challenges

**Basaveshwar Engineering College, Bagalkote**
**B.E. in Electronics and Communication Engineering**
**Scheme of Teaching and Examinations**
**AY: 2024-25**

# I SEMESTER (Physics Cycle)

| Sl. No. | Course and Course Code | | Course Title | Teaching / Paper setting Dept. | Teaching hrs./week | | | | Examination | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Lecture | Tutorial | Practical/ Drawing | Self-Study Component | Duration in hrs. | CIE Marks | SEE Marks | Total Marks | |
| | | | | | L | T | P | S | | | | | |
| 1 | ASC (IC) | BMAE101C | Mathematics-I | Maths Dept. | 3 | 0 | 2 | 0 | 3 | 50 | 50 | 100 | 4 |
| 2 | ASC (IC) | BPHE102C | Physics for Electrical Sciences | Physics Dept. | 3 | 0 | 2 | 0 | 3 | 50 | 50 | 100 | 4 |
| 3 | ESC | BECA103C | Basic Electronics | Dept. | 3 | 0 | 0 | 0 | 3 | 50 | 50 | 100 | 3 |
| 4 | ESC-I | BCSA104N | Engineering Science Course-I | Dept. | 2/3 | 0/0 | 2/0 | 0 | 3 | 50 | 50 | 100 | 3 |
| 5 | ETC-I | BECB105B | Emerging Technology Course-I | Dept. | 3 | 0 | 0 | 0 | 3 | 50 | 50 | 100 | 3 |
| 7 | HSMC | BHSA106C | Communicative English | HSS Dept. | 1 | 0 | 0 | 0 | 1 | 50 | 50 | 100 | 1 |
| 8 | HSMC | BHSA107C | Indian Constitution | HSS Dept. | 1 | 0 | 0 | 0 | 1 | 50 | 50 | 100 | 1 |
| 9 | AEC | BHSA108C | Scientific Foundations of Health | Dept. | 1 | 0 | 0 | 0 | 1 | 50 | 50 | 100 | 1 |
| | | | | **Total** | 17 | 0 | 6 | 0 | 18 | **400** | **400** | **800** | **20** |

| Sl. No. | Emerging Technology Course-I ETC-I | Engineering Science Course-I ESC-I | Engineering Science Course ESC |
|---|---|---|---|
| 1. | Introduction to Embedded System | Introduction to C Programming | Basic Electronics |
| 2. | Smart Materials and Systems | Introduction to Electronics & Communication | |
| 3. | Introduction to Nano Technology | | |
| 4. | Introduction to Sustainable Engineering | | |
| 5. | Introduction to Internet of Things (IOT) | | |

Note: Department is offering Subject: Introduction to Electronics & Communication (22UEC114N/214N) to other department students

**Basaveshwar Engineering College, Bagalkote**
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# I SEMESTER (Chemistry Cycle)

| Sl. No. | Course and Course Code | | Course Title | Teaching / Paper setting Dept. | Teaching hrs./week | | | | Examination | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Lecture | Tutorial | Practical/ Drawing | Self-Study Component | Duration in hrs. | CIE Marks | SEE Marks | Total Marks | |
| | | | | | L | T | P | S | | | | | |
| 1 | ASC (IC) | BMAE201C | Mathematics-II | Maths Dept. | 3 | 0 | 2 | 0 | 3 | 50 | 50 | 100 | 4 |
| 2 | ASC (IC) | BCHE202C | Chemistry for Electrical Sciences | Chemistry Dept. | 3 | 0 | 2 | 0 | 3 | 50 | 50 | 100 | 4 |
| 3 | ESC | BMEB203C | Computer Aided Engineering & Drawing | Civil / Mechanical Dept. | 2 | 0 | 2 | 0 | 3 | 50 | 50 | 100 | 3 |
| 4 | ESC-II | | Engineering Science Course-II | EEE Dept. | 3 | 0 | 0 | 0 | 3 | 50 | 50 | 100 | 3 |
| 5 | PLC-II | | Programming Language Course-II | Dept. | 2 | 0 | 2 | 0 | 3 | 50 | 50 | 100 | 3 |
| 6 | AEC | | Professional Writing Skills in English | HSS Dept. | 1 | 0 | 0 | 0 | 1 | 50 | 50 | 100 | 1 |
| 7 | HSMC | | Sanskritika Kannada | HSS Dept. | 1 | 0 | 0 | 0 | 1 | 50 | 50 | 100 | 1 |
| 8 | | | Balake Kannada | | | | | | | | | | |
| 9 | SDC | | Innovation and Design Thinking | Dept. | 1 | 0 | 0 | 0 | 1 | 50 | 50 | 100 | 1 |
| | | | | **Total** | 16 | 0 | 8 | 0 | 24 | **400** | **400** | **800** | **20** |

| Sl. No. | Programming Language Course-II PLC-II | Engineering Science Course-II ESC-II | Engineering Science Course ESC |
|---|---|---|---|
| 1. | Introduction to C++ Programming | Introduction to Electrical Engineering | CAED |
| 2. | Introduction to Python Programming | Introduction to Electronics & Communication | |
| 3. | Basics of JAVA programming | | |

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## II SEMESTER (Physics Cycle)

| Sl. No. | Course and Course Code | | Course Title | Teaching / Paper setting Dept. | Teaching hrs./week | | | | Examination | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Lecture | Tutorial | Practical / Drawing | Self-Study Component | Duration in hrs. | CIE Marks | SEE Marks | Total Marks | |
| | | | | | L | T | P | S | | | | | |
| 1 | ASC (IC) | | Mathematics-I for Electrical and Electronics Engineering stream | Maths Dept. | 3 | 0 | 2 | 0 | 3 | 50 | 50 | 100 | 4 |
| 2 | ASC (IC) | | Physics for Electrical Sciences | Physics Dept. | 3 | 0 | 2 | 0 | 3 | 50 | 50 | 100 | 4 |
| 3 | ESC | | Basic Electronics | Dept. | 3 | 0 | 0 | 0 | 3 | 50 | 50 | 100 | 3 |
| 4 | ESC-I | | Engineering Science Course-I | Dept. | 2/3 | 0/0 | 2/0 | 0 | 3 | 50 | 50 | 100 | 3 |
| 5 | ETC-I | | Emerging Technology Course-I | Dept. | 3 | 0 | 0 | 0 | 3 | 50 | 50 | 100 | 3 |
| 7 | HSMC | | Communicative English | HSS Dept. | 1 | 0 | 0 | 0 | 1 | 50 | 50 | 100 | 1 |
| 8 | HSMC | | Indian Constitution | HSS Dept. | 1 | 0 | 0 | 0 | 1 | 50 | 50 | 100 | 1 |
| 9 | AEC | | Scientific Foundations of Health | Dept. | 1 | 0 | 0 | 0 | 1 | 50 | 50 | 100 | 1 |
| | | | | **Total** | 17 | 0 | 6 | 0 | 18 | **400** | **400** | **800** | **20** |

| Sl. No. | Emerging Technology Course-I ETC-I | Engineering Science Course-I ESC-I | Engineering Science Course ESC |
|---|---|---|---|
| 1. | Introduction to Embedded System | Introduction to C Programming | Basic Electronics |
| 2. | Smart Materials and Systems | Introduction to Electronics & Communication | |
| 3. | Introduction to Nano Technology | | |
| 4. | Introduction to Sustainable Engineering | | |
| 5. | Introduction to Internet of Things (IOT) | | |

Note: Department is offering Subject: Introduction to Electronics & Communication (22UEC114N/214N) to other department students

**Basaveshwar Engineering College, Bagalkote**
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# II SEMESTER (Chemistry Cycle)

| Sl. No. | Course and Course Code | | Course Title | Teaching / Paper setting Dept. | Teaching hrs./week | | | | Examination | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Lecture | Tutorial | Practical/ Drawing | Self-Study Component | Duration in hrs. | CIE Marks | SEE Marks | Total Marks | |
| | | | | | L | T | P | S | | | | | |
| 1 | ASC (IC) | | Mathematics-II I for Electrical and Electronics Engineering stream | Maths Dept. | 3 | 0 | 2 | 0 | 3 | 50 | 50 | 100 | 4 |
| 2 | ASC (IC) | | Chemistry for Electrical Sciences | Chemistry Dept. | 3 | 0 | 2 | 0 | 3 | 50 | 50 | 100 | 4 |
| 3 | ESC | | Computer Aided Engineering & Drawing | Civil / Mechanical Dept. | 2 | 0 | 2 | 0 | 3 | 50 | 50 | 100 | 3 |
| 4 | ESC-II | | Engineering Science Course-II | EEE Dept. | 3 | 0 | 0 | 0 | 3 | 50 | 50 | 100 | 3 |
| 5 | PLC-II | | Programming Language Course-II | Dept. | 2 | 0 | 2 | 0 | 3 | 50 | 50 | 100 | 3 |
| 6 | AEC | | Professional Writing Skills in English | HSS Dept. | 1 | 0 | 0 | 0 | 1 | 50 | 50 | 100 | 1 |
| 7 | HSMC | | Sanskritika Kannada | HSS Dept. | 1 | 0 | 0 | 0 | 1 | 50 | 50 | 100 | 1 |
| 8 | | | Balake Kannada | | | | | | | | | | |
| 9 | SDC | | Innovation and Design Thinking | Dept. | 1 | 0 | 0 | 0 | 1 | 50 | 50 | 100 | 1 |
| | | | | **Total** | 16 | 0 | 8 | 0 | 24 | **400** | **400** | **800** | **20** |

| Sl. No. | Programming Language Course-II PLC-II | Engineering Science Course-II ESC-II | Engineering Science Course ESC |
|---|---|---|---|
| 1. | Introduction to C++ Programming | Introduction to Electrical Engineering | CAED |
| 2. | Introduction to Python Programming | Introduction to Electronics & Communication | |
| 3. | Basics of JAVA programming | | |

# Basaveshwar Engineering College, Bagalkote
## B.E. in Electronics and Communication Engineering
## Scheme of Teaching and Examinations
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**III SEMESTER**

| Sl. No | Course | Course Code | Course Title | Teaching Department (TD)and Question Paper Setting Board (PSB) | Teaching Hours /Week | | | | Examination | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Theory Lecture | Tutorial | Practical/ Drawing | SDA | Duration inhours | CIE Marks | SEE Marks | Total Marks | |
| | | | | | L | T | P | S | | | | | |
| 1 | PCC | | AV Mathematics-III for EC Engineering | MATHEMATICS | 3 | 0 | 0 | | 03 | 50 | 50 | 100 | 3 |
| 2 | IPCC | | Digital System Design using Verilog | ECE DEPT. | 3 | 0 | 2 | | 03 | 50 | 50 | 100 | 4 |
| 3 | IPCC | | Electronic Principles and Circuits | ECE DEPT. | 3 | 0 | 2 | | 03 | 50 | 50 | 100 | 4 |
| 4 | PCC | | Network Analysis | ECE DEPT. | 3 | 0 | 0 | | 03 | 50 | 50 | 100 | 3 |
| 5 | PCCL | | Analog and Digital Systems Design Lab | ECE DEPT. | 0 | 0 | 2 | | 03 | 50 | 50 | 100 | 1 |
| 6 | ESC | | ESC/ETC/PLC | ECE DEPT. | 3 | 0 | 0 | | 03 | 50 | 50 | 100 | 3 |
| 7 | UHV | | Social Connect and Responsibility | HSS DEPT. | 0 | 0 | 2 | | 01 | 100 | --- | 100 | 1 |
| 8 | AEC/ SEC | | Ability Enhancement Course/Skill EnhancementCourse– III | ECE DEPT. | If the course is a Theory: 1 | 0 | 0 | | 01 | 50 | 50 | 100 | 1 |
| | | | | | If a course is a laboratory: 0 | 0 | 2 | | 02 | | | | |
| 9 | MC | | Yoga | NSS COORDINATOR | 0 | 0 | 2 | | | 25 | --- | 25 | 0 |
| | | | National Service Scheme (NSS) | MUSIC TEACHER | | | | | | | | | |
| | | | Physical Education (PE) (Sports and Athletics) | PHYSICAL EDUCATION DIRECTOR | | | | | | | | | |
| | | | Music | YOGA TEACHER | | | | | | | | | |
| | | | | **Total** | **15/16** | **0** | **12** | | **22** | **550** | **350** | **900** | **20** |

| Sl. No. | Ability Enhancement Course (AEC) | Subject Code | Engineering Science Course (ESC) | Subject Code | Skill Enhancement Course (SEC) | Subject Code |
|---|---|---|---|---|---|---|
| 1. | C++ Basics | | Electronic Devices | | MATLAB Programming | |
| 2. | IOT for Smart Infrastructure | | Computer Organization and Architecture | | LABVIEW programming | |
| 3. | | | Sensors and Instrumentation | | | |
| 4. | | | Applied Numerical Methods for EC Engineers | | | |

**PCC**: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course(Non-credit),**AEC**: Ability Enhancement Course, **SEC**: Skill Enhancement Course,**L:**Lecture,**T**:Tutorial,**P**:Practical**S=SDA**:SkillDevelopmentActivity,**CIE**:ContinuousInternalEvaluation,**SXX**:

# Basaveshwar Engineering College, Bagalkote
## B.E. in Electronics and Communication Engineering
## Scheme of Teaching and Examinations
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**IV SEMESTER**

| Sl. No | Course and Course Code | | Course Title | Teaching Department (TD) and Question Paper Setting Board (PSB) | Teaching Hours /Week | | | | Examination | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Theory Lecture | Tutorial | Practical/ Drawing | Self-Study | Duration in hours | CIE Marks | SEE Marks | Total Marks | |
| | | | | | L | T | P | S | | | | | |
| 1 | PCC | | Electromagnetic Theory | ECE DEPT. | 3 | 0 | 0 | 0 | 03 | 50 | 50 | 100 | 3 |
| 2 | IPCC | | Principles of Communication Systems | ECE DEPT. | 3 | 0 | 2 | 0 | 03 | 50 | 50 | 100 | 4 |
| 3 | IPCC | | Control Systems | ECE DEPT. | 3 | 0 | 2 | 0 | 03 | 50 | 50 | 100 | 4 |
| 4 | PCCL | | Communication Lab | ECE DEPT. | 0 | 0 | 2 | 0 | 03 | 50 | 50 | 100 | 1 |
| 5 | ESC | | ESC/ETC/PLC | ECE DEPT. | 3 | 0 | 0 | 0 | 03 | 50 | 50 | 100 | 3 |
| 6 | AEC/ SEC | | Ability Enhancement Course/Skill Enhancement Course- IV | ECE DEPT. | If the course is Theory | | | | 01 | 50 | 50 | 100 | 1 |
| | | | | | 1 | 0 | 0 | 0 | | | | | |
| | | | | | If the course is a lab | | | | 02 | | | | |
| | | | | | 0 | 0 | 2 | 0 | | | | | |
| 7 | BSC | | Biology For Engineers | ECE DEPT. | 3 | 0 | 0 | 0 | 03 | 50 | 50 | 100 | 3 |
| 8 | UHV | | Universal human values course | ECE DEPT. | 1 | 0 | 0 | 0 | 01 | 50 | 50 | 100 | 1 |
| 9 | MC | | Yoga | YOGA TEACHER | 0 | 0 | 2 | | | 25 | --- | 25 | 0 |
| | | | National Service Scheme (NSS) | NSS COORDINATOR | | | | | | | | | |
| | | | Physical Education (PE) (Sports and Athletics) | PHYSICAL EDUCATION DIRECTOR | | | | | | | | | |
| | | | Music | MUSIC TEACHER | | | | | | | | | |
| | | | | **Total** | **16/17** | **0** | **10** | | **22** | **500** | **400** | **900** | **20** |

**PCC**: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course(Non-credit),**AEC**: Ability Enhancement Course, **SEC**: Skill Enhancement Course,**L:**Lecture,**T**:Tutorial,**P**:Practical**S=SDA**:SkillDevelopmentActivity,**CIE**:ContinuousInternalEvaluation,**SXX**:

| Sl. No. | Ability Enhancement Course AEC | Subject Code | Engineering Science Course ESC | Subject Code | Skill Enhancement Course (SEC) | Subject Code |
|---|---|---|---|---|---|---|
| 1. | Octave Programming | | Data Structures using C | | Data Structures Lab using C | |
| 2. | Programmable Logic Controllers | | Microcontrollers | | Microcontroller Lab | |
| 3. | | | Industrial Electronics | | | |
| 4. | | | Operating Systems | | | |

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## Scheme of Teaching and Examinations
## AY: 2024-25

**V SEMESTER**

| Sl. No | Course and Course Code | | Course Title | Teaching Department(TD) and Question Paper Setting Board(PSB) | Teaching Hours/Week | | | | Examination | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Theory Lecture | Tutorial | Practical/Drawing | SDA | Duration in hours | CIE Marks | SEE Marks | Total Marks | |
| | | | | | L | T | P | S | | | | | |
| 1 | HSMS | | Technological Innovation and Management Entrepreneurship | ECE DEPT. | 3 | 0 | 0 | 0 | 03 | 50 | 50 | 100 | 3 |
| 2 | IPCC | | Digital Signal Processing | ECE DEPT. | 3 | 0 | 2 | 0 | 03 | 50 | 50 | 100 | 4 |
| 3 | PCC | | Digital Communication | ECE DEPT. | 4 | 0 | 0 | 0 | 03 | 50 | 50 | 100 | 4 |
| 4 | PCCL | | Digital Communication Lab | ECE DEPT. | 0 | 0 | 2 | 0 | 03 | 50 | 50 | 100 | 1 |
| 5 | PEC | | Professional Elective Course | ECE DEPT. | 3 | 0 | 0 | 0 | 03 | 50 | 50 | 100 | 3 |
| 6 | PROJ | | Mini Project | ECE DEPT. | 0 | 0 | 4 | 0 | 03 | 100 | -- | 100 | 2 |
| 7 | AEC | | **Research Methodology and IPR** | ECE DEPT. | 2 | 2 | 0 | 0 | 02 | 50 | 50 | 100 | 3 |
| 8 | MC | | Environmental Studies | ANY DEPARTMENT | 2 | 0 | 0 | 0 | 02 | 50 | 50 | 100 | 2 |
| 9 | MC | | Yoga | YOGA TEACHER | 0 | 0 | 2 | | | 25 | --- | 25 | 0 |
| | | | National Service Scheme (NSS) | NSS COORDINATOR | | | | | | | | | |
| | | | Physical Education (PE) (Sports and Athletics) | PHYSICAL EDUCATION DIRECTOR | | | | | | | | | |
| | | | Music | MUSIC TEACHER | | | | | | | | | |
| 10 | AC | | Qualitative Aptitude and Soft Skills | TPC | 2 | 0 | 0 | 0 | 2 | 100 | -- | 100 | 0 |
| **Total** | | | | | **19** | **2** | **10** | **0** | **24** | **650** | **350** | **1000** | **22** |

**Professional Elective Course**

| | | |
|---|---|---|
| 1. | Intelligent Systems and Machine Learning Algorithms | |
| 2. | Digital Switching and Finite Automata Theory | |
| 3. | Data Structure using C++ | |
| 4. | Satellite and Optical Communication | |

**PCC**: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course(Non-credit),**AEC**: Ability Enhancement Course, **SEC**: Skill Enhancement Course,**L:**Lecture,**T**:Tutorial,**P**:Practical**S=SDA**:SkillDevelopmentActivity,**CIE**:ContinuousInternalEvaluation,**SXX**:, **AC**: Audit Course

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**VI SEMESTER**

| Sl.No | Course and Course Code | | Course Title | Teaching Department(TD) and Question Paper Setting Board(PSB) | Teaching Hours/Week | | | | Examination | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Theory Lecture | Tutorial | Practical/Drawing | SDA | Duration in hours | CIE Marks | SEE Marks | Total Marks | |
| | | | | | L | T | P | S | | | | | |
| 1 | IPCC | | Embedded System Design | ECE DEPT | 3 | 0 | 2 | 0 | 03 | 50 | 50 | 100 | 4 |
| 2 | PCC | | VLSI Design and Testing | ECE DEPT | 4 | 0 | 0 | 0 | 03 | 50 | 50 | 100 | 4 |
| 3 | PEC | | Professional Elective Course | ECE DEPT | 3 | 0 | 0 | 0 | 03 | 50 | 50 | 100 | 3 |
| 4 | OEC | | Open Elective Course | RESPECTIVE DEPT | 3 | 0 | 0 | 0 | 03 | 50 | 50 | 100 | 3 |
| 5 | PROJ | | Major Project Phase I | ECE DEPT | 0 | 0 | 4 | 0 | 03 | 100 | -- | 100 | 2 |
| 6 | PCCL | | VLSI Design and Testing Lab | ECE DEPT | 0 | 0 | 2 | 0 | 03 | 50 | 50 | 100 | 1 |
| 7 | AEC | | Indian Knowledge System | ECE DEPT | If the course is offered as a Theory | | | | 01 | 50 | 50 | 100 | 1 |
| | | | | | 1 | 0 | 0 | 0 | | | | | |
| | | | | | If course is offered as a practical | | | | | | | | |
| | | | | | 0 | 0 | 2 | 0 | | | | | |
| 8 | MC | | Yoga | YOGA TEACHER | 0 | 0 | 2 | | | 25 | --- | 25 | 0 |
| | | | National Service Scheme (NSS) | NSS COORDINATOR | | | | | | | | | |
| | | | Physical Education (PE) (Sports and Athletics) | PHYSICAL EDUCATION DIRECTOR | | | | | | | | | |
| | | | Music | MUSIC TEACHER | | | | | | | | | |
| **Total** | | | | | **14/13** | **0** | **12/10** | **0** | **19** | **500** | **300** | **800** | **18** |

| Sl. No. | Professional Elective Course (PEC) | Subject Code | Open Elective Course (OE) | Subject Code |
|---|---|---|---|---|
| 1. | Multimedia Communication | | Digital System Design using Verilog | |
| 2. | Digital Image Processing | | Electronic Communication Systems | |
| 3. | Computer and Data Security | | Consumer Electronics | |
| 4. | FPGA System Design using Verilog | | Basic VLSI Design | |

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**VII SEMESTER (Swappable VII and VIII SEMESTER)**

| Sl.No | Course and Course Code | | Course Title | Teaching Department(TD) and Question Paper Setting Board(PSB) | Teaching Hours/Week | | | | Examination | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Theory Lecture | Tutorial | Practical/Drawing | SDA | Duration in hours | CIE Marks | SEE Marks | Total Marks | |
| | | | | | L | T | P | S | | | | | |
| 1 | IPCC | | Microwave Engineering and Antenna Theory | ECE DEPT | 3 | 0 | 2 | 0 | 03 | 50 | 50 | 100 | 4 |
| 2 | IPCC | | Computer Networks and Protocols | ECE DEPT | 3 | 0 | 2 | 0 | 03 | 50 | 50 | 100 | 4 |
| 3 | PCC | | Wireless Communication Systems | ECE DEPT | 4 | 0 | 0 | 0 | 03 | 50 | 50 | 100 | 4 |
| 4 | PEC | | **Professional Elective Course** | RESPTIVE DEPT | 3 | 0 | 0 | 0 | 03 | 50 | 50 | 100 | 3 |
| 5 | OEC | | **Open Elective Course** | ECE DEPT | 3 | 0 | 0 | 0 | 03 | 50 | 50 | 100 | 3 |
| 6 | PROJ | | **Major Project Phase-II** | ECE DEPT | 0 | 0 | 12 | 0 | 03 | 100 | 100 | 200 | 6 |
| | | | | | 16 | 0 | 16 | 0 | 18 | **350** | **350** | **700** | **24** |

| Sl. No. | **Professional Elective Course (PEC)** | Subject Code | **Open Elective Course (OE)** | Subject Code |
|---|---|---|---|---|
| 1. | Application Specific Integrated Circuit | | E-waste Management | |
| 2. | Automative Electronics | | Embedded System Applications | |
| 3. | Cyber Security | | Automotive Electronics | |
| 4. | Radar Communication | | Sensors and Actuators | |

**L:**Lecture,**T**:Tutorial,**P**:Practical**S=SDA**:SkillDevelopmentActivity,**CIE**:ContinuousInternalEvaluation,**SEE**:SemesterEndEvaluation.**TD-**TeachingDepartment,**PSB**:PaperSettingdepartment,**OEC**:OpenElectiveCourse,**PEC**:ProfessionalElectiveCourse.**PROJ**:Projectwork,**INT**:IndustryInternship/ResearchInternship/RuralInternship

**Basaveshwar Engineering College, Bagalkote**
**B.E. in Electronics and Communication Engineering**
**Scheme of Teaching and Examinations**
**AY: 2024-25**

| VIII SEMESTER (Swappable VII and VIII SEMESTER) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sl.No | Course and Course Code | | Course Title | Teaching Department(TD)and Question Paper Setting Board(PSB) | Teaching Hours/Week | | | | Examination | | | | Credits |
| | | | | | Theory Lecture | Tutorial | Practical/Drawing | SDA | Duration in hours | CIE Marks | SEE Marks | Total Marks | |
| | | | | | L | T | P | S | | | | | |
| 1 | PEC | | **Professional Elective (Online Courses) MOOCS** | | 3 | 0 | 0 | 0 | 03 | 50 | 50 | 100 | 3 |
| 2 | OEC | | **Open Elective (Online Courses) MOOCS** | | 3 | 0 | 0 | 0 | 01 | 50 | 50 | 100 | 3 |
| 3 | INT | | **Internship (Industry/Research) (14-20weeks)** | | 0 | 0 | 12 | 0 | 03 | 100 | 100 | 200 | 10 |
| | | | **Total** | | 6 | 0 | 12 | 0 | 07 | **200** | **200** | **400** | **16** |
| **Professional Elective Course** | | | | | | | | | | | | | |
| | | BOS Recommended Course | | | | BOS Recommended Course | | | | | | | |
| | | BOS Recommended Course | | | | BOS Recommended Course | | | | | | | |
| **Open Elective Courses** | | | | | | | | | | | | | |
| | | BOS Recommended Course | | | | BOS Recommended Course | | | | | | | |
| | | BOS Recommended Course | | | | BOS Recommended Course | | | | | | | |

**L:**Lecture,**T**:Tutorial,**P**:Practical**S=SDA**:SkillDevelopmentActivity,**CIE**:ContinuousInternalEvaluation,**SEE**:SemesterEndEvaluation.**TD**-TeachingDepartment,**PSB**:PaperSettingdepartment,**OEC**:OpenElectiveCourse,**PEC**:ProfessionalElectiveCourse.**PROJ**:Projectwork,**INT**:IndustryInternship/ResearchInternship/RuralInternship

| Course Title: | **Basic Electronics (For ECE and Allied Branches)** | | |
|---|---|---|---|
| Course Code: | | CIE Marks | 50 |
| Course Type (Theory/Practical /Integrated ) | Theory | SEE Marks | 50 |
| | | Total Marks | 100 |
| Teaching Hours/Week (L:T:P: S) | 3:0:0:0 | Exam Hours | 03 |
| Total Hours of Pedagogy | 40 hours | Credits | 03 |

**Course objectives:** Students will be taught

1. Operation of Semiconductor diode, Zener diode and Special purpose diodes and their applications.
2. Biasing circuits for transistor (BJT) as an amplifier.
3. Study of linear Op-amps and its applications.
4. Logic circuits and their optimization.
5. Principles of Transducers and Communication.

**Teaching-Learning Process**

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective

1. Lecture method (L) does not mean only the traditional lecture method, but a different type ofteaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the functioning of various analog and digital circuits.
3. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
4. Show the different ways to solve the same problem and encourage the students to come up withtheir own creative ways to solve them.
5. Discuss how every concept can be applied to the real world - and when that's possible, it helpsimprove the students' understanding.

**Module-1 (8 Hours)**

**Semiconductor Diodes:** Introduction, PN Junction diode, Characteristics and Parameters, DiodeApproximations, DC Load Line analysis (Text 1: 2.1,2.2,2.3,2.4)

**Diode Applications:** Introduction, Half Wave Rectification, Full Wave Rectification, Full Wave Rectifier Power Supply: Capacitor Filter Circuit, RC $\pi$ Filter (includes numerical)
(Text 1: 3.1,3.2,3.4,3.5)

**Zener Diodes:** Junction Breakdown, Circuit Symbol and Package, Characteristics and Parameters,Equivalent Circuit, Zener Diode Voltage Regulator. (Text1:2.9, 3.7)

**Module-2(8 Hours)**

**Bipolar Junction Transistors:** Introduction BJT Voltages & Currents, BJT Amplification, Common BaseCharacteristics, Common Emitter Characteristics, Common Collector Characteristics, BJT Biasing:
Introduction, DC Load line and Bias point(Text
1: 4.2, 4.3, 4.5,4.6, 5.1)

**Field Effect Transistor:** Junction Field Effect Transistor, JFET Characteristics, MOSFETs: Enhancement MOSFETs, Depletion Enhancement MOSFETs (Text 1: 9.1,9.2,9.5)

**Module-3(8 Hours)**

**Operational Amplifiers**: Introduction, The Operational Amplifier, Block Diagram Representation of Typical Op-Amp, Schematic Symbol, Op-Amp parameters - Gain, input resistance, Output resistance, CMRR, Slew rate, Bandwidth, input offset voltage, Input bias Current and Input offset Current, The Ideal Op-Amp , Equivalent Circuit of Op-Amp, Open Loop Op-Amp configurations, Differential Amplifier, Inverting & Non Inverting Amplifier

**Op-Amp Applications:** Inverting Configuration, Non-Inverting Configuration, Differential Configuration, Voltage Follower, Integrator, Differentiator(Text 2: 1.1, 1.2, 1.3, 1.5, 2.2, 2.3, 2.4, 2.6, 6.5.1, 6.5.2, 6.5.3, 6.12, 6.13).

**Module-4(8 Hours)**

**Boolean Algebra and Logic Circuits:** Binary numbers, Number Base Conversion, octal & Hexa Decimal Numbers, Complements, Basic definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates (Text 3: 1.2, 1.3, 1.4, 1.5,2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7)

**Combinational logic**: Introduction, Design procedure, Adders- Half adder, Full adder (Text 3:4.1, 4.2, 4.3)

**Module-5(8 Hours)**

**Introduction to Transducers:** Introduction, Resistive Transducers, Inductive Transducers, Capacitive Transducers, Thermal transducers, Optoelectronic transducer, and Piezoelectric transducers (Text 4: Chapter 18: 18.1, 18.2, 18.3, 18.4, 18.5)

**Communications:** Introduction to communication, Communication System, Modulation (Text book 5: 1.1, 1.2, 1.3

**Course outcome (Course Skill Set)**

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

**CO1:**Develop the basic knowledge on construction, operation and characteristics ofsemiconductor devices.(Level: C3)

**CO2:**Apply the acquired knowledge to construct small scale circuits consisting of semiconductor devices (Level: C3)

**CO3:**Develop competence knowledge to construct basic digital circuit by make use of basic gateand its function.(Level: C3)

**CO4:** Construct the conceptual blocks for basic communication system. (Level: C3)

**CO5:** Apply the knowledge of various transducers principle in sensor system. (Level: C3)

**A. CO v/s PO Mapping Table**

| Cos/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | - | 2 | 2 | | | | | | |
| **CO2** | 3 | 2 | 3 | - | 2 | 1 | | | | | | |
| **CO3** | 3 | 2 | 3 | - | 3 | | | | 1 | | | |
| **CO4** | 2 | 1 | 1 | - | 2 | 1 | | | 1 | | | 1 |
| **CO5** | 2 | 1 | 1 | - | 2 | 1 | | | 1 | | | 1 |

**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**Continuous Internal Evaluation(CIE):**

Three Tests each of 20 Marks**;**

- 1st, 2nd, and 3rd tests shall be conducted after completion of the syllabus of 30-35%,70-75%, and 90-100% of the course/s respectively.
- Assignments/Seminar/quiz/group discussion /field survey & report presentation/ course project/Skill development activities, suitably planned to attain the COs and POs for a total of40 Marks.

  If the nature of the courses requires assignments/Seminars/Quizzes/group discussion two evaluation components shall be conducted. If course project/field survey/skill developmentactivities etc then the evaluation method shall be one.

Total CIE marks (out of 100 marks) shall be scaled down to 50 marks

**Semester End Examination(SEE):**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

- The question paper shall be set for 100 marks. The medium of the question paper shall be English). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionallyreduced to 50 marks**.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

**Suggested Learning Resources:**

**Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**


1. Electronic Devices and Circuits, David A Bell, 5th Edition, Oxford, 2016
2. Op-amps and Linear Integrated Circuits, Ramakanth A Gayakwad, Pearson Education, 4th Edition
3. Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008 ISBN-978-81-203-0417-8
4. Electronic Instrumentation and Measurements (3rd Edition) – David A. Bell, Oxford University Press,2013
5. Electronic Communication Systems, George Kennedy, 4th Edition, TMH


**Web links and Video Lectures (e-Resources):**

- https://nptel.ac.in/courses/122106025
- https://nptel.ac.in/courses/108105132
- https://nptel.ac.in/courses/117104072

| Course Title: | **Introduction to Electronics & Communication** | | |
|---|---|---|---|
| Course Code: | | CIE Marks | 50 |
| Course Type (Theory/Practical/Integrated ) | Theory | SEE Marks | 50 |
| | | Total Marks | 100 |
| Teaching Hours/Week (L:T:P: S) | 3:0:0:0 | Exam Hours | 03 |
| Total Hours of Pedagogy | 40 hours | Credits | 03 |

**Course objectives**

1. To prepare students with fundamental knowledge/ overview in the field ofElectronics and Communication Engineering.
2. To equip students with a basic foundation in electronic engineeringrequired for comprehendingthe operation and application of electroniccircuits, logic design, embedded systems, and communication systems.
3. Professionalism & Learning Environment: To inculcate in first-year engineering studentsan ethical and professional attitude by providing an academic environment inclusive of effective communication, teamwork, ability to relate engineering issues to a broader social context, and life-long learning needed for a successful professional career.

**Teaching-Learning Process**

These are sample Strategies, which teacher can use to accelerate the attainment of the various courseoutcomes and make Teaching –Learning more effective

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type ofteaching method may be adopted to develop the outcomes.
2. Arrange visits to nearby PSUs such as BHEL, BEL, ISRO, etc., and small-scale hardwareIndustries to give brief information about the electronics manufacturing industry.
3. Show Video/animation films to explain the functioning of various analog and digital circuits.
4. Encourage collaborative (Group) Learning in the class
5. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotescriticalthinking
6. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather thansimply recall it.
7. Topics will be introduced in multiple representations.
8. Show the different ways to solve the same problem and encourage the students to come upwith their own creative ways to solve them.
9. Discuss how every concept can be applied to the real world - and when that's possible, it Helps improve the students' understanding.

**Module-1 (8 hours )**

**Power Supplies** –Block diagram, Half-wave rectifier, Full-waverectifiers and filters, Voltageregulators, Output resistanceand voltage regulation, Voltage multipliers.

**Amplifiers** – Types of amplifiers, Gain, Input and output resistance, Frequency response, Bandwidth, Phase shift, Negativefeedback, multi-stage amplifiers (Text 1)

**Module-2(8 hours )**

**Oscillators** – Barkhausen criterion, sinusoidal and non-sinusoidal oscillators, Ladder network oscillator, Wein bridge oscillator, Multivibrators, Single-stage astable oscillator, Crystal controlled oscillators (Only Concepts, working, and waveforms. No mathematical derivations)

**Operational amplifiers -**Operational amplifier parameters, Operational amplifier characteristics, Operational amplifier configurations, Operational amplifier circuits.
Text 1)

**Module-3 ( 8 hours)**

**Boolean Algebra and Logic Circuits:** Binary numbers, Number Base Conversion, octal & HexaDecimal Numbers, Complements, Basic definitions, Axiomatic Definition of Boolean Algebra, BasicTheorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms,Other Logic Operations, Digital Logic Gates (Text 2: 1.2, 1.3, 1.4, 1.5,2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7) **Combinational logic**: Introduction, Design procedure, Adders- Half adder, Full adder (Text 2:4.1, 4.2, 4.3)

| Module-4 ( 8 hours) |
|---|
| **Embedded Systems** – Definition, Embedded systems vs general computing systems, Classificationof Embedded Systems, Major application areas of Embedded Systems, Elements of an Embedded System, Core of the Embedded System, Microprocessor vs Microcontroller, RISC vs CISC **Sensors and Interfacing** – Instrumentation and control systems, Transducers, Sensors, Actuators,<br>LED, 7-Segment LED Display. (Text 3) |
| **Module-5 ( 8 hours)** |
| **Analog Communication Schemes** – Modern communication system scheme, Information source,andinput transducer, Transmitter, Channel or Medium – Hardwired and Soft wired, Noise, Receiver, Multiplexing, Types of communication systems.Types of modulation (only concepts) – AM , FM,Concept of Radio wave propagation (Ground, space, sky)<br>**Digital Modulation Schemes**: Advantages of digital communication over analog communication,<br>ASK, FSK, PSK, Radio signal transmission Multiple access techniques. ( Text 4) |

**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**Continuous Internal Evaluation (CIE):**

Three Tests each of 20 Marks**;**

- 1st, 2nd, and 3rd tests shall be conducted after completion of the syllabus of 30-35%,70-75%, and 90-100% of the course/s respectively.
- Assignments/Seminar/quiz/group discussion /field survey & report presentation/ course project/Skill development activities, suitably planned to attain the COs and POs for a total of40 Marks.

  If the nature of the courses requires assignments/Seminars/Quizzes/group discussion two evaluation components shall be conducted. If course project/field survey/skill developmentactivities etc then the evaluation method shall be one.

Total CIE marks (out of 100 marks) shall be scaled down to 50 marks

**Semester End Examination(SEE):**

Theory SEE will be conducted by University as per the scheduled timetable, with common questionpapers for the subject (**duration 03 hours)**

- The question paper shall be set for 100 marks. The medium of the question paper shall beEnglish). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks**.
- There will be 2 questions from each module. Each of the two questions under a module (with amaximum of 3 sub-questions), **should have a mix of topics** under that module.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1. Mike Tooley, 'Electronic Circuits, Fundamentals & Applications',4thEdition, Elsevier, 2015.DOI https://doi.org/10.4324/9781315737980. eBook ISBN9781315737980
2. Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008 ISBN-978-81-203-0417-84.
3. K V Shibu, 'Introduction to Embedded Systems', 2nd Edition, McGraw Hill Education (India),Private Limited, 2016
4. S L Kakani and Priyanka Punglia, 'Communication Systems', New Age International Publisher,2017.

| Course Title: | INTRODUCTION TO EMBEDDED SYSTEMS | | | | |
|---|---|---|---|---|---|
| Course Code: | | | | CIE Marks | 50 |
| Course Type (Theory/Practical /Integrated ) | | Theory | | SEE Marks | 50 |
| | | | | Total Marks | 100 |
| Teaching Hours/Week (L:T:P: S) | 3:0:0:0 | | | Exam Hours | 03 |
| Total Hours of Pedagogy | 40 hours | | | Credits | 03 |

**Course objectives:** To teach students

- Introductory topics of Embedded System design
- Characteristics & attributes of Embedded System
- Introduction of Embedded System Software and Hardware development
- RTOS based Embedded system design

**Teaching-Learning Process**

These are sample Strategies, which teacher can use to accelerate the attainment of the various courseoutcomes and make Teaching –Learning more effective

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type ofteaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the functioning of various analog and digital circuits.
3. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather thansimply recall it.
4. Show the different ways to solve the same problem and encourage the students to come upwith their own creative ways to solve them.
5. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

**Module-1 (8 Hours)**

**Introduction:** Embedded Systems and general purpose computer systems, history, classifications, applications and purpose of embedded systems **Chapter 1 – Text 1**

**Core of Embedded Systems :** Microprocessors and microcontrollers, RISC and CISC controllers, Big endian and Little endian processors, Application specific ICs, Programmable logic devices, COTS, sensors and actuators: Light Emi ng Diode (LED) and 7-Segment LED Display, communication interface: Inter Integrated Circuit ( I2C) Bus, Serial Peripheral Interface ( SPI) Bus, Universal Asynchronous Receiver Transmitter ( UART) and RS-232 C and RS-485, embedded firmware, other system components : Oscillator Unit and Watchdog Timer,
PCB and passive components **Chapter 2 – Text 1**

**Module-2(8 Hours)**

**Characteristics and quality attributes of embedded systems:** Characteristics, Operational and nonoperational quality attributes, application specific embedded system - washing machine, domainspecific – automotive **Chapter 3 & 4 – Text 1**

**Module-3(8 Hours)**

**Hardware Software Co design and Program Modelling :** Fundamental issues in Hardware Software Co-design, Computational models in Embedded System Design **Chapter 7 – Text 1: 7.1, 7.2 Embedded Hardware Design and Development:** Analog Electronic Components, Digital Electronic Components, VLSI & Integrated Circuit Design, Electronic Design Automation Tools
**Chapter 8 – Text 1: 8.1, 8.2, 8.3, 8.4**

**Module-4(8 Hours)**

**Embedded Firmware Design and Development:** Embedded Firmware Design Approaches,Embedded Firmware Development Languages **Chapter 9 – Text 1: 9.1, 9.2**

**Embedded System Development Environments:** Types of files generated on cross compilation (only explanation – programming codes need not be dealt), disassemble/decompliler, Simulators,
Emulators and Debugging **Chapter 13 – Text 1: 13.2, 13.3,13.4**

**Module-5(8 Hours)**

**Real-time Operating System(RTOS) based Embedded System Design:**

Operating System basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessingand Multitasking, Task Scheduling **Chapter 10 – Text 1: 10.1 to 10.5**

**Course outcome (Course Skill Set)**

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

| | |
|---|---|
| CO1 | Explain characteristics of Embedded System design |
| CO2 | Acquire knowledge about basic concepts of circuit emulators, debugging and RTOS |
| CO3 | Analyse embedded system software and hardware requirements |
| CO4 | Develop programming skills in embedded systems for various applications. |
| CO5 | Design basic embedded system for real time applications |

**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**Continuous Internal Evaluation(CIE):**

Three Tests each of 20 Marks**;**

- 1st, 2nd, and 3rd tests shall be conducted after completion of the syllabus of 30-35%,70-75%, and 90-100% of the course/s respectively.
- Assignments/Seminar/quiz/group discussion /field survey & report presentation/ course project/Skill development activities, suitably planned to attain the COs and POs for a total of 40Marks.
  If the nature of the courses requires assignments/Seminars/Quizzes/group discussion two evaluation components shall be conducted. If course project/field survey/skill developmentactivities etc then the evaluation method shall be one.

Total CIE marks (out of 100 marks) shall be scaled down to 50 marks

**Semester End Examination (SEE):**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

- The question paper shall be set for 100 marks. The medium of the question paper shall beEnglish). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for20 marks.The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks**.

There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

**Suggested Learning Resources:**

**Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

1. Shibu K V, "Introduction to Embedded Systems", Second Edition, McGraw Hill Educatiion

**Web links and Video Lectures (e-Resources):**

NPTL Lectures: https://nptel.ac.in/courses/108102045Embedded Systems, IIT Delhi, Prof. Santanu Chaudhary

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- To design a simple Embedded System like simple remote

To demonstrate simple microcontroller based experiments like LED interfacing, LCDinterfacing, DAC etc

| Course Title: | Introduction to Nano Technology | | |
|---|---|---|---|
| Course Code: | | CIE Marks | 50 |
| Course Type (Theory/Practical /Integrated ) | ETC (Integrated) | SEE Marks | 50 |
| | | Total Marks | 100 |
| Teaching Hours/Week (L:T:P: S) | 02:00:02:00 | Exam Hours | 03 |
| Total Hours of Pedagogy | 40 hours | Credits | 03 |
| Teaching Department | NT/Chem/Phys/Any Engg. Branch | QP setting | NT/Chem/Phys |

**Course objectives**

- To provide a comprehensive overview of synthesis and characterization of nanoparticles,nanocomposites and hierarchical materials with nanoscale features.
- To provide the engineering students with necessary background for understanding variousnanomaterials characterization techniques
- To develop an understanding of the basis of the choice of material for device applications
- To give an insight into complete systems where nanotechnology can be used to improve oureveryday life

**Teaching-Learning Process**

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective

1. Chalk and Talk
2. Powerpoint presentation
3. Video Lecturing
4. E-sources
5. Self learning

**Module-1 (**07 **hours of pedagogy)**

**Introduction to Nanomaterials**

Nanotechnology, Frontier of future-an overview, Length Scales, Variation of physical properties from bulk to thin films to nanomaterials, Confinement of electron in 0D, 1D, 2D and 3D systems, Surface to Volume Ratio, Synthesis of Nanomaterials: Bottom-Up approach: Chemical Routes for Synthesis of nanomaterials-Sol-gel, Precipitation, Solution Combustion synthesis, Hydrothermal, SILAR, Chemical Bath Deposition. Top-Down approach- Ball milling technique, Sputtering, Laser Ablation

**Module-2 (07 hours of pedagogy)**

**Characterization of Nanomaterials**

Basic principles and instrumentations of Electron Microscopy –Transmission Electron Microscope, Scanning Electron Microscope, Scanning Probes- Scanning Tunneling microscope, Atomic Force Microscope –different imaging modes, comparison of SEM and TEM, AFM and STM, AFM and SEM.

Basic principles of working of X-ray diffraction, derivation of Debye-Scherrer equation, numericals on Debye Scherrer equation, Optical Spectroscopy- Instrumentation and application of IR, UV/VIS (Band gap measurement)

**Module-3(07 hours of pedagogy)**

**Carbon Based Materials**

Introduction, Synthesis, Properties (electrical, Electronic and Mechanical), and Applications of Graphene, SWCNT, MWCNT, Fullerenes and other Carbon Materials: Carbon nanocomposites,

nanofibres, nanodiscs, nanodiamonds.

**Module-4(07 hours of pedagogy)**

**Nanotechnology in Energy storage and conversion**

Solar cells: First generation, Second generation and third generation solar cells: Construction and working of Dye sensitized and Quantum dot sensitized solar cells.

Batteries: Nanotechnology in Lithium ion battery- working, Requirements of anodic and cathodic materials, classification based on ion storage mechanisms, limitations of graphite anodes, Advances in Cathodic materials, Anodic materials, Separators

Fuel Cells:Introduction, construction, working of fuel cells and nanotechnology in hydrogen storage and proton exchange membranes

**Self study for lifelong learning:**

Super capacitors: Introduction, construction and working of supercapacitor

**Module-5 (07 hours of pedagogy)**

**Applications of Nanotechnology**

Nanotech Applications and Recent Breakthroughs: Introduction, Significant Impact of Nanotechnology and Nanomaterial, Medicine and Healthcare Applications, Biological and Biochemical Applications (Nano biotechnology), Electronic Applications (Nano electronics), Computing Applications (Nano computers), Chemical Applications (Nano chemistry), Optical Applications (Nano photonics), Agriculture and Food Applications, Recent Major Breakthroughs in Nanotechnology.

**Self study for lifelong learning:**

Nano coatings (Photocatalysts) and super hydrophobic coatings (Lotus effect)

**Course outcome (Course Skill Set)**

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

| | |
|---|---|
| CO1 | Demonstrate the synthesis of nanoparticles by various techniques. [L2] |
| CO2 | Explain working of basic instruments used in characterization of nanoparticles. [L2] |
| CO3 | Discuss the application of nanotechnology to mechanical and civil domains [L2] |
| CO4 | Classify the nanomaterials based on the dimensions. [L3] |
| CO5 | Assess the suitability of nanomaterials for various device applications. [L4] |

**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is

35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**Continuous Internal Evaluation(CIE):**

Three Tests each of 20 Marks**;**

- 1st, 2nd, and 3rd tests shall be conducted after completion of the syllabus of 30-35%,70-75%, and 90-100% of the course/s respectively.
- Assignments/Seminar/quiz/group discussion /field survey & report presentation/ course project/Skill development activities, suitably planned to attain the COs and POs for a total of40 Marks.
  If the nature of the courses requires assignments/Seminars/Quizzes/group discussion two evaluation components shall be conducted. If course project/field survey/skill developmentactivities etc then the evaluation method shall be one.

Total CIE marks (out of 100 marks) shall be scaled down to 50 marks

**Semester End Examination (SEE):**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

- The question paper shall be set for 100 marks. The medium of the question paper shall be English). Theduration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks.The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks**.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximumof 3 sub-questions), **should have a mix of topics** under that module.

**Suggested Learning Resources:**

**Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**


1. Nano Materials – A.K. Bandyopadhyay/ New Age Publishers
2. Nanocrystals: Synthesis, Properties and Applications – C.N.R. Rao, P. John Thomas and G. U. Kulkarni, Springer Series in Materials Science
3. Nano Essentials- T. Pradeep/TMH
4. Peter J. F. Harris, Carbon nanotube science: synthesis, properties, and applications. Cambridge University Press, 2011
5. M.A. Shah, K.A. Shah, "Nanotechnology: The Science of Small", Wiley India, ISBN 13: 9788126538683


**Reference Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**


1. Introduction to Nanotechnology, C. P. Poole and F. J. Owens, Wiley, 2003
2. Understanding Nanotechnology, Scientific American 2002
3. Nanotechnology, M. Ratner and D. Ratner, Prentice Hall 2003
4. Nanotechnology, M. Wildon, K. Kannagara, G. Smith, M. Simmons and B. Raguse, CRC Press Boca Raton 2002
5. Recent reviews on Li-ion batteries, solar cells and fuel cells


**Web links and Video Lectures (e-Resources):**

- https://nptel.ac.in/courses/118104008
- https://www.digimat.in/nptel/courses/video/118104008/L16.html
- https://archive.nptel.ac.in/courses/113/106/113106099/
- https://nptel.ac.in/courses/112107283
- https://onlinecourses.nptel.ac.in/noc22_me131/preview

**Practical Based learning (Any 5 experiments x 2 hours = 10 practical hours)**

- Preparation of silver nanoparticles and characterization of particle size by optical spectroscopy
- Preparation of ZnO nanoparticles by combustion technique
- Preparation of $Al_2O_3$ nanoparticles by precipitation method
- Preparation of Silica nanoparticles by sol-gel method
- Preparation of metal oxide nanoparticles by hydrothermal method
- Determination of thermal conductivity of nanofluids using a thermal analyser
- Preparation of thin films by SILAR method
- Determination of Band gap of given material using Tauc plot

**COs and POs Mapping (Individual teacher has to fill up)**

| COs | POs | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| CO1 | 3 | 3 | 2 | | | | | | 2 | 1 | | |
| CO2 | 3 | 3 | 2 | | | | | | | | | |
| CO3 | 3 | 3 | | | | | | | | | | |
| CO4 | 3 | 3 | | | | | | | 2 | 1 | | 2 |
| CO5 | 3 | 3 | | | | | | | 2 | 1 | | 2 |

**Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped**