



Sanmarg Shikshan Sanstha's  
**SMT. RADHIKATAI PANDAV COLLEGE OF ENGINEERING**  
AN AUTONOMOUS INSTITUTE  
NAAC ACCREDITED

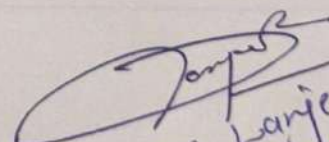
Recognized by Government of Maharashtra & AICTE New Delhi  
Affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur  
Near Dighori Naka, Umrer Road, Nagpur - 440 034  
Mob. : 9881014701, 9823464644, 8983550843  
Email : admin@srpce.ac.in • website : www.srpce.ac.in

**VISION:**

**"To impart quality technical education for producing professionals  
in electrical engineering to cater to the need of the country."**

**MISION:**

1. To impart quality education and technical environment that would contribute professionally and ethically to the growth of individuals and country as a whole.
2. Provide research-oriented learning environment to attract quality students for excellence and innovations.
3. To provide state of art infrastructure for the technical advancement of the faculties and students in electrical engineering.
4. To empower and train the graduating students in Electrical Engineering to serve the needs of industry, government & society as a whole.
5. To achieve visibility by active participation in workshop and technical activities

  
Dr. P. S. Lanjansen  
Dean Academics



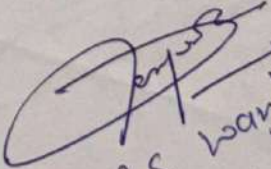
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### Program Outcomes (PO'S)

|      |                                                                                                                                                                                                                            |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PO1  | <b>Engineering knowledge:</b> Ability to apply the knowledge of mathematics, science and engineering principles for modeling, analyzing and solving electrical engineering problems.                                       |
| PO2  | <b>Problem analysis:</b> Ability to identify, formulate and analyze real-life electrical engineering problems.                                                                                                             |
| PO3  | <b>Design/development of solutions:</b> Ability to design and develop solutions for real-life electrical engineering problems.                                                                                             |
| PO4  | <b>Conduct investigations of complex problems:</b> Ability to design and develop sophisticated equipment and experimental systems for carrying out detailed investigation to multifaceted electrical engineering problems. |
| PO5  | <b>Modern tool usage:</b> Ability to develop and utilize modern tools for modeling, analyzing and solving electrical engineering problems.                                                                                 |
| PO6  | <b>The engineer and society:</b> Dedication to work as an electrical engineer who is capable of identifying solutions to various local and global problems faced by the society.                                           |
| PO7  | <b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.     |
| PO8  | <b>Ethics:</b> Willingness and ability to upkeep professional ethics and social values..                                                                                                                                   |
| PO9  | <b>Individual and team work:</b> Willingness and ability to think independently, take initiative, lead a team of engineers or researchers and inculcate team spirit. .                                                     |
| PO10 | <b>Communication:</b> Ability to express ideas clearly and communicate orally as well as in writing with others.                                                                                                           |
| PO11 | <b>Project management and finance:</b> Willingness and ability to take up administrative responsibilities involving both project and financial management confidently.                                                     |
| PO12 | <b>Life-long learning:.</b> Willingness and ability to maintain lifelong learning process by way of participating in various professional activities.                                                                      |

  
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Deem Academics



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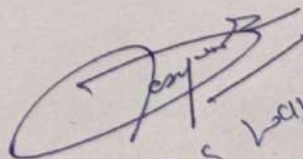
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### Program Specific Outcomes (PSO)

|      |                                                                                                    |
|------|----------------------------------------------------------------------------------------------------|
| PSO1 | Interpret, identify, analyze, and evaluate problems in power system operation, control and design. |
| PSO2 | Demonstrate knowledge to develop, control and assess electrical and electronic systems.            |

### Program Educational Objectives (PEOs)

|      |                                                                                                                                                       |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| PEO1 | Electrical engineer graduate shall be ready for modern technologies of electrical power system, energy industry and non- conventional energy sources. |
| PEO2 | Electrical engineer graduate shall be able to enhanced analytical skill to solve industrial problem and work as an entrepreneur                       |
| PEO2 | Electrical engineer graduate shall be able to promote the awareness of green technologies by considering environmental aspects.                       |

  
Dr. P. S. Lanjekar  
Dean Academics

# Semester wise Credit Distribution Structure for Four Year UG Electrical Engineering (Major) and Minor in Multidisciplinary

| Semester                                           | Category                                       | I         | II        | III       | IV        | V         | VI        | VII       | VIII      | Credits    |
|----------------------------------------------------|------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|
| Basic Science Course                               | BSC                                            | 7         | 8         | --        | --        | --        | --        | --        | --        | 15         |
| Engineering Science Course                         | ESC                                            | 9         | 6         | --        | --        | --        | --        | --        | --        | 15         |
| Programme Core Course (PCC)                        | Program Courses                                | --        | 2         | 10        | 10        | 10        | 8         | 4         | --        | 44         |
| Programme Elective Course (PEC)                    | Program Courses                                | --        | --        | --        | --        | 4         | 8         | 8         | --        | 20         |
| Multidisciplinary Minor (MDM)                      | Multidisciplinary Courses                      | --        | --        | 2         | 2         | 3         | 3         | --        | 4         | 14         |
| Open Elective (OE) Other than a particular program | OE                                             | --        | --        | 3         | 3         | 2         | --        | --        | --        | 8          |
| Vocational and Skill Enhancement Course(VSEC)      | Skill Courses                                  | 2         | 2         | --        | 2         | --        | 2         | --        | --        | 8          |
| Ability Enhancement Course (AEC-01,AEC-02)         | Humanities Social Science and Management(HSSM) | 2         | --        | --        | 2         | --        | --        | --        | --        | 4          |
| Entrepreneurship/Economics/Management Courses      | (HSSM)                                         | --        | --        | 2         | 2         | --        | --        | --        | --        | 4          |
| Indian Knowledge System (IKS)                      | (HSSM)                                         | --        | 2         | --        | --        | --        | --        | --        | --        | 2          |
| Value Education Course(VEC)                        | (HSSM)                                         | --        | --        | 2         | 2         | --        | --        | --        | --        | 4          |
| Research Methodology                               | Experiential Learning Courses                  | --        | --        | --        | --        | --        | --        | 4         | --        | 4          |
| Comm. Engg. Project(CEP)/Field Project(FP)         | CEP                                            | --        | --        | 2         | --        | --        | --        | --        | --        | 2          |
| Project                                            | Project                                        | --        | --        | --        | --        | --        | --        | 4         | --        | 4          |
| Internship/OJT                                     | OJT                                            | --        | --        | --        | --        | --        | --        | --        | 12        | 12         |
| Co-curricular Courses(CC)                          | Liberal Learning Courses                       | 2         | 2         | --        | --        | --        | --        | --        | --        | 4          |
| <b>Total Credits(Major)</b>                        |                                                | <b>22</b> | <b>22</b> | <b>21</b> | <b>23</b> | <b>19</b> | <b>21</b> | <b>20</b> | <b>16</b> | <b>164</b> |

*S. P. Suryakumar*  
*P. A. M. Mendhe*  
*V. A. Huchale*

*A. V. Wanjari*

*P. P. S. Tengsekar*  
*Dean Academy*



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**Teaching Scheme of Examination For**

**B.Tech .Semester-I Electrical Engineering-Major NEP ( Choice Based Credit System)**

| B.Tech .Semester-I Electrical Engineering-Major NEP ( Choice Based Credit System) |                 |             |                                                      |     |                       |   |    |                    |               |                    |        |     |           |     |                  |             |
|-----------------------------------------------------------------------------------|-----------------|-------------|------------------------------------------------------|-----|-----------------------|---|----|--------------------|---------------|--------------------|--------|-----|-----------|-----|------------------|-------------|
| Sr. No.                                                                           | Course Category | Course Code | Name of Course                                       | BoS | Teaching Scheme(hrs.) |   |    | Total Hrs per Week | Total Credits | Examination Scheme |        |     |           |     | Min. Pass. Marks | TOTAL MARKS |
|                                                                                   |                 |             |                                                      |     | L                     | T | P  |                    |               | Exam. Hrs.         | Theory |     | Practical |     |                  |             |
|                                                                                   |                 |             |                                                      |     |                       |   |    |                    |               |                    | CIE    | ESE | CIE       | ESE |                  |             |
| 1                                                                                 | BSC-I           | BT1EE01T    | Applied Mathematics-I                                | ASH | 3                     | — | —  | 3                  | 3             | 3                  | 40     | 60  | —         | —   | 50               | 100         |
| 2                                                                                 | BSC-II          | BT1EE02T    | Applied Physics                                      | ASH | 3                     | — | —  | 3                  | 3             | 3                  | 40     | 60  | —         | —   | 50               | 100         |
| 3                                                                                 | BSC-II          | BT1EE02P    | Applied Physics Lab                                  | ASH | —                     | — | 2  | 2                  | 1             | —                  | —      | —   | 25        | 25  | 25               | 50          |
| 4                                                                                 | ESC-I           | BT1EE03T    | Engineering Graphics                                 | ME  | 3                     | — | —  | 3                  | 3             | 3                  | 40     | 60  | —         | —   | 50               | 100         |
| 5                                                                                 | ESC-I           | BT1EE03P    | Engineering Graphics Lab                             | ME  | —                     | — | 2  | 2                  | 1             | —                  | —      | —   | 25        | 25  | 25               | 50          |
| 6                                                                                 | ESC-II          | BT1EE04T    | Basics of Electrical and Electronics Engineering.    | EE  | 3                     | — | —  | 3                  | 3             | 3                  | 40     | 60  | —         | —   | 50               | 100         |
| 7                                                                                 | ESC-II          | BT1EE04P    | Basics of Electrical and Electronics Engineering Lab | EE  | —                     | — | 2  | 2                  | 1             | —                  | —      | —   | 25        | 25  | 25               | 50          |
| 8                                                                                 | ESC-III         | BT1EE06P    | Basics of Solar PV Lab                               | EE  | —                     | — | 2  | 2                  | 1             | —                  | —      | —   | 25        | 25  | 25               | 50          |
| 9                                                                                 | AEC-I           | BT1EE05T    | Communication Skill                                  | ASH | 2                     | — | —  | 2                  | 2             | 2                  | 20     | 30  | —         | —   | 25               | 50          |
| 10                                                                                | VSEC-I          | BT1EE07P    | Electrical Workshop-I                                | EE  | —                     | — | 4  | 4                  | 2             | —                  | —      | —   | 50        | 50  | 50               | 100         |
| 11                                                                                | CC-I            | BT1EE08P    | Refer CC-I Basket                                    | ASH | —                     | — | 4  | 4                  | 2             | —                  | —      | —   | 100       | —   | 50               | 100         |
|                                                                                   |                 |             | Total                                                |     | 14                    | — | 16 | 30                 | 22            | —                  | 180    | 270 | 250       | 150 | —                | 850         |

VERSION 1.0

Session: 2026-27 Onward

**CC-I BASKET**

- (1) National Social Services(NSS)
- (2) Games & Sports
- (3) Cultural Activities
- (4) Yoga
- (5) Elements of Japanese Language (NPTEL ONLINE)
- (6) Elements of German Language (NPTEL ONLINE)
- (8) Elements of Spanish Language (NPTEL ONLINE)

*S. Bhujender*  
*S. Bhujender*

*Dr A. M. Mondhe*

*V. A. Huchhe*

*A. V. Wajani*

*Dr. P. S. Wanjekar*  
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**Teaching Scheme of Examination For**

| B.Tech .Semester-II Electrical Engineering-Major NEP ( Choice Based Credit System) |                 |             |                                               |     |                       |   |    |                    |               |                    |        |     |           |     |                  |             |
|------------------------------------------------------------------------------------|-----------------|-------------|-----------------------------------------------|-----|-----------------------|---|----|--------------------|---------------|--------------------|--------|-----|-----------|-----|------------------|-------------|
| Sr. No.                                                                            | Course Category | Course Code | Name of Course                                | BoS | Teaching Scheme(hrs.) |   |    | Total Hrs per Week | Total Credits | Examination Scheme |        |     |           |     | Min. Pass. Marks | TOTAL MARKS |
|                                                                                    |                 |             |                                               |     | L                     | T | P  |                    |               | Exam. Hrs.         | Theory |     | Practical |     |                  |             |
|                                                                                    |                 |             |                                               |     |                       |   |    |                    |               |                    | CIE    | ESE | CIE       | ESE |                  |             |
| 1                                                                                  | BSC-III         | BT2EE01T    | Applied Mathematics-II                        | ASH | 3                     |   | —  | 3                  | 3             | 3                  | 40     | 60  | —         | —   | 50               | 100         |
| 2                                                                                  | BSC-III         | BT2EE01P    | AppliedMathematics-II Lab                     | ASH | —                     | — | 2  | 2                  | 1             | —                  | —      | —   | 25        | 25  | 25               | 50          |
| 3                                                                                  | BSC-IV          | BT2EE02T    | Applied Chemistry                             | ASH | 3                     |   | —  | 3                  | 3             | 3                  | 40     | 60  | —         | —   | 50               | 100         |
| 4                                                                                  | BSC-IV          | BT2EE02P    | Applied Chemistry Lab                         | ASH | —                     | — | 2  | 2                  | 1             | —                  | —      | —   | 25        | 25  | 25               | 50          |
| 5                                                                                  | ESC-IV          | BT2EE03T    | Engineering Mechanics                         | CV  | 2                     | — | —  | 2                  | 2             | 2                  | 20     | 30  | —         | —   | 25               | 50          |
| 6                                                                                  | ESC-V           | BT2EE04T    | Electrical Measurements & Instrumentation     | EE  | 3                     | — | —  | 3                  | 3             | 3                  | 40     | 60  | —         | —   | 50               | 100         |
| 7                                                                                  | ESC-V           | BT2EE04P    | Electrical Measurements & Instrumentation Lab | EE  | —                     | — | 2  | 2                  | 1             | —                  | —      | —   | 25        | 25  | 25               | 50          |
| 8                                                                                  | PCC-I           | BT2EE05T    | Non Conventional Energy Source                | EE  | 2                     | — | —  | 2                  | 2             | 2                  | 20     | 30  | —         | —   | 25               | 50          |
| 9                                                                                  | IKS-I           | BT2EE06T    | Refer IKS Basket                              | ASH | 2                     | — | —  | 2                  | 2             | 2                  | 20     | 30  | —         | —   | 25               | 50          |
| 10                                                                                 | VSEC-II         | BT2EE07P    | Electrical Workshop-II                        | EE  | —                     | — | 4  | 4                  | 2             | —                  | —      | —   | 50        | 50  | 50               | 100         |
| 11                                                                                 | CC-II           | BT2EE08P    | Refer CC-II Basket                            | ASH | —                     | — | 4  | 4                  | 2             | —                  | —      | —   | 100       | —   | 50               | 100         |
|                                                                                    |                 |             | Total                                         |     | 15                    | — | 14 | 29                 | 22            | —                  | 180    | 270 | 225       | 125 | —                | 800         |

VERSION 1.0

Session: 2026-27

Onwards

**Exit option : Award of UG Certificate in Major with 44 credits and an additional 8 credits in skill based courses, internship ,mini project etc**

**IKS BASKET**

- (1) Consciousness Studies
- (2) Preserving Art, Culture and Tradition
- (3) Wellness, Traditional Medicines and Yoga
- (4) Glimpses of Ancient Science and Technology

**CC-II BASKET**

- (1) National Social Services(NSS)
- (2) Games & Sports
- (3) Cultural Activities
- (4) Yoga
- (5) Elements of Japanese Language (NPTEL ONLINE)
- (6) Elements of German Language (NPTEL ONLINE)
- (7) Elements of French Language (NPTEL ONLINE)
- (8) Elements of Spanish Language (NPTEL ONLINE)

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**Teaching Scheme of Examination For**

**B.Tech .Semester-III Electrical Engineering-Major NEP ( Choice Based Credit System)**

| B.Tech .Semester-III Electrical Engineering-Major NEP ( Choice Based Credit System) |                 |             |                               |     |                       |   |   |                    |               |                    |        |     |           |     |                  |             |
|-------------------------------------------------------------------------------------|-----------------|-------------|-------------------------------|-----|-----------------------|---|---|--------------------|---------------|--------------------|--------|-----|-----------|-----|------------------|-------------|
| Sr. No.                                                                             | Course Category | Course Code | Name of Course                | BoS | Teaching Scheme(hrs.) |   |   | Total Hrs per Week | Total Credits | Examination Scheme |        |     |           |     | Min. Pass. Marks | TOTAL MARKS |
|                                                                                     |                 |             |                               |     | L                     | T | P |                    |               | Exam. Hrs.         | Theory |     | Practical |     |                  |             |
|                                                                                     |                 |             |                               |     |                       |   |   |                    |               |                    | CIE    | ESE | CIE       | ESE |                  |             |
| 1                                                                                   | PCC-II          | BT3EE01T    | Network Analysis              | EE  | 3                     | — | — | 3                  | 3             | 3                  | 40     | 60  | —         | —   | 50               | 100         |
| 2                                                                                   | PCC-II          | BT3EE01P    | Network Analysis Lab          | EE  |                       | — | 2 | 2                  | 1             | —                  | —      | —   | 25        | 25  | 25               | 50          |
| 3                                                                                   | PCC-III         | BT3EE02T    | Electrical Machines - I       | EE  | 3                     | — |   | 3                  | 3             | 3                  | 40     | 60  | —         | —   | 50               | 100         |
| 4                                                                                   | PCC-III         | BT3EE02P    | Electrical Machines – I Lab   | EE  |                       | — | 2 | 2                  | 1             | —                  | —      | —   | 25        | 25  | 25               | 50          |
| 5                                                                                   | PCC-IV          | BT3EE03T    | Elements of Electromagnetic   | EE  | 2                     | — |   | 2                  | 2             | 2                  | 20     | 30  | —         | —   | 25               | 50          |
| 6                                                                                   | MDM-I           | BT3EE04T    | Refer MDM-I Basket            | EE  | 2                     | — |   | 2                  | 2             | 2                  | 20     | 30  | —         | —   | 25               | 50          |
| 7                                                                                   | OE-I            | BT3EE05T    | Refer Open Elective Basket    | MGT | 3                     | — |   | 3                  | 3             | 3                  | 40     | 60  | —         | —   | 50               | 100         |
| 8                                                                                   | HSSM-I          | BT3EE06T    | Entrepreneurship &startups    | ASH | 2                     | — | — | 2                  | 2             | 2                  | 20     | 30  | —         | —   | 25               | 50          |
| 9                                                                                   | VEC-I           | BT3EE07T    | Constitution of India         | ASH | 2                     | — | — | 2                  | 2             | 2                  | 20     | 30  | —         | —   | 25               | 50          |
| 10                                                                                  | CEP             | BT3EE08P    | Community Engineering Project | EE  |                       | — | 4 | 4                  | 2             | —                  | —      | —   | 50        | 50  | 50               | 100         |
|                                                                                     |                 |             | Total                         |     | 17                    | — | 8 | 25                 | 21            | —                  | 200    | 300 | 100       | 100 | —                | 700         |

|      |                   |          |
|------|-------------------|----------|
| OE-I | Stress Management | BT3EE05T |
|------|-------------------|----------|

VERSION 1.0

Session: 2027-28 Onward:

*J. Bhuyar*  
J. Bhuyar

*Dr. A. M. Mendhe*  
Dr. A. M. Mendhe

*V. A. Huchche*  
V. A. Huchche

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**Teaching Scheme of Examination For**

**B.Tech .Semester-IV Electrical Engineering-Major NEP ( Choice Based Credit System)**

| Sr. No. | Course Category | Course Code | Name of Course                 | BoS | Teaching Scheme(hrs.) |          |    | Total Hrs per Week | Total Credits | Examination Scheme |        |     |           |     |    | Min. Pass. Marks | TOTAL MARKS |
|---------|-----------------|-------------|--------------------------------|-----|-----------------------|----------|----|--------------------|---------------|--------------------|--------|-----|-----------|-----|----|------------------|-------------|
|         |                 |             |                                |     | L                     | T        | P  |                    |               | Exam. Hrs.         | Theory |     | Practical |     |    |                  |             |
|         |                 |             |                                |     |                       |          |    |                    |               |                    | CIE    | ESE | CIE       | ESE |    |                  |             |
| 1       | PCC-V           | BT4EE01T    | Electrical Machines-II         | EE  | 3                     | —        | —  | 3                  | 3             | 3                  | 40     | 60  | —         | —   | 50 | 100              |             |
| 2       | PCC-V           | BT4EE01P    | Electrical Machines-II Lab     | EE  | —                     | —        | 2  | 2                  | 1             | —                  | —      | —   | 25        | 25  | 25 | 50               |             |
| 3       | PCC-VI          | BT4EE02T    | Power Systems-I                | EE  | 3                     | —        | —  | 3                  | 3             | 3                  | 40     | 60  | —         | —   | 50 | 100              |             |
| 4       | PCC-VI          | BT4EE02P    | Power Systems-I Lab            | EE  | —                     | —        | 2  | 2                  | 1             | —                  | —      | —   | 25        | 25  | 25 | 50               |             |
| 5       | PCC-VII         | BT4EE03T    | Power Station Practice         | EE  | 2                     | —        | —  | 2                  | 2             | 2                  | 20     | 30  | —         | —   | 25 | 50               |             |
| 6       | MDM-II          | BT4EE04T    | Refer MDM-II Basket            | EE  | 2                     | —        | —  | 2                  | 2             | 2                  | 20     | 30  | —         | —   | 25 | 50               |             |
| 7       | OE-II           | BT4EE05T    | Refer Open Elective Basket     | MGT | 3                     | —        | —  | 3                  | 3             | 3                  | 40     | 60  | —         | —   | 50 | 100              |             |
| 8       | AEC-II          | BT4EE08P    | Technical Report Writing       | EE  | —                     | —        | 2  | 2                  | 1             | —                  | —      | —   | 25        | 25  | 25 | 50               |             |
| 9       | AEC-III         | BT4EE09P    | Communicatio Skill Lab         | ASH | —                     | —        | 2  | 2                  | 1             | —                  | —      | —   | 25        | 25  | 25 | 50               |             |
| 10      | HSSM-II         | BT4EE6T     | Digital Economy                | ASH | 2                     | —        | —  | 2                  | 2             | 2                  | 20     | 30  | —         | —   | 25 | 50               |             |
| 11      | VEC-II          | BT4EE07T    | Universal Human                | ASH | 2                     | —        | —  | 2                  | 2             | 2                  | 20     | 30  | —         | —   | 25 | 50               |             |
| 12      | VSEC-III        | BT4EE10P    | Electrical Engineering Drawing | EE  | —                     | —        | 4  | 4                  | 2             | —                  | —      | —   | 50        | 50  | 50 | 100              |             |
|         |                 |             | Total                          |     | 17                    | —        | 12 | 29                 | 23            | —                  | 200    | 300 | 150       | 150 | —  | 800              |             |
|         |                 | OE-II       | Principles of Management       |     |                       | BT4EE05T |    |                    |               |                    |        |     |           |     |    |                  |             |

VERSION 1.0

Session: 2027-28 Onward

**Exit option : Award of UG Diploma in Major with 88 credits and an additional 8 credits in skill based courses, internship ,mini project etc**

*S. Bhujar*  
S. Bhujar

*Dr. A. M. M. M. M.*  
Dr. A. M. M. M. M.

*V. A. H. H. H.*  
V. A. H. H. H.

*A. V. W. W. W.*  
A. V. W. W. W.

*Dr. P. S. W. W. W.*  
Dr. P. S. W. W. W.  
Dean Academics



**Sanmarg Shikshan Sanstha's**  
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 Email : admin@srpce.ac.in • website : www.srpce.ac.in

**Teaching Scheme of Examination For**

**B.Tech .Semester-V Electrical Engineering-Major NEP ( Choice Based Credit System)**

| Sr. No. | Course Category | Course Code | Name of Course             | BoS | Teaching Scheme(hrs.) |   |   | Total Hrs per Week | Total Credits | Examination Scheme |        |     |           |     | Min. Pass. Marks | TOTAL MARKS |
|---------|-----------------|-------------|----------------------------|-----|-----------------------|---|---|--------------------|---------------|--------------------|--------|-----|-----------|-----|------------------|-------------|
|         |                 |             |                            |     | L                     | T | P |                    |               | Exam. Hrs.         | Theory |     | Practical |     |                  |             |
|         |                 |             |                            |     |                       |   |   |                    |               |                    | CIE    | ESE | CIE       | ESE |                  |             |
|         |                 |             |                            |     |                       |   |   |                    |               |                    |        |     |           |     |                  |             |
| 1       | PCC-VIII        | BT5EE01T    | Power Electronics          | EE  | 3                     | — | — | 3                  | 3             | 3                  | 40     | 60  | —         | —   | 50               | 100         |
| 2       | PCC-VIII        | BT5EE01P    | Power Electronics Lab      | EE  | —                     | — | 2 | 2                  | 1             | —                  | —      | —   | 25        | 25  | 25               | 50          |
| 3       | PCC-IX          | BT5EE02T    | Control System             | EE  | 3                     | — | — | 3                  | 3             | 3                  | 40     | 60  | —         | —   | 50               | 100         |
| 4       | PCC-IX          | BT5EE02P    | Control System Lab         | EE  | —                     | — | 2 | 2                  | 1             | —                  | —      | —   | 25        | 25  | 25               | 50          |
| 5       | PCC-X           | BT5EE03T    | Power Systems-II           | EE  | 2                     | — | — | 2                  | 2             | 2                  | 20     | 30  | —         | —   | 25               | 50          |
| 6       | PEC-I           | BT5EE04T    | Program Elective-I         | EE  | 2                     | — | — | 2                  | 2             | 2                  | 20     | 30  | —         | —   | 25               | 50          |
| 7       | PEC-II          | BT5EE05T    | Program Elective-II        | EE  | 2                     | — | — | 2                  | 2             | 2                  | 20     | 30  | —         | —   | 25               | 50          |
| 8       | MDM-III         | BT5EE06T    | Refer MDM-III Basket       | EE  | 3                     | — | — | 3                  | 3             | 3                  | 40     | 60  | —         | —   | 50               | 100         |
| 9       | OE-III          | BT5EE07T    | Refer Open Elective Basket | MGT | 2                     | — | — | 2                  | 2             | 2                  | 20     | 30  | —         | —   | 25               | 50          |
|         |                 |             | Total                      |     | 17                    | — | 4 | 21                 | 19            | —                  | 200    | 300 | 50        | 50  | —                | 600         |

|          |                     |                              |
|----------|---------------------|------------------------------|
| BT5EE04T | Program Elective-I  | Electrical Power Utilization |
|          |                     | PLC and SCADA                |
| BT5EE05T | Program Elective-II | Power Quality                |
|          |                     | Electrical Machine Design    |
| BT5EE07T | Open Elective-III   | IPR Development & Training   |

VERSION 1.0

Session: 2028-29 Onwards

*[Signature]*  
J. Bhayander

*[Signature]*  
Dr. A. M. Tendulkar

*[Signature]*  
V. A. Hinkhe

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**Teaching Scheme of Examination For**

**B.Tech .Semester-VI Electrical Engineering- Major NEP ( Choice Based Credit System)**

| Sr. No. | Course Category | Course Code | Name of Course                           | BoS | Teaching Scheme(hrs.) |   |   | Total Hrs per Week | Total Credits | Examination Scheme |        |     |           |     | Min. Pass. Marks | TOTAL MARKS |
|---------|-----------------|-------------|------------------------------------------|-----|-----------------------|---|---|--------------------|---------------|--------------------|--------|-----|-----------|-----|------------------|-------------|
|         |                 |             |                                          |     | L                     | T | P |                    |               | Exam. Hrs.         | Theory |     | Practical |     |                  |             |
|         |                 |             |                                          |     |                       |   |   |                    |               |                    | CIE    | ESE | CIE       | ESE |                  |             |
| 1       | PCC-XI          | BT6EE01T    | Switch Gear &                            | EE  | 3                     | — | — | 3                  | 3             | 3                  | 40     | 60  | —         | —   | 50               | 100         |
| 2       | PCC-XI          | BT6EE01P    | Switch Gear & Protection Lab             | EE  | —                     | — | 2 | 2                  | 1             | —                  | —      | —   | 25        | 25  | 25               | 50          |
| 3       | PCC-XII         | BT6EE02T    | ComputerApplication in Power Systems     | EE  | 3                     | — | — | 3                  | 3             | 3                  | 40     | 60  | —         | —   | 50               | 100         |
| 4       | PCC-XII         | BT6EE02P    | ComputerApplication in Power Systems Lab | EE  | —                     | — | 2 | 2                  | 1             | —                  | —      | —   | 25        | 25  | 25               | 50          |
| 5       | PEC-III         | BT6EE03T    | Program Elective-III                     | EE  | 3                     | — | — | 3                  | 3             | 3                  | 40     | 60  | —         | —   | 50               | 100         |
| 6       | PEC-IV          | BT6EE04T    | Program Elective-IV                      | EE  | 3                     | — | — | 3                  | 3             | 3                  | 40     | 60  | —         | —   | 50               | 100         |
| 7       | PEC-V           | BT6EE05T    | Program Elective-V                       | EE  | 2                     | — | — | 2                  | 2             | 2                  | 20     | 30  | —         | —   | 25               | 50          |
| 8       | MDM-IV          | BT6EE06T    | Refer MDM-IV Basket                      | EE  | 3                     | — | — | 3                  | 3             | 3                  | 40     | 60  | —         | —   | 50               | 100         |
| 9       | VSEC-IV         | BT6EE07P    | Electrical Drawing & Simulation Lab      | EE  | —                     | — | 4 | 4                  | 2             | —                  | —      | —   | 50        | 50  | 50               | 100         |
|         |                 |             | Total                                    |     | 17                    | — | 8 | 25                 | 21            | —                  | 220    | 330 | 100       | 100 | —                | 750         |

|          |                      |                                   |
|----------|----------------------|-----------------------------------|
| BT6EE03T | Program Elective-III | Electrical Distribution Systems   |
|          |                      | Energy Management & Audit         |
| BT6EE04T | Program Elective-IV  | Electrical Drives & Their Control |
|          |                      | Battery Management System         |
| BT6EE05T | Program Elective-V   | Electrical Safety & Standards     |
|          |                      | Solar Photovoltaic Systems        |

VERSION 1.0

Session: 2028-29

Onwards

**Exit option : Award of UG Degree B.Voc/B.Sc. in Major with 128 credits and an additional 8 credits in skill based courses, internship ,mini project etc**

*S. Ranjane*  
S. Ranjane

*Dr. A. M. More*  
Dr. A. M. More

*V. A. Huchhe*  
V. A. Huchhe

*A. V. Wanjari*  
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**Teaching Scheme of Examination For**

**B.Tech .Semester-VII Electrical Engineering-Major NEP ( Choice Based Credit System)**

| Sr. No. | Course Category | Course Code | Name of Course               | BoS | Teaching Scheme(hrs.) |   |    | Total Hrs per Week | Total Credits | Examination Scheme |        |     |           |     |     | Min. Pass. Marks | TOTAL MARKS |
|---------|-----------------|-------------|------------------------------|-----|-----------------------|---|----|--------------------|---------------|--------------------|--------|-----|-----------|-----|-----|------------------|-------------|
|         |                 |             |                              |     | L                     | T | P  |                    |               | Exam. Hrs.         | Theory |     | Practical |     |     |                  |             |
|         |                 |             |                              |     |                       |   |    |                    |               |                    | CIE    | ESE | CIE       | ESE |     |                  |             |
| 1       | PCC-XIII        | BT7EE01T    | High Voltage Engineering     | EE  | 3                     | — | —  | 3                  | 3             | 3                  | 40     | 60  | —         | —   | 50  | 100              |             |
| 2       | PCC-XIII        | BT7EE01P    | High Voltage Engineering Lab | EE  | —                     | — | 2  | 2                  | 1             | —                  | —      | —   | 25        | 25  | 25  | 50               |             |
| 3       | RM              | BT7EE02T    | ResearchMethodology#         | EE  | 3                     | — | —  | 3                  | 3             | 3                  | 40     | 60  | —         | —   | 50  | 100              |             |
| 4       | RM              | BT7EE02P    | ResearchMethodology Lab#     | EE  | —                     | — | 2  | 2                  | 1             | —                  | —      | —   | 25        | 25  | 25  | 50               |             |
| 5       | PEC-VI          | BT7EE03T    | Program Elective-VI          | EE  | 3                     | — | —  | 3                  | 3             | 3                  | 40     | 60  | —         | —   | 50  | 100              |             |
| 6       | PEC-VII         | BT7EE04T    | Program Elective-VII         | EE  | 3                     | — | —  | 3                  | 3             | 3                  | 40     | 60  | —         | —   | 50  | 100              |             |
| 7       | PEC-VIII        | BT7EE05T    | Program Elective-VIII        | EE  | 2                     | — | —  | 2                  | 2             | 2                  | 20     | 30  | —         | —   | 25  | 50               |             |
| 8       | PROJ            | BT8EE06P    | Project                      | EE  |                       | — | 8  | 8                  | 4             | —                  | —      | —   | 100       | 100 | 100 | 200              |             |
|         |                 |             | Total                        |     | 14                    | — | 12 | 26                 | 20            | —                  | 180    | 270 | 150       | 150 | —   | 750              |             |

|          |                       |                                  |
|----------|-----------------------|----------------------------------|
| BT7EE03T | Program Elective-VI   | EHVAC & HVDC Transmission        |
|          |                       | Advance Control System           |
| BT7EE04T | Program Elective-VII  | Power Semiconductor Based Drives |
|          |                       | Electric Vehicles                |
| BT7EE05T | Program Elective-VIII | Flexible AC Transmission Systems |
|          |                       | Electrical Installation Design   |

VERSION 1.0

Session: 2029-30  
Onwards

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*S. Bhujender*  
S. Bhujender

*DR. M. J. Dhole*  
DR. M. J. Dhole

*V. A. Hinchche*  
V. A. Hinchche

*A. V. Wanjari*  
A. V. Wanjari

*Dr. P. S. Wanjari*  
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**Teaching Scheme of Examination For**

| B.Tech .Semester-VIII Electrical Engineering-Major NEP ( Choice Based Credit System) |                 |             |                       |     |                       |   |    |                    |               |                    |        |     |           |     |                  |             |
|--------------------------------------------------------------------------------------|-----------------|-------------|-----------------------|-----|-----------------------|---|----|--------------------|---------------|--------------------|--------|-----|-----------|-----|------------------|-------------|
| Sr. No.                                                                              | Course Category | Course Code | Name of Course        | BoS | Teaching Scheme(hrs.) |   |    | Total Hrs per Week | Total Credits | Examination Scheme |        |     |           |     | Min. Pass. Marks | TOTAL MARKS |
|                                                                                      |                 |             |                       |     | L                     | T | P  |                    |               | Exam. Hrs.         | Theory |     | Practical |     |                  |             |
|                                                                                      |                 |             |                       |     |                       |   |    |                    |               |                    | CIE    | ESE | CIE       | ESE |                  |             |
| 1                                                                                    | MDM-V           | BT8EE01T    | Refer MDM-V Basket #  | EE  | 2                     | _ | _  | 2                  | 2             | 2                  | 20     | 30  | _         | _   | 25               | 50          |
| 2                                                                                    | MDM-VI          | BT8EE02T    | Refer MDM-VI Basket # | EE  | 2                     | _ | _  | 2                  | 2             | 2                  | 20     | 30  | _         | _   | 25               | 50          |
| 3                                                                                    | OJT             | BT8EE03P    | Internship(12 Weeks)  | EE  | _                     | _ | 24 | 24                 | 12            | _                  | _      | _   | 200       | 200 | 200              | 400         |
|                                                                                      |                 |             | Total                 |     | 4                     | _ | 24 | 28                 | 16            | _                  | 40     | 60  | 200       | 200 | _                | 500         |

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VERSION 1.0

Session: 2029-30

Onwards

**4-Years Bachelor's Degree (B.Tech.) in Electrical Engineering with  
Multidisciplinary Minor**

*S. Bhayekar*  
S. Bhayekar

*Dr. A. M. Torale*  
Dr. A. M. Torale

*V. A. Hinchhe*  
V. A. Hinchhe

*A. V. Wanjari*  
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**LIST OF PROGRAM ELECTIVE COURSES (PEC) ELECTRICAL  
 ENGINEERING**

| S.N. | Semester        | Category | Course code | Course name                       |
|------|-----------------|----------|-------------|-----------------------------------|
| 1    | 5 <sup>th</sup> | PEC-I    | BT5EE04T    | Electrical Power Utilization      |
|      |                 |          |             | PLC and SCADA                     |
| 2    | 5 <sup>th</sup> | PEC-II   | BT5EE05T    | Power Quality                     |
|      |                 |          |             | Electrical Machine Design         |
| 3    | 6 <sup>th</sup> | PEC-III  | BT6EE03T    | Electrical Distribution Systems   |
|      |                 |          |             | Energy Management & Audit         |
| 4    |                 | PEC-IV   | BT6EE04T    | Electrical Drives & Their Control |
|      |                 |          |             | Battery Management System         |
| 5    | 6 <sup>th</sup> | PEC-V    | BT6EE05T    | Electrical Safety & Standards     |
|      |                 |          |             | Solar Photovoltaic Systems        |
| 6    |                 | PEC-VI   | BT7EE03T    | EHVAC & HVDC Transmission         |
|      |                 |          |             | Advance Control System            |
| 7    | 7 <sup>th</sup> | PEC-VII  | BT7EE04T    | Power Semiconductor Based Drives  |
|      |                 |          |             | Electric Vehicles                 |
| 8    | 7 <sup>th</sup> | PEC-VIII | BT7EE05T    | Flexible AC Transmission Systems  |
|      |                 |          |             | Electrical Installation Design    |

*S. Bhuyander*  
*S. Bhuyander*

*A. M. Hanchke*  
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**LIST OF MULTIDISCIPLINARY MINOR (MDM) OFFERED BY  
 ELECTRICAL ENGINEERING BOS**

**For Students of Computer Engineering (CE), Computer Science Engineering (CSE), Mechanical Engineering (ME), Civil Engineering (CV), Electronics & Telecommunication Engineering (ETC) and Artificial Intelligence & Data Science (AIDS)**

(Students of Electrical Engineering will not be able to opt these MDM courses)

| S.N. | Semester            | Category | Course code | Course name                             |                                                      |                                    |
|------|---------------------|----------|-------------|-----------------------------------------|------------------------------------------------------|------------------------------------|
|      |                     |          |             | Track:1<br>Basic Electrical Engineering | Track:2<br>Solar Engineering                         | Track:3<br>Electric Vehicles       |
| 1    | 3 <sup>rd</sup> SEM | MDM-I    | BT3EE04T    | Fundamentals of Electrical Engineering  | Introduction to Solar-Thermal Energy                 | Introduction to Electric Vehicles  |
| 2    | 4 <sup>th</sup> SEM | MDM-II   | BT4EE04T    | Renewable Energy Studies                | Semi-conductor material for Solar Photovoltaic cells | Energy storage devices             |
| 3    | 5 <sup>th</sup> SEM | MDM-III  | BT5EE06T    | Network Analysis                        | Applications of Solar Energy                         | Electric Machines                  |
| 4    | 6 <sup>th</sup> SEM | MDM-IV   | BT6EE06T    | Introduction to Power System            | Technical and economic analysis of Solar PV          | Power Electronics and Motor drives |
| 5    | 8 <sup>th</sup> SEM | MDM-V #  | BT8EE01T    | Power Plant Engineering #               | Solar Power Plant Design #                           | EV Fundamentals #                  |
| 6    | 8 <sup>th</sup> SEM | MDM-VI # | BT8EE02T    | Electricity & Safety Measures #         | Solar roof top: Design and Installation #            | EV Components & Charging #         |

#indicates that Online Courses to be done from NPTEL/SWAYAM. Examination will be conducted by NPTEL-SWAYAM/Institute.

*[Signature]*  
 J. Bhuyankar

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 Dr. A. M. Mendhe

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**LIST OF OPEN ELECTIVES (OE) OFFERED BY MANAGEMENT BOS**  
**Open Elective Basket -II**  
**For Students of Electrical Engineering (EE), Civil Engineering (CV), Mechanical Engineering (ME) and Electronics & Telecommunication Engineering (ETC)**

| S.N. | Semester            | Category | Course code ( For EE) | Course name                |
|------|---------------------|----------|-----------------------|----------------------------|
| 1    | 3 <sup>rd</sup> SEM | OE-I     | BT3EE05T              | Stress Management          |
| 2    | 4 <sup>th</sup> SEM | OE-II    | BT4EE05T              | Principles of Management   |
| 3    | 5 <sup>th</sup> SEM | OE-III   | BT5EE07T              | IPR Development & Training |

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ROAD, NAGPUR**

An Autonomous Institute Affiliated to RTMNU, Nagpur

Faculty of Science & Technology

**B.Tech. Mechanical Engineering/Civil Engineering/Electronics & Telecommunication  
/Electrical Engineering (NEP) (CBCS)**

|                    |                                         |                                |                       |
|--------------------|-----------------------------------------|--------------------------------|-----------------------|
| Sem-I              | Total Hours Distribution Per Week       |                                |                       |
| Total Credits : 3  | Lecture (L) : 3 Hrs                     | Tutorial/Activity (T/A) : 0 Hr |                       |
| Subject Code       | BT1ME01T/BT1CV01T/BT1ET01T/<br>BT1EE01T | Applied Mathematics-I          |                       |
| Examination Scheme |                                         |                                |                       |
| CIE                | ESE                                     | Minimum Passing Marks:         | Examination Duration: |
| 40 Marks           | 60 Marks                                | 50                             | 3 Hours               |

| Course Objectives |                                                                                                                                                    |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                 | Engineering Mathematics intent to equip first-year engineering students with fundamental mathematical tools.                                       |
| 2                 | To promote and develop the basic mathematics skills of engineering students that is essential for effective understanding of engineering subjects. |

| Course Outcomes                                         |                                                                                                                                                                      |
|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| After completion of syllabus, students would be able to |                                                                                                                                                                      |
| 1                                                       | Learn the concept of successive differentiation; express the function in series form and evaluation of indeterminate forms.                                          |
| 2                                                       | Study the nature of linear system of equations using rank and identify the special properties of a matrix such as the eigen values, eigen vectors.                   |
| 3                                                       | Understand the concept of Partial differentiation which is used to find the solution of real life problems.                                                          |
| 4                                                       | Solve first-order ordinary differential equations applicable to engineering problems and apply it to formulate mathematical models for simple electrical circuits.   |
| 5                                                       | Understand and solve the different types of higher order differential equations by using various techniques and apply it to solve the problems in engineering field. |

*(Dr. Yusuf Oluji)*  
09/07/2026

*Dr. D. Khar*  
09/07/2026

*Dr. D. P. Shastri*  
09/07/2026

*Dr. Ranjana Harane*  
09/07/2026

*Ms. M. S. Pabale*  
09/07/2026

Contd.

# SYLLABUS

| Details of Topic                                                                                                                                                                                                                                                                                             | Allotment of Hours |     | Mapped with CO Number |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----|-----------------------|
|                                                                                                                                                                                                                                                                                                              | L                  | T/A | CO                    |
| <b>Unit-1: Differential Calculus</b>                                                                                                                                                                                                                                                                         |                    |     |                       |
| Successive differentiation: Leibnitz's Rule, Taylor's and Maclaurin's series for function of one variable, Indeterminate forms and L'Hospital's Rule.                                                                                                                                                        | 7                  |     | 1                     |
| <b>Unit-2 Matrices</b>                                                                                                                                                                                                                                                                                       |                    |     |                       |
| Rank of a matrix, Consistency of linear system of non-homogeneous and homogeneous equations, Linear dependence of vectors, Eigen values and Eigen vectors, Cayley- Hamilton theorem (Statement only, Sylvester's theorem (Statement only).                                                                   | 8                  |     | 2                     |
| <b>Unit-3 Multivariable Calculus (Partial Differentiation)</b>                                                                                                                                                                                                                                               |                    |     |                       |
| Functions of several variables, First and Higher order partial derivatives, Euler's theorem, Chain rule and Total differential coefficient, Jacobians, Lagrange's method of undetermined multipliers.                                                                                                        | 8                  |     | 3                     |
| <b>Unit-4 First Order Ordinary Differential Equations</b>                                                                                                                                                                                                                                                    |                    |     |                       |
| Review of Linear differential equations, Reducible to linear and Bernoulli's differential equations, Exact differential equations (Excluding the cases of integrating factors), Application of first order differential equation to simple electrical circuits.                                              | 5                  |     | 4                     |
| <b>Unit-5 Higher Order Ordinary Differential Equations</b>                                                                                                                                                                                                                                                   |                    |     |                       |
| Higher order ordinary linear differential equations with constant coefficients, Method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations, Equations of the type $d^2y/dx^2 = f(y)$ . Applications of higher order differential equations to simple electrical circuits. | 8                  |     | 5                     |

## Text/Reference Books:

- (1) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
- (2) Ramana B.V., Higher Engineering Mathematics, Tata Mc-Graw Hill, New Delhi, 11th Reprint, 2010.
- (3) N.P. Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
- (4) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
- (5) P. N. Wartikar and J. N. Wartikar, Applied Mathematics, Volume I and II.
- (6) H.K Dass, Rama Verma, Rajnish Verma, V.J. Dagwal, Sajid Anwar and D.F. Shastrakar, Engineering Mathematics, Volume I and II, S. Chand.

Dr. R. S. Khanna  
9/7/2026

Dr. D. F. Shastrakar  
9/7/2026

Mr. S. S. Palani  
09/07/2026

Dr. S. Khanna  
09/07/2026

Dr. Ranjana Hanare  
09/07/2026

**SMT. RADHIKATAI PANDAV COLLEGE OF ENGINEERING, BAHADURA, UMRER ROAD, NAGPUR**

**An Autonomous Institute Affiliated to RTMNU, Nagpur**

**Faculty of Science & Technology**

**B. Tech. First Semester Mechanical Engineering, Electrical Engineering, Electronics & Telecommunication Engineering (NEP)**

|                    |                                         |                                     |                       |
|--------------------|-----------------------------------------|-------------------------------------|-----------------------|
| Sem-I              | Total Hours Distribution Per Week       |                                     |                       |
| Total Credits : 3  | Lecture (L) : 3 Hrs                     | Tutorial/Activity (T/A) : 0 Hr      |                       |
| Subject Code       | <b>BT1ME02T/<br/>BT1EE02T/ BT1ET02T</b> | <b>Applied/ Engineering Physics</b> |                       |
| Examination Scheme |                                         |                                     |                       |
| CIE                | ESE                                     | Minimum Passing Marks:              | Examination Duration: |
| 40 Marks           | 60 Marks                                | 50                                  | 3 Hours               |

**Course Objectives**

|   |                                                                                                                                      |
|---|--------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To Provide a Strong Foundation in physics to provide technical knowledge                                                             |
| 2 | To gain an understanding of the phenomenon of interference used for advanced applications in optics                                  |
| 3 | To familiarize prospective engineers with fundamental concepts of semi-conductors and their applications in semiconductor technology |
| 4 | To make acquainted with the laser technology and the operations of Laser                                                             |

**Course Outcomes**

After completion of syllabus, students would be able to

|   |                                                                                                                                                                     |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Learn the basic concepts of the dual nature of matter and wave packet and apply them to analyze various relevant phenomena and to solve related numerical problems. |
| 2 | Apply concepts in interference and diffraction to solve relevant numerical problems and to relate to relevant engineering applications                              |
| 3 | Identify and explain different types of diodes, transistors, and its applications.                                                                                  |
| 4 | Learn and explain quantum transitions and apply them to the working of lasers.                                                                                      |
| 5 | Learn Various types of Crystal structures and its dimensions.                                                                                                       |

*[Signature]*  
Dr. C. V. Phadke  
09/07/2026

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Dr. D. P. Shastri  
09/07/2026

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Ashutosh Raut  
09/07/26

*[Signature]*  
Santosh Londe  
09/07/2026

*[Signature]*  
Ms. M. S. Palani  
09/07/2026

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## SYLLABUS

| Details of Topic                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Allotment of Hours |     | Mapped with CO Number |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----|-----------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | L                  | T/A | CO                    |
| <b>Unit-1 Quantum Mechanics</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                    |     |                       |
| De-Broglie Hypothesis, Concept of wave-particle duality, Matter Waves, Davisson-Germer Experiment.<br>Compton effect, Photo electric effect, , Concept of wave packets, Heisenberg Uncertainty Principle, Significance of Wave function $\Psi$ and normalization condition, Schrodinger wave equation (Expression for time dependent and time independent), Application to one dimensional infinite potential well. . & Numericals                                               | 7                  |     | 1                     |
| <b>Unit 2: Wave optics</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |     |                       |
| Huygen's principle, superposition of waves and interference of light by wavefront splitting and amplitude splitting, Interference in thin films, Expression for Interference in Wedge-shaped thin film, Newton's rings, Expression for radii(for Dark & Bright Band) and Anti-reflection coating. And its Derivation Numericals                                                                                                                                                  | 7                  |     | 2                     |
| <b>Unit 3: Semiconductor Devices</b>                                                                                                                                                                                                                                                                                                                                                                                                                                             |                    |     |                       |
| Basic idea of free electron theory of metals ,expression of conductivity of a metals Semiconductor, Classification, Pure and doped semiconductors. Types of Semiconductor diodes - P-N junction Diode, Tunnel Diode, Zener Diode, Light Emitting Diode (LED). Transistors and it's type<br>PNP and NPN transistors, Hall Effect, Hall voltage, and Hall coefficient; its applications. & Numericals                                                                              | 8                  |     | 3                     |
| <b>Unit 4: Lasers</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                    |     |                       |
| Quantum Transitions: Absorption, Spontaneous emission & stimulated Emission, Metastable states, Principle of laser, Laser characteristics, Coherence length and coherence time, Pumping schemes: Three level and Four level.<br>components of laser system ,Construction & working of He-Ne laser, Ruby laser, Applications of laser in Engineering & Numericals                                                                                                                 | 7                  |     | 4                     |
| <b>Unit 5: Crystal Structure</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                    |     |                       |
| Meaning of lattice and basic ,Unit Cell: Primitive and non primitive Unit cell<br>Cubic Crystal structure: simple cubic and body centered cubic and face centre cubic structure<br>Unit cell characteristics: effective no of atoms per unit cell, atomic radius, nearest neighbor distance, coordinate number, Relation for Density atomic Packing fraction, Expression for Interplaner Spacing Crystal plane and miller indices, Braggs law of x ray diffraction, & Numericals | 7                  |     | 5                     |

Date  
 09/07/20  
 Dr. C. L. Kherbapande

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09/07/2016  
Dr. D. F. Shastri

Xant  
09/07/26  
Ashutosh Pant

~~4/11/16~~  
09/07/16  
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Master  
Mrs. M. S. Palani  
09/10/2026

Contd.

**Text/Reference Books:**

1. P. M. Mathews and K. Venkatesan, A Textbook of Quantum Mechanics, Tata Mc Graw Hill (1977).
2. J. L. Powell and B. Crasemann, Quantum Mechanics, Narosa Publishing House (1993).
3. Applied Physics, M. N. Avdhanulu, Shilpa A. Pande, Arti R. Golhar, Mohan Giriya, S. Chand
4. D. J. Griffiths, Quantum mechanics, Prentice Hall of India Private Limited, New Delhi
5. Charles Kittel, Introduction to Solid State Physics, Wiley Eastern, 5th edition, (1983).
6. Engineering Physics - Dr.N. S. Ugemuge, Dr. (Mrs.) S.U.Bhonsule and Dr.ShrutiPatle DNA Publication(2019)
7. David Halliday, Robert Resnick, Jearl Walker, Principles of Physics, 10th Edition, John Wiley and Sons (2017)
8. A. J. Dekker, Solid State Physics, Prentice Hall of India (1971).
9. A Textbook of Engineering Physics, Dr. M. N. Avdhanulu, Dr. P. G. Kshirsagar, S. Chand Publication
10. A Text Book of Engineering Physics Dr. DevashreeHardas & Dr. Ashish Panat, Das Ganu Publication ISBN-978-81-921757-7-5 (2011)
11. Applied Physics, - Dr. (Mrs)S.P. Wankhede, Dr.ShrutiPatle, Dr.(Mrs.)S.U.Bhonsule and Dr.N. S. Ugemuge DNA Publication ISBN-978-81-945174-6-7 (2020)
12. Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles by R. Eisberg and R. Resnick, Wiley and Sons
13. Text book of Applied Physics, Dr. D. S. Hardas, Dr. D. S. Bhounik, Dr.S. Shastri, Das Ganu Publication ISBN-978-93-84336-59-2 (2021)
14. Engineering Physics, second edition, Sanjay Jain, G. Sahasrabudhe, University's Press(India) Pvt. Ltd.(2016)
15. L. I. Schiff, Quantum Mechanics, TMH Publications
16. Advanced Engineering Materials - Dr. Sangeeta G. Itankar, Dr. Manjusha Dandekar, Dr. Tushar R. Shelke, Dr. Swati Fartode, Alliance & Co. ISBN 978-93-91322-12-0 (2023)
17. Applied Physics- Dr. Sangeeta G. Itankar, Dr. Manjusha Dandekar, Dr. Tushar R. Shelke, Dr. Swati Fartode, Alliance & Co. ISBN 978-93-91322-97-7 (2023)
18. Advanced physics - Dr. Shruti Patle, Dr.(Mrs.)S.U.Bhonsule, Dr.Ashish N. Bodhaye, Dr.ManoharD.Mehare DNA Publication (2019)
19. Text book of Advanced Engineering Physics – Alliance & Company Publication by Dr. Chandrakant Khobragade (2025-26)

*Deed*  
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*Shank*  
09/07/26

*Xant*  
09/07/26  
Ashutosh Pant

*Madhu*  
Mrs. M. S. Palani  
09/07/2026

*Dr. D. P. Shastri*  
09/07/2026  
Dr. D. P. Shastri

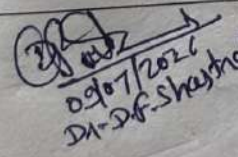
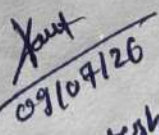
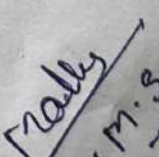
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**SMT. RADHIKATAI PANDAV COLLEGE OF ENGINEERING, BAHADURA,**  
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**An Autonomous Institute Affiliated to RTMNU, Nagpur**  
**Faculty of Science & Technology**  
**B.Tech. First Semester Mechanical, Electrical, Electronics & Telecommunication**  
**Engineering (NEP) (Practical) (CBCS)**

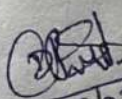
|                    |                                   |                                 |                       |
|--------------------|-----------------------------------|---------------------------------|-----------------------|
| Sem-I              | Total Hours Distribution Per Week |                                 |                       |
| Total Credits : 1  | Lecture (L) : 0 Hrs               | Tutorial/Activity (T/A) : 2 Hrs |                       |
| Subject Code       | BT1ME02P/BT1EE02P<br>/BT1ET02P    | Applied/Engineering Physics Lab |                       |
| Examination Scheme |                                   |                                 |                       |
| CIE                | ESE                               | Minimum Passing Marks:          | Examination Duration: |
| 25 Marks           | 25 Marks                          | 25                              | 3 Hours               |

List of Experiments: Performance of at least eight experiments is compulsory in a semester.

| Name of the Experiments |                                                                                                         |
|-------------------------|---------------------------------------------------------------------------------------------------------|
| 1                       | Energy gap of semiconductor /thermistor.                                                                |
| 2                       | To Study the V-I characteristics of PN junction diode.                                                  |
| 3                       | To Study the V-I characteristics of Zener diode.                                                        |
| 4                       | To Study the Input/Output of PNP/NPN transistor in CB and CE mode                                       |
| 5                       | To Study the V-I Characteristics of Tunnel diode..                                                      |
| 6                       | To Study V-I Characteristics of Light Emitting Diodes/ Determination of Plank's constant by using LEDs. |
| 7                       | Study the Diode rectification                                                                           |
| 8                       | Study of Hall Effect and determination of Hall Voltage of a given sample.                               |

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 Dr. S. Khan  
 09/07/2026  
 Mrs. M. S. Paley

|                    |                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| 9                  | To determine the Hall coefficient (RH) with temperature                                                                                |
| 10                 | To study the B-H curve and find out the values of coercivity, retentivity, and saturation magnetization of the experimental material.. |
| 11                 | Determination of NA in optical fiber                                                                                                   |
| 12                 | Calibration of Time Base circuit of CRO and determination of AC, DC voltage & frequency of electrical signals using CRO                |
| 13                 | To determine the Wavelength of laser by using diffraction grating                                                                      |
| <b>Virtual Lab</b> |                                                                                                                                        |
| 14                 | Experiment on the determination of the thickness of a thin foil using an air wedge arrangement                                         |
| 15                 | Experiment on the determination of the refractive indices of the material corresponding to ordinary and extra - ordinary rays.         |

  
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09/07/26  
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P. S. M. S. Paley  
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**SMT. RADHIKATAI PANDAV COLLEGE OF ENGINEERING NAGPUR**  
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**FACULTY OF SCIENCE & TECHNOLOGY**  
**B.TECH. ELECTRICAL ENGINEERING**

|                                           |                                       |                                  |                       |                      |
|-------------------------------------------|---------------------------------------|----------------------------------|-----------------------|----------------------|
| Course Category                           | Engineering Science Course -I (ESC-I) |                                  |                       |                      |
| Sem : I                                   | Total Hours Distribution per week     |                                  |                       |                      |
| Total Credit: 03                          | Lecture (L): 03 Hrs.                  | Tutorial/Activity(T/A): -----Hr. |                       |                      |
| Course Code                               | BT1EE03T                              | Course :- Engineering Graphics   |                       |                      |
| Examination Scheme                        |                                       |                                  |                       |                      |
| Continuous Internal Evaluation (CIE)Marks | End Semester Exam(ESE)Marks           | Total Marks                      | Minimum Passing Marks | Examination Duration |
| 40                                        | 60                                    | 100                              | 50                    | 3 Hours              |

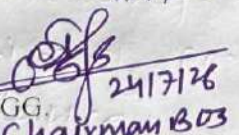
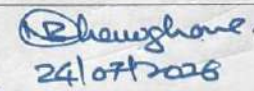
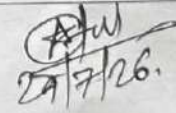
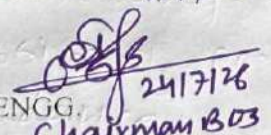
**Course Objectives**

|   |                                                                                                                                                                                                                                                              |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Understand the fundamentals of Engineering Graphics, including drawing instruments, line types, dimensioning techniques, scales, sheet layout, engineering curves, and the basics of orthographic projection, as well as the projection of points and lines. |
| 2 | Develop the ability to draw projections of planes and solids by understanding the principles of orthographic projection and generating different projection views accurately.                                                                                |
| 3 | Interpret and create orthographic views by converting pictorial representations into accurate two-dimensional (2D) engineering drawings.                                                                                                                     |
| 4 | Apply visualization skills to construct simple isometric views and isometric projections from given orthographic views in accordance with engineering drawing standards.                                                                                     |

**Course Outcomes**

After successful completion of this course the student will be able to:

|     |                                                                                                                                                                                                           |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CO1 | Draw various engineering curves such as ellipse, parabola, and hyperbola, cycloid and involutes using standard construction methods and also draw types of scales.                                        |
| CO2 | Draw projections of straight lines in different positions with respect to the principal planes. And Draw projections of plane surfaces inclined to one or both reference planes                           |
| CO3 | Draw projections of various solids such as cube, prisms, pyramids, cylinders, and cones in different orientations.                                                                                        |
| CO4 | Prepare accurate front, top, and side views of machine components.                                                                                                                                        |
| CO5 | Convert orthographic views into isometric views, Construct accurate isometric projections using the isometric scale and Use the CAD interface efficiently by applying basic drawing and editing commands. |

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**SMT. RADHIKATAI PANDAV COLLEGE OF ENGINEERING**  
**NAGPURA (NAGPUR)**  
 Session 2026-27

| SYLLABUS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| Contents                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | No. of hours |
| <b>Unit I: Introduction to Engineering Graphics :</b><br>Principles of Engineering Graphics and their significance, Need of Engineering Graphics and design, Sheet layout, Line types and dimensioning and usage of Drawing instruments, Engineering Curves: a) Conic Section : Construction of ellipse, parabola & hyperbola by various methods<br>b) Engineering Curves: Construction of Cycloid, Involute of circle. Methods of projections, 1st angle.<br>c) Scales: Types of Scale, Plain, Diagonal and Vernier.<br>d) CAD Software :-<br>List of Laboratory Practical-Introduction to 2D and 3D computer aided drafting packages-Evolution of CAD, Importance of CAD, Basic Commands - Edit, View, Insert, Modify, Dimensioning Commands, setting and tools etc. and its applications to construct the 2D and 3D drawings Can be utilized to teach the basic commands of any drafting package. | 10           |
| <b>Unit II: Projection of straight line :</b><br>Projection of point, projection of straight line parallel to one plane and inclined to other reference plane, projection of straight line inclined to both the reference plane.<br><b>Projection of Planes :</b><br>Triangular, Square, Rectangular, Pentagonal, Hexagonal, and Circular planes inclined to both HP and VP. (Exclude composite planes, true shapes )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 6            |
| <b>Unit III : Projection of Solids :</b><br>Projections of Cube, Prisms, Pyramids, Cylinder and Cones, axis inclined to HP or VP and parallel to other plane, two steps only (Excluding frustum and sphere Composite, Hollow solids.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 7            |
| <b>Unit IV : : Orthographic Views :</b><br>Fundamentals of orthographic projections. Different views of a simple machine part as per the first angle projection method recommended by I.S                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 7            |
| <b>Unit V: Isometric Views and Isometric Projection:</b><br>Principles of Isometric projection-Isometric Scale, Isometric Views, Conversion of Orthographic Views to Isometric Views (Excluding Sphere).<br>Arrangement of two solids with their axis vertical and coinciding.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 10           |
| <b>Total No. Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>40</b>    |

## References

### Text Books Recommended:

1. Bhatt .N.D. and Panchal V.M. (2016) "Engineering Drawing", Charotar Publications Anand, India
2. Dhawan R.K. (2000) "A Textbook of Engineering Drawing", S.Chand, New Delhi

### Reference Books Recommended:

1. Jolhe D.A. (2015) ,"Engineering Drawing", Tata McGraw Hill, New Delhi.
2. Shah P.J., (2012), "Basics of Engineering Graphics", S.Chand, New Delhi.
3. P.S.Gill, (2015), "Engineering Drawing", S.K.Kataria and Sons.

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**FACULTY OF SCIENCE & TECHNOLOGY**  
**B.TECH. ELECTRICAL ENGINEERING**

|                                           |                                       |                                   |                       |                      |
|-------------------------------------------|---------------------------------------|-----------------------------------|-----------------------|----------------------|
| Course Category                           | Engineering Science Course -I (ESC-I) |                                   |                       |                      |
| Sem:I                                     | Total Hours Distribution per week     |                                   |                       |                      |
| Total Credit: - 01                        | Practical(P): - 02 Hrs                | Tutorial/Activity(T/A): - ----Hr. |                       |                      |
| Course Code                               | BT1EE03P                              | Course :- Engineering Graphics    |                       |                      |
| Examination Scheme                        |                                       |                                   |                       |                      |
| Continuous Internal Evaluation (CIE)Marks | End Semester Exam(ESE)Marks           | Total Marks                       | Minimum Passing Marks | Examination Duration |
| 25                                        | 25                                    | 50                                | 25                    | -----Hours           |

### Course Outcomes

After successful completion of this course the student will be able to:

|            |                                                                                                                                                                                                           |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CO1</b> | Draw various engineering curves such as ellipse, parabola, and hyperbola, cycloid and involutes using standard construction methods and also draw types of scales.                                        |
| <b>CO2</b> | Draw projections of straight lines in different positions with respect to the principal planes. And Draw projections of plane surfaces inclined to one or both reference planes.                          |
| <b>CO3</b> | Draw projections of various solids such as cube, prisms, pyramids, cylinders, and cones in different orientations.                                                                                        |
| <b>CO4</b> | Prepare accurate front, top, and side views of machine components.                                                                                                                                        |
| <b>CO5</b> | Convert orthographic views into isometric views, Construct accurate isometric projections using the isometric scale and Use the CAD interface efficiently by applying basic drawing and editing commands. |

| Sr. No. | Drawing sheet Practice Guidelines                                                                                                          |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Follow <b>BIS/IS standards</b> for line types, dimensioning, lettering, and first-angle projection.                                        |
| 2       | Use proper drawing instruments to ensure neatness, accuracy, and clarity                                                                   |
| 3       | Each drawing sheet should include the student's name, roll number, assignment number, date, and title.                                     |
| 4       | Submit assignments on or before the specified deadline.                                                                                    |
| 5       | Evaluation will be based on accuracy, neatness, correct construction, proper dimensioning, and adherence to engineering drawing standards. |

SRPCE, ELECTRICAL ENGG.

Version:-1

Effective from session 2026-27

Dr. A.H. Ingle  
Chairman BOS

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**OF ENGINEERING**  
**NAGPURA (NAGPUR)**

### List of Practical's

All the following practicals shall be performed:

| Sr. No. | List of Practical's                           |
|---------|-----------------------------------------------|
| 01      | SHHET NO :- 01: SCALES                        |
| 02      | SHHET NO :- 02: ENGINEERING CURVES-01         |
| 03      | SHHET NO :- 03: ENGINEERING CURVES-02         |
| 04      | SHHET NO :- 04: PROJECTION OF STRAIGHT LINES  |
| 05      | SHHET NO :- 05: PROJECTION OF PLANES          |
| 06      | SHHET NO :- 06: PROJECTION OF SOLIDS          |
| 07      | SHHET NO :- 07: ORTHOGRAPHIC PROJECTION       |
| 08      | SHHET NO: - 08: ISOMETRIC VIEWS & PROJECTION. |
| 09      | SHHET NO :- 09: CAD -01                       |
| 10      | SHHET NO: - 10: CAD -02.                      |

#### References:

##### Text Books Recommended:

- 1 Bhatt .N.D. and Panchal V.M. (2016) "Engineering Drawing", Charotar Publications Anand, India
2. Dhawan R.K. (2000) "A Textbook of Engineering Drawing", S.Chand, New Delhi.

##### Reference Books Recommended:

1. Jolhe D.A. (2015) ,"Engineering Drawing", Tata McGraw Hill, New Delhi.
2. Shah P.J., (2012), "Basics of Engineering Graphics", S.Chand, New Delhi
3. P.S.Gill, (2015), "Engineering Drawing", S.K.Kataria and Sons.

#### Note:

1. Conduct all practical's from the above list.
2. Viva-voce question should be included in each of the practical.
3. Continuous Internal Evaluation (CIE) 25 internal practical marks will be distributed as a 10 marks for regular drawing sheets, 10 marks for final submission of portfolio with viva-voce and 05 marks for attendance.
4. End Semester Examination (ESE) 25 external practical marks are distributed as a external practical performance must be for 15 marks and 10 Marks for viva-voce.
5. For Eligibility of ESE Practical examination, internal submission of drawing sheets with Portfolio is mandatory.

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**NAGPUR**  
**FACULTY OF SCIENCE & TECHNOLOGY**  
**B.TECH. ELECTRICAL ENGINEERING**

|                                              |                                      |                                                  |                      |
|----------------------------------------------|--------------------------------------|--------------------------------------------------|----------------------|
| Course Category                              | Engineering Science Course- (ESC-II) |                                                  |                      |
| Sem.: I                                      | Total Hours Distribution per week    |                                                  |                      |
| Total Credit: 3                              | Lecture (L): 3 Hrs.                  | Tutorial/Activity(T/A): .....Hr.                 |                      |
| Subject Code                                 | BT1EE04T<br>(Theory)                 | Basics of Electrical and Electronics Engineering |                      |
| Examination Scheme                           |                                      |                                                  |                      |
| Continuous Internal Evaluation<br>(CIE)Marks | Semester End Exam(ESE)Marks          | Minimum Passing Marks                            | Examination Duration |
| 40                                           | 60                                   | 50                                               | 3 Hours              |

| Course Objectives: |                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------|
| 1                  | To learn basic concepts Electrical circuits and magnetic circuits.                                      |
| 2                  | To Learn the principles of single-phase and three-phase AC circuits and perform basic circuit analysis. |
| 3                  | Gain basic knowledge of semiconductor devices such as PN junction diodes, Zener diodes, and BJT.        |

| Course Outcomes:                                                        |                                                                                                                                                                                                |
|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| After successful completion of this course the student will be able to: |                                                                                                                                                                                                |
| CO1                                                                     | Understand the fundamental concepts of electrical circuits, circuit elements, sources, and apply Kirchhoff's laws, source transformation and star-delta transformation to analyze DC circuits. |
| CO2                                                                     | Understand the basic concepts of magnetic circuits and calculate magnetic circuit parameters and analyze series circuits.                                                                      |
| CO3                                                                     | Understand and solve single-phase AC circuit problems involving phasors, impedance, power, power factor.                                                                                       |
| CO4                                                                     | Understand and solve balanced three-phase AC circuit problems involving star-delta connections and power calculations.                                                                         |
| CO5                                                                     | Understand the working and characteristics of PN junction diodes, Zener diodes, and BJTs, and identify their basic applications.                                                               |

*Dr. Jyoti*

| SYLLABUS                                                                                                                                                                                                                                                                                                                                                                           |              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| Contents                                                                                                                                                                                                                                                                                                                                                                           | No. of hours |
| <b>Unit I: Basic Electric Circuit:</b><br>Types of sources (Current & Voltage), Ideal and Practical Sources (Independent Sources only), Source Conversion, Circuit element resistance, Inductor, capacitor, series & parallel combination of resistances, Kirchhoff's Laws (KVL, KCL) statement, Star/Delta transformation.                                                        | 8 HRS        |
| <b>Unit II : Magnetic Circuits:</b><br>Ampere's law, Magnetic field intensity, Magnetic flux and flux density, MMF, Magnetic circuit, Permeability, Reluctance and Permeance, Leakage and fringing; concepts of magnetic circuit, similarity between electric and magnetic circuit, magnetic leakage, BH curve, Series & Parallel magnetic circuits, numerical on series circuits. | 10 HRS       |
| <b>Unit III: Single phase A.C. circuits:</b><br>Generation of single-phase voltage, average and RMS value for sinusoidal waveform, periodic function, phasor representation of sinusoidal electrical quantities, reactance, impedance, power and energy in AC circuit, RL, RC, RLC Series and parallel circuit. AC circuit, concept and importance of power factor.                | 10 HRS       |
| <b>Unit IV: Three phase A.C. circuits:</b><br>Generation of three phase voltage, phase sequence, Star and delta connections, line and phase voltage/current relations, Voltage, Current & Power relations for Balanced three phase system only (With numerical)                                                                                                                    | 8 HRS        |
| <b>Unit V: Introduction to Electronic Components</b><br>Introduction to Semiconductor P-N junction diodes, Biasing, operation, V-I Characteristics and applications. Zener diode: Characteristics and Application. 2Introduction to BJT-NPN and PNP. Modes of Operation and working.                                                                                               | 8 HRS        |

*Text Books:*

1. V. K. Mehta and Rohit Mehta, **Principles of Electrical Engineering and Electronics**, S. Chand Publishing.
2. D. P. Kothari and I. J. Nagrath, **Basic Electrical Engineering**, McGraw Hill Education.
3. B. L. Theraja and A. K. Theraja, **A Textbook of Electrical Technology (Vol. I)**, S. Chand Publishing.

*Reference Books:*

1. Ashfaq Husain, **Fundamentals of Electrical Engineering**, Dhanpat Rai Publications.
2. Vincent Del Toro, **Principles of Electrical Engineering**, Prentice Hall of India.
3. Edward Hughes, **Electrical and Electronic Technology**, Pearson Education.

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**FACULTY OF SCIENCE & TECHNOLOGY  
B.TECH. ELECTRICAL ENGINEERING**

|                                              |                                       |                                                          |                      |
|----------------------------------------------|---------------------------------------|----------------------------------------------------------|----------------------|
| Course Category                              | Engineering Science Course - (ESC-II) |                                                          |                      |
| Sem.: I                                      | Total Hours Distribution per week     |                                                          |                      |
| Total Credit :1                              | Practical(P): 2 Hrs.                  | Tutorial/Activity(T/A): .....Hr.                         |                      |
| Subject Code                                 | BT1EE04P<br>(Practical)               | Basics of Electrical and Electronics<br>Engineering Lab. |                      |
| Examination Scheme                           |                                       |                                                          |                      |
| Continuous Internal<br>Evaluation (CIE)Marks | End Semester<br>Exam. (ESE) Marks     | Minimum<br>Passing Marks                                 | Examination Duration |
| 25                                           | 25                                    | 25                                                       | --                   |

**Practical Course Objectives:**

|   |                                                                                                                                                      |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | <b>Verify</b> the fundamental laws of electrical circuits through practical experiments                                                              |
| 2 | <b>Understand</b> the behavior of magnetic circuits and AC circuits using experimental methods                                                       |
| 3 | <b>Develop</b> skills in measuring electrical quantities such as voltage, current, power, and power factor in single-phase and three-phase circuits. |
| 4 | <b>Study</b> the characteristics and applications of basic semiconductor devices such as PN junction diodes, Zener diodes, and BJTs.                 |

**Practical Course Outcomes:**

After successful completion of this course the student will be able to:

|     |                                                                                                                                                       |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| CO1 | <b>Verify</b> Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL) through experiments and <b>interpret</b> the results.                   |
| CO2 | <b>Perform</b> experiments on magnetic circuits and AC circuits, and <b>draw</b> B-H curves and phasor diagrams for RLC series and parallel circuits. |
| CO3 | <b>Measure</b> voltage, current, and power in single-phase and balanced three-phase circuits and <b>calculate</b> the required electrical quantities. |
| CO4 | <b>Plot and interpret</b> the V-I characteristics of PN junction and Zener diodes and <b>identify</b> their operating regions.                        |
| CO5 | <b>Plot and analyze</b> the input and output characteristics of a BJT in Common Emitter (CE) configuration and <b>identify</b> its operating regions. |

*Signature*

### List of Practical

| Sr. No. | List of Practical's                                                                                                        |
|---------|----------------------------------------------------------------------------------------------------------------------------|
| 01      | To verify Kirchhoff's voltage law and Kirchhoff's current law.                                                             |
| 02      | To draw B-H curve of a magnetic material.                                                                                  |
| 03      | To study R-L-C series circuit. Also draw the phasor diagram.                                                               |
| 04      | To study R-L-C Parallel circuit. Also draw the phasor diagram.                                                             |
| 05      | To measure the voltage current and power in single phase circuit with resistive load.                                      |
| 06      | To measure the power in three-phase star connected Resistive balanced load with line and phase voltages.                   |
| 07      | To study and plot V-I characteristic of PN Junction diode in forward and reverse bias and determine cut-in (knee) voltage. |
| 08      | To study and plot V-I characteristics of a Zener diode.                                                                    |
| 09      | To study and plot input and output characteristics of BJT in Common Emitter (CE) configuration                             |

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**B.TECH. ELECTRICAL ENGINEERING**

|                                           |                                        |                                  |                      |
|-------------------------------------------|----------------------------------------|----------------------------------|----------------------|
| Course Category                           | Engineering Science Course - (ESC-III) |                                  |                      |
| Sem.: I                                   | Total Hours Distribution per week      |                                  |                      |
| Total Credit: 1                           | Practical(P): 2 Hrs.                   | Tutorial/Activity(T/A): .....Hr. |                      |
| Subject Code                              | BT1EE06P<br>(Practical)                | Basics of Solar PV Lab           |                      |
| Examination Scheme                        |                                        |                                  |                      |
| Continuous Internal Evaluation (CIE)Marks | End Semester Exam. (ESE)Marks          | Minimum Passing Marks            | Examination Duration |
| 25                                        | 25                                     | 25                               | .....                |

**Practical Course Objectives:**

|   |                                         |
|---|-----------------------------------------|
| 1 | To understand the Solar PV Technology   |
| 2 | To learn the basics of Solar PV Panels  |
| 3 | To prepare the design of Solar PV Plant |
| 4 | To install a small Solar PV Plant       |

**Practical Course Outcomes:**

After successful completion of this course the student will be able to:

|     |                                                                             |
|-----|-----------------------------------------------------------------------------|
| CO1 | Compute the electricity generation from solar radiations                    |
| CO2 | Carry out basic requirement of solar PV plants                              |
| CO3 | Identify and use the tools used for Solar PV system installation            |
| CO4 | Install the Civil/Mechanical and Electrical components of a Solar PV system |
| CO5 | Test and Commission Solar PV system                                         |

*Signature*

### List of Practical

Minimum Eight out of the following practical shall be performed:

| Sr. No. | List of Practical's                                                                                      |
|---------|----------------------------------------------------------------------------------------------------------|
| 01      | To study the performance of solar PV modules.                                                            |
| 02      | To make series combination of solar PV modules.                                                          |
| 03      | To make parallel combination of solar PV modules.                                                        |
| 04      | To demonstrate the I-V and P-V Characteristics of PV module with varying radiation and temperature level |
| 05      | To observe the effect of inclination angle on solar PV modules                                           |
| 06      | To study solar PV inverter                                                                               |
| 07      | To study characteristics of Buck , Boost converter                                                       |
| 08      | To study the on-grid and off-grid Solar PV plant                                                         |
| 09      | To study various maximum power point tracking.                                                           |
| 10      | To design a small Solar PV plant                                                                         |

#### References :

1. Chetan Singh Solanki, Solar Photovoltaics: Fundamentals, Technologies and Applications, PHI
2. Joseph Burdick, Philip Schmidt Storey ,Install Your Own Solar Panels by Publishing
3. Rachana Sagar Pvt Ltd., Solar PV Installer (Suryamitra)

#### Online references:

1. The complete Solar Energy Course Beginner to Advanced level-  
<https://www.udemy.com/course/the-complete-solar-energy-course-beginner-to-advanced-level/>

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Level  
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## SYLLABUS

| Details of Topic                                                                                                                                                                                                                                                                                                    | Allotment of Hours |     | Mapped with CO Number |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----|-----------------------|
|                                                                                                                                                                                                                                                                                                                     | L                  | T/A | CO                    |
| <b>Unit-1 : Grammar &amp; Composition</b>                                                                                                                                                                                                                                                                           |                    |     |                       |
| Subject-Verb Agreement <u>Types Of Tenses</u> & Question Tags, <u>Voice</u> : Active & Passive. <u>Narration</u> : Direct & Indirect. <u>Types Of Sentences</u> : Simple, Compound & Complex Sentences Imperative, Affirmative, Negative & Interrogative. <u>E-Mail Etiquettes, Paragraph &amp; Letter Writing.</u> | 6                  |     | 1                     |
| <b>Unit 2:</b>                                                                                                                                                                                                                                                                                                      |                    |     |                       |
| Communication Nature & Process, Types Of Communication (Verbal & Non-Verbal), Effective Communication, Types Of Verbal (Written & Oral), Types Of Non-Verbal Communication (Kinesics, Vocalics, Paralanguage, Chronemics, Haptics, Proxemics)                                                                       | 6                  |     | 2                     |
| <b>Unit 3</b>                                                                                                                                                                                                                                                                                                       |                    |     |                       |
| Barriers To Communication, Types Of Barriers & Remedies. 7 C's Of Communication (Clear, Concise, Correct, Coherent, Complete & Courteous)                                                                                                                                                                           | 6                  |     | 3                     |
| <b>Unit 4:</b>                                                                                                                                                                                                                                                                                                      |                    |     |                       |
| Public Speaking, Necessary Components, Do's & Don'ts, Reading, Hearing, Listening & Debating Skills. Group Discussion: Necessary Components, Do's & Don'ts.                                                                                                                                                         | 6                  |     | 4                     |

### Text/Reference Books: -

- 1) High School English Grammar & Composition by Wren & Martin. S. Chand & Company Ltd.
- 2) Professional Communication Skills. Dr. A.K. Jain, Dr. Pravin S.R. Bhatia Dr. A. M. Sheikh. S. Chand & Company Ltd.
- 3) Functional English. Dr. M. Sabir. Das Ganu Prakashan,
- 4) Functional English For Technical Students. Dr. Pratibha Mahato, Dr. Dora. Thompson. Himalaya Publishing House.

(Dr. V. V. Quazi)

09.07.26  
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Dr. D. F. Shinde

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M. S. Patil  
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**FACULTY OF SCIENCE & TECHNOLOGY**  
**B.TECH. ELECTRICAL ENGINEERING**

|                                              |                                                    |                                  |                      |
|----------------------------------------------|----------------------------------------------------|----------------------------------|----------------------|
| Course Category                              | Vocational and Skill Enhancement Course - (VSEC-I) |                                  |                      |
| Sem.: I                                      | Total Hours Distribution per week                  |                                  |                      |
| Total Credit: 2                              | Practical(P): 4 Hrs.                               | Tutorial/Activity(T/A): .....Hr. |                      |
| Subject Code                                 | BT1EE07P<br>(Practical)                            | Electrical Workshop -I           |                      |
| Examination Scheme                           |                                                    |                                  |                      |
| Continuous Internal<br>Evaluation (CIE)Marks | End Semester<br>Exam. (ESE)Marks                   | Minimum<br>Passing Marks         | Examination Duration |
| 50                                           | 50                                                 | 50                               | .....                |

| <b>Practical Course Objectives</b> |                                                                        |
|------------------------------------|------------------------------------------------------------------------|
| 1                                  | Understand basic electrical symbols, tools, materials, and components. |
| 2                                  | Develop skills in basic domestic electrical wiring.                    |
| 3                                  | Identify and use electrical devices and protective equipment safely.   |
| 4                                  | Follow electrical safety rules and precautions during electrical work. |

| <b>Practical Course Outcomes</b>                                        |                                                                                                                                              |
|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| After successful completion of this course the student will be able to: |                                                                                                                                              |
| CO1                                                                     | Identify different types of electrical symbols, tools, and electrical materials used in electrical installations.                            |
| CO2                                                                     | Differentiate and identify various types of cables, wires, switches, fuses, MCBs, ELCBs and MCCBs along with their ratings and applications. |
| CO3                                                                     | Demonstrate electrical safety practices and precautionary measures to prevent electrical shocks during installation and maintenance work.    |
| CO4                                                                     | Perform domestic wiring such as simple light/fan circuits, two-way (staircase) wiring and fluorescent lamp with socket wiring.               |
| CO5                                                                     | Compare different domestic wiring systems and study various types of batteries along with their specifications and applications.             |

*Pragya*

## List of Practical

Minimum Eight out of the following practical shall be performed:

| Sr. No. | List of Practical's                                                                          |
|---------|----------------------------------------------------------------------------------------------|
| 01      | Use of different types of electrical symbols and electrical tools used in electrical works   |
| 02      | Identification of different types of electrical materials                                    |
| 03      | Application of different types of cables, wires,                                             |
| 04      | Identify different types of switches, fuses, fuse carriers, MCB, ELCB and MCCB with ratings. |
| 05      | Demonstrate the precautionary steps adopted in case of Electrical shocks.                    |
| 06      | Wiring of simple light circuit for controlling fan point.                                    |
| 07      | Wiring of light/fan circuit using Two way switches. (Staircase wiring).                      |
| 08      | Wiring of Fluorescent lamps and sockets (6/16 Amps).                                         |
| 09      | Comparison and use of different types of wiring used for domestic purpose                    |
| 10      | To study different types of batteries with their specifications.                             |

### *References:*

1. S. L. Uppal and G. C. Garg, Electrical Wiring, Estimating and Costing, Khanna Publishers, New Delhi.
2. B. L. Theraja and A. K. Theraja, A Textbook of Electrical Technology (Vol. I), S. Chand & Company Ltd., New Delhi.
3. V. K. Mehta and Rohit Mehta, Principles of Electrical Engineering, S. Chand & Company Ltd., New Delhi.
4. Bureau of Indian Standards (BIS), National Electrical Code of India (NEC 2023), BIS, New Delhi.

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**Faculty of Science & Technology**

**B.Tech. Mechanical Engineering/Civil Engineering/Electronics & Telecommunication**

**/Electrical Engineering/**

**Computer Science & Engineering/Computer Engineering (NEP) (CBCS)**

|                    |                                                               |                                |                       |
|--------------------|---------------------------------------------------------------|--------------------------------|-----------------------|
| Sem-I              | Total Hours Distribution Per Week                             |                                |                       |
| Total Credits : 2  | Lecture (L) :                                                 | Tutorial/Activity (T/A) : 4Hrs |                       |
| Subject Code       | BT1ME08P/BT1CV08P/<br>BT1ET08P/BT1EE08P/BT1C<br>S08P/BT1CE08P | CC Basket-I (Games & Sports)   |                       |
| Examination Scheme |                                                               |                                |                       |
| CIE                | ESE                                                           | Minimum Passing Marks:         | Examination Duration: |
| 100 Marks          | -                                                             | 50                             | -                     |

**Course Objectives**

|   |                                                                            |
|---|----------------------------------------------------------------------------|
| 1 | Improved knowledge of rules and strategies of particular games and sports. |
| 2 | To develop physical fitness, strength, flexibility, and coordination.      |

**SYLLABUS**

•**Basics of Games and Sports:** History of games, Classification of games, Importance of games.

•**Indoor Games:** Chess, Carrom, Table-Tennis and Badminton.

•**Outdoor Games:** Cricket, Football, Volleyball, Athletic (track and field), Kabaddi, Tug of war.

•**Role of Sports in Education and Society:** Physical benefits, Safety measure and Injury prevention, Emotional & Mental health.

*[Signature]*

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**Faculty of Science & Technology**

**B.Tech. Electronics and Telecommunication/Electrical Engineering (NEP) (CBCS)**

|                    |                                   |                                |                       |
|--------------------|-----------------------------------|--------------------------------|-----------------------|
| Sem-II             | Total Hours Distribution Per Week |                                |                       |
| Total Credits : 3  | Lecture (L) : 3 Hrs               | Tutorial/Activity (T/A) : 0 Hr |                       |
| Subject Code       | BT2ET01T/BT2EE01T                 | Applied Mathematics-II         |                       |
| Examination Scheme |                                   |                                |                       |
| CIE                | ESE                               | Minimum Passing Marks:         | Examination Duration: |
| 40 Marks           | 60 Marks                          | 50                             | 3 Hours               |

**Course Objectives**

|   |                                                                                                                                                                                                             |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To develop advanced analytical skills for calculating accumulated totals (such as areas, volumes, and mass), and to model multidimensional real-world problems in engineering using multivariable calculus. |
| 2 | To solve multi-variable differentiation (like gradients and directional derivatives), evaluating multiple integrals, and applying fundamental integral.                                                     |

**Course Outcomes**

|                                                         |                                                                                                                     |
|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| After completion of syllabus, students would be able to |                                                                                                                     |
| 1                                                       | Understand the methods of evaluating improper integrals and tracing of curves.                                      |
| 2                                                       | Understand the method of finding the area mass and volume by using multiple integral.                               |
| 3                                                       | Understand the application of vector calculus in extending single-variable calculus into multi-dimensional spaces.  |
| 4                                                       | Understand the application of Laplace Transform & Fourier Transform in solving Differential and Integral Equations. |
| 5                                                       | Describe the specific skills in students to formulate & solve Algebraic, Transcendental and Linear Equations.       |

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# SYLLABUS

| Details of Topic                                                                                                                                                                                                                                                                                                                                                                                                                          | Allotment of Hours |     | Mapped with CO Number |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----|-----------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                           | L                  | T/A | CO                    |
| <b>Unit-1: Integral Calculus</b>                                                                                                                                                                                                                                                                                                                                                                                                          |                    |     |                       |
| <b>Evaluation of Definite and Improper Integrals:</b> Beta and Gamma functions and their properties, Mean value, Mean square value and Root mean square value, Tracing of curves (Cartesian), Applications of definite integrals to find length of curve, area, volume.                                                                                                                                                                   | 7                  |     | 1                     |
| <b>Unit 2: Multivariable Calculus (Integration)</b>                                                                                                                                                                                                                                                                                                                                                                                       |                    |     |                       |
| <b>Multiple Integration:</b> Double integrals (Cartesian), Change of order of integration in double integrals, Change of variables (Cartesian to Polar). Applications on Area, Mass, Volume                                                                                                                                                                                                                                               | 8                  |     | 2                     |
| <b>Unit 3: Vector Calculus</b>                                                                                                                                                                                                                                                                                                                                                                                                            |                    |     |                       |
| <b>Vector Calculus:</b> Vector triple product, Product of four vectors, Scalar point function, Vector point function, Vector differentiation, Gradient, Divergence and Curl, Directional derivatives, Solenoidal and Irrotational motions.                                                                                                                                                                                                | 7                  |     | 3                     |
| <b>Unit 4: Laplace Transform &amp; Fourier Transform</b>                                                                                                                                                                                                                                                                                                                                                                                  |                    |     |                       |
| <b>Laplace Transform:</b> Definition and Properties with examples, Inverse Laplace Transform, Convolution theorem (Statement only), Unit step function and Periodic Function, Application of Laplace Transform to solve Ordinary Differential Equation, Integral and Integro-Differential Equations.<br><b>Fourier Transform:</b> Definition & Properties, Fourier Integral, Application of Fourier Transform to solve Integral Equation. | 8                  |     | 4                     |
| <b>Unit-5: Numerical Methods:</b>                                                                                                                                                                                                                                                                                                                                                                                                         |                    |     |                       |
| Solution of Algebraic and Transcendental Equations: Method of False position, Newton-Raphson method and its convergence, Solution of system of simultaneous linear equations: Crout's method (LU decomposition Method), Gauss-Seidel method.                                                                                                                                                                                              | 6                  |     | 5                     |

## Text/Reference Books:

- (1) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
- (2) Ramana B. V., Higher Engineering Mathematics, Tata Mc-Graw Hill, New Delhi, 11th Reprint, 2010.
- (3) N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
- (4) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
- (5) P. N. Wartikar and J. N. Wartikar, Applied Mathematics, Volume I and II.
- (6) H.K Dass, Rama Verma, Rajnish Verma, V.J. Dagwal, Sajid Anwar and D.F. Shastrakar, Engineering Mathematics, Volume II, S. Chand.

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**B. Tech. Electronics and Telecommunication/Electrical Engineering (NEP) (CBCS)**

|                    |                                   |                                |                       |
|--------------------|-----------------------------------|--------------------------------|-----------------------|
| Sem-II             | Total Hours Distribution Per Week |                                |                       |
| Total Credits : 1  | Practical (P) : 2Hrs              | Tutorial/Activity (T/A) : 0 Hr |                       |
| Subject Code       | BT2ET01P/BT2EE01P                 | Applied Mathematics-II Lab     |                       |
| Examination Scheme |                                   |                                |                       |
| CIE                | ESE                               | Minimum Passing Marks:         | Examination Duration: |
| 25 Marks           | 25 Marks                          | 25 Marks                       | 3 Hours               |

**Practical Course Objectives**

Solving problems using Open-Source Software Programming Language

**Practical Course Outcomes**

After completing the practical course, students will be able to solve the following using Open-Source Software Programming Language.

- 1 Problems on Definite & Improper Integral.
- 2 Problems by using the different methods to solve Multiple Integration.
- 3 Problems on Vector Calculus.
- 4 Problems based on Laplace & Fourier Transform.
- 5 Problems on the Algebraic, Transcendental and simultaneous linear equations.

**Sr. No. List of the Practical:** Performance of at least SIX practical is compulsory in a semester.

**Unit-1: Integral Calculus(6 Hours)**

- 1 Write a Program to solve Definite and Improper Integrals.
- 2 Write a Program to find Mean value, Mean square value and Root mean square value.

**Unit 2: Multivariable Calculus (Integration) (04 Hours)**

- 3 Write a Program to solve Double integrals (Cartesian).
- 4 Write a Program to solve the Area, Mass, Volume.

**Unit 3: Vector Calculus (04 Hours)**

- 5 Write a Program to solve Vector triple product, Product of four vectors.
- 6 Write a Program to find Vector differentiation, Gradient, Divergence and Curl.
- 7 Write a Program to solve find Directional derivatives.

**Unit-4 Laplace Transform & Fourier Transform**

- 9 Write a Program to find the Laplace transform and Inverse Laplace transform of different functions.
- 10 Write a Program to find the Fourier transform of different functions.

**Unit-5: Numerical Differentiation and Integration**

- 11 Write a Program to find the solution of Algebraic and Transcendental Equations by using the method of False position and Newton-Raphson method.
- 12 Write a Program to find the solution of system of simultaneous linear equations by using Crout's method (LU decomposition Method), Gauss-Seidel method.

*Handwritten signature and date: 09/07/2026*

*Handwritten signature and date: 09/07/2026*

*Handwritten signature and name: R.V. Hanane*

*Handwritten signature and name: M.S. Patel*

**SMT. RADHIKATAI PANDAV COLLEGE OF ENGINEERING, BAHADURA, UMRER  
ROAD, NAGPUR**

**An Autonomous Institute Affiliated to RTMNU, Nagpur**

**Faculty of Science & Technology**

**B.Tech. Mechanical Engineering/Electrical Engineering/ Electronics & Telecommunication  
Engineering (NEP) (CBCS)**

|                      |                                   |                                |                          |
|----------------------|-----------------------------------|--------------------------------|--------------------------|
| Sem-II               | Total Hours Distribution Per Week |                                |                          |
| Total Credits :<br>3 | Lecture (L) : 3 Hrs               | Tutorial/Activity (T/A) : 0 Hr |                          |
| Subject Code         | BT2ME02T/BT2EE02T/BT2ET02T        | Applied/Engineering Chemistry  |                          |
| Examination Scheme   |                                   |                                |                          |
| CIE                  | ESE                               | Minimum<br>Passing Marks:      | Examination<br>Duration: |
| 40 Marks             | 60 Marks                          | 50 Mark                        | 3 Hours                  |

**Course Objectives**

|   |                                                                                                                                                   |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | To provide fundamental knowledge of electrochemistry necessary to understand the function of batteries and understanding of the rare earth metals |
| 2 | To make students learn about the environment and ensuring sustainable development.                                                                |
| 3 | To develop analytical problem-solving and laboratory skills for applying chemical concepts.                                                       |

**Course Outcomes**

After completion of syllabus, students would be able to

|   |                                                                                                                                                                                            |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Students will inculcate the use of instrumentation techniques and interpret its applications in material characterization.                                                                 |
| 2 | Know about fuels and lubricants and analyze the situation for their appropriate applications                                                                                               |
| 3 | Analyze the various industrial problems arising due to water quality and their remediation.                                                                                                |
| 4 | Develop the environmental awareness from the basics of green chemistry and its application                                                                                                 |
| 5 | Students will able to solve problems regarding rare earth elements, the correct disposal methods of e-wastes and while creating any tool they will keep this environmental aspect in mind. |

*Dr. Aravind*  
09/07/2026

*Dr. S. K. Sharma*  
09/07/2026  
*Dr. D. P. Sharma*  
09/07/2026

*Dr. D. P. (Hons.)*  
09/07/2026

*Mr. S. P. Patil*  
09/07/2026

*P. A. Patle*  
09/07/2026

**Contd.**

# SYLLABUS

| Details of Topic                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Allotment of Hours |     | Mapped with CO Number |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----|-----------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | L                  | T/A | CO                    |
| <b>Unit-1: Fundamentals of Spectroscopy and instrumentation</b>                                                                                                                                                                                                                                                                                                                                                                                                                              |                    |     |                       |
| UV-visible Spectroscopy (Beer-Lambert's law and its numerical), (IR) Infrared spectroscopy and (NMR) Nuclear Magnetic Resonance spectroscopy, (XRD) X-ray Diffraction Analysis, Gas Chromatography.                                                                                                                                                                                                                                                                                          | 7                  |     | 1                     |
| <b>Unit-2: Fuels &amp; Lubricants</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                    |     |                       |
| A] Fuels: Introduction: HCV & LCV, numerical based on calorific value determination by Bomb and Boy's calorimeter; Liquid fuels – fractional distillation of crude petroleum.<br>B] Lubricants: Mechanism of lubrication, types of lubricants and its properties (viscosity & viscosity index, flash & fire point, aniline point).                                                                                                                                                           | 8                  |     | 2                     |
| <b>Unit 3: Water Chemistry</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                    |     |                       |
| Introduction, potable water quality parameter, types of hardness sterilization desalination of water by RO softening of water by zeolite process and ion exchange, demineralization of water, numerical based on Zeolite process, boiler trouble –Scale and sludge.                                                                                                                                                                                                                          | 7                  |     | 3                     |
| <b>Unit- 4: Electrochemical Power system</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                    |     |                       |
| <b>Battery:</b> Introduction, characteristic and general application, H <sub>2</sub> -O <sub>2</sub> fuel cells, Lithium ion battery.<br><b>Super capacitors:</b> Definition, types, characteristics and application. amorphous Si and quantum dye sensitized solar cells.<br><b>Corrosion:</b> Definition cause & Theories of Corrosion (Dry, Wet and Differential Aeration), Pilling-Bedworth Rule & Numerical, Types of Corrosion (Intergranular & Stress), Corrosion Protection methods. | 7                  |     | 4                     |
| <b>Unit 5:Sustainable material and E-waste</b>                                                                                                                                                                                                                                                                                                                                                                                                                                               |                    |     |                       |
| Introduction, source, composition characteristic and need of E waste management, E- waste environmental and health risks, Extraction of rare earth and precious metals from e-wastes, Twelve principles of Green Chemistry. Green Computing, Role of Green Computing in Environment and Research, Green devices and Green data Servers.                                                                                                                                                      | 7                  |     | 5                     |

*(Dr. A. Vaidya)*  
09/07/26

*(Dr. D. P. Shastri)*  
09/07/2026

*(Dr. S. K. Khosla)*  
09/07/2026

*(Mrs. M. S. Palwal)*

*(Mr. D. P. Chaudhary)*  
09/07/26

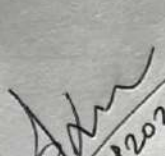
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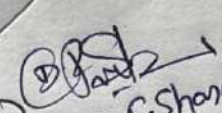
*(P. A. Patil)*  
09/07/26

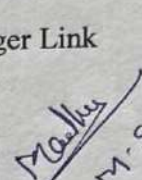
### Text/Reference Books:

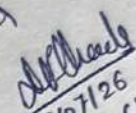
1. M Afshar Alam, Sapna Jain, HenaParveen, Green Computing Approach Towards Sustainable Development, Wiley Interscience Publications.
2. S. S. Dara, A Textbook of Engineering Chemistry, S. Chand Publications
3. ShikhaAgrawal, Engineering Chemistry: Fundamentals and Applications, Cambridge University Press.
4. Supercapacitors and Their Applications Fundamentals, Current Trends, and Future Perspectives, Edited By Anjali Paravannoor, Baiju K.V, CRC Press
5. The Rare Earth Elements: An Introduction, JHL Voncken, Springer Link

  
09/07/26  
(Dr. A. Vardiy)

  
09/07/2026  
(Dr. S. Khar)

  
Dr. D. F. Shastri  
09/07/2026

  
Mrs. M. S. Palani

  
09/07/26  
(Mr. D. P. Chaulke)

  
09/07/26  
P. A. Patle

**SMT. RADHIKATAI PANDAV COLLEGE OF ENGINEERING, BAHADURA, UMRER  
ROAD, NAGPUR**

**An Autonomous Institute Affiliated to RTMNU, Nagpur**

**Faculty of Science & Technology**

**B.Tech. Mechanical Engineering/Electrical Engineering/ Electronics & Telecommunication  
Engineering (NEP) (CBCS)**

|                      |                                   |                                   |                       |
|----------------------|-----------------------------------|-----------------------------------|-----------------------|
| Sem-II               | Total Hours Distribution Per Week |                                   |                       |
| Total Credits :<br>1 | Lecture (L) : 0 Hrs               | Practical/Activity (P/A) : 2 Hr   |                       |
| Subject Code         | BT2ME02P/BT2EE02P/BT2ET02P        | Applied/Engineering Chemistry Lab |                       |
| Examination Scheme   |                                   |                                   |                       |
| CIE                  | ESE                               | Minimum Passing Marks:            | Examination Duration: |
| 25 Marks             | 25 Marks                          | 25                                | 3 Hours               |

**Practical Course Objectives**

|   |                                                                                                              |
|---|--------------------------------------------------------------------------------------------------------------|
| 1 | Analyze experimental data, interpret results and draw scientifically valid conclusion.                       |
| 2 | Use modern laboratory techniques analytical tools for the characterization of chemical system and materials. |

**Practical Course Outcomes**

|                                                                  |                                                                                           |
|------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| After completion the Practical course, students would be able to |                                                                                           |
| 1                                                                | Estimate the concentration soluble impurities present in the given water sample.          |
| 2                                                                | Operate laboratory instrument safely and accurately to evaluate fuel and lubricant.       |
| 3                                                                | Perform quantitative chemical analysis using standard laboratory Procedure with accuracy. |

| Sr. no. | List of Practical (Any 6 performance based and 1 virtual lab experiment)         |
|---------|----------------------------------------------------------------------------------|
| 1       | Proximate Analysis of coal.                                                      |
| 2       | Estimation of viscosity of oil by Redwood Viscometer 1 or 2.                     |
| 3       | Estimation of Flash point of lubricating oil by open/ closed cup apparatus.      |
| 4       | Estimation of Hardness of water (Total, Permanent & Temporary) by complexometry. |
| 5       | Estimation of Alkalinity of water (Warder's Method).                             |
| 6       | Estimate the amount of dissolved oxygen present in water sample.                 |
| 7       | Estimation of Ni by complexometry.                                               |
| 8       | Fe (II)/ (III) estimation by redox titration.                                    |
| 9       | Virtual Lab: Experiment on Calorimetry.                                          |
| 10      | Virtual Lab: Beer's Law verification by spectrophotometer.                       |

*(Signature)*  
09/07/26  
A. Vaidya

*(Signature)*  
09/07/2026  
D.P. Shandekar  
09/07/2026

*(Signature)*  
09/07/26  
P.A. Patil

*(Signature)*  
Ms. M.S. Patil

*(Signature)*  
09/07/26  
(Ms. D.P. Chaudhary)

**SMT. RADHIKATAI PANDAV COLLEGE OF ENGINEERING NAGPUR**  
**AN AUTONOMOUS INSTITUTE**  
 AFFILIATED TO RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR  
**FACULTY OF SCIENCE & TECHNOLOGY**  
**B.TECH. ELECTRICAL ENGINEERING**

|                                           |                                   |                               |                      |
|-------------------------------------------|-----------------------------------|-------------------------------|----------------------|
| Course Category                           | ESC- IV                           |                               |                      |
| Sem: II                                   | Total Hours Distribution per week |                               |                      |
| Total Credit: 2                           | Lecture (L): 2 Hrs                | Tutorial/Activity(T/A): 0 Hr. |                      |
| Subject Code                              | BT2EE03T (Th)                     | ENGINEERING MECHANICS         |                      |
| Examination Scheme                        |                                   |                               |                      |
| Continuous Internal Evaluation (CIE)Marks | End Semester Exam(ESE)Marks       | Minimum Passing Marks         | Examination Duration |
| 20                                        | 30                                | -                             | 2 Hours              |

**Course Objectives**

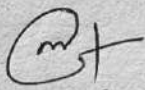
|   |                                                                                                                     |
|---|---------------------------------------------------------------------------------------------------------------------|
| 1 | To Understand the force systems and draw free body diagram to analyze rigid body equilibrium.                       |
| 2 | To Comprehend the principles of friction and solve engineering mechanics problems associated with frictional force. |
| 3 | To introduce the concept of centriod and moment of inertia of plane area.                                           |
| 4 | To make student aware about the method of joint and method of section to analyse the truss.                         |

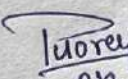
**Course Outcomes**

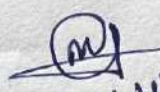
After successful completion of this course the student will be able to:

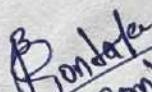
|     |                                                                                                                                                                                      |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CO1 | Analyse a given force system and apply the knowledge of force system and moment to determine resultant of various force system & apply the knowledge of equilibrium of force system. |
| CO2 | To apply the basics of friction                                                                                                                                                      |
| CO3 | Locate Centroid and compute area Moment of Inertia for standard shapes and composites areas.                                                                                         |
| CO4 | Analyze simple determinate trusses                                                                                                                                                   |

  
 Dr. A.S. Moon  
 Chairman B.O.S

  
 Dr. S.M. Gajbhiye

  
 Er. P.R. Morey

  
 Er. M.G. Hingane

  
 Er. B. Sondake

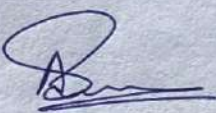
  
 S.V. Rathore

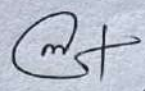
| SYLLABUS                                                                                                                                                                                                                                                                                                                                                                                                                           |              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| Contents                                                                                                                                                                                                                                                                                                                                                                                                                           | No. of hours |
| <b>UNIT 1: Basics Concepts and equilibrium of force systems</b><br>Introduction to Engineering Mechanics: Force Systems, Basic concepts, Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Resultant Moment of Forces and its Applications. Equilibrium of System of Forces, Free body diagrams, Equilibrium of Coplanar Systems. Simple beams and support reactions. Diagram of Statically Determinate Beams. | 7            |
| <b>UNIT 2: Friction</b><br>Types of friction, Limiting friction, Laws of Friction, Static Friction; Motion of Bodies, wedge friction.                                                                                                                                                                                                                                                                                              | 5            |
| <b>UNIT 3: Centroid and Moment of Inertia</b><br>Centroid and Centre of Gravity, Centroid of standard shapes and application to composite plane shapes; Area moment of inertia: formula of area moment of inertia of standard shapes, parallel and perpendicular axis theorem, application to composite plane shapes                                                                                                               | 7            |
| <b>UNIT 4: Analysis of structures- Trusses</b><br>Assumption and Analysis of simple trusses by method of joints & method of sections                                                                                                                                                                                                                                                                                               | 5            |

#### References

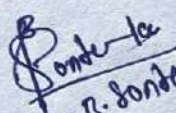
##### Text Books Recommended:

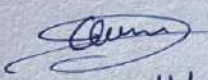
1. Vector Mechanics for Engineers: Statics and Dynamics, Johnston. R.E., Beer. F., Eisenberg. E. R. & Mazurek. D., McGraw Hill
2. Engineering Mechanics: Principles of Statics and Dynamics, R. C. Hibbler, Pearson Press
3. Engineering Mechanics, S S Bhavikatti, Newage International publication

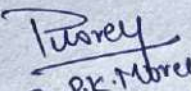
  
 Dr. A.S. Moon  
 Chairman BOS

  
 Dr. S.M. Gajbhiye

  
 Dr. M.G. Khandare

  
 Dr. B. Sontakke  
 S.V. Patil

  
 Dr. L. Budhwar

  
 Dr. P.K. More

**SMT. RADHIKATAI PANDAV COLLEGE OF ENGINEERING NAGPUR**  
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**FACULTY OF SCIENCE & TECHNOLOGY**  
**B.TECH. ELECTRICAL ENGINEERING**

|                                              |                                    |                                              |                      |
|----------------------------------------------|------------------------------------|----------------------------------------------|----------------------|
| Course Category                              | Engineering Science Course (ESC-V) |                                              |                      |
| Sem.: II                                     | Total Hours Distribution per week  |                                              |                      |
| Total Credit: 3                              | Lecture (L): 3.Hrs                 | Tutorial/Activity(T/A): .....Hr.             |                      |
| Subject Code                                 | BT2EE04T<br>(Theory)               | Electrical Measurements &<br>Instrumentation |                      |
| Examination Scheme                           |                                    |                                              |                      |
| Continuous Internal<br>Evaluation (CIE)Marks | Semester End<br>Exam(ESE)Marks     | Minimum<br>Passing Marks                     | Examination Duration |
| 40                                           | 60                                 | 40                                           | 3 Hours              |

**Course Objectives:**

|   |                                                                                                          |
|---|----------------------------------------------------------------------------------------------------------|
| 1 | Understand the fundamentals of electrical measurements, errors, and measuring instruments                |
| 2 | Apply bridge circuits and measuring techniques to measure R, L, and C                                    |
| 3 | Analyze methods of measuring power, energy, and electrical quantities in AC/DC circuits                  |
| 4 | Understand the operation of transformers, instrument transformers, and transducers used in measurements. |
| 5 | Apply digital measuring instruments and modern measurement systems such as SCADA and EMS.                |

**Course Outcomes:**

After successful completion of this course the student will be able to:

|     |                                                                                                      |
|-----|------------------------------------------------------------------------------------------------------|
| CO1 | Explain the principles and characteristics of electrical measuring instruments.                      |
| CO2 | Measure resistance, inductance, and capacitance using bridge methods.                                |
| CO3 | Analyze the measurement of power, energy, and power factor in electrical circuits.                   |
| CO4 | Explain the operation and applications of transformers and instrument transformers.                  |
| CO5 | Select suitable transducers, sensors, and digital measuring instruments for electrical measurements. |

*Praveen*  
*22/07/2026*

| SYLLABUS                                                                                                                                                                                                                                                                                                                                                                                                                                               |              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| Contents                                                                                                                                                                                                                                                                                                                                                                                                                                               | No. of hours |
| <b>Unit I: Generalized Measuring Instruments:</b><br>Measurement & error, Accuracy & Precision, Error & Error Analysis, Forces acting on indicating instruments, Classification of instruments: analog & digital, Galvanometers- Theory & Operation, moving coil, moving iron, PMMC type instruments.                                                                                                                                                  | 8            |
| <b>Unit II: Measurement of RLC Elements:</b><br>Measurement of low Resistance: Kelvin's Double Bridge, Measurement of medium resistance: Wheatstone Bridge & Measurement of high resistance: Ohm meter, Meggar. Measurement of inductance using Maxwell's inductance-capacitance bridge, Measurement of Capacitance using Schering Bridge.                                                                                                             | 10           |
| <b>Unit III: Measurement of Power and Energy:</b><br>Measurement of power- Power in AC and DC circuit, Electrodynamometer type of wattmeter, measurement of power in three phase circuit, one, two & three wattmeter method. Measurement of active, reactive and apparent power. Measurement of Energy in single and polyphase circuits, Induction type Energy meter, digital energy meters. Special Instruments: Power factor meter, frequency meter. | 10           |
| <b>Unit IV: Transformer:</b><br>Principle and working of single-phase transformer, d.c. machines construction and working. <b>Instrument Transformers</b> -General theory of Instrument transformers, characteristics and Phasor diagram of Current transformer and potential transformers (overview), errors in instrument transformers.                                                                                                              | 8            |
| <b>Unit V: Transducer &amp; Digital Measuring Instruments:</b><br><b>Analog Transducer:</b> Classification of Transducer, Measurement of Electric quantities through Resistive, inductive, capacitive effects, fundamental of sensors.<br><b>Digital Measuring Instruments:</b> Definition of Digital transducer, Classification, Introduction to digital measurement, Measurement of Electric quantities like Digital Encoder, Hall effect sensor.    | 8            |

#### Textbooks:

1. A. K. Sawhney, *A Course in Electrical and Electronic Measurements and Instrumentation*, Dhanpat Rai Publications.
2. R. K. Rajput, *Electrical and Electronic Measurements*, S. Chand.
3. U. A. Bakshi and A. V. Bakshi, *Electrical Measurements*, Technical Publications.

#### Reference Books:

1. E. W. Golding, *Electrical Measurements and Measuring Instruments*, CBS Publishers.
2. H. S. Kalsi, *Electronic Instrumentation*, McGraw-Hill.
3. C. S. Rangan, *Instrumentation Devices and Systems*, Tata McGraw-Hill.
4. John P. Bentley, *Principles of Measurement Systems*, Pearson.
5. Ernest O. Doebelin, *Measurement Systems: Application and Design*, McGraw-Hill.

*S. P. Bhargava*  
S. P. Bhargava

*Dr. A. H. Motwale*

*Dr. V. A. Huchke*

*Dr. A. V. Wanjari*

*Dr. P. S. Larywar*  
Dean Academics

**SMT. RADHIKATAI PANDAV COLLEGE OF ENGINEERING NAGPUR**  
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**FACULTY OF SCIENCE & TECHNOLOGY**  
**B.TECH. ELECTRICAL ENGINEERING**

|                                              |                                    |                                                 |                      |
|----------------------------------------------|------------------------------------|-------------------------------------------------|----------------------|
| Course Category                              | Engineering Science Course (ESC-V) |                                                 |                      |
| Sem.: II                                     | Total Hours Distribution per week  |                                                 |                      |
| Total Credit : 1                             | Practical(P): 2 Hrs.               | Tutorial/Activity(T/A): .....Hr.                |                      |
| Subject Code                                 | BT2EE04P<br>(Practical)            | Electrical Measurement &<br>Instrumentation Lab |                      |
| Examination Scheme                           |                                    |                                                 |                      |
| Continuous Internal<br>Evaluation (CIE)Marks | End Semester Exam<br>(ESE)Marks    | Minimum<br>Passing Marks                        | Examination Duration |
| 25                                           | 25                                 | 25                                              | --                   |

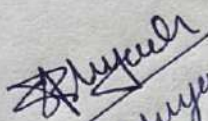
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| <b>Practical Course Objectives:</b>                                     |                                                                                            |
| 1                                                                       | Understand the principles and characteristics of electrical measuring instruments.         |
| 2                                                                       | Measure electrical quantities using analog, digital, and bridge-based methods.             |
| 3                                                                       | Analyze measurement errors and calibrate measuring instruments.                            |
| 4                                                                       | Evaluate the performance of electrical equipment through practical experiments.            |
| <b>Practical Course Outcomes:</b>                                       |                                                                                            |
| After successful completion of this course the student will be able to: |                                                                                            |
| CO1                                                                     | Analyze measurement errors and instrument characteristics.                                 |
| CO2                                                                     | Measure electrical quantities using appropriate measuring instruments and bridge circuits. |
| CO3                                                                     | Calibrate electrical measuring instruments and interpret experimental results.             |
| CO4                                                                     | Evaluate the performance of electrical equipment using standard measurement techniques.    |

*Signature*

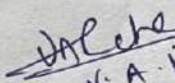
### List of Practical's

Minimum Eight out of the following practical's shall be performed:

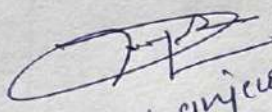
| Sr. No. | List of Practical's                                                                    |
|---------|----------------------------------------------------------------------------------------|
| 01      | Measurement Error Analysis (Absolute, Relative, and Percentage Error)                  |
| 02      | Study of Sensitivity and Resolution of Measuring Instruments                           |
| 03      | Measurement of Unknown Resistance using Wheatstone Bridge.                             |
| 04      | Measurement of Low Resistance using Kelvin Double Bridge.                              |
| 05      | Determine unknown inductance by Maxwell's Bridge.                                      |
| 06      | Measurement of three phase power by Two Wattmeter method                               |
| 07      | Measurement of Power Factor using Single-Phase Wattmeter                               |
| 08      | Reactive power measurement by Wattmeter                                                |
| 09      | Measurement of Frequency using Frequency Meter                                         |
| 10      | Determine regulation & efficiency of single-phase transformer by direct loading method |
| 11      | Measurement of Voltage and Current using Analog and Digital Meters                     |
| 12      | Calibration of Energy Meter                                                            |

  
S. P. Bhusarale

  
Dr. A. P. Jadhav

  
Dr. V. A. Phichole

  
Dr. A. V. Waghmare

  
Dr. P. S. Lanjewar  
Dean Academics

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**FACULTY OF SCIENCE & TECHNOLOGY**  
**B.TECH. ELECTRICAL ENGINEERING**

|                                              |                                   |                                  |                      |
|----------------------------------------------|-----------------------------------|----------------------------------|----------------------|
| Course Category                              | Program Core Course (PCC- I)      |                                  |                      |
| Sem.: II                                     | Total Hours Distribution per week |                                  |                      |
| Total Credit: 2                              | Lecture (L): 2 Hrs.               | Tutorial/Activity(T/A): .....Hr. |                      |
| Subject Code                                 | BT2EE05T<br>(Theory)              | NON-CONVENTIONAL ENERGY SOURCE   |                      |
| Examination Scheme                           |                                   |                                  |                      |
| Continuous Internal<br>Evaluation (CIE)Marks | End Semester<br>Exam. (SEE)Marks  | Minimum<br>Passing Marks         | Examination Duration |
| 20                                           | 30                                | 25                               | 2 Hours              |

**Course Objectives:**

|   |                                                                                         |
|---|-----------------------------------------------------------------------------------------|
| 1 | To create awareness among the students about the renewable energy sources.              |
| 2 | Define energy scenario and future development.                                          |
| 3 | Demonstrate the generation of electricity from various non-conventional energy sources. |
| 4 | Explore the methods the storing solar energy and application of solar energy.           |

**Course Outcomes:**

After successful completion of this course the student will be able to:

|     |                                                                                                                   |
|-----|-------------------------------------------------------------------------------------------------------------------|
| CO1 | Identifying non-conventional sources of energy.                                                                   |
| CO2 | Estimate the solar energy, fundamental of solar radiation geometry and Utilization of it                          |
| CO3 | Identify and analyze the process of power generation through solar photovoltaic                                   |
| CO4 | Explore the concepts involved in wind energy conversion system and compare the different types of wind generator. |

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| SYLLABUS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| Content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | No. of HRS. |
| <b>Unit I: Introduction to Energy Sources:</b><br>Non-conventional sources of electrical energy- Solar, Wind, Geo-Thermal, Ocean, Tidal, Wave, MHD and Biomass; Their Scope and potentialities for energy conversion, world energy status, current energy scenario in India, Environment-Economy-Energy and Sustainable Development, energy planning.                                                                                                                                      | 6           |
| <b>Unit II: Solar Radiation &amp; its Measurement:</b><br>Solar Radiation & its Measurement: Solar Constant, Solar radiation at earth's surface, solar radiation geometry, solar radiation measurement, estimation of average solar radiation, solar radiation on tilted surfaces, Application of Solar Energy: Solar water heating, space heating. Space cooling. Solar Cooking, Solar water pumping for agriculture purposes, Solar Green Houses, Hydrogen production from Solar Energy. | 10          |
| <b>Unit III: Solar Photovoltaic power generation:</b><br>Solar Photovoltaic power generation: Physics of solar cells, Characteristics of solar cell, series and parallel connection, types of solar cell, module manufacturing. Partial shading. bypass and blocking diode. Load calculation, different panel calculations and selection {Monocrystalline, Polycrystalline etc.) Introduction to MPPT.                                                                                     | 6           |
| <b>Unit IV: Wind Energy:</b><br>Basic principles of wind energy conversion, wind energy conversion system, wind data & energy estimation, site selection consideration, basic components of wind energy conversion system (WECS), classification of WEC system, generating system, energy storage, application of wind energy. Stand-Alone and Grid Connected Wind-Electrical Power System                                                                                                 | 6           |

#### Text Books:

1. **G. D. Rai** – *Non-Conventional Energy Sources*  
**Publisher:** Khanna Publishers.
2. **B. H. Khan** – *Non-Conventional Energy Resources*, 2nd Edition  
**Publisher:** McGraw Hill Education.
3. **S. P. Sukhatme & J. K. Nayak** – *Solar Energy: Principles of Thermal Collection and Storage*, 2nd Edition  
**Publisher:** Tata McGraw Hill Publishing Company Ltd.
4. **Chetan Singh Solanki** – *Solar Photovoltaics: Fundamentals, Technologies and Applications*  
**Publisher:** PHI Learning.

#### Reference Books:

1. **R. K. Rajput** – *Non-Conventional Energy Sources and Utilization*  
**Publisher:** S. Chand Publications.
2. **D. P. Kothari, R. Rakesh Ranjan & K. C. Singal** – *Renewable Energy Resources and Emerging Technologies*, 2nd Edition  
**Publisher:** Prentice Hall India Pvt. Ltd., 2011.
3. **John Twidell & Tony Weir** – *Renewable Energy Resources*  
**Publisher:** Routledge.
4. **Tony Burton, Nick Jenkins, David Sharpe & Ervin Bossanyi** – *Wind Energy Handbook*  
**Publisher:** Wiley.
5. **Mukund R. Patel** – *Wind and Solar Power Systems: Design, Analysis, and Operation*  
**Publisher:** CRC Press.

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**Faculty of Science & Technology**

**B. Tech. Mechanical Engineering/Civil Engineering/Electrical Engineering/  
Electronics & Telecommunication/Computer Sci. Engineering/Computer Engineering  
(NEP) (CBCS)**

|                    |                                                           |                                                          |                       |
|--------------------|-----------------------------------------------------------|----------------------------------------------------------|-----------------------|
| Sem-II             | Total Hours Distribution Per Week                         |                                                          |                       |
| Total Credits : 2  | Lecture (L): 2Hrs                                         | Tutorial/Activity (T/A) : 0 Hr                           |                       |
| Subject Code       | BT2ME06T/BT2CV06T/BT2EE06T<br>/BT2ET07T/BT2CS06T/BT2CE06T | REFER TO IKS<br>(Preserving Art, Culture and Traditions) |                       |
| Examination Scheme |                                                           |                                                          |                       |
| CIE                | ESE                                                       | Minimum Passing Marks:                                   | Examination Duration: |
| 20 Marks           | 30 Marks                                                  | 25 Marks                                                 | 2 Hours               |

| Course Objectives |                                                                                                         |
|-------------------|---------------------------------------------------------------------------------------------------------|
| 1                 | To recognize the perspective of Indian Knowledge System v(IKS) for national pride.                      |
| 2                 | Sensitize the students to the contributions made by Indians in the field of philosophy, art and health. |

| Course Outcomes                                      |                                                               |
|------------------------------------------------------|---------------------------------------------------------------|
| After completion of syllabus, students would be able |                                                               |
| 1                                                    | Interpret basics of Indian Knowledge system.                  |
| 2                                                    | Integrate the teaching of Indian culture and civilization.    |
| 3                                                    | Appreciate Indian artistic tradition.                         |
| 4                                                    | Analyze Indian health and wellness system for healthy living. |

DR. AMR MUSALE

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# SYLLABUS (REFER TO IKS)

| DETAILS OF TOPIC                                                                                                                                                                                                                                                                            | Allotment of Hours |     | Mapped with CO Number |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----|-----------------------|
|                                                                                                                                                                                                                                                                                             | L                  | T/A | CO                    |
| Unit-1                                                                                                                                                                                                                                                                                      |                    |     |                       |
| Introduction to Indian Knowledge System: Introduction and overview of Indian Knowledge Sysatem , Vedic Corpus-Vedas, Types of Vedas, Upvedas, Types of Upvedas.                                                                                                                             | 6                  |     | 1                     |
| Unit-2                                                                                                                                                                                                                                                                                      |                    |     |                       |
| Indian Culture and Civilization: Indian Culture and Civilization, Its characteristics, Difference between Culture and Civilization, Indus Valley Civilization, Vedic Civilization.                                                                                                          | 6                  |     | 2                     |
| Unit-3                                                                                                                                                                                                                                                                                      |                    |     |                       |
| Indian Artistic Traditions: Indian Artistic Traditions, Chitrakala- Indian Style Painting (Madhubani, Warli, Phad, Kalamkari, Gond, Mandana), Nritya: Indian Dance Forms(Bharat natyam , Kathak, Kathakali, Kuchipudi, Manipuri, Mohiniattyam). Sangeet: Carnatic Music & Hindustani Music. | 6                  |     | 3                     |
| Unit-4                                                                                                                                                                                                                                                                                      |                    |     |                       |
| Health And Wellness: Wellbeing, Mental And Physical, Dimensions of Wellness, Concept of Healthy Living In Ayurveda, Tri-Doshas-Relationship To Health.                                                                                                                                      | 6                  |     | 4                     |

## Text/Reference Books: -

- 1) Indian Knowledge Systems Ancient Wisdom For The Modern World, Dr. Madhukar Nikam, DATTSONS.
- 2) Indian Knowledge Systems Concepts And Applications. B. Mahadevan, Vinayak Rajat Bhat, Nagendra Pavana R.N.PHI Learning Private Limited.
- 3) Indian Knowledge Systems. Dr. Vilas Gajbe. Dr. Sanjiv Khondekar. Dr. Vinay Upadhayay. Dr. Prashant Raut. Nutan Akash Publication.

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**B. Tech. Mechanical Engineering/Civil Engineering/Electrical Engineering/  
Electronics & Telecommunication/Computer Sci. Engineering/Computer Engineering  
(NEP) (CBCS)**

|                    |                                                           |                                          |                       |
|--------------------|-----------------------------------------------------------|------------------------------------------|-----------------------|
| Sem-II             | Total Hours Distribution Per Week                         |                                          |                       |
| Total Credits : 2  | Lecture (L): 2Hrs                                         | Tutorial/Activity (T/A) : 0 Hr           |                       |
| Subject Code       | BT2ME06T/BT2CV06T/BT2EE06T<br>/BT2ET07T/BT2CS06T/BT2CE06T | REFER TO IKS<br>( Consciousness Studies) |                       |
| Examination Scheme |                                                           |                                          |                       |
| CIE                | ESE                                                       | Minimum Passing<br>Marks:                | Examination Duration: |
| 20 Marks           | 30 Marks                                                  | 25                                       | 2 Hours               |

| Course Objectives |                                                        |
|-------------------|--------------------------------------------------------|
| 1                 | To recognize the perspectives of Consciousness Studies |

| Course Outcomes                                      |                                                                                                               |
|------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| After completion of syllabus, students would be able |                                                                                                               |
| 1                                                    | To define the primary fundamentals of Consciousness Studies.                                                  |
| 2                                                    | To explain the pros and cons of the effects of Consciousness Studies.                                         |
| 3                                                    | To classify the consequences of Consciousness studies to promote behavioural science.                         |
| 4                                                    | To relate the basics of Consciousness Studies to better understanding the problems of individual and society. |

  
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 (Dr. Anil Musace)

Mrs. M. S. Patel  
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Dr. D. F. Shastri  
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(Supriya Aher)  
 09/07/2026

# SYLLABUS (REFER TO IKS)

| DETAILS OF TOPIC                                                                                                                                                                                                                                                                                                             | Allotment of Hours |     | Mapped with CO Number |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----|-----------------------|
|                                                                                                                                                                                                                                                                                                                              | L                  | T/A | CO                    |
| Unit-1                                                                                                                                                                                                                                                                                                                       |                    |     |                       |
| Introduction to Psychology: An introduction to Psychology, Definition of Psychology, History of Psychology, Psychological methods, Sub-divisions of Psychology, Application of Psychology.                                                                                                                                   | 6                  |     | 1                     |
| Unit-2                                                                                                                                                                                                                                                                                                                       |                    |     |                       |
| Basic Cognitive Processes Sensory Process-general characteristics of senses, visual sense, auditory sense, other senses, Perpetual organization-principles of Perceptual organization, object perception and perceptual, object perception and perceptual constancies, influences upon perception, extra sensory perception. | 6                  |     | 2                     |
| Unit-3                                                                                                                                                                                                                                                                                                                       |                    |     |                       |
| Classical conditioning, theories about classical conditioning, Reinforcement and Punishment.                                                                                                                                                                                                                                 | 6                  |     | 3                     |
| Unit-4                                                                                                                                                                                                                                                                                                                       |                    |     |                       |
| Theories about memory, brain and memory, long term memory, forgetting.                                                                                                                                                                                                                                                       | 6                  |     | 4                     |

## Text/Reference Books: -

1. Clifford T Morgan, King, Weiss and Schopler, Introduction to Psychology, McGraw Hill Education (India) Private Limited.
2. Hilliard Atkinson and Atkinson, (1977) Introduction to Psychology, Tatty McGraw Hill.
3. Kao H.S.R. & Sin had. (Ends), (1977) Asian Perspectives on Psychology

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medieval India.

# SYLLABUS (REFER TO IKS)

| DETAILS OF TOPIC                                                                                                                                                                                                                                                                                                                                                                     | Allotment of Hours |     | Mapped with CO Number |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----|-----------------------|
|                                                                                                                                                                                                                                                                                                                                                                                      | L                  | T/A | CO                    |
| <b>Unit-1</b>                                                                                                                                                                                                                                                                                                                                                                        |                    |     |                       |
| Mathematics in India: Introduction of inception of Mathematics from Vedic periods. Great mathematician and their contribution (e.g. Aryabhatta, Bhaskara, Bhramagupta, Ramanujan, Pingala, Bhaskara-II, Sulabhasutras (Pythagoras theorem), Square, Square root of imperfect squares, Value of Pi.                                                                                   | 6                  |     | 1                     |
| <b>Unit-2</b>                                                                                                                                                                                                                                                                                                                                                                        |                    |     |                       |
| India: Vaisheshikadarshan Atomic Theory & law of motion, Theory of Panchamahabhoota, BrihatShathaka (division of time, unit of distance), Bhaskaracharya (Introduction to theory of gravity, Suryasidhanta & Sidhantasjhiromani), Lilavati (Gurutvakarshan shakti)                                                                                                                   | 6                  |     | 2                     |
| <b>Unit-3</b>                                                                                                                                                                                                                                                                                                                                                                        |                    |     |                       |
| Chemistry of India: Vatsyayana, Nagarjuna, Vagbhata – building of Theras-Shala (laboratory), working arrangements of Ras-Shala, material and equipment, YashoDharaBhatta-process of distillation, apparatus. Metallurgy in India, Suvarna(gold) and its different types of properties, Rajata (Silver), Tamra (Copper) , Loha (Iron), Jasta (Zinc) Naga/Sisa (lead), Pittala (brass) | 6                  |     | 3                     |
| <b>Unit- 4</b>                                                                                                                                                                                                                                                                                                                                                                       |                    |     |                       |
| Medicines and yog in India : Importance and benefits of yoga purpose of yoga traditional knowledge of medicinal plant, use of home available herbs and spices.                                                                                                                                                                                                                       | 6                  |     | 4                     |

## Text/Reference Books: -

1. R. P Kularani, Glimpse of Indian Engineering and Technology ( Ancient & Medieval period, Munshiram Manoharlal Publishers Pvt. Ltd, 2018
2. A.K. Pathak, Science and Technology in India, Anshikaparakashnpratapgarh ,2016.
3. PB Sharma, S Narnia, Doctors Scientists and Engineers of Ancient India, Kalpaz Publications 2017.
4. NVP, Unithiri.Indian Scientific Traditions(Professor K.N. NeelkantanElayath Felicitation Volume), publicatio9n division, University of Calicut,2006.
5. Anonymous, History of Science in India-Volume-I, Part-I(Physics, Mathematics & Statistics), the national academy of science, India & the Ramakrishna Mission Institute of culture, 2014.
6. Kaptur K and Singh A.K.(Eds 2005), Indian Knowledge Systems, Vol-1, Indian Institute of Advanced Study, Shimla. Tatvabodh of Snakaracharya, Central Chimney Mission Trust, Bombay, 1995.
7. Dharmpal, Indian Science & Technology in the 18<sup>th</sup> century, Rashtrottahanasahitya, 1983.
8. S Biswal, B L Ray, Vedic Science and Technology, DK Porint world, 2009.

DR. AMALMUSACE

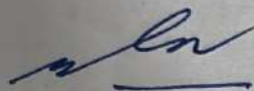
ms. M. S. Palani

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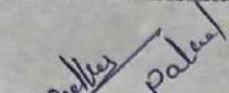
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(Supriya Aien)

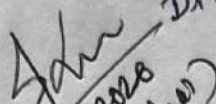
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(Dr. Moumuni Aich)

9. A. K. Bag, History of technology in India, (Set 3 vol), Indian Nation Science Academy, 1997.
10. A Gosh, History of Science in India (Volume-I Part-II Astronomy), the national academy of science, India & the Ramakrishna mission institute of culture, 2014.



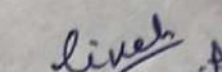
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Dr. D. R. Shastri  
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**B. Tech. Mechanical Engineering/Civil Engineering/Electrical Engineering/  
Electronics & Telecommunication/Computer Sci. Engineering/Computer Engineering  
(NEP)(CBCS)**

|                    |                                                           |                                                             |                          |
|--------------------|-----------------------------------------------------------|-------------------------------------------------------------|--------------------------|
| Sem-II             | Total Hours Distribution Per Week                         |                                                             |                          |
| Total Credits : 2  | Lecture (L): 2Hrs                                         | Tutorial/Activity (T/A) : 0 Hr                              |                          |
| Subject Code       | BT2ME06T/BT2CV06T/BT2EE06T<br>/BT2ET07T/BT2CS06T/BT2CE06T | REFER TO IKS<br>(Wellness, traditional<br>medicines & yoga) |                          |
| Examination Scheme |                                                           |                                                             |                          |
| CIE                | ESE                                                       | Minimum Passing<br>Marks:                                   | Examination<br>Duration: |
| 20 Marks           | 30 Marks                                                  | 25 Marks                                                    | 2 Hours                  |

| Course Objectives |                              |
|-------------------|------------------------------|
| 1                 | To recognize the perspective |

| Course Outcomes                                      |                                                                            |
|------------------------------------------------------|----------------------------------------------------------------------------|
| After completion of syllabus, students would be able |                                                                            |
| 1                                                    | To define the primary fundamentals Wellness, Traditional Medicines & Yoga. |
| 2                                                    | To relate the overall elements of nature around human life & livelihood.   |
| 3                                                    | To classify and rectify the problems related to body .                     |
| 4                                                    | To explain benefits of wellness.                                           |

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# SYLLABUS ( REFER TO IKS)

| DETAILS OF TOPIC                                                                                                                               | Allotment of Hours |     | Mapped with CO Number |
|------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----|-----------------------|
|                                                                                                                                                | L                  | T/A | CO                    |
| Unit-1                                                                                                                                         |                    |     |                       |
| Importance of health and wellness, Essential components of balance diet for healthy living, Processed foods and unhealthy eating habits.       | 6                  |     | 1                     |
| Unit-2                                                                                                                                         |                    |     |                       |
| Body systems and common disease, Sedentary lifestyle and its risk of disease, Stress, Anxiety and depression, Factors affecting mental health. | 6                  |     | 2                     |
| Unit-3                                                                                                                                         |                    |     |                       |
| Importance and benefits of Yoga, Purpose of Yoga, traditional knowledge of medicinal plant, use of home available herbs and spices.            | 6                  |     | 3                     |
| Unit-4                                                                                                                                         |                    |     |                       |
| Vedas and its types, Social change in Indian society, Social stratification and class conflicts.                                               | 6                  |     | 4                     |

## Text/Reference Books:

1. Sociology in India- Surendra Sharma, Rawat Publication.
2. Bradford B, Strand and Others, Fitness Education Arizona GorsuchSeani; sbrick Publishers, 1997.
3. Scott K Powers and Stephen L Dodd. Total Fitness; Exercise; Nutrition and wellness Boston: Ally and Bacon, 1999.
4. RigvedaSamhita with SayanaBhashya, VaidikSamshodhanMandal, Pune.
5. Riksuktashati, H. D. Velankar, Bharatiya VidyaBahavan, Mumbai.

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**FACULTY OF SCIENCE & TECHNOLOGY**  
**B.TECH. ELECTRICAL ENGINEERING**

| B.TECH. ELECTRICAL ENGINEERING               |                                                     |                                  |                      |
|----------------------------------------------|-----------------------------------------------------|----------------------------------|----------------------|
| Course Category                              | Vocational and Skill Enhancement Course - (VSEC-II) |                                  |                      |
| Sem.: II                                     | Total Hours Distribution per week                   |                                  |                      |
| Total Credit:- 2                             | Practical(P): 4 Hrs                                 | Tutorial/Activity(T/A): .....Hr. |                      |
| Subject Code                                 | BT2EE07P<br>(Practical)                             | Electrical Workshop-II           |                      |
| Examination Scheme                           |                                                     |                                  |                      |
| Continuous Internal<br>Evaluation (CIE)Marks | Semester End<br>Exam(SEE)Marks                      | Minimum<br>Passing Marks         | Examination Duration |
| 50                                           | 50                                                  | 50                               | -----                |

**Practical Course Objectives:**

|   |                                                   |
|---|---------------------------------------------------|
| 1 | To learn basic electrical tools and instruments.  |
| 2 | To develop testing and repairing skills.          |
| 3 | To perform basic electrical measurements.         |
| 4 | To practice safe wiring and installation methods. |

**Practical Course Outcomes:**

After successful completion of this course the student will be able to:

|     |                                                                                      |
|-----|--------------------------------------------------------------------------------------|
| CO1 | To demonstrate the use of a line tester, series test lamp, and parallel test lamp.   |
| CO2 | To calculate the insulation resistance of an electrical installation using a Megger. |
| CO3 | To dismantle, reassemble, and troubleshoot a ceiling fan.                            |
| CO4 | To perform fault finding and repair of a mixer and grinder.                          |
| CO5 | To measure the field resistance and armature resistance of a DC machine.             |

*Signature*

**Minimum Eight out of the following practical shall be performed:**

**List of Practical**

| Sr. No. | List of Practical's                                                                                                                                                                        |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 01      | To demonstrate the use of line tester , series and parallel test lamp                                                                                                                      |
| 02      | Calculating Insulation resistance with the help of megger.                                                                                                                                 |
| 03      | Demonstrate good earthing of domestic installation and earth continuity conductors by measuring voltages between P-N, P-E and N-E.                                                         |
| 04      | Dismantling , re-assembling and trouble shooting of electric iron                                                                                                                          |
| 05      | Dismantling , re-assembling and trouble shooting of ceiling fan                                                                                                                            |
| 06      | Testing of domestic pump motor before starting and testing its wiring                                                                                                                      |
| 07      | To perform fault finding and repair of mixer and grinder                                                                                                                                   |
| 08      | Estimate the cost of material for wiring in PVC channel for an office room having 2 lamps, 1 Fan, one 6A socket outlet and wire up along with test of continuity, polarity and insulation. |
| 09      | Measurement of Field resistance and armature resistance of DC Machine.                                                                                                                     |
| 10      | Usage and operation of CT and PT.                                                                                                                                                          |

**References:**

1. S. L. Uppal and G. C. Garg, **Electrical Wiring, Estimating and Costing**, Khanna Publishers.
2. B. L. Theraja and A. K. Theraja, **A Textbook of Electrical Technology (Vol. I)**, S. Chand & Co.
3. V. K. Mehta and Rohit Mehta, **Principles of Electrical Engineering**, S. Chand & Co.
4. Bureau of Indian Standards (BIS), **National Electrical Code of India (NEC 2023)**.

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*Dr. V. A. Hunkale*

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**B.Tech. Mechanical Engineering/Civil Engineering/Electronics & Telecommunication**

**/Electrical Engineering/**

**Computer Science & Engineering/Computer Engineering (NEP) (CBCS)**

|                    |                                                               |                                           |                       |
|--------------------|---------------------------------------------------------------|-------------------------------------------|-----------------------|
| Sem-II             | Total Hours Distribution Per Week                             |                                           |                       |
| Total Credits : 2  | Lecture (L) :                                                 | Tutorial/Activity (T/A) : 4Hrs            |                       |
| Subject Code       | BT2ME08P/BT2CV08P/<br>BT2ET08P/BT2EE08P/BT2CS08P/<br>BT2CE08P | CC Basket-II (Yoga & Cultural Activities) |                       |
| Examination Scheme |                                                               |                                           |                       |
| CIE                | ESE                                                           | Minimum Passing Marks:                    | Examination Duration: |
| 100 Marks          | -                                                             | 50                                        | -                     |

| Course Objectives |                                                                             |
|-------------------|-----------------------------------------------------------------------------|
| 1                 | To understand the fundamental and benefits of yoga and cultural activities. |
| 2                 | To develop physical fitness, strength, flexibility, and coordination.       |

### SYLLABUS

**1. Yoga Practices:** Importance and types of yoga, Warm up and stretching exercise, Pranayam techniques, Suryanamaskar, safety precaution during yogapractice.

**2. Health and Wellness:** Stress management through yoga, Healthy lifestyle and nutrition, mindfulness and emotional balance.

**3. Cultural Activities:** Meaning and importance of culture activities, Indian art, music, dance, drama, folk tradition.

**4. Cultural Excellence and Creative Expression:** National festival, Regional festivals, college cultural festivals and competitions and Innovation.

*Handwritten signature:* Mrs. M. S. Palani  
21/07/2026

*Handwritten signature:* Dr. D. F. Shinde  
29/07/2026

*Handwritten signature:* Sandesh R. Grandhe  
09/07/2026