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| **Institute / School Name** | Chitkara School of Engineering & Technology/  School of Electronics and Communication Engineering | | |
| **Program Name** | B.E. (ECE/CSE/ME/CE) | | |
| **Course Code** | EEL4103 | | |
| **Course Name** | Basics of Electrical Engineering | | |
| **Lecture/Tutorial (per week)** | 4/1 | **Course Credits** | 5 |
| **Course Coordinator Name** | Ms. Mamatha Sandhu | | |

1. **Scope and Objectives of the Course**

* To provide an elementary knowledge of Electrical Engineering for both electrical as well as non-electrical undergraduates.
* To understand the basics of electrical elements, magnetic effects, magnetism and their functionality.
* To understand the working principle of various electrical machines and to understand their operation.
* To understand methods to analyze and characterize the circuits and to have basic understanding for implementation in real applications.
* To understand protection and safety precautions in electrical systems and know the earthing concept in real world applications.

1. **Textbooks /Reference books**

**TB1:** ‘Basic Electrical Engineering’ by D C Kulshreshtha’, Tata McGraw Hill, 2009.

1. **Reference Books**

**RB1:** ‘Basic Electrical and Electronics Engineering’ by M.S. Sukhija, T.K. Nagsarkar, Oxford University, 2012

**RB2:** 'Principles of Electrical Engineering by V.K Mehta & Rohit Mehta, S. Chand & Company Limited,

Latest Edition.

1. **Other readings and relevant websites**

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| S. No. | **Link of Journals, Magazines, websites and Research Papers** |
| 1 | http://nptel.ac.in/courses/108105053/12 |
| 2 | http://nptel.ac.in/courses/108105053/18 |
| 3 | http://nptel.ac.in/courses/108105053/21 |
| 4 | http://nptel.ac.in/courses/108105053/23 |
| 5 | http://nptel.ac.in/courses/108108076/26 |
| 6 | http://nptel.ac.in/courses/108108076/35 |
| 7 | <http://nptel.ac.in/courses/108103009/32> |
| 8 | http://electrical-engineering-portal.com/what-is-the-difference-between-mcb-mccb-elcb-and-rccb |

1. **Course Plan**

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| **Lect. No. (1 Hr)** | **Topics** | **Text Book** | **Section No., Page No.** |
| 1-2 | **UNIT-1**  **Analysis of AC Circuits:-** Introduction to Alternating Voltage and Current—Waveforms, terms and definitions . | TB1  RB1 | Sec-9.1-9.2(P 233-238)  Sec-4.1-4.4(P 170-178) |
| 3-5 | Root Mean Square, Peak value, Average value of A.C, phasor representation, and rectangular and polar forms of alternating quantities. | TB1  RB1 | Sec-9.2-9.6(P 239-256)  Sec-4.5-4.8(P 178-196)  Sec-4.4-4.6 (P 123-140) |
| 6-7 | Analysis of pure resistive, Inductive and Capacitive circuits | TB1  RB1 | Sec-9.7(P 256-271)  Sec-4.9(P 196-203) |
| 8-10 | Analysis of R-L, R-C and series R-L-C circuits & phasor diagrams. Analysis of parallel R-L and R-C circuits. Power in Ac circuits, Resonance in series circuit. Significance of pf & its importance. | TB1  RB1 | Sec-10.1-10.6(P 272-282)  Sec-11.1-11.4(P 310- 320)  Sec-4.10-4.11(P 203-224)  Sec-4.13-4.14(P 228-244) |
| 11-12 | **Introduction to three-phase systems :**-  Comparison of single phase systems & three phase systems, generation of three-phase voltage, phase sequence. | TB1  RB1 | Sec-12.-2.5(P 335-340)  Sec-5.1-5.3.2(P 279-282) |
| 13-15 | Types of connections, relationship between line and phase values, AC power calculations for three phase systems, two-watt meter method, star–delta conversions. | TB1  RB1 | Sec-12.6-12.52(P 335-352)  Sec-12.11(P 352-364)  Sec-4.15(P 250-251) |
| 16 -17 | **UNIT-2**  **Magnetic circuits: -** Definition of mmf, flux and reluctance, Faraday’s laws, self and mutual inductance, comparison between magnetic and electric circuit. | TB1 | Sec-6.1-6.3(P 164-169) |
| 18 | Energy in linear magnetic systems, coils connected in series, electromagnets. | TB1  RB1 | Sec-7.1-7.(P 183-200)  Sec 3.13-3.15(P 152-159) |
| **ST-I (5, 6 & 12 Oct 2015)** | | | |
| 19-22 | **UNIT-3**  **Electric Machines :**  **Transformer** – Principle, construction, working, Emf equation, equivalent resistance & reactance circuit and efficiency. | TB1 | Sec 13.1-13.8 (P 372-380)  Sec 13.5 (P 383-390)  Sec 13.10 (P 394-396)  Sec 13.14 (P 402-404) |
| 23-25 | **DC Motors** –Construction, Working principle, Back emf in a DC motor. Types of motors & applications. | TB1  RB1 | Sec-16.6(P 521-522)  Sec-16.11-16.13(P 535-340)  Sec-9.1-9.2(P 481-483)  Sec-9.7.1-9.7.5(P 505-508) |
| 26-27 | **Three-phase induction motor :**  Principle of operation, construction, working and applications. Torque & speed characteristics. | TB1  RB1 | Sec-15.2-15.4(P 476-483)  Sec-15.7(P 491-494  Sec 8.1 (P 430-436) |
| 28-30 | **Single phase induction motor-** Principle of operation, rotating magnetic field. Torque –slip characteristics, types of motors: split phase motors only i.e resistance and capacitor motor. | TB1  RB1 | Sec-17.1-17.3(P 561-569)  Sec 8.4.1-8.4.3.2 (P 463-469) |
| 31-33 | **UNIT-4**  **Measuring Instruments and Transducers:-** Classification of Instruments, Principle of Indicating Instruments, Essential features of measuring instruments.  Voltmeters & Ammeters, moving coil permanent magnet type, moving coil dynamo-meter type & moving iron type, Extension of instrument range - Ammeter & Voltmeter, measurement errors. | TB1  RB1 | Sec-18.1-18.8(P 589-610)  Sec-10.1-10.4(P 534-545)  Sec 10.11(P 571-572) |
| 34-36 | Classification of Transducers, Active and passive transducers. Temperature Transducers- Resistance Temperature Detectors, thermistors, thermocouples and, Piezoelectric Transducers. Displacement transducers- LVDT. | RB1 | Sec-17.1(P 764-771)  Sec-17.6.5.1(P 778-779)  Sec-17.6.2(P 774-776) |
| **ST-2 (16, 17 & 23 Nov 2015)** | | | |
| 37-39 | **UNIT-5**  **Batteries:** Types, Construction, charging and maintenance of batteries. | Link 4 | Other readings and relevant websites |
| 40-43 | **UNIT-6**  **Electrical Protection and Safety -** Basic Protection Devices – Types and Rating of fuses, MCB’s, ELCB and MCCB.  **http://www.electricaltechnology.org/2014/11/fuse-types-of-fuses.html.**  **http://www.electrical4u.com/working-principle-of-earth-leakage-circuit-breaker-elcb-voltage-current-elcb-rccb** | Link 7 | **Notes** |
| 44-45 | Electrical shock and precautions against shock, Concept of earthing and various types of earthing & its importance. | RB1 | **Notes**  Sec 11.8 (P 597-601) |
| **ST-3 (3 Dec 2015 – 5 Dec 2015)** | | | |

1. **Evaluation Scheme:**

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| Component 1 | Three Subjective Sessional Tests | 40% |
| Component 2 | End Term Examination | 60% |
|  | Total | 100% |

**Details of Component-1:** There will be two assignments and overall weightage of assignments of will be 10%

**Details of Component-2:** There will be three sessional tests (STs) for all the theory papers as per below stated guidelines:

**(i)** 1st sessional test will be from 0- 40% syllabus of the subject.

**(ii)** 2nd sessional test will be from 41-80% syllabus of the subject.

**(iii)** 3rd sessional test will be from 100% syllabus of the subject.

**(iv)** The average of best of two tests will be taken for finalizing the internal of the subject.

**(V)** Sessional Tests are compulsory.

**Details of Component-3:** The End Term Examination will be held at the end of semester. As per academic guidelines minimum 75% attendance is required to become eligible for appearing in the end term examination. The syllabus for end term will be 100% from full syllabus.

**BASICS OF ELECTRICAL ENGINEERING**

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| **S. No** | **Topics** | **Lectures** | **Weightage (%age)** |
| 1 | **ANALYSIS OF AC CIRCUITS:** Introduction to Alternating Voltage and Current—Waveform terms and Definitions. Root mean square, peak value, average value of A.C, phasor representation, and rectangular and polar forms of alternating quantities. Analysis of pure resistive, inductive and capacitive circuits. Analysis of series R-L, R-C and R-L-C circuits. AC power calculations for single phase. Analysis of parallel circuits, Power in Ac circuits, Resonance in series circuit. Significance of pf & its importance. Introduction to three phase systems-types of connections, relationship between line and phase values, AC power calculations for three phase systems. Two-watt meter method. Star–delta conversions. | 15 | 34% |
| 2 | **MAGNETIC CIRCUITS:** Definition of mmf, flux and reluctance, Faraday’s laws, self and mutual inductance, Energy in linear magnetic systems, coils connected in series, electromagnets. | 3 | 6% |
| 3 | **ELECTRIC MACHINES:**  **Transformer** – Principle, construction, working, equivalent resistance & reactance circuit and efficiency.  **DC Motors-** Working principle, construction and applications of DC Motors.  **Three-phase induction motor-**  Principle, construction, working and applications.  **Single-phase induction motor-** Principle of operation, rotating magnetic field. Torque –slip characteristics, types of motors: split phase motors only i.e resistance and capacitor motor. | 12 | 26% |
| 4 | **MEASURING INSTRUMENTS AND TRANSDUCERS:-** Classification of Instruments, Principle of Indicating Instruments, Extension of instrument range - Ammeter & Voltmeter measurement errors.  Classification of Transducers, Active and passive transducers, Displacement transducers- LVDT, Temperature Transducers- Resistance Temperature Detectors, thermocouples and Thermistors, Piezoelectric Transducers. | 6 | 16% |
| 5 | **BATTERIES:** types,construction, charging and maintenance of batteries. | 3 | 6% |
| 6 | **ELECTRICAL PROTECTION AND SAFETY: -** Basic Protection Devices – Types and Rating of fuses, MCB’s, ELCB and MCCB. Electrical shock and precautions against shock, Concept of earthing and various types of earthing. | 6 | 12% |
| **TOTAL** | | 45 | 100% |

**This Document is approved by:**

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| **Designation** | **Name** | **Signature** |
| **Course Coordinator** | Ms. Mamatha Sandhu |  |
| **Program In charge** | Ms. Shivani Malhotra |  |
| **Dean / Deputy Dean** |  |  |
| **Date** | 18-08-2015 |  |