

**Department of Electrical and Telecommunication Engineering
Faculty of Engineering
South Eastern University of Sri Lanka**

**DETAIL CURRICULUM OF ELECTRICAL AND
ELECTRONIC ENGINEERING DEGREE PROGRAM**

Jan 2022

ELECTRICAL AND ELECTRONIC ENGINEERING DEGREE CURRICULUM

| Semester 1 | Module Code and Name | GPA | L | T | P | Evaluation (%) | |
|------------|---------------------------------------------|---------|-----|-----|-----|----------------|------|
| | | Credits | (h) | (h) | (h) | CA | Exam |
| | ID1301 Mathematics - I | 3 C | 38 | 14 | - | 30 | 70 |
| | ID1202 English | 2 C | - | 60 | - | 50 | 50 |
| | CS1301 Introduction to Computing | 3 C | 30 | 04 | 26 | 50 | 50 |
| | EE1301 Principles of Electrical Engineering | 3 C | 35 | 10 | 10 | 30 | 70 |
| | ME1301 Applied Mechanics | 3 C | 33 | 13 | 11 | 30 | 70 |
| | ME1302 Engineering Drawing | 3 C | 23 | - | 44 | 50 | 50 |
| | Total | 17 C | | | | | |

| Semester 2 | Module Code and Name | GPA | L | T | P | Evaluation (%) | |
|------------|---------------------------------------------|---------|-----|-----|-----|----------------|------|
| | | Credits | (h) | (h) | (h) | CA | Exam |
| | ID1303 Mathematics - II | 3 C | 38 | 14 | - | 30 | 70 |
| | ID1204 Communication Skills for Engineers | 2 C | 20 | 10 | 10 | 50 | 50 |
| | CE1301 Mechanics of Materials | 3 C | 32 | 16 | 10 | 30 | 70 |
| | EE1302 Principles of Electronic Engineering | 3 C | 35 | 10 | 10 | 30 | 70 |
| | ME1303 Engineering Materials and Processes | 3 C | 26 | - | 38 | 50 | 50 |
| | ME1304 Thermodynamics and Fluid Mechanics | 3 C | 33 | 11 | 13 | 30 | 70 |
| | Total | 17 C | | | | | |

| Semester 3 | Module Code and Name | GPA | L | T | P | Evaluation (%) | |
|------------|-------------------------------------------|----------|-----|-----|-----|----------------|------|
| | | Credits | (h) | (h) | (h) | CA | Exam |
| | ID2301 Differential Equations | 3 C | 38 | 14 | - | 30 | 70 |
| | EE2201 Electromagnetics | 2 C | 30 | - | - | 30 | 70 |
| | EE2202 Electrical Circuit Analysis | 2 C | 29 | - | 02 | 30 | 70 |
| | EE2203 Electrical Measurements | 2 C | 26 | - | 08 | 30 | 70 |
| | EE2304 Digital Electronics | 3 C | 39 | 06 | 06 | 30 | 70 |
| | EE2305 Introduction to Telecommunications | 3 C | 39 | 06 | 06 | 30 | 70 |
| | EE2306 Theory of Electricity | 3 C | 39 | 06 | 06 | 30 | 70 |
| | Module from ID Electives (Basket A) | 1 E | | | | | |
| | Total | 18 C+1 E | | | | | |

| Semester 4 | Module Code and Name | GPA | L | T | P | Evaluation (%) | |
|------------|--------------------------------------------------------------|----------|-----|-----|-----|----------------|------|
| | | Credits | (h) | (h) | (h) | CA | Exam |
| | ID2302 Probability and Statistics for Engineers | 3 C | 38 | 14 | - | 30 | 70 |
| | ID2303 Industrial Management I | 3 C | 38 | 14 | - | 30 | 70 |
| | CS2302 Computer Architecture | 3 C | 30 | - | 30 | 50 | 50 |
| | EE2307 Introduction to Electrical Machines and Power Systems | 3 C | 39 | 06 | 06 | 30 | 70 |
| | EE2308 Analog Electronics | 3 C | 39 | 06 | 06 | 30 | 70 |
| | EE2309 Signals and Systems | 3 C | 39 | 06 | 06 | 30 | 70 |
| | Module from ID Electives (Basket B) | 2 E | | | | | |
| | Total | 18 C+2 E | | | | | |

| | Module Code and Name | GPA | L | T | P | Evaluation (%) | |
|--|------------------------------|---------|-----|-----|-----|----------------|------|
| | | Credits | (h) | (h) | (h) | CA | Exam |
| | IT3301 Industrial Training I | 3 C | - | - | - | 100 | - |

| Semester 5 | Module Code and Name | | GPA | L | T | P | Evaluation (%) | |
|------------|-------------------------------------|----------------------------------------|----------|-----|-----|-----|----------------|------|
| | | | Credits | (h) | (h) | (h) | CA | Exam |
| | ID3301 | Complex Analysis and Numerical Methods | 3 C | 32 | 12 | 14 | 30 | 70 |
| CS3301 | Computer Networks | 3 C | 30 | 03 | 27 | 50 | 50 | |
| EE3301 | Power Systems I | 3 C | 39 | 06 | 06 | 30 | 70 | |
| EE3302 | Communication Theory | 3 C | 39 | 06 | 06 | 30 | 70 | |
| EE3303 | Power Electronics | 3 C | 39 | 06 | 06 | 30 | 70 | |
| EE3204 | Applied Electromagnetics | 2 C | 24 | - | 12 | 30 | 70 | |
| | Module from ID Electives (Basket A) | | 1 E | | | 30 | 70 | |
| | Total | | 17 C+1 E | | | | | |

| Semester 6 | Module Code and Name | | GPA | L | T | P | Evaluation (%) | |
|------------|-------------------------------------|--------------------------|----------|-----|-----|-----|----------------|------|
| | | | Credits | (h) | (h) | (h) | CA | Exam |
| | ID3302 | Industrial Management II | 3 C | 38 | 14 | - | 30 | 70 |
| CS3302 | Data Structures and Algorithms | 3 C | 30 | 05 | 25 | 50 | 50 | |
| EE3305 | Communication Systems I | 3 C | 39 | 06 | 06 | 30 | 70 | |
| EE3306 | Control Systems | 3 C | 38 | - | 14 | 20 | 80 | |
| EE3307 | Electrical Installations | 3 C | 39 | 06 | 06 | 40 | 60 | |
| EE3308 | Electrical Machines and Drives I | 3 C | 35 | 10 | 10 | 30 | 70 | |
| | Module from ID Electives (Basket B) | | 2 E | | | | | |
| | Total | | 18 C+2 E | | | | | |

| Semester 6 | Module Code and Name | | GPA | L | T | P | Evaluation (%) | |
|------------|------------------------|-----|---------|-----|-----|-----|----------------|------|
| | | | Credits | (h) | (h) | (h) | CA | Exam |
| IT4301 | Industrial Training II | 3 C | - | - | - | 100 | - | |

| Semester 7 | Module Code and Name | | GPA | L | T | P | Evaluation (%) | |
|------------|-------------------------------------|--------------------|----------|-----|-----|-----|----------------|------|
| | | | Credits | (h) | (h) | (h) | CA | Exam |
| | ID4301 | Project Management | 3 C | 34 | 10 | 12 | 30 | 70 |
| ID4202 | Engineer in Society | 2 C | 26 | 08 | | 30 | 70 | |
| EE4301 | Robotics | 3 C | 35 | 10 | 10 | 30 | 70 | |
| EE4302 | Power Systems II | 3 C | 34 | 10 | 12 | 30 | 70 | |
| EE4403 | Final Year Project (Part I) | 4 C | 10 | | | 100 | | |
| | Module from ID Electives (Basket A) | | 1 E | | | | | |
| | Module from CS Electives | | 3 E | | | | | |
| | Module from EE Electives | | 2 E | | | | | |
| | Total | | 15 C+6 E | | | | | |

| Semester 8 | Module Code and Name | | GPA | L | T | P | Evaluation (%) | |
|------------|-------------------------------------|--------------------------------------------|----------|-----|-----|-----|----------------|------|
| | | | Credits | (h) | (h) | (h) | CA | Exam |
| | ID4203 | Entrepreneurship and Intellectual Property | 2 C | 27 | 06 | - | 30 | 70 |
| ID4204 | Industrial Law | 2 C | 27 | 06 | - | 30 | 70 | |
| EE4304 | Communication Systems II | 3 C | 35 | 10 | 10 | 30 | 70 | |
| EE4305 | Mechatronic Applications | 3 C | 35 | 10 | 10 | 30 | 70 | |
| EE4406 | Final Year Project (Part II) | 4 C | 10 | | | 100 | | |
| | Module from ID Electives (Basket B) | | 2 E | | | | | |
| | Module from EE / ME Electives | | 2 E | | | | | |
| | Total | | 14 C+4 E | | | | | |

| ID Electives | Module Code and Name | | GPA | L | T | P | Evaluation (%) | |
|-----------------------------------|----------------------|------------------------------------|---------|-----|-----|-----|----------------|------|
| | | | Credits | (h) | (h) | (h) | CA | Exam |
| Basket A (Semesters 3/5/7) | | | | | | | | |
| | ID5101 | Introduction to English Literature | 1 E | 13 | 04 | - | 30 | 70 |
| | ID5102 | Poetry and Short Stories | 1 E | 13 | 04 | - | 30 | 70 |
| | ID5103 | English Novels | 1 E | 13 | 04 | - | 30 | 70 |
| Basket B (Semesters 4/6/8) | | | | | | | | |
| | ID5211 | Climate Change | 2 E | 24 | 06 | 06 | 30 | 70 |
| | ID5212 | Disaster Management | 2 E | 24 | 06 | 06 | 30 | 70 |
| | ID5213 | Psychology for Life | 2 E | 25 | 10 | - | 30 | 70 |
| | ID5214 | Ethnic Cohesion and Peace Building | 2 E | 23 | 08 | 06 | 40 | 60 |

| EE Electives | Module Code and Name | | GPA | L | T | P | Evaluation (%) | |
|----------------------|----------------------|-----------------------------------|---------|-----|-----|-----|----------------|------|
| | | | Credits | (h) | (h) | (h) | CA | Exam |
| Semesters 7/8 | | | | | | | | |
| | EE5201 | Energy Studies | 2 E | 30 | - | - | 30 | 70 |
| | EE5202 | High Voltage Engineering | 2 E | 27 | - | 06 | 30 | 70 |
| | EE5203 | Electrical Machines and Drives II | 2 E | 30 | - | - | 30 | 70 |
| | EE5204 | Electronic Instrumentation | 2 E | 30 | - | - | 30 | 70 |
| | EE5205 | Industrial Electronics | 2 E | 30 | - | - | 30 | 70 |
| | EE5206 | Digital System Design | 2 E | 30 | - | - | 30 | 70 |
| | EE5207 | Digital Communications | 2 E | 26 | 4 | 4 | 30 | 70 |
| | EE5208 | Digital Image Processing | 2 E | 15 | | 30 | 50 | 50 |

| CS Electives | Module Code and Name | | GPA | L | T | P | Evaluation (%) | |
|--------------|----------------------|----------------------------|---------|-----|-----|-----|----------------|------|
| | | | Credits | (h) | (h) | (h) | CA | Exam |
| | CS5301 | Operating Systems | 3 E | 30 | 04 | 26 | 50 | 50 |
| | CS5302 | Machine Learning | 3 E | 30 | - | 30 | 50 | 50 |
| | CS5303 | Data Science for Engineers | 3 E | 30 | - | 30 | 50 | 50 |

| ME Electives | Module Code and Name | | GPA | L | T | P | Evaluation (%) | |
|--------------|----------------------|-------------------------------|---------|-----|-----|-----|----------------|------|
| | | | Credits | (h) | (h) | (h) | CA | Exam |
| | ME4304 | Building Services Engineering | 3 E | 38 | 04 | 10 | 30 | 70 |

| Module Code and Name | | ID1301 Mathematics - I | | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-----------------|----|---|
| Credits | 3 | Lectures | L (hrs) | 38 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 14 | |
| Semester | 1 | Lab / Field / Design work | P (hrs) | - | |
| Prerequisite | None | Core (C)/Elective (E) | | C | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO-1: Demonstrate the Mathematics rules and apply the structured mathematical approaches to problem solving. | | | | | |
| ILO-2: Find the simplified Boolean expression by Karnaugh maps. | | | | | |
| ILO-3: Solve problems using appropriate mathematical knowledge and methods. | | | | | |
| ILO-4: Find Eigen values and Eigen vectors by the theories of matrices. | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Mathematics Logic: Propositions, Basic logical operations, Truth Tables, Logical equivalence, Conditional Connectives, Quantifiers, Techniques of Proof. | | 1 | 3 | 1 | - |
| 2. Boolean Algebra: Disjunctive and Conjunctive Normal Forms, Logic Gates, | | 1 | 3 | 1 | - |
| 3. Karnaugh Maps, Minimization, and Applications | | 2 | 3 | 3 | - |
| 4. Set Theory: Sets and elements, Set operations, Cartesian Products, Ordered Pairs, Relations and Functions | | 1 | 3 | - | - |
| 5. Vectors: Vectors, Vector Product, Scalar Product, Vector Triple Product, Scalar Triple Product, Gradient, Divergence, Curl | | 3 | 10 | 3 | - |
| 6. Definition of Vector Space: Real vector spaces, Subspaces, Linear Independence, Basis and Dimensions | | 1 | 2 | - | - |
| 7. Linear Algebra: Matrices, Matrix addition and multiplication, Types of matrices (symmetric, triangular, orthogonal, etc.), Transpose, Adjoint. | | 1 | 4 | 2 | - |
| 8. Inverse of a matrix, Echelon Forms, Rank, Determinants. | | 3 | 5 | 2 | - |
| 9. Determining Eigenvalues and Eigenvectors, Some Applications of Eigenvalue Problems. | | 4 | 5 | 2 | - |
| Total | | | 38 | 14 | - |
| Continuous Assessment | Quiz 1 | (ILO-1) | | | |
| | Quiz 2 | (ILO-2) | | | |
| | Quiz 3 | (ILOs 3, 4) | | | |
| | Tutorials | (ILOs 1, 2, 3, 4) | | | |
| Method of Assessment | Continuous Assessment: | | 30 % | | |
| | Quizzes | 25 % | | | |
| | Tutorials | 05 % | | | |
| | End of Semester Examination: | | 70 % | | |
| Recommended Texts | 1. Seymour Lipschutz and Marc Lipson, Discrete Mathematics (Schaum's Outline Series), McGraw-Hill, 3 rd Edition 2007 ISBN: 978-0071470384 2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons Inc., 10 th Edition 2011 ISBN 978-0-470-45836-5 | | | | |

| Module Code and Name | | ID1202 English | | |
|---------------------------------------------------------------------------------------------------------------|------------|---------------------------|---------|----|
| Credits | 2 | Lectures | L (hrs) | - |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 60 |
| Semester | 1 | Lab / Field / Design work | P (hrs) | - |
| Prerequisite | None | Core (C)/Elective (E) | | C |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | |
| ILO-1: Speak effectively and confidently in English in real life situations. | | | | |
| ILO-2: Use basic sentence construction knowledge and write academic texts. | | | | |
| ILO-3: Read and comprehend variety of texts with inferring, skimming and scanning. | | | | |
| ILO-4: Write effectively in different genres and demonstrate listening and note taking skills. | | | | |
| ILO-5: Apply stock of vocabulary needed for the academic studies. | | | | |
| Course Content | ILO | Allocated Hours | | |
| | | L | T | P |
| 1. Introduction | 1 | - | 2 | - |
| 2. Focus on grammar: Use of Present Simple and Present continuous in writing. | 2 | - | 2 | - |
| 3. Reading comprehension | 2, 3, 4 | - | 2 | - |
| 4. Reading skills-skimming & scanning | 1, 2, 3, 4 | - | 2 | - |
| 5. Reading comprehension | 2,3,4 | - | 2 | - |
| 6. Grammar review: Active voice and passive voice. | 2 | - | 2 | - |
| 7. Introducing word formation: prefix and suffix | 3, 5 | - | 2 | - |
| 8. Reading comprehension - Focus on creative writing | 2, 3, 4 | - | 2 | - |
| 9. Grammar review: Use of preposition | 2, 4 | - | 2 | - |
| 10. Reading & role play | 1, 3, 4 | - | 2 | - |
| 11. Subject + Verb Agreement "if" conditional; cause and effect in writing | 2 | - | 2 | - |
| 12. Conditionals in writing | 2, 4 | - | 2 | - |
| 13. Using collocations, compounding and use of preposition to create words | 2, 5 | - | 2 | - |
| 14. Learning about process writing | 2, 4, 5 | - | 2 | - |
| 15. Preparing a short report writing | 2, 4, 5 | - | 2 | - |
| 16. Describing and interpreting different charts and graphs | 1, 2, 4, 5 | - | 2 | - |
| 17. UTEL orientation | 1, 3, 4 | - | 2 | - |
| 18. UTEL mock test, preparation activities | 1, 3, 4 | - | 2 | - |
| 19. Describing shapes and features. Learn connected vocabulary | 4, 5 | - | 2 | - |
| 20. Reading comprehension and listening skills | 3, 4 | - | 2 | - |
| 21. Reading comprehension and use of simple past tense and simple past passive voice | 2, 3, 4 | - | 2 | - |

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| 22. Grammar review: Relative clauses. | | 2 | - | 2 | - |
| 23. Pre and post listening activities to improve the note taking while listening with prepared task. | | 4 | - | 2 | - |
| 24. Reading comprehension, group discussion and writing | | 1, 2, 3, 4 | - | 2 | - |
| 25. Describing figures: Interpreting different graphs and charts. | | 1, 4 | - | 2 | - |
| 26. Grammar review: <i>Simple present, present perfect and past perfect tenses.</i> | | 2 | - | 2 | - |
| 27. Reading comprehension and discussions | | 1, 3, 4 | - | 2 | - |
| 28. Reading comprehension, understanding sentence structure and use of verbs | | 2, 3, 4 | - | 2 | - |
| 29. Revision | | | - | 4 | - |
| | | Total | - | 60 | - |
| Continuous Assessment | 1. Oral Test (ILO-1) 2. Written Assignment (ILOs 2, 4) 3. Quiz (ILOs 2, 3, 4, 5) | | | | |
| Method of Assessment | Continuous Assessment: 50 % Oral Test 10% Written Assignment 20% Quiz 20% End of Semester Examination: 50 % | | | | |
| Recommended Texts | 1. Cambridge English for engineers, Ibbotson. M. (2008) Cambridge University Press. 2. Academic writing Course, Jordan. R. R. (1999) 3. Just grammar-Pre-Intermediate and intermediate levels. British English Version. Hamer. J. et al. (2008) Marshall Cavendish Publication. 4. Focus on Grammar-Book 2&3, Schoenberg. I. E (2012) Person publication | | | | |

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|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------------------------------------|------------------------|-----------|----------|
| Module Code and Name | | CS1301 Introduction to Computing | | | |
| Credits | 3 | Lectures | L (hrs) | 30 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 04 | |
| Semester | 1 | Lab / Field / Design work | P (hrs) | 26 | |
| Prerequisite | None | Core (C)/Elective (E) | | | C |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO 1: Explain the theoretical foundations of computing | | | | | |
| ILO 2: Apply the basic computer programming concepts | | | | | |
| ILO 3: Experiment the basics of networking and the Internet | | | | | |
| ILO 4: Design and develop simple web pages | | | | | |
| ILO 5: Use analytical and simulation software to process and present engineering information | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Overview of computer systems | | | | | |
| 1.1. Coverage of binary, octal, and hexa-decimal representations of data | | 1 | 2 | 2 | - |
| 1.2. Overview of computer architecture and organization. Hardware, operating systems, and application software. Coverage of standard hardware components (motherboard, input/output and other ports, central processing unit, memory, power supply and other essential network and interface systems) and how they interact with one another | | 1 | 1 | - | - |
| 1.3. Study of storage devices and how they work including standard measures (bit, byte, kilobyte, megabyte, gigabyte) and formats | | 1 | 1 | - | - |
| 1.4. Practical study of purchasing a modern personal computer | | 1 | - | - | 2 |
| 2. Introduction to computer programming fundamentals using Python | | | | | |
| 2.1. Variables | | 2 | 2 | - | 2 |
| 2.2. Input/ output | | 2 | 2 | - | 2 |
| 2.3. Selection (IF/ELSE, SWITCH) | | 2 | 2 | - | 2 |
| 2.4. Iteration (FOR, WHILE) | | 2 | 2 | - | 2 |
| 2.5. Algorithm development with sorting example | | 2 | 2 | - | 4 |
| 3. Fundamentals of computer networks and the Internet | | | | | |
| 3.1. Network types and standard protocols | | 3 | 2 | - | - |
| 3.2. IP addressing, subnetting | | 3 | 2 | 2 | - |
| 4. Overview of web contents development | | | | | |
| 4.1. Website development with HTML | | 4 | 4 | - | 2 |
| 4.2. Basics of CSS and XML | | 4 | 2 | - | 2 |
| 5. Introduction to analytical and simulation software | | | | | |

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| 5.1. Introduction to the basic theory in numerical computation | | 5 | 2 | - | 2 |
| 5.2. Fundamental concepts in programming | | 5 | 2 | - | 4 |
| 5.3. Data Presentation | | 5 | 2 | - | 2 |
| Total | | | 30 | 4 | 26 |
| Continuous Assessment | Computer Laboratory Sessions | | | | |
| | <ol style="list-style-type: none"> 1. Computer Hardware and OS (ILO 1) 2. Programming in Python, Variables, and Conditions (ILO 2) 3. Functions (ILO 2) 4. Iterations (ILO 2) 5. Strings (ILO 2) 6. Lists (ILO 2) 7. HTML labs (ILO 4) 8. MatLab labs (ILO 5) | | | | |
| | Quizzes (ILOs 1, 2, 3 & 4) | | | | |
| Method of Assessment | <ul style="list-style-type: none"> • Continuous Assessment: 50% • Laboratory Sessions: 40% • Quizzes: 10% • End of Semester Examination (2 hours): 50% | | | | |
| Recommended Texts | <ol style="list-style-type: none"> 1. Introduction to Computers (7th Edition) by Peter Norton, Tata McGraw-Hill Edition, ISBN 0-07 059374-4 2. Python Crash Course, Erick Myers, Amazon Digital Services LLC, ISBN: 1077579640 3. MatLab help 4. Geek for geeks website (www.geeksforgeek.org) | | | | |

| Module Code and Name | | EE1301 Principles of Electrical Engineering | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------|-----------------|----|----|
| Credits | 3 | Lectures | L (hrs) | 35 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 10 | |
| Semester | 1 | Lab / Field / Design work | P (hrs) | 10 | |
| Prerequisite | None | Core (C)/Elective (E) | | C | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO-1: Solve DC circuits using circuit theorems and techniques including Thevenin's theorem, superposition, and source transformation. | | | | | |
| ILO-2: Describe the transient behavior of non-linear circuit elements. | | | | | |
| ILO-3: Explain and use vector and complex representation of AC quantities. | | | | | |
| ILO-4: Solve AC circuits in their steady state. | | | | | |
| ILO-5: Draw the complete wiring circuit of a household and explain the importance of components. | | | | | |
| ILO-6: Describe the steps involved in electrical power generation, transmission, distribution and utilization. | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. DC Circuit Analysis Revision on circuit laws, solution of circuits with parallel and series combinations of elements, Solution of bridge circuits, solution of simple circuits with non-linear elements, transient solutions | | 1, 2 | 15 | 4 | 4 |
| 2. AC Theory Phasor and complex representation, Concept of impedance and AC circuit calculations, Concepts of apparent, active (real) and reactive (imaginary) power and power factor, RLC circuits. | | 3, 4 | 14 | 4 | 2 |
| 3. Electrical Installations Fuses, MCBs, ELCBs, complete household wiring circuit, continuity and insulation resistance. | | 5 | 3 | 0 | 2 |
| 4. Electrical Power Systems Generation, Transmission and Distribution aspects of the Power System. Energy and Power with reference to the power system. Basics of conventional and renewable generation options, Efficiency of Generation, Transmission, Distribution and Utilization. | | 6 | 3 | 2 | 2 |
| | | Total | 35 | 10 | 10 |
| Continuous Assessment | Laboratory Practical Sessions | | | | |
| | 1. Basic measurements | | (ILO-1) | | |
| | 2. Capacitor characteristics, AC circuits | | (ILOs 2, 3, 4) | | |
| | 3. Network theorems | | (ILO-1) | | |
| 4. Electrical wiring, Solar power | | (ILOs 5, 6) | | | |
| Assignments and visit to electrical installations | | (ILOs 1, 2, 3, 4, 5, 6) | | | |
| Quizzes | | (ILOs 1, 4, 6) | | | |
| Method of Assessment | Continuous Assessment: | | 30% | | |
| | Laboratory Sessions: | | 15% | | |
| | Assignments & Quizzes: | | 15% | | |
| | End of Semester Examination: | | 70% | | |

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| Recommended Texts | <ol style="list-style-type: none">1. Textbook of Electrical Technology, B. L. Theraja, A. K. Theraja, S. Chand Ltd publishers, New Delhi, ISBN: 1-219-0289-4.2. A Course in Electrical Technology, J. B. Guptha, S. K. Kataria & Sons publishers, Delhi, ISBN: 81-85749-31-0.3. Hayt, Kemerly and Durbin, Engineering Circuit Analysis, 8th Edition Mc GRAW-HILL, 2012.4. Electrical Engineering, R. K. Rajput, Firewell Media publishers, 2007, ISBN: 8131800717.5. Hughes Electrical & Electronic Technology, Edward Hughes, John Hiley, Keith Brown Ian McKenzie Smith, Prentice Hal Publishers, 2008, ISBN: 978-81-317-3366-0. |
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| Module Code and Name | | ME1301 Applied Mechanics | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------------------|---------|----|
| Credits | 3 | Lectures | L (hrs) | 33 |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 13 |
| Semester | 1 | Lab / Field / Design work | P (hrs) | 11 |
| Prerequisite | None | Core (C)/Elective (E) | | C |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | |
| ILO-1: Represent the scalar and vector quantities with their units and perform operations leading to numerical calculations in engineering mechanics. | | | | |
| ILO-2: Isolate appropriate free body diagrams and solve for unknown external and internal forces using equilibrium equations. | | | | |
| ILO-3: Solve for the properties of areas, volumes and masses and to represent associated internal forces with magnitude, direction and location. | | | | |
| ILO-4: Use of work and energy principles to solve static and dynamic problems. | | | | |
| ILO-5: Use of kinematic expressions of particles and rigid bodies to represent motion of particles and rigid bodies. | | | | |
| ILO-6: Solve 2-D dynamic problems by considering inertial forces and or impulse and momentum. | | | | |
| Course Content | ILO | Allocated Hours | | |
| | | L | T | P |
| 1. Introduction: Units of Measurement, International System of Units and Numerical Calculations, Scalars and Vectors, Vector Operation, Vector Addition of Forces, Coplanar Forces, Cartesian Vectors, Force Vector Directed along Lines, Dot Product and Cross Product | 1 | 2 | 1 | - |
| 2. Review of Statics: Condition for Equilibrium, Free-Body Diagrams, Coplanar Force systems, Moment of a Force, Moment of a Couple, Simplification of a Couple Systems, Two and Three Force Members, Equations of Equilibrium, Constraints and Statical Determinacy | 2 | 4 | 1 | - |
| 3. Internal Forces: Simple Trusses, The method of Joints, Zero-Force/Members, The Method of Sections, Frames and Machines, Internal Loadings Developed in Structural Members, Shear and Moment Equation and Diagrams, Relations between Distributed Load, Shear and Moment, Characteristics of Friction Forces, Impending Motion, Friction in Multiple Sliding Surfaces, Belt Friction, Friction in Braking, Friction in Plane Machines | 2 | 8 | 3 | 5 |
| 4. Center of Gravity and Centroid: Center of Gravity, Center of Mass, Centroid of a Body, Composite Bodies, Resultant of a General Distributed Loading, Definition of Moment of Inertia for Areas, Parallel-Axis Theorem for an Area, Radius of Gyration of an Area, Moments of Inertia for Composite Areas, Product of Inertia for an Area, Mass Moment of Inertia | 3 | 4 | 2 | - |
| 5. Virtual Work: Definition of Work, Principle of Virtual Work, Principle of Virtual Work for a System of Connected Rigid Bodies, Conservative Forces, Potential Energy, Potential Energy Criterion for Equilibrium, Stability of Equilibrium Configuration | 4 | 4 | 1 | - |

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| 6. Kinematics: Rectilinear Motion, Curvilinear Motion, Components in Rectangular and Polar Coordinate Systems, relative motion of two particles | 5 | 2 | 1 | 3 |
| 7. Kinematics and Rigid bodies: Rectilinear and Curvilinear Translation of a Rigid Body, Rotation of a Rigid Body with Constant Acceleration, Relationship Between Rotational and Translational Motions, Rotational and Translation Motions of Connected Bodies | 5 | 3 | 1 | 3 |
| 8. Work Energy methods: Energy of a Mass Particle due to Position of Motion, Work Energy Method for a Particle, Work Energy Method for a Rigid Body In-Plane Motion, Work Energy Method for Connected Bodies, Work Energy Method to Find Normal Acceleration of a Particle | 4 | 2 | 1 | - |
| 9. Impulse and Momentum: Principal of impulse and momentum, impulse motion, conservation and momentum | 6 | 2 | 1 | - |
| 10. Vibration: Un-Damped Free Vibrations, Un-Damped Force Vibrations, Resonance, Free Vibration under Viscous Damping, Forced Vibration under Viscous Damping | 6 | 2 | 1 | - |
| Total | | 33 | 13 | 11 |
| Continuous Assessment | Laboratory Sessions 1. Truss Analysis (ILO-2) 2. Friction Analysis (ILO-2) 3. Determination of the polar moment (ILO-3) 4. Gyroscopic effect and determine the gyroscopic couple (ILO-5) Two Assignments Two Quizzes | | | |
| Method of Assessment | Continuous Assessment: 30 % Laboratory Sessions: 20 % Quizzes / Assignments: 10% End of Semester Examination (3 hours): 70 % | | | |
| Recommended Texts | 1. R.C. Hibbeler. Engineering Mechanics: Statics and Dynamics, Prentice Hall, 13th Edition 2012 ISBN-13: 978-0132915489 2. Schaum. S Outline of Engineering Mechanics Statics, Nelson, Charles Best, William McLean and Merle Potter Publisher: McGraw Hill, 6th Edition 2010 ISBN-13: 978-0071632379 3. Schaum. S Outline of Engineering Mechanics Dynamics Nelson, Charles Best, William McLean and Merle Potter Publisher: McGraw Hill, 1st Edition 2010, ISBN-13: 978-0071713603 | | | |

| Module Code and Name | | ME1302 Engineering Drawing | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------------------------|---------|----|
| Credits | 3 | Lectures | L (hrs) | 23 |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | - |
| Semester | 1 | Lab / Field / Design work | P (hrs) | 44 |
| Prerequisite | None | Core (C)/Elective (E) | | C |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | |
| ILO-1: Prepare engineering drawings to express or communicate design ideas and concepts. | | | | |
| ILO-2: Produce orthographic projections of 3 – Dimensional objects. | | | | |
| ILO-3: Produce assembly drawings of complex engineering assemblies. | | | | |
| ILO-4: Interpret Civil and Electrical Engineering drawings for building services and other requirements. | | | | |
| ILO-5: Generate standard drawings to process, interpret and present engineering concepts and ideas using Computer Aided Drafting Software. | | | | |
| ILO-6: Produce Computer Aided Engineering Drawings of acceptable professional standard. | | | | |
| Course Content | ILO | Allocated Hours | | |
| | | L | T | P |
| 1. Introduction to Drawings: Introduction to Drawing Equipment, Lettering and Types of lines, Layout of Drawings, Scales and Spacing | 1 | 1 | - | 3 |
| 2. Simple Geometrical Constructions: Bisectors, Perpendiculars and other useful Constructions and Tangencies, Conics, Ellipses, Parabolas and Hyperbolas | 1 | 2 | - | 3 |
| 3. Orthographic Projection: Introduction to Projections and Free-Hand Sketches, First and Third angle Projections, Orthographic Projections from Pictorial Views, Sectioning and Sectional Elevations | 2 | 2 | - | 9 |
| 4. Isometric Projections: Isometric Axes and Isometric Scale, Isometric Projections using Isometric Scale | 1 | 1 | - | - |
| 5. Other Geometrical Constructions: Interpenetration Curves – Intersections of Cylinders, Prisms, Cones and Spheres, Developments – from Elevations of Conical and Prismatic Objects. | 1 | 2 | - | 3 |
| 6. Assembly Drawings: Assembly Drawing with parts Assembled, Exploded views of an Assembly – Nut and Bolt, Valve Assembly etc., Assembly Drawings with Scattered Views, Fastenings and Conventions in Mechanical Engineering Drawings | 3 | 2 | - | 6 |
| 7. Civil and Electrical Engineering Conventions: Civil Engineering Drawing Practice, Symbols and Conventions in Civil Engineering Drawings, Electrical Engineering Drawing Practice, Symbols and Conventions in Electrical Engineering Drawing | 4 | 2 | - | 6 |
| 8. Introduction to CAD and Working with the Windows Environment: Starting CAD and Understanding the Display, Interacting with CAD, CAD File Operations, Setting up a Drawing, Using CAD Drafting Tools | 5 | 2 | - | 2 |

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| 9. Viewing and Plotting a Drawing: Understanding the Display and Virtual Screen, Using ZOOM and PAN To Control the Display, Using the Aerial View Window and Creating Views | 5 | 1 | - | - |
| 10. Basic CAD Drawing Techniques: Setting the Display Format and Units, Working with Prototype Drawings, Coordinate System Basics, Working with Layers, Understanding and Creating Line types | 5 | 1 | - | 3 |
| 11. Creating Basic Geometry: Drawing Rectangles, Drawing Circles, Drawing Arcs, Adding Text to a Drawing, Filling Areas with Hatching | 5 | 2 | - | 3 |
| 12. Basic Editing Skills: Deleting and Restoring Objects, Moving, Copying, and Offsetting Objects, Rotating, Mirroring, Scaling, and Stretching Objects, Editing Edges and Corners of Objects, Producing Arrays of Objects (ARRAY) | 5,6 | 2 | - | 3 |
| 13. Dimensioning a Drawing: Dimensioning Basics and Dimensioning with Precision, Linear and Radial Dimensioning, Angular Dimensioning, Editing Dimensions, Managing Dimension Styles | 5,6 | 1 | - | - |
| 14. Using Symbols and Attributes: Changing Object Properties, Extracting Information from your Drawing, Defining Groups, Creating Blocks Adding Information to a Block with Attributes, CAD Design Centre | 6 | 2 | - | 3 |
| Total | | 23 | - | 44 |
| Continuous Assessment | <p>Drawing Sessions – Manual drafting:</p> <ol style="list-style-type: none"> 1. Use of drawing equipment and lettering 2. Geometrical constructions – Ellipses, Parabolas & Hyperbolas and their methods of construction, Bisectors, Perpendiculars, Tangencies, Conic Sections etc. 3. Orthographic projections of simple objects / models in First/Third Angle. 4. Orthographic projections from two given projected views. 5. Orthographic projections of an object such as a 'Bracket' with Sectional Views. 6. Isometric projections of a given object, Interpenetration Curves generated by the intersection of Cylinders, Cones, Prisms and Spheres and Developments of objects such as a Bucket or Gutter Joint. 7. Assembly Drawing of a Fly Wheel and Bearing. 8. Exploded Orthographic Projections of an Assembly. 9. Civil Engineering Drawing 10. Electrical Engineering Circuits and Wiring Diagrams <p>Computer Laboratory Sessions – Computer aided drafting.</p> <ol style="list-style-type: none"> 1. Practice basic file operations with viewing & setting up of drawing tool 2. Exercise on setting up of coordinates, using layers and drawing lines. 3. Drawing basic geometrical entities, adding text and hatching enclosed areas and editing a set of drawings with moving, copying, rotating and scaling. 4. Drawing orthographic projections with dimensions of a simple object. 5. Drawing orthographic projections with dimensions of a simple assembly. | | | |
| Method of Assessment | Continuous Assessment: | | 50 % | |
| | End of Semester Examination: | | 50 % | |

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| Recommended Texts | <ol style="list-style-type: none">1. The Art of Mechanical Drawings, A Practical Course for Drafting and Design, William F. Willard, Popular Mechanics, Publisher: Hearst Communications; Revised edition, 2009. ISBN-10: 1588167593, 13: 978-15881675902. Drawing for Engineering, Paul Smith, Publisher: Juta & Co. Ltd., 1999. ISBN: 0702144061, 97807021440663. Sri Lanka Standard 409: 2004 ; Engineering Drawing Practice, Sri Lanka Standards Institution4. User Manual on Cad Software and/or online help menu |
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| Module Code and Name | | ID1303 Mathematics-II | | | |
|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-----------------|----|---|
| Credits | 3 | Lectures | L (hrs) | 38 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 14 | |
| Semester | 2 | Lab / Field / Design work | P (hrs) | - | |
| Prerequisite | ID1301 Mathematics I | Core (C)/Elective (E) | | C | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO-1: Apply the knowledge of differential equations to solve engineering problems. | | | | | |
| ILO-2: Demonstrate sound understanding of linear, surface and volume integrals. | | | | | |
| ILO-3: Solve systems of linear equations by matrix algebra and determinants. | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Ordinary Differential Equations: First Order Ordinary Differential Equations: Separation of variables | | 1 | 4 | 1 | - |
| 2. Homogeneous and Exact Differential Equations | | 1 | 5 | 2 | - |
| 3. Second Order Differential Equations: Reducible Forms | | 1 | 6 | 2 | - |
| 4. Vector Calculus: The vector differentiation, Gradient and Divergence | | 2 | 3 | 1 | - |
| 5. Ordinary integrals of vectors, Line integrals, Surface integrals, Volume integrals | | 2 | 6 | 2 | - |
| 6. The Green's theorem, Gauss theorem and Stoke's theorem in the plane. | | 2 | 6 | 3 | - |
| 7. Systems of Linear Equations: Gaussian Elimination, Gauss-Jordan Method | | 3 | 4 | 2 | - |
| 8. Iterative Methods: Gauss-Seidel Method | | 3 | 4 | 1 | - |
| | | Total | 38 | 14 | - |
| Continuous Assessment | Quiz 1 (ILO-1) Quiz 2 (ILO-2) Quiz 3 (ILO-3) Tutorials (ILOs 1, 2, 3) | | | | |
| Method of Assessment | Continuous Assessment: 30 % Quizzes 25 % Tutorials 05 % End of Semester Examination: 70 % | | | | |
| Recommended Texts | 1. Erwin Kreyszc, Advanced Engineering Mathematics, John Wiley & Sons Inc., 10 th Edition 2011 ISBN 978-0-470-45836-5 2. S.S. Sastry, Engineering Mathematics, Prentice Hall of India Private Ltd., Edition 2010 ISBN: 978-8120341005User | | | | |

| Module Code and Name | | ID1204 Communication Skills for Engineers | | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------------|-----------------|----|----|
| Credits | 2 | Lectures | L (hrs) | 20 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 10 | |
| Semester | 2 | Lab / Field / Design work | P (hrs) | 10 | |
| Prerequisite | None | Core (C)/Elective (E) | | C | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO-1: Communicate most effectively and efficiently both verbally and in writing. | | | | | |
| ILO-2: Write business letters, memos, project and field reports that are grammatically correct and in appropriate business style. | | | | | |
| ILO-3: Deliver effective presentations to the wider Engineering and non-Engineering stakeholders. | | | | | |
| ILO-4: Use effective interpersonal communication skills to become brand ambassadors of their representations. | | | | | |
| ILO-5: Demonstrate confidence in communicating their ideas to larger wide non-technical audience. | | | | | |
| ILO-6: Write a good job application to attract the employers and gather information to present it to their peers/hierarchies to advocate for actions. | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Planning for business writing | | 1 | 1 | 1 | - |
| 2. Language needed for business writing | | 1 | 1 | - | - |
| 3. Memos/Notice/ invitations -response | | 2 | 1 | - | - |
| 4. Layout of business letters | | 2 | 1 | - | - |
| 5. Writing E-Mails, Informal letters and notes | | 2 | 1 | 1 | - |
| 6. Writing cover letter, job application, and CV | | 6 | 3 | 2 | - |
| 7. Writing effectively | | 6 | 1 | 1 | - |
| 8. Writing technical reports | | 2 | 3 | 1 | 3 |
| 9. Publishing and marketing your reports | | 5 | 1 | - | - |
| 10. Learning the Three Ps of Oral Presentations | | 3 | 1 | - | - |
| 11. Powerful Presentation Skills | | 3 | 3 | 1 | - |
| 12. Presenting for Success | | 4 | 1 | 1 | - |
| 13. Successful presenter | | 4 | 1 | 1 | - |
| 14. Pitching an idea for general audience | | 5 | 1 | 1 | 2 |
| 15. Field visits | | 4,5 | - | - | 5 |
| | | Total | 20 | 10 | 10 |
| Continuous Assessment | 1. Business writing (ILO-1) | | | | |
| | 2. Job application (ILO-6) | | | | |
| | 3. Field visit report (ILO-2) | | | | |
| | 4. Field visit presentation (ILO-3) | | | | |
| Method of Assessment | Continuous Assessment: | | 50 % | | |
| | Business writing: | | 10% | | |
| | Job application: | | 10% | | |
| | Field visit report + presentations: | | 30 % | | |
| End of Semester Examination: | | 50 % | | | |

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| Recommended Texts | <ol style="list-style-type: none">1. Smith R.J., Butler B.R., LeBold W.K. (1983) Engineering as a career. McGraw-Hill, Inc.2. Garner B.A. HBR guide to better business writing (2012), Harvard Business Review Press, Boston, Massachusetts.3. Less John, Just the job – smart and fast strategies to get the perfect job, (2013), Pearson4. Kuo Chengi, Business fundamentals for Engineers (1992), McGraw Hill. England5. Davies W. John, Communication for Engineering students (1996), Longman group ltd. England. |
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| Module Code and Name | | CE1301 Mechanics of Materials | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-------------------------------|---------|----|
| Credits | 3 | Lectures | L (hrs) | 32 |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 16 |
| Semester | 2 | Lab / Field / Design work | P (hrs) | 10 |
| Prerequisite | ME1301 Applied Mechanics | Core (C)/Elective (E) | | C |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | |
| ILO-1: Identify the equilibrium and compatibility conditions within a deformable body by relating to stress and strain at points inside the body. | | | | |
| ILO-2: Solve for stresses, stress resultants, strains and deformations using equilibrium and compatibility conditions together with the definitions of axial, bending and twisting actions. | | | | |
| ILO-3: Recognize the state of stress and strain at a point and solve for stress and strain components in different directions for 2-D problems. | | | | |
| ILO-4: Identify the basic instability of compression members and solve for associated critical loads. | | | | |
| Course Content | ILO | Allocated Hours | | |
| | | L | T | P |
| 1. Stress and Strain: Equilibrium of a Deformable Body, Stress, Average Normal Stress in an Axially Loaded Bar, Average Shear Stress, Allowable Stress Design, Deformation and Strain | 1 | 3 | 2 | - |
| 2. Mechanical Properties of Materials: Tension and Compression Test, Stress-Strain Diagrams, Hooke's Law, Strain Energy, Poisson's Ratio, Shear Stress-Strain Diagram, Fatigue and Creep | 1 | 3 | 2 | - |
| 3. Axial load: Saint-Venant's Principle, Elastic deformation, Principle of Superposition, Statically Indeterminate Axially Loaded Member, Force Method Analysis for Axially Loaded Members, Thermal Stress | 2 | 3 | 2 | - |
| 4. Torsion: Torsional Deformation of Circular Shaft, Torsion Formula, Power Transmission, Angle of Twist, Statically Indeterminate Torque Loaded Members, | 2 | 3 | 2 | 2 |
| 5. Bending and Shear: Shear and Moment Diagrams, Graphical Method of Constructing Shear and Moment Diagrams, Bending Deformation of Straight Member, Flexure Formula, Unsymmetrical Bending, Composite beams, Shear Formula, Shear Flow in Built Up Members | 2 | 6 | 2 | 4 |
| 6. Stress and Strain Transformation: Plane Stress and Plain Strain, Principal Stresses and Maximum Shear Stress, Mohr's Circle Plane Stress Mohr's Circle-Plane Strain, Strain Rosettes, Theories of Failure | 3 | 6 | 2 | 2 |
| 7. Buckling of columns: Critical Load, Ideal Column with Pin Supports, Various Supports, Secant Formula, Core of a Section | 4 | 4 | 2 | 2 |
| 8. Deflection of Beams: Elastic Line (Deflection Curve, Determination of Slope by Integration, Deflection by Macaulay's Method of Integration, Moment Area Method, Method of Superposition | 2 | 4 | 2 | - |
| Total | | 32 | 16 | 10 |

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| Continuous Assessment | <p>Laboratory Sessions</p> <p>1: Determination of Bending Moment (ILO-2)</p> <p>2: Influence of Bending and Shear force (ILO-2)</p> <p>3: Torsional behaviour (ILO-2)</p> <p>4: Biaxial behaviour (ILO-3)</p> <p>5: Buckling behaviour of columns (ILO-4)</p> <p>Two Quizzes (ILO-1/2/3/4)</p> |
| Method of Assessment | <p>Continuous Assessment: 30 %</p> <p>End of Semester Examination: 70 %</p> |
| Recommended Texts | <ol style="list-style-type: none"> 1. James M.G. Mechanics of materials, 5th Edition, Thomson Brooks, 2001, 2. Hibbeler, R. C. Mechanics of materials, 6th Edition, Pearson Education Limited,, 2013, 3. Beer, F. P, Johnston E. R. Jr, Dewolf, J.T. and Mazurek, D.F. Mechanics of Materials: 5th Edition, McGraw-Hill International Editions, 2008 |

| Module Code and Name | | EE1302 Principles of Electronic Engineering | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|---------|----|
| Credits | 3 | Lectures | L (hrs) | 35 |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 10 |
| Semester | 2 | Lab / Field / Design work | P (hrs) | 10 |
| Prerequisite | None | Core (C)/Elective (E) | | C |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | |
| ILO-1: Explain the operation of diode circuits and their implementation. | | | | |
| ILO-2: Explain the operation of BJTs and implement transistor amplifier circuits and switching circuits using BJTs. | | | | |
| ILO-3: Analyze digital logic circuits. | | | | |
| ILO-4: Construct simple digital logic circuits. | | | | |
| Course Content | ILO | Allocated Hours | | |
| | | L | T | P |
| 1. Diode circuits a) The p-n junction and its behavior under unbiased and biased conditions. b) Rectifiers, their operation and use in power supplies. c) Zener diode and its use in dc voltage regulation. d) Voltage multipliers and signal shaping circuits. e) Light Emitting Diode (LED), Photo diode and their simple applications. | 1 | 10 | 3 | 4 |
| 2. Transistor amplifiers and switches with BJT a) Bipolar Junction Transistor (BJT) behavior; pnp and npn structures. b) CE, CB and CC transistor configurations and their uses. c) CE transistor and CE transistor amplifier. | 2 | 15 | 4 | 2 |
| 3. Digital circuits a) Logic gates and their outputs in Boolean Algebra form. b) Karnaugh Maps of 3 variables. c) Combinational Logic circuits | 3, 4 | 10 | 3 | 4 |
| Total | | 35 | 10 | 10 |
| Continuous Assessment | Laboratory Practical Sessions | | | |
| | 1. Diode characteristics (ILO-1) 2. Zener, LED (ILO-1) 3. BJT Characteristics (ILO-2) 4. Basic logic gates (ILOs 3, 4) 5. Logic gates, K'Maps (ILOs 3, 4) Assignments (ILOs 1, 2, 3, 4) Quizzes (ILOs 1, 2, 3, 4) | | | |
| Method of Assessment | Continuous Assessment: | | 30% | |
| | Laboratory Sessions: | | 15% | |
| Assignments & Quizzes: | | 15% | | |
| End of Semester Examination: | | 70% | | |
| Recommended Texts | 1. Electronic devices and Circuits; by Theodore F Bogart, Jeffrey S. Beasley, Guillermo Rico, Prentice Hall, 2004. 2. Electronic devices and circuit theory; Boylestand, Robert L; Nashelsky, Louis (10th Edition), 2013 3. Digital Systems Principles and Applications; by Ronald J Tocci Publisher: Prentice Hall Inc., India: 1995. ISBN: 81-203-0985-5 | | | |

| Module Code and Name | | ME1303 Engineering Materials and Processes | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|--------------------------------------------|-----------------|----|---|
| Credits | 3 | Lectures | L (hrs) | 26 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | - | |
| Semester | 2 | Lab / Field / Design work | P (hrs) | 38 | |
| Prerequisite | None | Core (C)/Elective (E) | | C | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO-1: Identify the structures of wide ranging engineering materials, including metals and alloys, polymers, ceramics and composites. | | | | | |
| ILO-2: Describe the characteristic properties, applications and limitations of engineering materials in practical use. | | | | | |
| ILO-3: Discuss the suitability of tools, equipment and machinery to perform various manufacturing process. | | | | | |
| ILO-4: Describe various material removal and material forming processes and their applications. | | | | | |
| ILO-5: Describe various metal casting processes and select suitable processes for their applications | | | | | |
| ILO-6: Choose suitable materials, fabrication processes in practice, and use principles of metrology for quality assurance. | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Materials | | | | | |
| 1.1. Basic Structures of Engineering Materials Nature of Atomic Bonding, Crystalline and non-Crystalline Structure, and Structural Defects in Crystalline Metals. | | 1 | 2 | - | - |
| 1.2. Mechanical Properties of Engineering Materials. Structure – Property relationship, and Testing of Materials 2 //- Tensile, Hardness. | | 2 | 2 | - | - |
| 1.3. Phase Equilibrium in Metal Alloy Systems. Introduction to Phase Diagrams, Iron - Carbon Phase Diagram, and Equilibrium Cooling of Plain Carbon Steels. | | 2 | 2 | - | - |
| 1.4. Polymeric materials. Introduction to Thermoplastics, Thermosets and Elastomers, Polymerization Processes and Strengthening Mechanisms, and Polymer Structures and Applications. | | 2 | 2 | - | - |
| 1.5. Ceramics. Ceramic Materials and Structures, Clay Products, Refractories and Glasses, and Mechanical Properties of Ceramics. | | 2 | 2 | - | - |
| 1.6. Composite Materials. Timber as a natural composite, Agglomerated and Reinforced Materials including Concrete, Fibre Reinforced Materials, and Glass Reinforced and Carbon Reinforced Plastics | | 2 | 2 | - | - |

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| 2. Processes | | | | | |
| 2.1. Cutting and hand tools. | Various cutting tools used in the industry. Selection of tools to perform various operations | 3 | 2 | - | 10 |
| 2.2. Forms of metallic materials. | Production processes of metallic materials, Forms available for further processing. | 4 | 2 | - | 5 |
| 2.3. Machining process. | Introduction to Lathe, Drill, Shaper, Milling and Abrasive machining. Machining operations such as turning, drilling, facing, thread cutting, boring, reaming, grinding and simple gear cutting etc. | 4 | 4 | - | 5 |
| 2.4. Metal forming. | Hot, and cold forming processes. Forming of sheet metals. Forging and its applications | 4 | 2 | - | 5 |
| 2.5. Metal casting. | Types of casting processes. Melting practice and defects in castings. | 5 | 2 | - | - |
| 2.6. Fabrication. | Mechanical fasteners. Welding practice; gas & arc welding | 6 | 2 | - | 5 |
| 2.7. Field Visit | A visit to an industrial site to review the types of materials used and the processes involved | 6 | | | 8 |
| | | Total | 26 | - | 38 |
| Continuous Assessment | Laboratory Work Sessions | | | | |
| | 1. Machining (ILOs 2, 3, 4) 2. Fitting (ILOs 2, 3, 4) 3. Fabrication (ILOs 2, 3, 4) 4. Sheet Metal Work (ILOs 2, 3, 4) 5. Electrical Services (ILOs 2, 3, 4) 6. Carpentry (ILOs 2, 3, 4) Field visit to an Industrial Site (ILO-6) | | | | |
| Method of Assessment | Continuous Assessment: 50 % | | | | |
| | Laboratory Works (42%) Field Visit (08%) End of Semester Examination: 50 % | | | | |
| Recommended Texts | 1. Elements of Materials Science, L.H. Van Vlack, Publisher: Addison-Wesley 1989, ISBN: 10: 0201093146 / 0-201-09314-6, 13: 9780201093148 2. Engineering Materials and their Applications, R.A. Flinn and P.K. Trojan, Publisher: Wiley 1995, ISBN: 0471125083, 9780471125082 3. The Principles of Engineering Materials, C.R. Barnett, W.D. Nix, A.S. Tetelman, Publisher: Prentice-Hall, Inc., 1973. ISBN: 10: 0137093942, 13: 978-0137093946 4. Materials Science and Engineering – An Introduction, Callister, Jr., William D., Publisher: John Wiley and Sons., 2000. ISBN: 13: 9780470419977, 0470419970 | | | | |

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| | <p>5. Introduction to basic manufacturing processes and workshop technology, Rajender Singh, Publisher: New Age International (P) Ltd., New Delhi, 2006 ISBN: 81-224-1846-5</p> <p>6. Workshop Technology, Chapman W.A.J. Publisher: Viva Books 1998, ISBN: 8185617805, 9788185617800</p> |
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| Module Code and Name | | ME1304 Thermodynamics & Fluid Mechanics | | |
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| Credits | 3 | Lectures | L (hrs) | 33 |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 11 |
| Semester | 2 | Lab / Field / Design work | P (hrs) | 13 |
| Prerequisite | None | | | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to; | | | | |
| ILO 1: Describe the basic principles of thermodynamics to analyse simple thermodynamic systems including cycles | | | | |
| ILO 2: Analyse properties of pure substances and their principles through phase diagrams and phase rules and the application of First Law of Thermodynamics | | | | |
| ILO 3: Describe limitations of First Law of Thermodynamics and the use of second law of thermodynamics and Power cycles | | | | |
| ILO 4: Analyse the hydrostatic forces on submerged surfaces and stability of floating bodies | | | | |
| ILO 5: Classify fluid flows and solve problems of steady inviscid one-dimensional fluid flow | | | | |
| ILO 6: Explain flow patterns and carry out velocity measurements | | | | |
| Course Content | ILO | Allocated Hours | | |
| | | L | T | P |
| 1. Introduction to Thermodynamics: Interrelation of Thermodynamics and Energy, Unit and Dimensions; Definition of Thermodynamic Terms - System, Property, State, Process, Cycle, Reversibility, basic properties; Forms of Energy, Internal Energy, Work and Heat; Conservation of Mass and Energy and First Law of Thermodynamics; Non-Flow processes, Irreversible processes; Flow Processes and Control Volume, Steady and Unsteady Flow Processes; Properties Internal Energy & Enthalpy; Heat transfer basic equations. | 1 | 6 | 2 | 3 |
| 2. Properties of Pure substances and Ideal Gases Properties of Pure Substances, Phase Diagrams, Phase rule and independent Properties; Development of Property Tables structures; Ideal Gas behaviour, Ideal Gas equation; Application of First Law to non-flow and flow processes. | 2 | 4 | 2 | 3 |
| 3. Second Law of Thermodynamics Limitation of First Law and introduction of the Second Law of Thermodynamics; Thermal Energy Reservoir, Reversible and Irreversible Processes; Heat Engine and Heat Pump; Different statements of the Second Law; Perpetual-Motion Machines, Thermodynamic Temperature Scales; Property Entropy; Carnot Cycle and Carnot Efficiency. | 3 | 4 | 1 | 2 |
| 4. Power Cycles and Refrigeration Cycle Gas Power Cycles - Carnot cycle, Otto cycle, Diesel cycle, Dual cycle, Thermal Efficiency and Power Output; Vapour Power Cycles - Carnot cycle. | 3 | 2 | 1 | - |
| 5. Fluid statics Properties of fluids, Hydrostatic pressure, Pascal's law, Pressure measurements, Forces on submerged planes and surfaces, Stability of floating bodies. | 4 | 7 | 2 | 2 |
| 6. Fluid flow concepts Continuum concept, Flow lines, Stream tube, Classification of flows, Steady inviscid one-dimensional fluid flow, Bernoulli equation and applications. | 5&6 | 6 | 2 | - |

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| 7. Introduction real fluid flows Laminar and turbulent flows, Flow visualization, energy losses, velocity and flow measuring devices, bio-fluid flows. | | 6 | 4 | 1 | 3 |
| | | Total | 33 | 11 | 13 |
| Continuous Assessment | Laboratory Practicals 1. Bomb Calorimeter (ILO 1) 2. Marcet Boiler (ILO 2) 3. Redwood Viscometer (ILO 3) 4. Hydrostatic thrust on submerged surface (ILO 4) 5. Stability of a pontoon (ILO 4) 6. Flow visualization and velocity measurements (ILO 5&6) Quizzes/ Assignments (ILOs 1, 2, 3, 4, 5 & 6) | | | | |
| Method of Assessment | Continuous Assessment: 30% 1. Laboratory Sessions 15% 2. Quizzes and Assignments 15% End of Semester Examination: 70% | | | | |
| Recommended Texts | 1. Fundamentals of Thermal-Fluid Sciences By Yunus Cengel and Robert Turner and John Cimbala, Publisher: McGraw-Hill, 5th Edition 2017, ISBN10: 0078027683 2. Fundamentals of Engineering Thermodynamics by E. Rathakrishnan, Publisher: Prentice Hall of India, 2nd Edition 2005, ISBN-13: 978-8120327900 3. Fluid Mechanics by Er. R. K. Rajput, Publisher: S. Chand Publishing, 2016, ISBN: 9788121916677 4. Fluid Mechanics by V. Streeter, Publisher: McGraw-Hill: 9th Edition 1998, ISBN-13: 978-0071156004 | | | | |

| Module Code and Name | | ID2301 Differential Equations | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-------------------------------|---------|----|
| Credits | 3 | Lectures | L (hrs) | 38 |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 14 |
| Semester | 3 | Lab / Field / Design work | P (hrs) | - |
| Prerequisite | ID1303 Mathematics – II | Core (C)/Elective (E) | | C |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | |
| ILO 1: Apply a range of techniques to find solutions of standard partial differential equations. | | | | |
| ILO 2: Solve first and second order partial differential equations, which are physically important, under given boundary conditions. | | | | |
| ILO 3: Derive Fourier series of a given periodic function by evaluating Fourier coefficients and expand an odd or even function as a half-range cosine or sine Fourier Series. | | | | |
| ILO 4: State fundamental mathematical properties of the Fourier transform including linearity, shift, symmetry, scaling, modulation and convolution. | | | | |
| ILO 5: Compute the Laplace transform of a function and use theorems to compute the Laplace transform and inverse Laplace transform. | | | | |
| ILO 6: Compute the Z transform of elementary sequences both from the definition and by using tables and use the appropriate theorems to calculate Z transforms and inverse Z transforms. | | | | |
| ILO 7: Develop advanced mathematical models through differential equations and transforms, and appropriately apply to a range of problems in engineering. | | | | |
| Course Content | ILO | Allocated Hours | | |
| | | L | T | P |
| 1. Partial Differential Equations: First order PDEs, Second order PDEs, Solution by separation of variables, Application to boundary value problems. | 1, 2 | 12 | 5 | - |
| 2. Fourier Series Approximations: Fourier coefficients, Dirichlet's condition, Half-range series, Trigonometric approximation to discrete data. | 3, 7 | 6 | 2 | - |
| 3. Fourier Transform and Applications: Fourier transforms, Properties of Fourier transforms, Fourier transform solution of some PDEs. | 4, 7 | 4 | 2 | - |
| 4. Laplace Transform and Applications: Laplace transforms of elementary functions, Basic theorems on Laplace transform, Application of Laplace transforms to solution of differential equations and system of differential equations. | 5, 7 | 8 | 3 | - |
| 5. Z Transform and Applications: Discrete Time Systems, Z-Transforms, Regions of Convergence, Z-Transform Mathematics, Properties of Z-Transforms, Inverse Z-Transform, Pole-Zero Plots, Applications (<i>eg. Solving Difference Equations with Z-Transforms, Filter Design</i>) | 6, 7 | 8 | 2 | - |
| Total | | 38 | 14 | - |
| Continuous Assessment | Quiz 1 | (ILOs 1, 2) | | |
| | Quiz 2 | (ILOs 3, 4) | | |
| | Quiz 3 | (ILOs 5, 6) | | |
| Continuous Assessment: | | 30 % | | |

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|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Method of Assessment | End of Semester Examination: 70 % |
| Recommended Texts | <ol style="list-style-type: none"> 1. An Introduction to Partial Differential Equations, Yehuda Pinchover and Jacob Rubinstein, (2005) ISBN-10: 052161323X 2. Applied Partial Differential Equations with Fourier Series and Boundary Value Problems, R. Haberman, Pearson Prentice Hall (2012), ISBN-10: 0321797051 3. Advanced Engineering Mathematics (8th edition), R.K. Jain and S.R.K. Iyengar, Publisher- Alpha Science International, Limited, ISBN: 1842651854 4. Signals and Systems; Alan V. Oppenheim and Alan S. Willsky. Prentice Hall, NJ-USA. ISBN 0-13-814757-4 Richard |

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| Module Code and Name | | EE2201 Electromagnetics | | | |
| Credits | 2 | Lectures | L (hrs) | 30 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | - | |
| Semester | 3 | Lab / Field / Design work | P (hrs) | - | |
| Prerequisite | ID1303 Mathematics -II | Core (C)/Elective (E) | | C | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO-1: Solve electrostatic field problems involving simple electrode configurations. | | | | | |
| ILO-2: Solve electromagnetic field problems for standard and practical conductor configurations. | | | | | |
| ILO-3: Calculate the forces acting on a charge in electric and magnetic fields and determine its trajectory. | | | | | |
| ILO-4: Apply Maxwell's equations in typical situations. | | | | | |
| ILO.5: Solve problems related to plane wave propagation through lossless or lossy media considering boundary conditions. | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Electrostatics Field Theory Electric charge and electric field, Coulomb's law, Gauss's theorem and its application for calculation of Electric flux density and electric field strength, energy stored in the electrostatic field, Curl free nature of field strength in an electrostatic field, relationship between electric field strength and electric potential, Laplace and Poisson equations and their applications to obtain potential distribution, use of numerical methods in solving practical problems, Boundary conditions at the interface between two dielectric media, Introduction of images to satisfy the boundary conditions, capacitance of conductor configurations, Maxwell's capacitance coefficients, energy stored in a charged capacitor, calculation of mechanical force produced by the electrostatic field . | | 1 | 8 | - | - |
| 2. Electromagnetic field theory Magnetic fields produced by permanent magnets, magnetic flux density and magnetic field strength, divergence free nature of magnetic flux density, the field inside the magnet, Magnetic fields produced by currents, Ampere's and Bio-Savart's laws, magnetic potential, solution of magnetic field problems for typical configurations, Design calculation for magnetic circuits, air-gap flux, flux leakage, Electromagnetic induction, Faraday's law, energy in magnetic fields, calculation of mechanical force due to magnetic fields | | 2 | 8 | - | - |
| 3. Electrodynamics Motion of charged particles in electric and magnetic | | 3 | 2 | - | - |

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| 4. Maxwell's equations Concept of displacement current, divergence and Stoke's theorem, Maxwell's equations in differential and integral form, Maxwell's equations for harmonic fields | | 4 | 2 | - | - |
| 5. Quasi stationary fields Definition and field equations, application and solution of practical examples, continuity equation | | 4 | 2 | - | - |
| 6. Plane waves Wave equation and its solution for single dimensional case, definition of the wave front and the plane waves, propagation velocity, Propagation of plane waves through dielectric media with and without losses, power flow and Poyntin's theorem, Wave impedance, reflection and penetration of a wave incident on a boundary, plane waves in conductors, skin effect and skin depth | | 5 | 6 | - | - |
| 7. Plane waves as TEM waves, introduction to TE and TM waves | | 5 | 2 | - | - |
| Total | | | 30 | - | - |
| Continuous Assessment | Assignments (ILOs 1,2,3,4,5) Quizzes (ILOs 1,2,3,4,5) | | | | |
| | Continuous Assessment: 30% Assignments & Quizzes: 30% End of Semester Examination (3 hours): 70% | | | | |
| Recommended Texts | [1] L. Chi Shen, J. Au Kong and A. Patnaik, <i>Engineering Electromagnetics</i> , 3rd ed. Delhi: CENGAGE publishers, 2011. | | | | |

| Module Code and Name | | EE2202 Electrical Circuit Analysis | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|---------|----|
| Credits | 2 | Lectures | L (hrs) | 29 |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | - |
| Semester | 3 | Lab / Field / Design work | P (hrs) | 02 |
| Prerequisite | None | Core (C)/Elective (E) | | C |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | |
| ILO-1: Analyse a circuit using both manual and computer based methods. | | | | |
| ILO-2: Derive network functions for a given circuit and thereby explain the circuit properties. | | | | |
| ILO-3: Synthesis networks and filter circuits. | | | | |
| ILO-4: Simulate a circuit using computer software. | | | | |
| Course Content | ILO | Allocated Hours | | |
| | | L | T | P |
| 1. The s-plane The general complex exponential excitation function; Network functions; Pole-zero patterns. Properties of LC, RC and RLC network functions; energy functions. | 1 | 4 | - | - |
| 2. Introduction to the state-space representation The selection of state variables, transformations. Canonical forms, Solutions. | 2 | 6 | - | - |
| 3. Computer aided circuit simulation DC and AC circuit simulation using SPICE. Circuit description using net list, text based simulation, Graphical simulation tools. | 4 | 6 | - | 2 |
| 4. Synthesis of passive networks Synthesis of LC, RC, & RLC networks; Cauer, Foster canonical forms, Other methods of synthesis. | 3 | 4 | - | - |
| 5. Classical filter design Matching, low pass, high pass and band pass filters; basic sections; modern filter design: Butterworth approximation, Tschebychev approximations etc. frequency transformations, active filter design. | 3 | 9 | - | - |
| Total | | 29 | - | 02 |
| Continuous Assessment | Laboratory Exercise 1: Circuit simulation software packages (ILO-3) Assignments (ILOs 1,2,3) Quizzes (ILOs 1,2) | | | |
| | Continuous Assessment: 30% | | | |
| | Laboratory exercises: 20% | | | |
| | Assignments & Quizzes: 10% | | | |
| | End of Semester Examination (3 hours): 70% | | | |
| Recommended Texts | [1] G. Kishor, S. Sivanagaraju and C. Rao, Electrical Circuit Analysis, 1st ed. CENGAGE Learning India Pvt Ltd, 2009. [2] J. Nilsson and S. Riedel, Electric circuits, 11th ed. Pearson, 2018. [3] M. Nahvi and J. Edminister, Schaum's outline of theory and problems of electric circuits, 4th ed. New York: McGraw-Hill, 2002. | | | |

| Module Code and Name | | EE2203 Electrical Measurements | | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|--------------------------------|-----------------|----|---|
| Credits | 2 | Lectures | L (hrs) | 26 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | - | |
| Semester | 3 | Lab / Field / Design work | P (hrs) | 08 | |
| Prerequisite | None | Core (C)/Elective (E) | | C | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO-1: Identify and describe various functional elements of the measurement process and estimate different properties related to measurements in general. | | | | | |
| ILO-2: Explain and apply the concept of standards and their importance, and the process of calibration of instruments. | | | | | |
| ILO-3: Differentiate the working principles of both analog and digital measuring instruments and their applications. | | | | | |
| ILO-4: Illustrate various sensors and transducers used for measuring different physical parameters. | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. General principles of measurements SI units, objectives of engineering measurements, composition of measuring systems, absolute and working standards, the process of meter calibration. | | 1,2 | 4 | - | - |
| 2. Instruments used to measure electrical quantities Moving coil and moving iron meters. Dynamometer, induction, thermal and electrostatic type meters. Types of Galvanometers. Ballistic and vibration type, accuracy class, sensitivity, response time and damping of meters, selection of meters for different applications. | | 2,3 | 6 | - | 2 |
| 3. Cathode ray oscilloscope (CRO) Operation principles of CRO, use of CRO to measure voltage, current, frequency, phase shift, and transient behaviour. | | 3 | 4 | - | 2 |
| 4. Bridge methods Direct current potentiometers, Wheatstone bridge, Kelvin double bridge, AC potentiometers, AC bridges for measurement of inductance and capacitance. | | 2,3 | 4 | - | 2 |
| 5. Transducers Active and passive transducers and their working principles, loading effects. Applications of transducers for measurement of different quantities. | | 4 | 4 | - | 2 |
| 6. Digital meters Principles and operation of digital meters used for different applications. | | 3,4 | 4 | - | - |
| Total | | | 26 | - | 8 |
| Continuous Assessment | Laboratory Exercise 1: Measurements using CRO | | (ILOs 1,2,3) | | |
| | Laboratory Exercise 2: DC and AC bridge circuits | | (ILOs 2,3) | | |
| | Laboratory Exercise 3: Transducers and their application | | (ILO-4) | | |
| | Laboratory Exercise 4: Waveform errors | | (ILO-2) | | |

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| | Assignments (ILOs 1,2,3) Quizzes (ILOs 3,4) |
| | <p>Continuous Assessment: 30%</p> <p>Laboratory exercises: 20%</p> <p>Assignments & Quizzes: 10%</p> <p>End of Semester Examination (3 hours): 70%</p> |
| Recommended Texts | <p>[1] R. Langari and A. Morris, <i>Measurement and Instrumentation - Theory and Application</i>, 1st ed. Elsevier, 2012.</p> <p>[2] P. Purkait, B. Biswas, S. Das and C. Koley, <i>Electrical and electronics measurements and instrumentation</i>. New Delhi: McGraw Hill Education (India), 2013.</p> <p>[3] R. Rajput, <i>Electrical measurements and measuring instruments</i>. S Chand.</p> <p>[4] W. Boyes, <i>Instrumentation reference book</i>, 4th ed. Elsevier, 2009.</p> |

| Module Code and Name | | EE2304 Digital Electronics | | | |
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| Credits | 3 | Lectures | L (hrs) | 39 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 06 | |
| Semester | 3 | Lab / Field / Design work | P (hrs) | 06 | |
| Prerequisite | None | Core (C)/Elective (E) | | C | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO-1: Design, build and test combinational digital circuits. | | | | | |
| ILO-2: Design, build and test sequential digital circuits. | | | | | |
| ILO-3: Differentiate characteristics of logic families. | | | | | |
| ILO-4: Implement logic circuits with MSI chips. | | | | | |
| ILO-5: Compare different types of analog-to-digital and digital-to-analog converters. | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Combinational logic circuits Karnaugh Maps, Design of combinational logic circuits, Parity generators and checker, half adders, full adders, Troubleshooting combinational circuits. | | 1 | 7 | 2 | 2 |
| 2. Sequential logic circuits Flip flops:- SR flip-flops, JK flip-flops, D flip-flops, T flip-flops, Master/slave flip-flops, clocked flip-flops, Design sequential circuits, Synchronous and asynchronous counters, Troubleshoot sequential circuits | | 2 | 10 | 2 | 2 |
| 3. Logic families DL,DTL, RTL, TTL,CMOS, ECL logic families and their characteristics, Tristate TTL | | 3 | 8 | - | 2 |
| 4. MSI logic circuits Encoders/Decoders and BCD-to-7-segment drivers, Multiplexers/DE multiplexers, comparators, code converters, ROM, PLC, PLA, RAM | | 4 | 8 | 2 | - |
| 5. Analog to digital and digital to analog converters Parallel A/D converter, integral type A/D converter Resolution, conversion time | | 5 | 6 | - | - |
| Total | | | 39 | 06 | 06 |
| Continuous Assessment | Laboratory Exercise 1: Combinational logic circuits (ILO-1) | | | | |
| | Laboratory Exercise 2: Sequential logic circuits (ILO-2) | | | | |
| Continuous Assessment | Laboratory Exercise 3: TTL Logic families (ILO-3) | | | | |
| | Assignments (ILOs 1,2,3,4,5) | | | | |
| Continuous Assessment | Quizzes (ILOs 1,2,3,4,5) | | | | |
| | Continuous Assessment: | | 30% | | |
| Continuous Assessment | Laboratory exercises: | | 20% | | |
| | Assignment & Quiz: | | 10% | | |
| Continuous Assessment | End of Semester Examination (3 hours): | | 70% | | |
| | Recommended Texts | [1] R. Tocci, N. Widmer and G. Moss, <i>Digital Systems Principles and Applications</i> , 10th ed. Pearson Prentice Hall, 2007. | | | |
| [2] M. Mano and M. Ciletti, <i>Digital Design</i> , 5th ed. Harlow, United Kingdom: Pearson Education Limited, 2012. | | | | | |

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| Module Code and Name | | EE2305 Introduction to Telecommunications | | | |
| Credits | 3 | Lectures | L (hrs) | 39 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 06 | |
| Semester | 3 | Lab / Field / Design work | P (hrs) | 06 | |
| Prerequisite | None | Core (C)/Elective (E) | | C | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO-1: Review the historical evolution of the telecommunications industry. | | | | | |
| ILO-2: Define the basic theoretical concepts and terminology related to telecommunications signals and systems. | | | | | |
| ILO-3: Evaluate characteristics of signals and communication systems. | | | | | |
| ILO-4: Classify and compare communication systems in different ways such as analog/digital, baseband/modulated, fixed/mobile, local area/wide area etc. | | | | | |
| ILO-5: Discuss future trends in the telecommunications industry. | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Introduction Basic model of a telecommunication system in block diagram form, Data compression, Error control, Data Encryption, Types and functions of telecommunication systems, Duplexing methods (simplex, half-duplex, and full duplex), Telecommunication networks, Transmission media, Historical evolution of telecommunications, challenges and future trends. | | 1, 2 | 8 | | - |
| 2. Basic theoretical concepts in telecommunications Characterizing signals, Characterizing communication channel and noise, Performance evaluation of telecommunication systems. | | 2, 3 | 10 | | 2 |
| 3. Modulation and Multiplexing Modulation/demodulation: introduction to AM, FM, and PM, Power efficiency of AM, Analog to digital conversion: theory and applications, Digital carrier modulation (ASK, FSK, PSK), Multiplexing/DE multiplexing: introduction to FDM, TDM, CDM, and applications. | | 3, 4 | 15 | | 4 |
| 4. Telecommunication networks and services Switching, Public Switched Telephone Network (PSTN) and its evolution to broadband network, Mobile/wireless networks and their evolution to wireless broadband network, Computer networks: protocols, standards, capabilities. | | 4, 5 | 6 | | - |
| Total | | | 39 | 06 | 06 |
| Continuous Assessment | Laboratory Exercise 1: Spectrum Analyser Laboratory Exercise 2: Amplitude Modulation | | (ILO-2, 3) | (ILO-4) | |

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| | Laboratory Exercise 3: Frequency Modulation Assignments (ILOs 2,3) Quizzes (ILOs 1,2,3,4) | (ILO-4) |
| | Continuous Assessment: Laboratory exercises Assignments & Quizzes: End of Semester Examination (3 hours): | 30% 20% 10% 70% |
| | <p>[1] L. Goleniewski and K. Jarrett, <i>Telecommunications Essentials, Second Edition: The Complete Global Source</i>, 2nd ed. Addison Wesley Professional, 2006.</p> <p>[2] N. Benvenuto and M. Zorzi, <i>Principles of communications networks and systems</i>, 1st ed. Chichester, West Sussex, U.K.: Wiley, 2011.</p> <p>[3] A. Gokhale, <i>Introduction to telecommunications</i>, 2nd ed. Australia: CENGAGE Delmar Learning, 2005.</p> | |

| Module Code and Name | | EE2306 Theory of Electricity | | |
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| Credits | 3 | Lectures | L (hrs) | 39 |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 06 |
| Semester | 3 | Lab / Field / Design work | P (hrs) | 06 |
| Prerequisite | EE1301 Principles of Electrical Engineering | Core (C)/Elective (E) | | C |
| <p>Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to:</p> <p>ILO-1: Solve coupled circuits involving mutual impedance, dependant voltage/current sources and/or resonance phenomena.</p> <p>ILO-2: Apply network theorems in solving circuits.</p> <p>ILO-3: Solve circuits containing three phase generators and loads.</p> <p>ILO-4: Analyse circuits with non-sinusoidal voltage/ current sources.</p> | | | | |
| Course Content | ILO | Allocated Hours | | |
| | | L | T | P |
| <p>1. Review of fundamentals and resonance circuits DC circuits and AC theory. Transient solution of RLC circuits using differential equations, series and parallel resonance.</p> | 1,2 | 5 | - | - |
| <p>2. Network theorems Superposition, Thevenin's, Norton's, Milman's, reciprocity, maximum power transfer and compensation theorems and their applications, Network topology, incidence matrices. Nodal and mesh analysis, Two-port theory, z, y, h and ABCD parameters and their applications.</p> | 2 | 8 | 2 | 2 |
| <p>3. Coupled circuits and dependent sources Mutual inductance, electromagnetic coupling in circuits, analysis of coupled circuits, Transformer as a coupled circuit, dependent sources, solution of circuits with dependent sources</p> | 4 | 6 | 2 | 2 |
| <p>4. Three phase analysis Concept and advantages of three phase supply, three phase balanced circuits, single line equivalent circuit, and three phase power calculation. Symmetrical components and their use to solve unbalanced three phase circuits.</p> | 3 | 8 | 2 | 2 |
| <p>5. None-sinusoidal periodic and none-periodic waveforms Peak, rms, average and rectified average values of a waveform. Breaking down a periodic waveform into fundamental and harmonics using Fourier analysis, Solution of circuits using harmonics, Total Harmonic Distortion caused by non-linear loads, disadvantages of harmonics in different applications, Fourier transform and its reverse transform.</p> | 4 | 8 | - | - |
| <p>6. Transient analysis using Laplace transform Circuit Elements in the s Domain, Circuit Analysis in the s Domain, RLC circuit behaviour to impulse function, introduction of transfer function of a circuit, Transient analysis for DC and AC inputs on a RLC circuit in s domain, application of initial and final value theorem on RLC circuit's transfer function with DC and AC inputs.</p> | 3,4 | 4 | - | - |
| Total | | 39 | 06 | 06 |

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| Continuous Assessment | Laboratory Exercise 1: RC Time Constant (ILOs 1,2) Laboratory Exercise 2: Two port Network (ILO-2) Laboratory Exercise 3: Measurement of power in a three phase system (ILO-3,4) Assignments (ILOs 1,2,3,4,5) Quizzes (ILOs 1,2,3,4,5) |
| | Continuous Assessment: 30% Laboratory exercises: 20% Assignment & Quiz: 10% End of Semester Examination (3 hours): 70% |
| Recommended Texts | [1] J. Gupta, A course in electrical technology, 13th ed. New Delhi: S.K. Kataria & Sons, 2014. [2] B. Theraja, B. Theraja and A. Theraja, A textbook of electrical technology. Ram Nagar, New Delhi, India: S. Chand & Co. [3] R. Rajput, Electrical Engineering, 1st ed. New Delhi, India: Laxmi Publications, 2007. [4] John Bird, Electrical Circuit Theory and Technology, 4th Edition, Elsevier, 2010. [5] Edward Hughes, Electrical and Electronics Technology, 10th Edition Pearson Education India, 2010. |

| Module Code and Name | | ID2302 Probability & Statistics for Engineers | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----------------------------------------------|-----------------|----|---|
| Credits | 3 | Lectures | L (hrs) | 38 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 14 | |
| Semester | 4 | Lab / Field / Design work | P (hrs) | - | |
| Prerequisite | None | Core (C)/Elective (E) | | C | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO-1: Define statistics, experiment, sample space, event, probability and equally likely to occurrences. | | | | | |
| ILO-2: Derive and use the formula for finding the probability of an event and mutually exclusive events. | | | | | |
| ILO-3: Identify and use which addition rule applies to mutually exclusive events and non-mutually exclusive events. | | | | | |
| ILO-4: Use the concept of a statistical distribution. | | | | | |
| ILO-5: Derive the mean and variance of a variety of random variables. | | | | | |
| ILO-6: Apply basic probability principles to solve problems and manipulate probabilities in practical situations. | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Introduction to Probability and Statistics | | 1 | 1 | - | - |
| 2. Sample Space and Relationships among events | | 1 | 1 | - | - |
| 3. Counting Rules Useful in Probability | | 2, 3 | 2 | - | - |
| 4. Conditional Probability and Independency | | 2, 3 | 2 | - | - |
| 5. Rules of Probability | | 2, 3 | 1 | - | - |
| 6. Discrete Random Variables and Their Probability Distributions, Expected Values of Discrete Random Variables | | 4, 5, 6 | 2 | - | - |
| 7. The Binomial Distribution, The Geometric and Negative binomial Distribution, The Poisson Distribution, The Hypergeometric Distribution | | 4, 5, 6 | 8 | 5 | - |
| 8. Continuous Random Variables and Their Probability Distributions, Expected Values of Continuous Random Variables | | 4, 5, 6 | 2 | - | - |
| 9. The Uniform Distribution, The Exponential Distribution, The Gamma Distribution, The Normal Distribution | | 4, 5, 6 | 10 | 6 | - |
| 10. Multivariate Probability Distributions Bivariate and Marginal Probability Distributions, Conditional Probability Distributions, Expected Values of Functions of Random Variables | | 4, 5, 6 | 4 | 1 | - |
| 11. Introduction to Control Charts | | 6 | 3 | 1 | - |
| 12. Simple Linear Regression | | 6 | 2 | 1 | - |
| | | Total | 38 | 14 | - |
| Continuous Assessment | Quiz 1 | (ILO-1,2,3) | | | |
| | Quiz 2 | (ILO-4,5,6) | | | |
| | Quiz 3 | (ILO-4,5,6) | | | |
| | Quiz 4 | (ILOs 1-6) | | | |

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| Method of Assessment | Continuous Assessment: 30 % End of Semester Examination: 70 % |
| Recommended Texts | <ol style="list-style-type: none"> <li data-bbox="459 297 1402 392">1. Probability and Statistics for Engineers 5th edition International Edition, Authors: Scheaffer R.L and Mc Clave, Publisher: Brooks/Cole, Cengage Learning <li data-bbox="459 394 1402 472">2. Theory and Problems of Statistics 4th edition. Authors: Murray R.S and Larry J.S, publisher: McGraw-Hill, London. ISBN 9780071485845 |

| Module Code and Name | | ID2303 Industrial Management I | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|--------------------------------|---------|----|
| Credits | 3 | Lectures | L (hrs) | 38 |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 14 |
| Semester | 4 | Lab / Field / Design work | P (hrs) | - |
| Prerequisite | None | Core (C)/Elective (E) | | C |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | |
| ILO-1: Discuss and recognize cost and management principles in decision making, in planning, design and implementation and day-to day running of engineering related ventures. | | | | |
| ILO-2: Interpret financial reports and communicate with the Accounting Personnel in an engineering venture regarding cost and management accounting aspects. | | | | |
| ILO-3: Describe the use of break-even-point chart in fundamental micro-economic activities. | | | | |
| ILO-4: Interpret the basic principles of micro-economics and macro-economics for decision making in marketing, production and investment. | | | | |
| Course Content | ILO | Allocated Hours | | |
| | | L | T | P |
| 1. Cost Accounting and Management | | | | |
| 1.7. Introduction to Cost and Management Accounting. The modern business environment, the objectives of cost and management accounting, Comparison of financial and cost/management accounting. | 1 | 1 | | |
| 1.8. Cost concepts and cost terms. Various cost terms, Cost classification for inventory valuation, Cost classification for decision making and planning, Cost classification for control. | 1 | 2 | | |
| 1.9. Accounting for Material. Types of materials, Material storage control, Pricing or costing the material issued, Stock taking. | 1 | 2 | | |
| 1.10. Accounting for Labour. Importance for labour for a firm, Composition for labour cost, Incentive payment schemes. | 1 | 1 | | |
| 1.11. Accounting for Overhead. Overheads, Overhead allocation, apportionment and absorption, reapportioning the service cost center costs to production cost centers, predetermined overhead absorption rates | 1 | 2 | | |
| 1.12. Various types of costing. Job Costing, Contract Costing, Process Costing, Marginal Costing and decision making, Standard Costing and variance analysis, Activity based costing, Break-even analysis. | 1 | 4 | | |
| 1.13. Cost volume and profit analysis (CVP analysis). CVP analysis, Contribution, Decision making using CVP analysis, Graphical approach to CVP analysis. | 1 | 2 | | |
| 1.14. Decision making using CVP and relevant cost concepts. | 1 | 1 | | |
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| Relevant costs, Various decisions that could be taken based on CVP and relevant cost principles. | | | | |
| 2. Financial Accounting and Management | | | | |
| 2.1. Fundamentals of Accounting. Basic accounting concepts and principles, Accounting equation & recording transactions, Introduction of the double entry system and books of accounting, Regulatory framework for accounting, Users of accounting information. | 2 | 2 | 4 | |
| 2.2. Financial Statements. Income statement and the elements of the income statement, Balance sheet and the elements of the balance sheet, Cash flow statement and the elements of the cash flow statement. | 2 | 2 | | |
| 2.3. Budgets and forecasted financial statements. Link of budgets to strategic planning, Procedure of budgets preparation, Forecasted financial statements, Budgetary control process. | 2 | 3 | | |
| 2.4. Capital investment decisions. The opportunity cost of an investment, Compounding and discounting, Techniques in capital investment decisions. | 2 | 1 | | |
| 2.5. Management of working capital. Concepts of working capital, Operating cycle, Determinants of working capital. | 2 | 1 | | |
| 2.6. Managing current assets. Receivables management, Inventory management, Cash management. | 2 | 1 | | |
| 3. Economics Management - Part I | | | | |
| 3.1. Introduction. Flow in an economy, Basic concepts of Economics, Elements of Costs / Revenues. | 3 | 2 | 5 | |
| 3.2. Theory of Production. Factors and Laws of Production, The short-run production function, Analysis of operational costs, Adjustment of labour to minimize costs. | 3 | 2 | | |
| 3.3. Production in the Long-run. The two-dimensional model, Isoquants, Price lines, Cost lines, Scale lines, The shape of the production and scale lines, Adjustment of production inputs to offset changing costs, Average cost, marginal cost and total cost in the long run. | 3 | 2 | | |
| 3.4. Derivation of Supply and Demand. Supply - the production goal, Demand - the limit of production, The consumer's motivation, Indifference curves, Supply and demand. | 3 | 1 | | |
| 3.5. Determination of Market Price in Perfect Competition. Perfect Competition, Derivation of market supply curves, Elasticity, cross elasticity, Effect of demand and supply in perfect competition. | 3 | 2 | | |
| 3.6. Determination of Output, Revenue and Profit. | 3 | 1 | | |

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| Output in Perfect competition, Determination of a firm's demand curve, supply curve, Determination of a firm's output by total cost analysis. | | | | |
| 3.7. Imperfect Competition. Limits of perfect competition and Monopoly, Construction of the MR curve, Calculation of optimum output and profits. | | 3 | 1 | |
| 3.8. Macro Economics: The Business Cycle and National Income. Macroeconomics, The business cycle, The cyclical nature of engineering industry, National Income. | | 4 | 2 | |
| | | Total | 38 | 14 |
| Continuous Assessment | Tutorials (ILOs 2, 3, 4) Assignments (ILOs 2, 3, 4) | | | |
| Method of Assessment | Continuous Assessment: | | 30 % | |
| | End of Semester Examination: | | 70 % | |
| Recommended Texts | <ol style="list-style-type: none"> 1. Cost and Management Accounting by Jill Hussey and Roger Hussey, Publisher: Macmillan Press Limited, ISBN 0 333 69407 4. 2. Management and Cost Accounting by Colin Drury. Publisher: Thomson Learning, ISBN 978 1 84480 349 1 3. A Text Book of Cost and Management Accounting by M N Arora. Publisher: Vikas Publishing House, India. 4. Fundamentals of Financial Accounting by Fred Philips, Robert libby and Patricia Libby. A McGraw-Hill Book, 5th Edition, ISBN10: 0078025915. 5. Engineering Economics by Robert L. Michell. Publisher: John Wiley & Sons. ISBN 0 471 27619 7 6. Engineering Economics by R. Paneerselvam, Publisher: Prentice Hall of India, ISBN 81-203-1743-2. 7. Economics for Engineers by T R Jain, M L Grover et al, Publisher: V K (India) Enterprises, ISBN 81-88597-60-0. 8. Engineering Economy by William G Sullivan, Elen M Wicks, C Patrick Koelling, Publisher: Prentice Hall, ISBN 013 614 2974 / ISBN 13: 9780136142973. | | | |

| Module Code and Name | | CS2302 Computer Architecture | | |
|---------------------------------------------------------------------------------------------------------------|------|------------------------------|---------|----|
| Credits | 3 | Lectures | L (hrs) | 30 |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | - |
| Semester | 4 | Lab / Field / Design work | P (hrs) | 30 |
| Prerequisite | None | Core (C)/Elective (E) | | C |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | |
| ILO 1: Explain the modern architecture of computer systems. | | | | |
| ILO 2: Demonstrate representation of data and its operations in computer systems | | | | |
| ILO 3: Demonstrate functionalities of memory hierarchy of computer systems. | | | | |
| ILO 4: Explain the functionalities of input-output devices and their interfaces. | | | | |
| ILO 5: Design simple CPU and ISA | | | | |
| ILO 6: Compare various performance enhancement mechanisms in computer systems. | | | | |
| Course Content | ILO | Allocated Hours | | |
| | | L | T | P |
| 1. Overview of a computer system (1 h) | 1 | 1 | - | - |
| 2. Arithmetic for Computers (3 h) | | | | |
| 2.1. Data representation in computers (1 h) | 2 | 1 | - | 6 |
| 2.2. Addition, subtraction, multiplication and division (2 h) | 2 | 2 | - | - |
| 3. CPU organization (9 h) | | | | |
| 2.1. Assembly programming (3 h) | 5 | 3 | - | 3 |
| 2.2. Register organization and addressing modes (1 h) | 5 | 1 | - | 6 |
| 2.3. Single cycle data path and control (3 h) | 5 | 3 | - | 6 |
| 2.4. Multicycle data path and control (2 h) | 5 | 2 | - | 3 |
| 4. Memory organization (4 h) | | | | |
| 4.1. Memory types (1h) | 3 | 1 | - | - |
| 4.2. Memory hierarchy and Auxiliary memory (1 h) | 3 | 1 | - | - |
| 4.3. Cache Memory (2 h) | 3 | 2 | - | - |
| 5. Input-output organization (4 h) | | | | |
| 5.1. I/O and relevant concepts (1 h) | 4 | 1 | - | - |
| 5.2. Connecting processor, memory and other devices (1 h) | 4 | 1 | - | 3 |
| 5.3. Polling, interrupt and DMA (2 h) | 4 | 2 | - | - |
| 6. Performance enhancement mechanisms (7 h) | | | | |
| 5.1. CPU performance factors (2 h) | 6 | 2 | - | - |
| 5.2. Measuring performance and benchmarking (1 h) | 6 | 1 | - | - |
| 5.3. Parallelism and pipelining (2 h) | 6 | 2 | - | 3 |
| 5.4. Introduction to multiprocessor architectures (1 h) | 6 | 1 | - | - |
| 5.3 Introduction to Graphics Processing Units (GPUs) (1 h) | 6 | 1 | - | - |
| 7. Emerging trends in computer architecture (2h) | 1 | 2 | - | - |
| Total | | 30 | - | 30 |

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| Continuous Assessment | <p>Laboratory Exercises every week of 3 hours duration. Laboratory sessions will cover assembly language programming using a popular instruction set such as ARM and design and simulation of a simple ISA using a simulation package such as CPU Sim.</p> <ol style="list-style-type: none"> 1. Disassemble and reassemble a PC (ILO 1) 2. Introduction to assembly programming (ILO 5) 3. Control Statements (ILO 5) 4. Addressing modes: arrays and pointers (ILO 5) 5. Subroutines and the stack (ILO 5) 6. Introduction to CPU simulator (ILO 5) 7. Write assembly programs for a given simple hypothetical ISA. (ILO 5) 8. Improve the hypothetical ISA by adding stack pointer, push, pop, call and return instructions (ILO 5) 9. Improve the hypothetical ISA by adding indirect, stack-relative, immediate addressing modes, index register and indexed-addressing modes (ILO 5) 10. Improve the hypothetical ISA by adding bit operations (AND, OR, XOR, NOT), and shift operations (ILO 5) <p>Ref: Skrien, Dale. (2001). CPU Sim 3.1: A tool for simulating computer architectures for computer organization classes. ACM Journal of Educational Resources in Computing. 46-59.</p> <p>Quizzes (ILOs 1, 2, 3 & 4)</p> |
| Method of Assessment | <ul style="list-style-type: none"> ● Continuous Assessment: 50 % <li style="padding-left: 20px;">Laboratory Sessions: 40% <li style="padding-left: 20px;">Quizzes: 10% ● End of Semester Examination: 50 % |
| Recommended Texts | <ol style="list-style-type: none"> 1. Computer organization and design : the hardware/software interface (4th Edition or latest) by David A. Patterson, and John L. Hennessy, Morgan Kaufmann, ISBN 0124077269 2. Computer System Architecture (3rd Edition or latest) by M. Morris Mano, Prentice-Hall India, ISBN 8120308557 |

| Module Code and Name | | EE2307 Introduction to Electrical Machines & Power Systems | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------------------------------------------------------|-----------------|----|---|
| Credits | 3 | Lectures | L (hrs) | 39 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 06 | |
| Semester | 4 | Lab / Field / Design work | F/P (hrs) | 06 | |
| Prerequisite | None | Core (C)/Elective (E) | | C | |
| <p>Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to:</p> <p>ILO-1: Explain the construction features and operating principles of DC and AC machines. ILO-2: Describe the operation and features of single phase and three phase transformers. ILO-3: Describe power generation and distribution systems. ILO-4: Demonstrate the knowledge of electricity tariff systems. ILO-5: Calculate voltage drop and power loss in radial and ring type power distribution systems. ILO-6: Describe techniques used to improve end use efficiency and to do necessary calculations.</p> | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Electromechanical energy conversion Principles of operation of DC, induction, synchronous and other types of electrical machines, Stationary and rotating magnetic fields. | | 1 | 2 | - | - |
| 2. Transformers Single phase transformer: differential equations describing transformer action, o/c and s/c tests, equivalent circuit, full load and all-day efficiencies, voltage regulation, Three phase transformers: construction features, types of connections and the vector group, parallel operation. | | 2 | 6 | 1 | 2 |
| 3. DC machines Constructional features and types of windings and types of DC machines, Analysing Equivalent circuit of various types of DC machines (Motors and Generators). | | 1,3 | 8 | 2 | 2 |
| 4. AC Machines Rotor and winding types used three phase induction machines, operating principle, Slip, parameters and equivalent circuit, variation of torque with motor parameters, losses and efficiency, Single-phase induction motor, methods of starting, characteristics and applications, Synchronous motors and generators operating principle, Equivalent Circuit. | | 1,3 | 8 | 2 | 2 |
| 5. Power generation and distribution Introduction to different types of generation systems (conventional hydro, thermal, nuclear, and renewable), Environmental issues in power generation. Different distribution system arrangements, types of distribution systems (Ring, Radial and interconnected), voltage drop and distribution loss calculations for concentrated and distributed loads | | 5 | 7 | - | - |

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| 6. Electricity tariff Fixed charge, maximum demand charge and energy charge, tariff blocks and tariff categories used in Sri Lanka, Time of use tariffs, calculation of monthly electricity bill. | | 4 | 4 | 1 | |
| 7. Efficient utilization of power Economic and other advantages of power factor correction, Methods used for power factor correction | | 6 | 4 | - | - |
| Total | | | 39 | 06 | 06 |
| Continuous Assessment | Laboratory Exercise 1: Single Phase Transformers | (ILO-1,2) | | | |
| | Laboratory Exercise 2: DC Machines | (ILO-1) | | | |
| | Laboratory Exercise 3: Single Phase Induction Motors | (ILO-1) | | | |
| | Assignments | (ILOs 1,2,3,4) | | | |
| | Quizzes | (ILOs 1,3,4) | | | |
| | Continuous Assessment: | 30% | | | |
| | Laboratory exercises | 15% | | | |
| | Assignments & Quizzes: | 15% | | | |
| | End of Semester Examination (3 hours): | 70% | | | |
| | <p>[1] S. Umans, A. Fitzgerald and C. Kingsley, <i>Electric Machinery</i>, 6th ed. New Delhi: Tata McGraw-Hill.</p> <p>[2] C. B. Gray, <i>Electrical machines and drive systems</i>. USA: Longman Scientific and Technical, 1989.</p> <p>[3] W. Leonhard, <i>Control of Electrical Drives</i>, 3rd ed. Berlin, Heidelberg: Springer-Verlag Berlin Heidelberg, 2001.</p> | | | | |

| Module Code and Name | | EE2308 Analog Electronics | | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------|-----------------|----|----|
| Credits | 3 | Lectures | L (hrs) | 39 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 06 | |
| Semester | 4 | Lab / Field / Design work | P (hrs) | 06 | |
| Prerequisite | None | Core (C)/Elective (E) | | C | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO-1: Analyse small-signal BJT and FET amplifiers. | | | | | |
| ILO-2: Identify the functionality and applications of operational amplifiers. | | | | | |
| ILO-3: Analyse different power amplifier classes and their characteristics. | | | | | |
| ILO-4: Build and test analog electronic circuits. | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Small-signal BJT and FET amplifiers Biasing circuits for BJTs and FETs, Single-stage BJT/ FET amplifier configurations, Small-signal models, small signal mid-frequency equivalent circuits and analysis, h-parameter model, Low frequency and high frequency equivalent circuits of BJT/FET circuits, Bode plots, frequency response of amplifiers, Multistage amplifiers, BJT differential pair and small-signal operation of the BJT differential amplifier | | 1 | 16 | 2 | 2 |
| 2. Functionality and applications of operational Ideal Opamp and practical behaviour of Opamps, Opamp applications, Instrumentation amplifiers. | | 2 | 10 | 2 | 2 |
| 3. Power amplifier classes and their characteristics Amplifier classes, Transistor power dissipation and efficiency, Push-pull amplifiers, Harmonic distortion, Heat generation of power transistors and heat sinks | | 3,4 | 13 | 2 | 2 |
| Total | | | 39 | 06 | 06 |
| Continuous Assessment | Laboratory Exercise 1: Operational Amplifiers | | (ILO-2) | | |
| | Laboratory Exercise 2: Differential Amplifiers | | (ILO-1) | | |
| | Laboratory Exercise 3: Push-Pull Amplifiers | | (ILO-3,4) | | |
| | Quizzes | | (ILOs 1,2,3) | | |
| Continuous Assessment: | | 30% | | | |
| Laboratory exercises: | | 20% | | | |
| Assignment & Quiz: | | 10% | | | |
| End of Semester Examination (3 hours): | | 70% | | | |
| Recommended Texts | [1] T. Bogart, <i>Electronic devices and circuits</i> , 6th ed. Prentice Hall, 2004. | | | | |

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| Module Code and Name | | EE2309 Signals and Systems | | | |
| Credits | 3 | Lectures | L (hrs) | 39 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 06 | |
| Semester | 4 | Lab / Field / Design work | P (hrs) | 06 | |
| Prerequisite | EE2202 Electrical Circuit Analysis | Core (C)/Elective (E) | | C | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO-1: Classify signals and systems. | | | | | |
| ILO-2: Analyse signals and systems using time, frequency, Laplace and Z- domain tools. | | | | | |
| ILO-3: Describe the relationship between the input and output of Linear Time Invariant (LTI) systems. | | | | | |
| ILO-4: Apply appropriate tools and techniques for the evaluation of communication and control system building blocks. | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Introduction Introduction to signals and systems found in communication systems and control systems, types, functions and the need for analysis and synthesis. | | 1 | 2 | - | - |
| 2. Fundamentals of Signals and Systems Time domain representation of signals, their classification and operations. Modelling and analysis of signals and systems using elementary signals, Noise – types of electrical noise and their sources. Thermal noise and its characterization. | | 2 | 5 | 1 | - |
| 3. Time domain representation of Linear Time Invariant Systems Characterization of input/output behavior using the impulse response, Characterization of input/output behavior using differential and difference equations, application to discrete and continuous-time systems. | | 3 | 6 | 2 | 2 |
| 4. Fourier analysis of signals and systems Fourier representation of signals, Analysis of input-output relationships of LTI systems in the frequency domain, Example applications in communications. | | 4 | 10 | 2 | 2 |
| 5. Laplace domain analysis of signals and systems Using continuous-time complex exponentials as a tool for representing signals and systems, The Laplace transform and its properties, s-domain transfer function of an LTI system | | 4 | 8 | 1 | 2 |
| 6. Z-domain analysis of signals and systems Using discrete-time complex exponentials as a tool for representing signals and systems, The Z-transform, its properties, Z-domain transfer function of an LTI system | | 4 | 8 | - | - |
| | | Total | 39 | 06 | 06 |

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| Continuous Assessment | Laboratory Exercise 1: Discrete-Time Signal manipulation (ILO-1,2,3) Laboratory Exercise 2: Frequency domain analysis of Discrete-Time Signals and Systems (ILO-1,2, 3) Laboratory Exercise 3: Examine system models with Difference and Differential equations (ILO-3,4) Assignments (ILOs 1,2,3) Quizzes (ILOs 3,4) |
| | Continuous Assessment: 30% Laboratory exercises: 20% Assignment & Quiz: 10% End of Semester Examination (3 hours): 70% |
| Recommended Texts | [1] S. Haykin and B. Van Veen, <i>Signals and systems</i> , 2nd ed. New Delhi: John Wiley & Sons(Asia) pte. Ltd., 2004, pp. chapters 1-7. [2] R. Ziemer, W. Tranter and D. Fannin, <i>Signals and systems</i> , 4th ed. Pearson, 1998. [3] C. Phillips, J. Parr and E. Riskin, <i>Signals, systems, and transforms</i> , 4th ed. Upper Saddle River, NJ: Prentice Hall, 2008. |

| Module Code and Name | | ID3301 Complex Analysis and Numerical Methods | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------------------------------------------|---------|----|
| Credits | 3 | Lectures | L (hrs) | 32 |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 12 |
| Semester | 5 | Lab / Field / Design work | P (hrs) | 14 |
| Prerequisite | None | Core (C)/Elective (E) | | C |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | |
| ILO-1: State fundamental concepts of complex numbers and functions, and demonstrate familiarity of these concepts by solving computational problems. | | | | |
| ILO-2: Evaluate complex contour integrals directly and by using fundamental theorem, and apply the Cauchy integral theorem and Cauchy integral formula. | | | | |
| ILO-3: Represent functions as Taylor, power and Laurent series, classify singularities and poles, find residues and evaluate complex integrals using the residue theorem. | | | | |
| ILO-4: Apply appropriate numerical methods to approximately solve, otherwise intractable mathematical problems and analyse accuracy of implemented methods. | | | | |
| ILO-5: Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equation systems, and the solution of differential equations (ordinary and partial). | | | | |
| ILO-6: Implement numerical methods in corresponding computational steps (i.e. without using high level library functions) to solve mathematical problems by using a chosen software development environment (such as Matlab, Octave, SciLab, Python). | | | | |
| Course Content | ILO | Allocated Hours | | |
| | | L | T | P |
| 1. Complex Analysis | | | | |
| 1.1. Complex Numbers and Functions | | | | |
| Algebraic and Geometric Representation, Polar Form (Powers and Roots), Derivative, Analytic Function, Cauchy-Riemann Equations, Laplace Equation, Exponential Function, Trigonometric and Hyperbolic Function, Euler's Formula, Logarithm (General Power, Principal Value) | 1 | 4 | 4 | - |
| 1.2. Complex Integration | | | | |
| Line Integral in the Complex Plane, Cauchy's Integral Theorem/Formula, Derivatives of Analytic Functions | 2 | 4 | 4 | - |
| 1.3. Infinite Series | | | | |
| <i>Power Series, Taylor Series:</i> Sequences, Series, Convergence Tests, Power Series, Functions Given by Power Series, Taylor and Maclaurin Series <i>Laurent Series. Residue Integration:</i> Laurent Series, Singularities and Zeros. Infinity, Residue Integration Method, Residue Integration of Real Integrals | 3 | 4 | 4 | - |
| 2. Numerical Methods | | | | |
| 2.1. Roots of Equations | | | | |
| <i>Bracketing Methods:</i> Graphical Methods, The Bisection Method, The False Position Method, Incremental Searches and Determining Initial guesses. <i>Open Methods:</i> Simple Fixed Point iteration, The Newton-Raphson Method, The Secant Method, Multiple Roots, Systems of Nonlinear Equations <i>Roots of Polynomials:</i> Muller's Method, Other Methods | 4, 6 | 6 | - | 6 |

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| 2.2. Numeric Linear Algebra Naive Gauss Elimination, Gauss-Jordan Method, LU- Decomposition and Matrix Inversion, Gauss-Seidel Method (Special Matrices) | | 4, 5, 6 | 4 | - | 4 |
| 2.3. Numerical Differentiation and Integration <i>Integration:</i> Newton-Cotes Integration Formulas (The Trapezoidal rule, Simpson's rules), Integration of Equations (Newton-Cotes Algorithm, Romberg Integration), <i>Differentiation:</i> High Accuracy Differentiation Formulas, Richardson Extrapolation Method, Unequally Spaced Data, Data with Errors | | 5, 6 | 4 | - | 4 |
| 2.4. Differential Equations <i>ODF:</i> Euler's Method, Runge-Kutta Method, Stiffness and Multistep Methods, Boundary Value Problems. <i>PDF:</i> Finite Difference (Elliptic/Parabolic Equations), Finite-Element Method. | | 5 | 6 | - | - |
| Total | | | 32 | 12 | 14 |
| Continuous Assessment | Quizzes (ILOs 1, 2, 3) Computer Laboratory Sessions (ILO-6) | | | | |
| Method of Assessment | Continuous Assessment: 30 % Quizzes: 15% Laboratory Sessions: 15% End of Semester Examination: 70 % | | | | |
| Recommended Texts | <ol style="list-style-type: none"> 1. Erwin Kreyszig, Herbert Kreyszig and Edward J. Norminton (2011): Engineering Mathematics 10th Edition. John Wiley & Sons Inc. ISBN- 978-0-470-45836-5 2. Steven C. Chapra and Raymond P. Canale (2015): Numerical Methods for Engineers: Mc Graw Hill Education. ISBN-978-0-07-339792-4. | | | | |

| Module Code and Name | | CS3301 Computer Networks | | | |
|---------------------------------------------------------------------------------------------------------------|------|---------------------------|---------|-----|----|
| Credits | 3 | Lectures | L (hrs) | 30 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 03 | |
| Semester | 3 | Lab / Field / Design work | P (hrs) | 27 | |
| Prerequisite | None | Core (C)/Elective (E) | | C | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO 1: Demonstrate how TCP and UDP protocols operate | | | | | |
| ILO 2: Compare and contrast different routing algorithms and protocols | | | | | |
| ILO 3: Identify network services and application layer protocols | | | | | |
| ILO 4: Implement an internetwork with different types of LANs, switching, and routing mechanisms | | | | | |
| Course Content | ILO | Allocated Hours | | | |
| | | L | T | P | |
| 1. OSI and TCP/IP layered protocol architectures (2 h) | | | | | |
| 1.1. Revisit OSI and TCP reference model, and Physical and Data Link layers in brief | 4 | 2 | - | 3 | |
| 2. LAN and WAN (5 h) | | | | | |
| 2.1. Revision of Wired LANs and Wireless LANs (1 h) | 4 | 1 | - | 3 | |
| 2.2. Revision of LANs and introducing VLAN (2 h) | 4 | 2 | - | 3 | |
| 2.3. Introduction to WAN (2 h) | 4 | 2 | - | 3 | |
| 3. Network layer (10 h) | | | | | |
| 3.1. IP Addressing – revise IPv4, IPv6 in detail (2 h) | 2 | 2 | 3 | 1.5 | |
| 3.2. Routing algorithms (3 h) | 2 | 3 | - | 1.5 | |
| 3.3. Congestion control (1 h) | 2 | 1 | - | 1.5 | |
| 3.4. Internetworking (2 h) | 2 | 2 | - | 1.5 | |
| 3.5. QoS (1 h) | 2 | 1 | - | 1.5 | |
| 3.6. Security - VPN (1 h) | 2 | 1 | - | 1.5 | |
| 4. Transport layer (7 h) | | | | | |
| 4.1. UDP (2 h) | 1 | 2 | - | 1 | |
| 4.2. TCP (3 h) | 1 | 3 | - | 1 | |
| 4.3. Performance (2 h) | 1 | 2 | - | 1 | |
| 5. Application layer (6 h) | | | | | |
| 5.1. Network services (2 h) | 3 | 2 | - | 1 | |
| 5.2. World Wide Web (2 h) | 3 | 2 | - | 1 | |
| 5.3. Multimedia (2 h) | 3 | 2 | - | 1 | |
| | | Total | 30 | 03 | 27 |

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| Continuous Assessment | <p>Computer Laboratory Sessions Laboratory Exercises every week of 3 hours duration. Laboratory sessions will cover the following activities and almost all exercises are based on IPv4 and IPv6:</p> <ol style="list-style-type: none"> 1. Preparing copper cables for Ethernet 2. Setting up LANs with wired and wireless stations (ILO 4) 3. Assigning IPv6 addresses (ILO 4) 4. Basics of switching & routing configurations (ILO 2) 5. Implementing Switching and VLAN techniques (ILO 4) 6. Implementing Static routing techniques (ILO 2) 7. Dynamic Routing - RIPv2 (ILO 2) 8. Dynamic Routing - EIGRP (ILO 2) 9. Dynamic Routing - OSPF (ILO 2) 10. Packet capturing and protocol analysis-Transport Layer and Application Layer (ILO 1,3) <p>Quizzes (ILOs 1, 2, 3, 4 and 5)</p> |
| Method of Assessment | <ul style="list-style-type: none"> ● Continuous Assessment (Laboratory Sessions & Quizzes): 50 % ● End of Semester Examination (2h): 50 % <p>Field visit to a network operating center (NOC) or server farm.</p> |
| Recommended Texts | <ol style="list-style-type: none"> 1. Data and Computer Communications (10th Edition or latest) by William Stallings, Prentice-Hall, ISBN-13: 978-0-13-3506488 2. Computer Networks (5th Edition or latest) by Andrew S. Tanenbaum, Prentice-Hall, ISBN-13: 978-0-13-2126953 |

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| Module Code and Name | | EE3301 Power Systems I | | | |
| Credits | 3 | Lectures | L (hrs) | 39 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 06 | |
| Semester | 5 | Lab / Field / Design work | P (hrs) | 06 | |
| Prerequisite | None | Core (C)/Elective (E) | | C | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO-1: Explain characteristics and construction features of underground and overhead transmission systems and their effects on environment and human life. | | | | | |
| ILO-2: Calculate parameters of a practical transmission line and evaluate its performance | | | | | |
| ILO-3: Design an overhead line complying to standards. | | | | | |
| ILO-4: Explain the use and function of switchgear and methods of system grounding. | | | | | |
| ILO-5: Perform load flow analysis on power systems using standard techniques. | | | | | |
| ILO-6: Calculate fault currents in a practical power system. | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Power transmission Overhead and underground systems, conductor and cable types, insulating materials, environmental, safety and health issues, Calculation of resistance and inductance in a three phase equally spaced line, Calculation of inductance & capacitance in a regularly transposed multiple circuit bundled conductor line considering the effect of the earth, Different insulator types, insulator strings, voltage distribution and string efficiency | | 1,2 | 9 | 1 | 3 |
| 2. Mechanical characteristics of lines Mechanical design of overhead lines, sag and span calculations, Choice of route, types of towers, conductor spacing and configuration, sag templates, stringing charts | | 2 | 4 | 1 | - |
| 3. Transmission line modelling Differential equations and their solutions, Short, medium and long line models, calculations using T and Pi equivalent circuits, Ferranti effect, shunt and series compensation | | 3 | 6 | 1 | 3 |
| 4. Switchgear Different types, fault clearance and interruption of currents, making and breaking capacities, arc formation and quenching, System grounding and substation earthing, step and touch potentials | | 4 | 6 | - | - |
| 5. Load flow analysis Real and reactive power flow, Gauss Seidel method of power flow analysis, Newton-Raphson method of power flow, Dc power flow analysis | | | 8 | 2 | - |
| 6. Fault analysis Per unit system, effects of faults, symmetrical three-phase fault, Symmetrical components, unsymmetrical fault current calculation | | 5 | 6 | 1 | - |
| Total | | | 39 | 06 | 06 |

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| Continuous Assessment | Laboratory Exercise 1: Voltage regulation in Characteristics (ILO-2) Laboratory Exercise 2: P-V Curve for AC transmission lines (ILO-3) Assignments (ILOs 2,3,5,6) Quizzes (ILOs 1,2,5,6) |
| | Continuous Assessment: 30% Laboratory exercises: 20% Assignment & Quiz: 10% End of Semester Examination (3 hours): 70% |
| Recommended Texts | [1] S. Singh, <i>Electric power generation, transmission and distribution</i> , 2nd ed. New Delhi: Prentice Hall India, 2003. [2] J. Grainger and W. Stevenson, <i>Power system analysis</i> . McGraw-Hill, 1994. [3] J. Blackburn and T. Domin, <i>Protective relaying</i> , 3rd ed. Boca Raton, Fla.: CRC Press, 2007. [4] S. Nasar, <i>Electric power systems</i> , 2nd ed. New York, N.Y: McGraw-Hill, 1990. [5] H. Beaty, <i>Handbook of electric power calculations</i> , 3rd ed. New York: McGraw-Hill, 2001. |

| Module Code and Name | | EE3302 Communication Theory | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|------------------------------------|---------|-----------|
| Credits | 3 | Lectures | L (hrs) | 39 |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 06 |
| Semester | 5 | Lab / Field / Design work | P (hrs) | 06 |
| Prerequisite | EE2309 Signals and Systems | Core (C)/Elective (E) | | C |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | |
| ILO-1: Characterize random signals and processes. | | | | |
| ILO-2: Analyze analog modulation/demodulation schemes and their performance in noise. | | | | |
| ILO-3: Explain the principles related to pulse modulation. | | | | |
| ILO-4: Analyze the behaviour of digital signals in noise. | | | | |
| Course Content | ILO | Allocated Hours | | |
| | | L | T | P |
| 1. Signal and Systems Models Review of Fourier analysis of signals and systems, Low-pass and band-pass models | 1 | 5 | 1 | - |
| 2. Analog modulation schemes Amplitude Modulation (DSBSC, AM with carrier, SSB, VSB, QAM): waveforms and spectra, bandwidth comparison, modulator/demodulator functional blocks, methods and circuits, Angle Modulation (FM, PM): waveforms and spectra, power, bandwidth, modulation and demodulation methods | 2 | 9 | 2 | 2 |
| 3. Random processes and noise Random variables, Random processes Noise in analog modulation, SNR, and Figure of Merit, Power Spectral Density (PSD) | 1, 2 | 10 | 1 | 2 |
| 4. Digital Representation of Analog Signals Pulse code modulation (sampling, quantization, and binary encoding), Pulse modulation techniques (PAM, PWM, PPM) | 3 | 6 | 1 | 2 |
| 5. Introduction to Digital Communications Line coding, Transmission through band limited channels: ISI and pulse shaping, Model of a digital communication system Statistical characterization of digital signals in noise and BER analysis, M-ary modulation (M-ary ASK, PSK, FSK, QAM) | 4 | 9 | 1 | - |
| Total | | 39 | 06 | 06 |

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| Continuous Assessment | Laboratory Exercise 1: Random Variables and processes (ILO-1, 2) Laboratory Exercise 2: Study of Pulse code modulation (ILO-3) Laboratory Exercise 3: Study of Digital signals in Noise (ILO-4) Assignments (ILOs 1,2,3,4) Quizzes (ILOs 1,2,3,4) |
| | Continuous Assessment: 30% Laboratory exercises: 20% Assignment & Quiz: 10% End of Semester Examination (3 hours): 70% |
| Recommended Texts | [1] B.P. Lathi and Zhi Ding, <i>Modern Digital and Analog Communication Systems</i> , 4th ed., Oxford University Press, 2010. [2] S. Haykin and M. Moher, <i>Communication systems</i> , 5th ed., Hoboken, N.J.: J. Wiley, 2009. [3] S. Haykin, <i>Communication systems</i> , 4th ed., John Wiley, 2006. |

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| Module Code and Name | | EE3303 Power Electronics | | |
| Credits | 3 | Lectures | L (hrs) | 39 |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 06 |
| Semester | 5 | Lab / Field / Design work | P (hrs) | 06 |
| Prerequisite | None | Core (C)/Elective (E) | | C |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | |
| ILO-1: Describe the fundamental principles of power electronic devices | | | | |
| ILO-2: Identify applications of power electronics | | | | |
| ILO-3: Build and test power electronics devices and circuits | | | | |
| Course Content | | ILO | Allocated Hours | |
| | | | L | T |
| | | | P | |
| 1. Power electronic devices Rectifiers, Zener diodes, Silicon Control Rectifier (SCR), DIACs and TRIACs, Power MOSFETs, Uni-junction transistors | | 1 | 9 | 2 |
| 2. Power supplies and voltage regulators AC power controlling, Linear power supplies, Stabilization and protection circuits, Switching regulators, Switch mode power supplies, Uninterrupted power supplies, Design of buck, boost and buck-boost converters, Thermal management and heat sink calculations | | 2 | 18 | 2 |
| 3. Motor controlling Introduction to motors, AC, DC and BLDC motor control methods and their designs | | 3 | 12 | 2 |
| Total | | | 39 | 06 |
| Continuous Assessment | Laboratory Exercise 1: Mini Project (ILO-3) Assignments (ILOs 1,2) Quizzes (ILOs 1,2) | | | |
| | Continuous Assessment: | | 30% | |
| | Laboratory exercises: | | 20% | |
| | Assignment & Quiz: | | 10% | |
| | End of Semester Examination (3 hours): | | 70% | |
| Recommended Texts | [1] T. Bogart, <i>Electronic devices and circuits</i> , 6th ed. Prentice Hall, 2004. | | | |

| Module Code and Name | | EE3204 Applied Electromagnetics | | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------|----|----|
| Credits | 2 | Lectures | L (hrs) | 24 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | | |
| Semester | 5 | Lab / Field / Design work | P (hrs) | 12 | |
| Prerequisite | EE2201 Electromagnetics | Core (C)/Elective (E) | | C | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO-1: Apply Maxwell's equations for time varying electromagnetic fields and identify electromagnetic wave propagation. | | | | | |
| ILO- 2: Identify transmission lines and propagation of signals through twin lines and coaxial lines | | | | | |
| ILO-3: Identify metal waveguides and their properties in RF and microwave signal propagation | | | | | |
| ILO- 4: Demonstrate an understanding of different antennas and their uses | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Electromagnetic wave propagation Maxwell's equations for time varying fields, Wave equation for plane wave propagation in free space and in lossy media, Polarization, reflection and refraction of electromagnetic waves | | 1,2 | 6 | - | 3 |
| 2. Transmission Lines Twin lines and coaxial lines and their characteristics, Propagating waves and standing waves, Smith chart and impedance matching | | 2 | 6 | - | 3 |
| 3. Metal Waveguides TE and TM modes in rectangular metal waveguides, Electromagnetic field inside rectangular waveguides, Power transmitted through a lossless rectangular waveguide | | 3 | 6 | - | 3 |
| 4. Antennas and Radiation Basic antenna parameters, Dipole antenna, loop antenna and antenna arrays, Reflector antennas | | 4 | 6 | - | 3 |
| Total | | | 24 | - | 12 |
| Continuous Assessment | Laboratory Exercise 1: Antenna Operations & Radiation | | (ILO-4) | | |
| | Laboratory Exercise 2: Waveguides | | (ILO-3) | | |
| | Assignments (ILOs 1,2,3,4) | | | | |
| | Quizzes (ILOs 1,2,3,4) | | | | |
| Continuous Assessment: | | 30% | | | |
| Laboratory exercises: | | 20% | | | |
| Assignments & Quizzes: | | 10% | | | |
| End of Semester Examination (3 hours): | | 70% | | | |
| Recommended Texts | [1] J. Kraus and K. Carver, <i>Electromagnetics. Second edition</i> . New York, etc.: McGraw-Hill Book Co., 1973, pp. chapter 11-15. | | | | |
| | [2] J. Edminister and M. Nahvi, <i>Schaum's outlines electromagnetics</i> , 3rd ed. New York: McGrawHill, 2010, pp. Chapters 14-17. | | | | |

| Module Code and Name | | ID3302 Industrial Management II | | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|---------------------------------|-----------------|----|---|
| Credits | 3 | Lectures | L (hrs) | 38 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 14 | |
| Semester | 5 | Lab / Field / Design work | P (hrs) | - | |
| Prerequisite | ID2303 Industrial Management I | Core (C)/Elective (E) | | C | |
| <p>Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to:</p> <p>ILO-1: Describe the basic principles of micro-economics and macro-economics for decision making in marketing, production and investment.</p> <p>ILO-2: Interpret and make choices of alternative projects.</p> <p>ILO-3: Describe basic concepts and principles of organizational management and apply them to manage modern organizations.</p> <p>ILO-4: Identify the principles and practices of the primary areas of human resource management and industrial relations in organizations.</p> <p>ILO-5: Describe basic marketing concepts, theories and their applications.</p> <p>ILO-6: Illustrate the basic concepts and theories of management of technology and identify their usage in modern organizations and economy.</p> | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Economics Management - Part II | | | | | |
| 1.1. Money The importance, role and creation of money, The bank's multiplier, The circulation of money, bank rate and the velocity of money. | | 1 | 1 | | |
| 1.2. Taxation Taxation and money supply, Government expenditure, Types of taxation and effects of progressive taxation. | | 1 | 1 | | |
| 1.3. Public or Welfare Economics Involvement of Engineers in welfare economics, Public goods and funding of Public Schemes, Externalities | | 1 | 1 | | |
| 1.4. Inflation Definition of Inflation, Methods of control of inflation, Inflation and capital intensive works, Current purchasing power. | | 1 | 1 | 6 | - |
| 1.5. Project Appraisals Economic analysis of engineering projects, Raising of capital in the private and public sector, Basic concepts of economic appraisals, The effect of interest and service life on costs, Sensitivity of life forecasting, Interest rates and sensitivity, Effect of inflation and taxation. | | 2 | 1 | | |
| 1.6. Decision making on Cost-benefit analysis The sensitivity of cost benefit data, The market interest rate, Effect of change in future income, Effect of errors in construction estimates, Effect of taxation, depreciation and | | 1, 2 | 3 | | |

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| obsolescence, Comparison and selection of depreciation methods, Cost-benefit, analysis in public & private sectors. | | | | | |
| 2. Organization Management | | | | | |
| 2.1. The concept and role of organisations, Elements of an organisation, The description of management, Management functions, Management roles and levels of management, Functional areas of management, Managing change, Approaches to management | | 3 | 8 | 2 | |
| 3. Human Resources & Industrial Relations Management | | | | | |
| 3.1. Evolving HRM concepts, People and work, HR Planning process, Employee recruitment and development, Rewards and career planning, Industrial relations [IR] systems, Industrial conflict, Workplace relations | | 4 | 8 | 2 | |
| 4. Marketing Management | | | | | |
| 4.1. The nature of marketing, Marketing Philosophies, Marketing environment, Buyer behaviour, Market research, Marketing mix (7 Ps), Marketing strategies | | 5 | 8 | 2 | |
| 5. Technology Management | | | | | |
| 5.1. Technology and economic development, Key concepts of technology management, Technology and competitiveness, Innovation, Technology transfer | | 6 | 6 | 2 | |
| | | Total | 38 | 14 | |
| Continuous Assessment | Tutorials (ILOs 1, 2, 3, 4, 5, 6) Assignments (ILOs 3, 4, 5, 6) | | | | |
| Method of Assessment | Continuous Assessment: 30 % End of Semester Examination: 70 % | | | | |
| Recommended Texts | <ol style="list-style-type: none"> 1. Engineering Economics by Robert L. Michell, Publisher: John Wiley & Sons, ISBN 0 471 27619 7. 2. Engineering Economics by R. Paneerselvam, Publisher: Prentice Hall of India, ISBN 81-203-1743-2. 3. Economics for Engineers by T R Jain, M L Grover et al, Publisher: V K (India) Enterprises, ISBN 81-88597-60-0. 4. Engineering Economy by William G Sullivan, Elen M Wicks, C Patrick Koelling, Publisher: Prentice Hall, ISBN 013 614 2974 / ISBN 13: 9780136142973. 5. Management, by Stoner, J.A.F., Freeman, & Gilbert, D.R. Jr. Publisher: Prentice Hall of India, 6th Edition, 2007, ISBN: 81-203-0981-2. 6. Human Resource Management, by Ivancevich, J.M. Publisher: McGraw-Hill, 10th Edition, 2007, ISBN: 0073137111. 7. Marketing Management by Kotler, P. and Keller, K. Publisher: Prentice Hall; 13th Edition, 2008, ISBN: 978-0136009986. 8. Management of Technology, by Khalil, Tarek, Publisher: McGraw-Hill, 2009, ISBN: 9780070677371. | | | | |

| Module Code and Name | | CS3302 Data Structures and Algorithms | | |
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| Credits | 3 | Lectures | L (hrs) | 30 |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 05 |
| Semester | 5 | Lab / Field / Design work | P (hrs) | 25 |
| Prerequisite | None | Core (C)/Elective (E) | | C |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | |
| ILO 1: Implement and use common data structures | | | | |
| ILO 2: Implement and use basic sorting and searching algorithms | | | | |
| ILO 3: Analyze the complexity of basic algorithms | | | | |
| ILO 4: Select appropriate data structures and algorithms for a given situation | | | | |
| ILO 5: Apply basic algorithm design techniques for a given situation | | | | |
| Course Content | ILO | Allocated Hours | | |
| | | L | T | P |
| 1. Introduction (2 h) | | | | |
| 1.1. What is an Algorithm?, The Role of Algorithms in Computing (1 h) | 1 | 1 | - | - |
| 1.2. Iteration & Recursion (1 h) | 1 | 1 | - | 2.5 |
| 2. Sorting (4 h) | | | | |
| 2.1. Insertion Sort, Bubble Sort (2 h) | 2 | 2 | 0.5 | 2.5 |
| 2.2. Merge Sort (2 h) | 2 | 2 | - | 2.5 |
| 3. Complexity Analysis of Algorithms (4 h) | | | | |
| 3.1. Analyzing Algorithms and Asymptotic Notation (2 h) | 3 | 2 | 0.5 | - |
| 3.2. Analyzing Recurrences (2 h) | 3 | 2 | 0.5 | - |
| 4. Searching (1 h) | | | | |
| 4.1. Binary Search | 2 | 1 | 0.5 | 2.5 |
| 5. Basic Data Structures and Operations on them (14 h) | | | | |
| 5.1. Introduction to Abstract Data Types, Records, Dictionary, Arrays and Linked lists (2 h) | 1 | 2 | 0.5 | 5 |
| 5.2. Queues and Stacks, Implementing Queues and Stacks using Arrays and Linked Lists (2 h) | 1 | 2 | 0.5 | 2.5 |
| 5.3. Direct Access Tables, Hash Tables, Collision Avoidance in Hash Tables and Designing Hash Functions (2 h) | 1 | 2 | - | 2.5 |
| 5.4. Trees, Binary Trees, Binary Search Trees, Operations on Binary Search Trees (2 h) | 4 | 2 | - | 2.5 |
| 5.5. Introduction to Graphs and Searching in Graphs (2 h) | 4 | 2 | - | 2.5 |
| 5.6. Minimum Spanning Trees (2 h) | 4 | 2 | - | - |
| 5.7. Single-Source Shortest Path (2 h) | 4 | 2 | - | - |
| 6. Basic algorithm design techniques (4 h) | | | | |
| 6.1. Divide-and-Conquer Approach and Greedy Approach (2 h) | 5 | 2 | 0.5 | - |
| 6.2. Dynamic Programming (2 h) | 5 | 2 | 0.5 | - |
| 7. Introduction to NP-Completeness (1 h) | | | | |
| | 4 | 1 | 1 | - |

| | | Total | 30 | 5 | 25 |
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| Continuous Assessment | <p>Computer Laboratory Sessions</p> <ol style="list-style-type: none"> 1. Recursion (ILO 1) 2. Insertion and bubble sorting algorithms (ILO 2) 3. Merge sort algorithm (ILO 2) 4. Searching algorithms (ILO 2) 5. 1D and 2D arrays (ILO 1) 6. Abstract data types - List (ILO 1) 7. Hash table implementation (ILO 1) 8. Implementing stack and queue (ILO 1) 9. Tree data structure (ILO 4) 10. Graph data structure (ILO 4) <p>Quizzes (ILOs 1, 2, 3, 4 & 5)</p> | | | | |
| Method of Assessment | <ul style="list-style-type: none"> • Continuous Assessment: 50 % <ul style="list-style-type: none"> Laboratory Sessions: 40% Quizzes: 10% • End of Semester Examination (2h): 50 % | | | | |
| Recommended Texts | <ol style="list-style-type: none"> 1. Introduction to Algorithms (Third Edition or latest) by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, MIT Press, ISBN 9780262533058 | | | | |

| Module Code and Name | | EE3305 Communication Systems I | | | |
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| Credits | 3 | Lectures | L (hrs) | 39 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 06 | |
| Semester | 6 | Lab / Field / Design work | P (hrs) | 06 | |
| Prerequisite | EE3370 Communication Theory | Core (C)/Elective (E) | | C | |
| <p>Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to:</p> <p>ILO-1: Identify a variety of systems which enable subscribers to access different types of telecommunication services.</p> <p>ILO-2: Identify key features of different generations of access networks and associated standards.</p> <p>ILO-3: Compare the nature and capabilities of wired, wireless and optical access networks.</p> <p>ILO-4: Demonstrate awareness of the evolution of broadcasting, including new standards.</p> | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Wired access networks Digital subscriber loop (DSL) standards and services, T1 carrier system, SDH, ATM | | 1 | 5 | 1 | - |
| 2. Wireless Multiplexing/Multiple Access Techniques FDMA, TDMA, Spread Spectrum (CDMA and frequency hopping), Orthogonal Frequency Division Multiplexing (OFDM) | | 1 | 8 | 2 | 2 |
| 3. Wireless access networks Wireless channel characteristics and models, fixed and mobile wireless access systems, evolution of cellular systems to mobile broadband, wireless broadband networks, smart antenna systems, SDMA, MIMO | | 2 | 12 | 2 | 2 |
| 4. Optical communications and access networks Fundamentals of optical communications systems, Optical access networks; configurations and capabilities | | 3 | 8 | 1 | 2 |
| 5. Broadcast networks Evolution of broadcasting from analog to digital, Digital audio and video broadcasting; systems and standards | | 4 | 6 | - | - |
| Total | | | 39 | 06 | 06 |
| Continuous Assessment | Field Visit Assignments (ILOs 1,2,3,4) Quizzes (ILOs 1,2,3,4) | | | | |

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| | Continuous Assessment: 30% Assignments & Quizzes: 30% End of Semester Examination (3 hours): 70% |
| Recommended Texts | <p>[1] L. Goleniewski and K. Jarrett, <i>Telecommunications Essentials, Second Edition: The Complete Global Source</i>, 2nd ed. Addison Wesley Professional, 2006.</p> <p>[2] N. Benvenuto and M. Zorzi, <i>Principles of communications networks and systems</i>, 1st ed. Chichester, West Sussex, U.K.: Wiley, 2011.</p> <p>[3] A. Gokhale, <i>Introduction to telecommunications</i>, 2nd ed. Australia: CENGAGE Delmar Learning, 2005.</p> <p>[4] W. Tomasi, <i>Advanced electronic communications systems</i>, 6th ed. Upper Saddle River, N.J.: Pearson/Prentice Hall, 2004.</p> <p>[5] R. Ramaswami, G. Sasaki and K. Sivarajan, <i>Optical networks</i>, 3rd ed. Burlington, Mass.: Morgan Kaufmann Publishers, 2009.</p> |

| Module Code and Name | | EE3306 Control Systems | | | |
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| Credits | 3 | Lectures | L (hrs) | 38 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 6 | |
| Semester | 6 | Lab / Field / Design work | P (hrs) | 8 | |
| Prerequisite | EE2307 Signals and Systems | Core (C)/Elective (E) | | C | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO-1: Derive the model of a plant. | | | | | |
| ILO-2: Design a feedback control system for a plant | | | | | |
| ILO-3: Model and simulate control systems using Matlab and Simulink | | | | | |
| ILO-4: Analyse performance of control systems | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Plant Modelling, Response and Feedback Control Historical control systems, Open loop modelling of plant response: electrical and mechanical plants, Feedback control, Transfer function, Characteristic equation, Poles and zeros, Effect of a single feedback gain on poles and plant response. | | 1,2 | 10 | 2 | 2 |
| 2. Control systems design in time-domain Pole placement with Root Locus method, Design of second order control systems (rise time, settling time, overshoot, etc.), PID Controller, Matlab design and simulation. | | 3,4 | 12 | 2 | 2 |
| 3. Control systems design in frequency-domain Compensator design using Bode method (lead, lag and notch), Gain and Phase margins, Matlab design and simulation. | | 3,4 | 8 | 2 | 4 |
| 4. Implementation of Control systems Analog controllers using Op-amps, Digital controllers using microcontrollers | | 4 | 8 | - | |
| Total | | | 38 | 6 | 8 |
| Continuous Assessment | Laboratory Practical Sessions | | | | |
| | Mathematical modelling of physical systems | | (ILO-1,2) | | |
| | Linear time-invariant systems and representation | | (ILO-3,4) | | |
| | Performance of first order and second order system | | (ILO-3,4) | | |
| Design of PID controllers | | (ILO-3,4) | | | |
| Assignments | | (ILOs 1,2,4) | | | |
| Quizzes | | (ILOs 1,2,4) | | | |
| Continuous Assessment: | | 30% | | | |
| Laboratory exercises: | | 20% | | | |
| Assignments & Quizzes: | | 10% | | | |
| End of Semester Examination (3 hours): | | 70% | | | |
| Recommended Texts | [1] R. Munasinghe, <i>Classical Control Systems: Design and Implementation</i> . Narosa Publishing House, 2012, pp. Chapters 1, 2, 4, 5, 6, 7, 8, 9. | | | | |

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| Module Code and Name | | EE3307 Electrical Installations | | | |
| Credits | 3 | Lectures | L (hrs) | 39 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 6 | |
| Semester | 6 | Lab / Field / Design work | P (hrs) | 6 | |
| Prerequisite | None | Core (C)/Elective (E) | | C | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO-1: Describe the structure of IEE Wiring Regulations with respect to cable types and sizes, earthing systems, special installation requirements and apply them in electrical installation designs | | | | | |
| ILO-2: Distinguish the characteristics of different types of protective devices used in Electrical Installations, their principle of operation, advantages, and disadvantages | | | | | |
| ILO-3: Differentiate among electrical wiring systems in Domestic, Commercial, and Industrial applications | | | | | |
| ILO-4: Carry out inspection and testing in electrical installations | | | | | |
| ILO-5: Carry out a lighting design for a building environment | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Electrical Installations Introduction to Wiring Regulations: Structure of the 18th Edition of the IEE Wiring Regulations (BS 7671: 2018), its importance and applicability to Sri Lanka, Earthing systems: TT, TN, IT systems and their features, commonly used grounding arrangements, Electrical safety and protective measures: Safety of persons & livestock and Protection of equipment, Protection against direct and indirect contact, Protection against over current, Fuses, MCBs MCCBs ELCBs, RCCBs, Design criteria of electrical installations: Assessment of general characteristics of an electrical installation, Sizing and selection of cables, accessories, Rating factors, current rating, temperature dependence, voltage drop, Inspection, testing and certification: Basic Testing and commissioning of electrical installations, preparation of test reports., Earth resistivity measurements, ground resistance calculations, continuity and insulation testing, polarity checking, Power quality and Electromagnetic Compatibility, Building Management systems. | | 1,2,4 | 15 | 2 | 4 |
| 2. Domestic and Industrial Lighting Design Definition of terms: laws of illumination, Polar curves, Photometry, Luminous efficacy, Types of electric lamps, their operations: incandescent, electric arc, discharge, Illumination of surfaces: level of Illumination, selection of lamps and lighting design | | 5 | 12 | 2 | 2 |
| 3. Wiring Design Conventional symbols for domestic and industrial installations: lighting, socket outlets, rotating machines, transformers, Sketches and drawings of electric wiring circuits: layout diagrams, single line diagrams, conduit | | 3 | 12 | 2 | |

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| diagrams, Documentation: BOQs Technical Specifications, technical schedule, Preparation& use of: Tender documents, technical specifications and drawings, BOQs, contract documents, Wiring design using CAD -Use of a software package for electrical wiring design | | | | |
| | | Total | 39 | 6 |
| Continuous Assessment | Laboratory Exercise 1: Earth Electrode Resistance measurement (ILO-1,2,4) 2: Installation systems (TT & TN) and Protective devices (ILO-1,2,3,4) 3: Computer aided design of wiring and lighting in a building (ILO-05) Assignments (ILOs 01-05) Quizzes (ILOs 01,02,04) | | | |
| | Continuous Assessment: 40% Laboratory exercises: 20% Assignments & Quizzes: 20% End of Semester Examination (3 hours): 60% | | | |
| Recommended Texts | [1] V. Jain and A. Bajaj, <i>A Textbook of Design of Electrical Installations</i> . Laxmi Publications, 1993, p. 526. | | | |

| Module Code and Name | | EE3308 Electrical Machines and Drives I | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----------------------------------------|---------|----|
| Credits | 3 | Lectures | L (hrs) | 35 |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 10 |
| Semester | 6 | Lab / Field / Design work | P (hrs) | 10 |
| Prerequisite | None | Core (C)/Elective (E) | | C |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | |
| ILO-1: Operate a large generator and vary its output power within safe limits | | | | |
| ILO-2: Perform calculations of steady state behaviour of generators, three-phase transformers and three-phase and single-phase induction motors | | | | |
| ILO-3: Select appropriate starting, braking, or speed control equipment for a three-phase induction motor for a given application. | | | | |
| ILO-4: Select and apply synchronous generators, three phase transformers and three phase induction motors | | | | |
| ILO-5: Demonstrate knowledge of construction and operation of stepper motor drives. | | | | |
| Course Content | ILO | Allocated Hours | | |
| | | L | T | P |
| 1. Synchronous generators for bulk generation Constructional features of cylindrical rotor and salient pole rotor types, cooling, excitation, equivalent circuit, phasor diagram, power-angle characteristic, safe operation, turbine-governor characteristic, real power control, reactive power control, AVR, parallel operation, synchronizing, earthing. | 1,2 | 9 | 1 | - |
| 2. Three-phase transformers Construction of different types, vector group, per-unit equivalent circuit, characteristic, losses and efficiency, magnetization phenomena, unbalanced loading, parallel operation, tap changing, inrush current. | 2,3,4 | 6 | 4 | 4 |
| 3. Three-phase induction motors Construction of squirrel cage rotor and wound rotor types, equivalent circuits, torque characteristic, losses and efficiency, NEMA classes, testing, starting, braking, principles of speed control, operation as a generator | 3,4 | 10 | 2 | 6 |
| 4. Single-phase induction motors Construction, different types, equivalent circuit calculations, torque-speed characteristic, methods of speed control, applications, AC commutator motor (universal motor) (Moved from El Mcs) | 2 | 4 | 2 | |
| 5. Stepper motor drives Types of stepper motors, their constructions and operating principles, stepping sequence, torque characteristic, dynamic performance, operational constraints, drive systems, unipolar and bipolar excitation, closed loop operation (switch reluctance motor) | 5 | 6 | 1 | |
| Total | | 35 | 10 | 10 |

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| Continuous Assessment | Laboratory Exercise 1: Three phase transformer (ILOs 2,4) Laboratory Exercise 2: Asynchronous Induction motors (ILOs 1,3,4) Laboratory Exercise 3: Synchronous Machines (ILOs 1,3,4) Assignments (ILOs 1.2.3.4.5) Quizzes (ILOs 1,2,3,4,5) |
| | Continuous Assessment: 30% Laboratory exercises: 20% Assignment & Quiz: 10% End of Semester Examination (3 hours): 70% |
| Recommended Texts | [1] Fitzgerald, C. Kingsley and S. Umans, Electric machinery. Boston [etc.]: McGraw-Hill, 2005. [2] P. Bimbhra, Electrical machinery. Khanna. [3] A. Hughes and B. Drury, Electric Motors and Drives, 5th Edition, 7th ed. p. 511. |

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| Module Code and Name | | ID4301 Project Management | | |
| Credits | 3 | Lectures | L (hrs) | 34 |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 10 |
| Semester | 7 | Lab / Field / Design work | P (hrs) | 12 |
| Prerequisite | | Core (C)/Elective (E) | | C |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | |
| ILO-1: Execute a project planning using project management tools and techniques, | | | | |
| ILO-2: Produce project progress reports, | | | | |
| ILO-3: Use of leading project management software. | | | | |
| Course Content | | ILO | Allocated Hours | |
| | | | L | T |
| | | | P | |
| 1. Project Management Framework: Introduction to Project Management, Project Management Context and Project Management Process groups. | | 1 | 04 | |
| 2. Organization Types: Functional Organization, Matrix Organization, and Projectised Organization. | | 1 | 04 | |
| 3. Project Management Knowledge Areas: Integration Management, Project Scope, Time Management, Cost Management, Quality Management, Human Resource Management, Communication Management, Risk Management, Procurement Management and Code of Professional Conduct | | 1 & 2 | 18 | 10 |
| 4. Project Management Information Systems: Project Management Computer Based Tools and Techniques –Project Management Software | | 3 | 08 | 12 |
| | | Total | 34 | 10 |
| | | | 12 | |
| Continuous Assessment | 1. Preparation of project scope, project charter and work breakdown structure (WBS) (ILOs 1 & 2) 2. Preparation of project plan using computer software such as MS Project or Primavera (ILO-3) 3. Project Cost estimating, budgeting and cost control with special emphasis on Earned Value (EV) technique (ILO-1& 2) 4. Project risk management and project quality assessment – (ILOs 1& 2) 5. Completion of a project (ILOs 1& 2) | | | |
| Method of Assessment | Continuous Assessment: 30 % End of Semester Examination: 70 % | | | |
| Recommended Texts | 1. Project Management Institute, “Project Management Body of Knowledge”, 6th Edition, Project Management Institute Inc, USA 2. Greene, Jennifer, and Stellman, Andrew “Head First PMP”, Third Edition, O’Reilly Media, Inc, 2013 | | | |

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| Module Code and Name | | ID4202 Engineer in Society | | |
| Credits | 2 | Lectures | L (hrs) | 26 |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 08 |
| Semester | 7 | Lab / Field / Design work | P (hrs) | - |
| Prerequisite | None | Core (C)/Elective (E) | | C |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | |
| ILO-1: Discuss the functions and roles of an engineer | | | | |
| ILO-2: Characterize professional ethics, sustainability and cost-effectiveness in engineering design and practice | | | | |
| ILO-3: Apply engineering principles in handling societal and environmental issues with regard to engineering practice | | | | |
| ILO-4: Apply professional and ethical judgment in design and engineering obligations | | | | |
| ILO-5: Develop the ability to work as a team-member to handle complex engineering problems | | | | |
| Course Content | | ILO | Allocated Hours | |
| | | | L | T |
| | | | P | |
| 1. Engineering and Technology development | | | | |
| <ul style="list-style-type: none"> Brief description of the role of engineering and technology in society and how development took place from a historical perspective. A description of technology that goes beyond mere creation and use of artefacts. A holistic approach that encompasses transfer and understanding of technology in context. | | 1 | 4 | - |
| 2. Engineers' attributes | | | | |
| <ul style="list-style-type: none"> What an engineer's role is. Ability to apply knowledge and skills gained to solve engineering problems in a sustainable manner. Engineering education requirements to become a competent engineer. Acquiring 'softer skills': leadership; appreciation of different cultures and business practices; understanding of societal, economic, and environmental impacts of engineering decisions. | | 1, 2 | 4 | - |
| 3. Engineering as a profession | | | | |
| <ul style="list-style-type: none"> The concept of professions Introduction to Engineering Professional Bodies Importance of ethics in Science and Engineering Professional Competencies and Codes of Ethics Professional responsibilities of engineers | | 3, 4 | 4 | 3 |
| 4. Service learning in engineering | | | | |
| <ul style="list-style-type: none"> The necessity to '<i>situate their learning</i>' to be more effective and realistic. Ability to contextualise solutions and obtain feedback as a <i>reality check</i>. | | 3, 4 | 4 | 3 |

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| <p>5. Interdisciplinary approach</p> <ul style="list-style-type: none"> • Ability to work with a group that has different backgrounds and training. • To see others' perspective of a problem. Others will include not only specialists but also end-users such as farmers, industrial workers. | 4, 5 | 4 | - | - |
| <p>6. Sharing and dissemination of knowledge</p> <ul style="list-style-type: none"> • Ability to share and pass on knowledge among disparate groups of people not confined to subject specialists. To be able to understand an issue deeply and simplify it without misinterpreting, for general understanding. • Avoid use of unnecessary jargon and mathematical symbols when these can be expressed in simpler terms. | 2, 3 | 3 | - | - |
| <p>7. Engineering challenges in modern society</p> <ul style="list-style-type: none"> • Challenges faced by engineers in making the modern world • Assurance of public safety, health, and clean environment • Impact of human-induced climate change, greenhouse effects, and global warming • Energy efficiency and renewable energy | 2, 3, 4 | 3 | 2 | - |
| Total | | 26 | 8 | - |
| Continuous Assessment | <ol style="list-style-type: none"> 1. Presentation based on a case study with regard to code of ethics (Group activity) (ILOs 3, 4) 2. Report based on a case study project with regard to modern challenges and issues faced by engineers in handling complex engineering projects (Individual) (ILOs 2, 3, 4) 3. Presentation based on a problem identification that needs service-learning approach (Group activity) (ILOs 3, 4) | | | |
| Method of Assessment | Continuous Assessment: 30 % End of Semester Examination: 70 % | | | |
| Recommended Texts | <ol style="list-style-type: none"> 1. EmBeder, S., The Nature of Sustainable Development. Victoria: Scribe (1993) 2. Cramer, J. & Zegveld, W. C. L., The future role of technology in environmental management. Futures, 23, 5, 451-68 (1991). 3. R. Logeswaran, Hairul Azhar, Pau Kiu Nai, Sim Hock Kheng, "Engineers in Society", 2nd ed., McGraw-Hill, Malaysia, 2006. 4. Stephen Collins, John Ghey, Graham Mills, The Professional Engineer in Society: A Textbook for Engineering Students, Kingsley-London, 1989 5. Foong Pek Ling, et al, "Engineering Professionalism and Ethics", IEM, Malaysia, 4th Ed., 1995. 6. Rogene A. Buchholz, Alfred A. Marcus, James E. Post, "Managing Environmental Issues: A Casebook", Prentice Hall, Eaglewood Cliffs, New Jersey, 1992. | | | |

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| Module Code and Name | | EE4301 Robotics | | | |
| Credits | 3 | Lectures | L (hrs) | 35 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 10 | |
| Semester | 7 | Lab / Field / Design work | P (hrs) | 10 | |
| Prerequisite | None | Core (C)/Elective (E) | | C | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO-1: Describe different types of robots and their applications at present and future | | | | | |
| ILO-2: Describe industrial applications of robots and their significance in development | | | | | |
| ILO-3: Carry out static and differential kinematic analysis of a robot manipulator | | | | | |
| ILO-4: Design a trajectory planner and control system for a robot manipulator | | | | | |
| ILO-5: Implement force torque analysis of a constrained robot manipulator | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Introduction to Robotics Milestones of the developments of the robotics field, Various robots and their applications, Industrial robots and their contribution in automation. | | 1,2 | 5 | 1 | - |
| 2. Co-ordinate Transformation Relationship of position and orientation between two bodies, Position and orientation relationship between multiple bodies. | | 2,3 | 7 | 4 | 2 |
| 3. Manipulator Static Kinematics Denavit-Hartenberg parameters of robot manipulators, Forward and inverse kinematics of robot manipulators. | | 3 | 7 | 2 | 2 |
| 4. Manipulator Differential Kinematics Velocity relationship between joint variables and task-space variables, Determination of singularities. | | 2,3 | 6 | 2 | 3 |
| 5. Trajectory planning and control of robot manipulators Overall control system of robot manipulators, Joint space trajectory planning, major control scheme of robot manipulators. | | 4 | 5 | 1 | 3 |
| 6. Force Control of Manipulators Force-torque transformation of a robot manipulator, Control of force and torque at the end-effector. | | | 5 | - | - |
| Total | | | 35 | 10 | 10 |
| Continuous Assessment | Four Laboratory Practical Sessions (MatLab based) | | | | |
| | Continuous Assessment: | | 30% | | |
| | Laboratory exercises: | 20% | | | |
| | Assignment & Quiz: | 10% | | | |
| | End of Semester Examination (3 hours): | 70% | | | |
| Recommended Texts | [1] J. Craig, Introduction to robotics, 3rd ed. Upper Saddle Hall: Pearson Education International, 2005. | | | | |

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| Module Code and Name | | EE4302 Power Systems II | | | |
| Credits | 3 | Lectures | L (hrs) | 34 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 10 | |
| Semester | 7 | Lab / Field / Design work | P (hrs) | 12 | |
| Prerequisite | EE3310 Power Systems I | Core (C)/Elective (E) | | C | |
| <p>Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to:</p> <p>ILO-2: Explain and perform calculations related to frequency and voltage control of a power system</p> <p>ILO-3: Demonstrate knowledge of power system stability phenomena and use stability calculations to improve system performance</p> <p>ILO-4: Perform economic dispatch of generating units taking system constraints into consideration</p> <p>ILO-5: Calculate reliability indices and use them in power system planning</p> | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Introduction to power system protection Need for protection, requirements of protective relaying, unit and non-unit protection, primary and back-up protection, Transformer and generator protection | | 1,2 | 4 | 1 | - |
| 2. Transmission line protection, over current and distance protection | | | 6 | | |
| 3. Power system control Automatic load-frequency control, Dynamic model of a governor, concept of control area, droop settings, AVR and voltage control, voltage injection | | 2,3 | 6 | 4 | 3 |
| 4. Power System stability Steady state stability, power angle characteristics, effect of AVR and governor, Transient stability, swing equation, equal area criterion, step by step solution, Stability under contingencies, load shedding, voltage stability | | 3 | 6 | 2 | 3 |
| 5. Power system economics Economic operation of power systems, merit order dispatch, Use of Lagrange multipliers and penalty factors, load dispatch with system constraints, Power sector restructuring, horizontal and vertical unbundling, competition and regulation, international and local experience | | 2,3 | 6 | 2 | 3 |
| 6. Power system planning and reliability Long term planning, load forecasting methods, Probabilistic production costing, Reliability indices, SAIFI, SAIDI, LOLP and LOEP and their calculation. | | 4 | 6 | 1 | 3 |
| Total | | | 34 | 10 | 12 |

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| Continuous Assessment | <p>Laboratory Exercise 1: Field visit to a power plant to observe frequency control, governors and AVR (ILO-1,2,3)</p> <p>Laboratory Exercise 2: Calculation of load flow in reduced Sri Lankan Grid using MATLAB (ILO-1,2, 3)</p> <p>Laboratory Exercise 3: Field visit to a grid substation (ILO-2,3)</p> <p>Assignments (ILOs 1,2,3)</p> <p>Quizzes (ILOs 3,4)</p> |
| | <p>Continuous Assessment: 30%</p> <p>Laboratory exercises: 20%</p> <p>Assignments & Quizzes: 10%</p> <p>End of Semester Examination (3 hours): 70%</p> |
| Recommended Texts | <p>[1] J. Grainger and W. Stevenson, Power system analysis. New York, NY: McGraw Hill, 1994.</p> <p>[2] J. Blackburn and T. Domin, Protective Relaying, 4th Edition.</p> <p>[3] S. Nasar, Electric power systems. New York, N.Y: McGraw-Hill, 1990.</p> <p>[4] H. Wayne Beaty. and Surya Santoso., "Handbook of Electric Power Calculations, Fourth Edition", 4th ed. 2015.</p> <p>[5] J. Glover, M. Sarma and T. Overbye, Power system analysis and design, 5th ed. Stamford, CT: Cengage Learning, 2012.</p> |

| Module Code and Name | | EE4403 Final Year Project (Part I) | | | |
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| Credits | 4 | Lectures | L (hrs) | 10 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | - | |
| Semester | 7 | Project work (Equivalent Weeks) | | 4 | |
| Prerequisite | None | Core (C)/Elective (E) | | C | |
| <p>Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to:</p> <p>ILO-1: Apply the process of scientific research, techniques, and rationalisation</p> <p>ILO-2: Conduct a research study on a topic of interest using appropriate techniques and resources</p> <p>ILO-3: Incorporate the outcomes of the research in an appropriate manner during the development phase</p> <p>ILO-4: Demonstrate independent learning and technical presentation ability through research project presentation and proposal/report writing</p> <p>ILO-5: Demonstrate the ability to solve an engineering problem for improvement including cost, efficiency and innovation</p> | | | | | |
| Course Content / Description | | ILO | Allocated Hours | | |
| | | | L | T | P |
| <p>1. Problem Identification (research and development) The exercise will start with a problem identification which can be done individually or as a group usually two, but not more than four (4) students in consultation with a supervisor. The whole process will be under the supervision and control of an academic staff member who is appointed as the Final Year Project Coordinator by the Department. Each group will identify and solve an engineering problem which can be realistically achieved within two semesters.</p> | | 1,5 | 4 | - | 30 |
| <p>2. Project proposal formulation The project, which comprises of both research as well as engineering development, will be identified and agreed between the students and a supervisor. This will take into account the type, amount, and level of research and engineering development work required and the resources available to complete the task. The nature of the project must demonstrate the students' ability at the Honours Graduate level.</p> <p>Within the first four weeks, the student is expected to carry out a literature survey, formulate clear aims and objectives, and start developing a formal project proposal which must be submitted for the first evaluation at the end of week #4. This can be based on the initial proposal accompanied by presentations made by each student, which will be individually evaluated.</p> | | 1,4 | 2 | - | 20 |
| <p>3. Project implementation and demonstration The progress of the students will be monitored on a regular basis by the supervisors through weekly meetings and the project coordinator will organize mid progress review meetings for formal evaluations through presentations and demonstration of work depending on the developments accomplished in week #9.</p> | | 2,3,5 | 2 | - | 80 |

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| <p>4. Project reporting and presentation</p> <p>The final evaluation of the first (7th) semester may include a formal report, a presentation, and a demonstration of developments up to that time. All presentations will be individually assessed.</p> <p>The final marks will consist of all assessment components evaluated by the panels as well as by the supervisor(s). All assessment steps will be conducted under the direct control and supervision of the Final Year Project Coordinator of the Department.</p> | | 4 | 2 | - | 10 | | | | | | | | | | | | | | | |
| Total (minimum) per semester | | | 10 | - | 140 | | | | | | | | | | | | | | | |
| Continuous Assessment | <ol style="list-style-type: none"> 1. Proposal presentation (week #4) 2. Project proposal submission (week#5) 3. Mid-Progress Review presentations should be conducted in (week#9) and students should do individual presentations of their sections 4. Project completion and demonstration (Part I) - individual presentations (Week #13) 5. Project report for the completion of work in Part I (Week #15) | | | | | | | | | | | | | | | | | | | |
| Method of Assessment | <table style="width: 100%; border: none;"> <tr> <td style="width: 60%;">Proposal presentation/proposal review:</td> <td style="width: 20%;">20%</td> <td style="width: 20%;"></td> </tr> <tr> <td>Mid-Progress Review:</td> <td>10%</td> <td></td> </tr> <tr> <td>Project (Part I completion) Presentation:</td> <td>25%</td> <td></td> </tr> <tr> <td>Project (Part I) Demonstration:</td> <td>25%</td> <td>(Total 100%)</td> </tr> <tr> <td>Project (Part I) Report:</td> <td>20%</td> <td></td> </tr> </table> | | | | | Proposal presentation/proposal review: | 20% | | Mid-Progress Review: | 10% | | Project (Part I completion) Presentation: | 25% | | Project (Part I) Demonstration: | 25% | (Total 100%) | Project (Part I) Report: | 20% | |
| Proposal presentation/proposal review: | 20% | | | | | | | | | | | | | | | | | | | |
| Mid-Progress Review: | 10% | | | | | | | | | | | | | | | | | | | |
| Project (Part I completion) Presentation: | 25% | | | | | | | | | | | | | | | | | | | |
| Project (Part I) Demonstration: | 25% | (Total 100%) | | | | | | | | | | | | | | | | | | |
| Project (Part I) Report: | 20% | | | | | | | | | | | | | | | | | | | |
| Recommended Texts | <ol style="list-style-type: none"> 1. Walliman, Nicholas, Your undergraduate dissertation: the essential guide for success, 2nd ed. Sage Publications, London, 2014 2. Wisker, Gina. The undergraduate research handbook, Palgrave Macmillan, New York, 2009 3. Walliman, Nicholas. Your research project a step by step guide for the first-time researcher, Vistaar publications, New Delhi, 2005 | | | | | | | | | | | | | | | | | | | |

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| Module Code and Name | | EE4406 Final Year Project (Part II) | | | |
| Credits | 4 | Lectures | L (hrs) | 10 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | - | |
| Semester | 8 | Project work (Equivalent Weeks) | | 4 | |
| Prerequisite | None | Core (C)/Elective (E) | | C | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO-1: Incorporate the outcomes of the research in an appropriate manner during the development phase | | | | | |
| ILO-2: Demonstrate the ability to solve an engineering problem for improvement including cost, efficiency and innovation. | | | | | |
| ILO-3: Demonstrate independent learning and technical presentation ability through research project presentation and report writing | | | | | |
| Course Content / Description | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Project implementation and demonstration The students will continue their work according to the project proposal and the implementation plan developed in semester 7. The progress of the students will be monitored on a regular basis by the supervisors through weekly meetings and the project coordinator will organize two mid progress review meetings for formal evaluations through presentations and demonstration of work depending on the developments accomplished (week#5 and week#9) | | 1,2 | - | - | 90 |
| 2. Project closing and product development/articulate research findings The second (8 th) semester work will be targeted towards implementation of the proposed plan and complete the project. The product or research findings will be finalised and students will prepare for the final phase of the project, completing design and construction of a working prototype, which would be ready for demonstration by the end of the semester. | | 2 | 8 | - | 30 |
| 3. Project reporting and presentation On completion of the project, the student will be expected to submit a comprehensive report or a research paper accepted for publication by a journal or a conference (whichever deemed sufficient by the Department), make a 10 – 15 minutes oral presentation of the work carried out, and demonstrate the development to a panel of at least two subject experts including the project supervisor. The final mark will consist of all assessment components evaluated by the panels as well as by the supervisor(s). All assessment steps will be conducted under the direct control and supervision of the Final Year Project Coordinator of the Department. | | 3 | 2 | - | 20 |
| Total (minimum) per semester | | | 10 | | 140 |

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| Continuous Assessment | <ol style="list-style-type: none"> 1. Mid-Progress Review presentations should be conducted in (week#5 and week#9) and students should do individual presentations of their sections 2. Project completion and demonstration - individual presentations (Week #13) 3. Project report for the completion of work (Week #15) | | | | | | | | | | | | | | |
| Method of Assessment | <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Mid-Progress Review#1 (week#5):</td> <td style="width: 10%;">10%</td> <td style="width: 20%;"></td> </tr> <tr> <td>Mid-Progress Review#2 (week#9):</td> <td>10%</td> <td></td> </tr> <tr> <td>Project Completion Presentation:</td> <td>20%</td> <td></td> </tr> <tr> <td>Project Completion Demonstration:</td> <td>40%</td> <td rowspan="2" style="text-align: right; vertical-align: middle;">(Total 100%)</td> </tr> <tr> <td>Project Completion Report/Publication:</td> <td>20%</td> </tr> </table> | Mid-Progress Review#1 (week#5): | 10% | | Mid-Progress Review#2 (week#9): | 10% | | Project Completion Presentation: | 20% | | Project Completion Demonstration: | 40% | (Total 100%) | Project Completion Report/Publication: | 20% |
| Mid-Progress Review#1 (week#5): | 10% | | | | | | | | | | | | | | |
| Mid-Progress Review#2 (week#9): | 10% | | | | | | | | | | | | | | |
| Project Completion Presentation: | 20% | | | | | | | | | | | | | | |
| Project Completion Demonstration: | 40% | (Total 100%) | | | | | | | | | | | | | |
| Project Completion Report/Publication: | 20% | | | | | | | | | | | | | | |
| Recommended Texts | <ol style="list-style-type: none"> 1. Walliman, Nicholas, Your undergraduate dissertation: the essential guide for success, 2nd ed. Sage Publications, London, 2014 2. Wisker, Gina. The undergraduate research handbook, Palgrave Macmillan, New York, 2009 3. Walliman, Nicholas. Your research project a step by step guide for the first-time researcher, Vistaar publications, New Delhi, 2005 | | | | | | | | | | | | | | |

| Module Code and Name | | ID4203 Entrepreneurship & Intellectual Property | | | |
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| Credits | 2 | Lectures | L (hrs) | 27 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 06 | |
| Semester | 8 | Lab / Field / Design work | P (hrs) | - | |
| Prerequisite | ID3302 Industrial Management II | Core (C)/Elective (E) | | C | |
| <p>Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to:</p> <p>ILO-1: Describe the competencies required to commence own enterprise with confidence after few years of industry experience.</p> <p>ILO-2: Apply the basic aspects related to entrepreneurship for establishment of an enterprise including protection of IPR.</p> <p>ILO-3: Work within the scope of product (or service) cycles including accessing technology and collaboration.</p> <p>ILO-4: Apply IPR and related laws and conventions on Patents, Industrial Designs, Trademarks etc.</p> | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| <p>1. Engineer as a Job Seeker or a Job Provider</p> <ul style="list-style-type: none"> Is the graduate Engineer to continue his traditional role as a Job Seeker OR start a new role as an Entrepreneur? What are the proficiencies needed, in addition to engineering competencies, to become an entrepreneur? | | 1 | 1 | - | - |
| <p>2. Establishing an Enterprise</p> <ul style="list-style-type: none"> Scope of the enterprise Business plan, Economic viability, Financial feasibility, Sensitivity analysis, Availability of Technology and its relevance, Infrastructure Starting up an enterprise: Registration and approvals needed | | 1, 2 | 3 | - | - |
| <p>3. Economic Viability</p> <ul style="list-style-type: none"> Method of investment, return on investment, need for profit Cost components: Cost of Production - Raw materials, Labour, Machinery and Equipment, Overhead costs, Cost of Technology, Cost of marketing Taxes and other statutory liabilities, need for maintaining accounts etc., Basic labour laws and regulations Profit margin and scale of operation, Expansion of sales, Marketing and Product strategies | | 2 | 4 | 1 | - |
| <p>4. Financial feasibility</p> <ul style="list-style-type: none"> How to Finance Cash flow, Payback period, Grace period, Depreciation, Present value, net annual value, etc., Sales and collection of money | | 2 | 3 | 1 | - |

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| 5. Operational Procedures <ul style="list-style-type: none"> Acquiring of plant and machinery/ raw materials Financing through Bank loans –procedures & documentation Obtaining Venture capital: for what and how? Recruitment, training, development of human resources Adherence to Labour laws, Factory & Safety regulations Approvals from local authorities, Disposal of waste, Cleaner production | | 2, 3 | 4 | 1 | - |
| 6. Competitiveness and market share <ul style="list-style-type: none"> Need for continuous improvement of the product / service with ‘Innovations’ and ‘Inventions’ Providing for fluctuations of demand to remain in business | | 3 | 2 | - | - |
| 7. Introduction to Intellectual Property <ul style="list-style-type: none"> Copy rights and Industrial rights, IP related laws and conventions, WIPO etc., Patents, definition of Novelty, Invention and Innovation Industrial Designs, Trademarks and Geographical indications Protections offered by IP, ownership of inventions etc, Infringement on Patent and other rights Acquiring of such rights by enterprises / industries Creative Commons license | | 2, 4 | 4 | 1 | - |
| 8. Need and use of Inventions & Innovations for enterprise <ul style="list-style-type: none"> Ability to see across disciplines and integrate knowledge to find solution to novel situations. Threats and competition from local and foreign competitors, Improving productivity, upgrading product Cost of purchase of Technology Patent as a source of latest technology Technology available in Live/Dormant/Sleeping Patents | | 4 | 4 | 1 | - |
| 9. Patents-Understanding, Drafting, Obtaining Patent rights <ul style="list-style-type: none"> Inventions and Patents, Inventor describing the invention through patent document Ownership of a patent Drafting a patent Submitting the Patent application, search report (PCT application), relevant fees, examination | | 4 | 2 | 1 | - |
| Total | | | 27 | 06 | - |
| Continuous Assessment | Assignment 1 | (ILO-1) | | | |
| | Assignment 2 | (ILO-2) | | | |
| | Assignment 3 | (ILO-3) | | | |
| | Assignment 4 | (ILO-4) | | | |
| Method of Assessment | Continuous Assessment: | | 30 % | | |
| | End of Semester Examination: | | 70 % | | |

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| Recommended Texts | <ol style="list-style-type: none">1. Sri Lanka: Intellectual Property Act No. 36 of 20032. Shane, S. (2003). A general theory of entrepreneurship: The individual-opportunity nexus. Cheltenham, UK: E. Elgar. ISBN: 978 1 84376 382 6, ISBN: 978 1 84376 996 5, eISBN: 978 1 78100 799 03. Stim, R. (2018). Patent, copyright & trademark: An intellectual property desk reference. ISBN-13: 978-1413316803, ISBN-10: 1413316808 |
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| Module Code and Name | | ID4204 Industrial Law | | | | | | | |
| Credits | 2 | Lectures | L (hrs) | 27 | | | | | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 06 | | | | | |
| Semester | 7 | Lab / Field / Design work | P (hrs) | - | | | | | |
| Prerequisite | None | Core (C)/Elective (E) | | C | | | | | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | | | | | |
| ILO-1: Demonstrate the basic knowledge of legal system of Sri Lanka , Structure of the court system. | | | | | | | | | |
| ILO-2: Demonstrate the essential knowledge of contract law and apply the legal principles of a valid contract to a given factual situation. | | | | | | | | | |
| ILO-3: Explain the factories ordinance and its importance. | | | | | | | | | |
| ILO-4: Demonstrate the knowledge of basics of employment law of Sri Lanka.. | | | | | | | | | |
| Course Content | | ILO | Allocated Hours | | | | | | |
| | | | L | T | P | | | | |
| 1. Introduction to legal systems and Court system of Sri Lanka | | 1 | 4 | 1 | - | | | | |
| <ul style="list-style-type: none"> • Salient features of Roman Dutch law, and English law; • Sources and applicability of Kandyan Law, Tesawalamai Law and Muslim Law; • What is known as Common Law and Special Laws; • Structure and jurisdictions of the Court System of Sri Lanka. | | | | | | | | | |
| 2. Nature and types of contracts | | | | | | 2 | 5 | 2 | - |
| <ul style="list-style-type: none"> • Fundamentals of Contract Law; • Application of legal principles of contract law | | | | | | | | | |
| 3. Employment Law | | 2 | 4 | 1 | - | | | | |
| <ul style="list-style-type: none"> • Nature of the contract of employment and types of employment | | | | | | | | | |
| 4. Factories Ordinance | | 3 | 3 | 1 | - | | | | |
| <ul style="list-style-type: none"> • Registration of factories • Provisions relating to health, safety and welfare | | | | | | | | | |
| 5. Settlement of industrial disputes | | 3 | 4 | 2 | - | | | | |
| <ul style="list-style-type: none"> • Industrial Dispute Act • Modes of settlement of industrial disputes | | | | | | | | | |
| 6. Termination of employment | | 4 | 2 | 2 | - | | | | |
| <ul style="list-style-type: none"> • Termination of the contract of employment • Consequences of illegal termination | | | | | | | | | |
| 7. Trade unions | | 4 | 2 | 2 | - | | | | |
| <ul style="list-style-type: none"> • Trade Union Ordinance • Rights and privileges of registered trade unions | | | | | | | | | |
| 8. Legislation on terms and conditions of employment | | 4 | 3 | - | - | | | | |
| <ul style="list-style-type: none"> • Law relating to wages, social security, compensation, retirement benefits etc. | | | | | | | | | |
| | | Total | 27 | 6 | - | | | | |

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| Continuous Assessment | Assignment 1 (ILO-1) Assignment 2 (ILO-2) Assignment 3 (ILO-3) Assignment 4 (ILO-4) |
| Method of Assessment | Continuous Assessment: 30 % End of Semester Examination: 70 % |
| Recommended Texts | <ol style="list-style-type: none"> 1. Cooray, LJM., An Introduction to the Legal System of Sri Lanka, Pannipitiya: Stamford Lake (Pvt) Ltd., 2003 2. Weerasooria W., Commercial Law, PIM, University of Sri Jayawardanapura, 2010 3. Anson's Law of Contract by Beatson, Publisher: Oxford University Press, 29th Edition 2010, ISBN-13: 0199282471 4. Silva, De S. R, The Contract of Employment, The employers' federation of Ceylon 5. Silva, De S. R, The Law of Dismissal, The employers' federation of Ceylon 6. Labour Law and Relations by Arosha S. Adikaram, Publisher: Stanford Lake Publishers, 2012, ISBN - 97895565811 |

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| Module Code and Name | | EE4304 Communication Systems II | | | |
| Credits | 3 | Lectures | L (hrs) | 39 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 06 | |
| Semester | 8 | Lab / Field / Design work | P (hrs) | 06 | |
| Prerequisite | EE3374 Communication Systems I | Core (C)/Elective (E) | | C | |
| <p>Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to:</p> <p>ILO-1: Design microwave links for terrestrial and satellite communication systems</p> <p>ILO-2: Demonstrate knowledge on the principles of radar and electronic navigation systems</p> <p>ILO-3: Describe optical transmission techniques and devices</p> <p>ILO-4: Identify how the core network in telecommunication supports global connectivity between services, content and subscribers</p> | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Microwave communication systems Microwave communication systems and components, Terrestrial Microwave link design, Satellite communications and link design, Applications of satellite and terrestrial microwave communication. | | 1,2 | 10 | 2 | 4 |
| 2. Radar and Navigation Navigational aids for aircraft, Satellite-based navigation systems, Radar systems. | | 2,3 | 10 | 2 | |
| 3. Optical transmission Optical devices and techniques for high speed transmission, Standards and capabilities. | | 3 | 9 | | 2 |
| 4. Core networks Core network architecture, multiplexing and transmission hierarchies, High speed switching technologies, Convergence of services; voice and video over packet switching | | 4 | 10 | 2 | |
| Total | | | 39 | 06 | 06 |
| Continuous Assessment | Assignments (ILOs 1,2,3) Quizzes (ILOs 3,4) | | | | |
| | Microwave Laboratory I, II (ILO 1, 2) Optical communication laboratory (ILO 3) | | | | |
| | Continuous Assessment: 30% Laboratory exercises 20% Assignment & Quiz: 10% | | | | |
| | End of Semester Examination (3 hours): | | 70% | | |

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| Recommended Texts | <p>[1] L. Goleniewski and K. Jarrett, <i>Telecommunications Essentials, Second Edition: The Complete Global Source</i>, 2nd ed. Addison Wesley Professional, 2006.</p> <p>[2] N. Benvenuto and M. Zorzi, <i>Principles of communications networks and systems</i>. Chichester, West Sussex, U.K.: Wiley, 2012.</p> <p>[3] A. Gokhale, <i>Introduction to telecommunications</i>, 2nd ed. Australia: Thomson/Delmar Learning, 2005.</p> <p>[4] W. Tomasi, <i>Advanced electronic communications systems</i>, 6th ed. Upper Saddle River, N.J.: Pearson/Prentice Hall, 2004.</p> <p>[5] R. Ramaswami and K. Sivarajan, <i>Optical networks</i>. San Francisco, Calif.: Kaufmann, 2002.</p> |
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| Module Code and Name | | EE4305 Mechatronics Applications | | | |
| Credits | 3 | Lectures | L (hrs) | 35 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 10 | |
| Semester | 8 | Lab / Field / Design work | P (hrs) | 10 | |
| Prerequisite | None | Core (C)/Elective (E) | | C | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO-1: Input and output analog and digital signals to and from a microcontroller | | | | | |
| ILO-2: Program a control algorithm onto a microcontroller | | | | | |
| ILO-3: Interface sensors and actuators to a microcontroller | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Introduction to Mechatronics Electromechanical systems, Basics on system modelling and control, Applications of mechatronics | | 1,2 | 6 | 1 | - |
| 2. Data Acquisition Sampling and Zero order hold, ADC and DAC, Noise and signal conditioning. | | 2,3 | 8 | 4 | 2 |
| 3. Sensor Interfacing Properties of sensors, Principle of operation of IR range sensor, Ultrasonic sensor, and a temperature sensor, Interfacing sensors to a microcontroller. | | 3 | 7 | 2 | 2 |
| 4. Actuator Control Basic features of actuators and their specific applications, Principle of operation of DC, servo and stepper motors, Control of DC, Stepper, and Servo motors. | | 2,3 | 7 | 2 | 3 |
| 5. Mechatronic System Design Controller implementation using Opamps, Digital approximation of analog controllers. | | 2 | 6 | 1 | 3 |
| Total | | | 35 | 10 | 10 |
| Continuous Assessment | Three Lab Exercises | | | | |
| | Continuous Assessment: 30% | | | | |
| | Laboratory exercises: 20% | | | | |
| | Assignment & Quiz: 10% | | | | |
| | End of Semester Examination (3 hours): 70% | | | | |
| Recommended Texts | [1] W. Bolton, <i>Mechatronics</i> . Harlow: Pearson, 2010. | | | | |

| Module Code and Name | | ID5101 Introduction to English Literature | | |
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| Credits | 1 | Lectures | L (hrs) | 13 |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 04 |
| Semester | 3 / 5 / 7 | Lab / Field / Design work | P (hrs) | - |
| Prerequisite | None | Core (C)/Elective (E) | | E |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | |
| ILO-1: Describe the background knowledge necessary to study English Literature. | | | | |
| ILO-2: Identify the different genres and their structure. | | | | |
| ILO-3: Distinguish the language skills necessary for appreciation. | | | | |
| ILO-4: Use reading skills necessary for effective study of literary texts. | | | | |
| Course Content | ILO | Allocated Hours | | |
| | | L | T | P |
| 1. Introduction Different forms of texts and genres including novels, short stories (<i>Setting, Plot, Characters, Narrative structure, Techniques etc</i>), poetry (<i>Elegy, Sonnet, Ballad, Ode Lyrics</i>), and Acquaint with the skills required in literature studies. | 1, 2 | 1 | - | - |
| 2. Poetry <ul style="list-style-type: none"> • William Shakespeare - Shall I Compare thee to a Summer's day • William Wordsworth - Daffodils • Robert Herrick - To Daffodils • William Blake - The Poison Tree, Clod and Pebble • Anne Ranasinghe - On the Beach • Kamala Wijeratne - The White Saree • Suresh Canagarajah - Let life go on | 2, 3, 4 | 6 | 2 | - |
| 3. Short Stories <ul style="list-style-type: none"> • Oscar Wilde - The Nightingale and the Rose • Punyakante Wijenayake - The Hut • Nirmali Hettiarachchi - The Competition • Maureen Seneviratne - Reunion | 2, 3, 4 | 6 | 2 | - |
| Total | | 13 | 4 | - |
| Continuous Assessment | Discussion / Group tasks / Presentations | | | |
| Method of Assessment | Continuous Assessment: | | 30 % | |
| | End of Semester Examination: | | 70 % | |
| Recommended Texts | <ol style="list-style-type: none"> 1. An Outline History of English Literature by W.H. Hudson, Publisher: Atlantic Publishers & Dist, 1999 ISBN- 8171568459, 9788171568451 2. History Of English Literature by E. Albert Publisher: Oxford University Press, ISBN- 978019562240,978-0195612240 3. A Glossary of Literary Terms by M.H. Abrams, Geoffrey Galt Harpham Publisher: Michael Rosenberg, ISBN-13-978-0-459-89802-3 4. A selection of Modern Sri Lankan Poetry in English by Rajiva Wijesinha Publisher: International Book House,2006, ISBN-9558975338, 5. A selection of Sri Lankan Short Stories in English edited by Dinali Fernando and Rajiva Wijesinghe, Publisher: International Book House, 1992, ISBN 955897532X | | | |

| Module Code and Name | | ID5102 Poetry and Short Stories | | |
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| Credits | 1 | Lectures | L (hrs) | 13 |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 04 |
| Semester | 3 / 5 / 7 | Lab / Field / Design work | P (hrs) | - |
| Prerequisite | None | Core (C)/Elective (E) | | E |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | |
| ILO-1: Respond personally to the text: feelings, characters, events, scenes, settings. | | | | |
| ILO-2: Confidently read and appreciate a range of literary text. | | | | |
| ILO-3: Describe contextual meaning of a literary work. | | | | |
| ILO-4: Trace development of character. | | | | |
| Course Content | ILO | Allocated Hours | | |
| | | L | T | P |
| 1. Introduction <ul style="list-style-type: none"> Brief overview of the craft and culture of poetry and short story; introduction to a range of poetry and variety of short texts written in English and short stories translated into English | 1 | 1 | - | - |
| 2. Poetry <ul style="list-style-type: none"> William Blake - The Garden of Love, London William Wordsworth- The Solitary Reaper, The Rainbow P.B. Shelley- Ozymandias John Keats- Ode to Autumn Alfred Lord Tennyson- The Charge of the Light Bridge | 2, 3, 4 | 6 | 2 | - |
| 3. Short Stories <ul style="list-style-type: none"> O. Henry- The Gift of the Magi James Joyce - Eveline Saki- Open Window | 2, 3, 4 | 6 | 2 | - |
| Total | | 13 | 4 | - |
| Continuous Assessment | Discussion / Group tasks / Presentations | | | |
| Method of Assessment | Continuous Assessment: | 30 % | | |
| | End of Semester Examination : | 70 % | | |
| Recommended Texts | <ol style="list-style-type: none"> English Romantic Poetry: An Anthology by Stanley Appelbaum, Publisher: Dover, 1996, ISBN-9780486292823 Dubliners -Eveline's state of paralysis with special regard to her different roles she had to play as a women. By Florian Wenz, Publisher: Books on demand GmbH, Norderstedt Germany, ISBN- 978-3-656-17839-2 The Pit and the Pendulum & Other Stories by Edgar Allan Poe, James Prunier, Publisher: Viking, 1999, ISBN-9780670887255 | | | |

| Module Code and Name | | ID5103 English Novels | | |
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| Credits | 1 | Lectures | L (hrs) | 13 |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 04 |
| Semester | 3 / 5 / 7 | Lab / Field / Design work | P (hrs) | - |
| Prerequisite | None | Core (C)/Elective (E) | | E |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | |
| ILO-1: Describe how texts are related to social and cultural categories | | | | |
| ILO-2: Describe the approaches and techniques of novels. | | | | |
| ILO-3: Describe contextual meaning of a literary work. | | | | |
| ILO-4: Develop a deeper sense of the nature of classical literature. | | | | |
| Course Content | ILO | Allocated Hours | | |
| | | L | T | P |
| 1. Introduction to Novels | 1, 2 | 1 | - | - |
| 2. English Novels | | | | |
| <ul style="list-style-type: none"> Charles Dickens - Great expectations / Oliver Twist (OR) Jane Austen - Pride and Prejudice | 3, 4 | 6 | 2 | - |
| <ul style="list-style-type: none"> George Orwell – Animal Farm (OR) Anita Desai - The Village by the sea | 3, 4 | 6 | 2 | - |
| Total | | 13 | 4 | - |
| Continuous Assessment | Discussion / Group tasks / Presentations | | | |
| Method of Assessment | Continuous Assessment: | | 30 % | |
| | End of Semester Examination: | | 70 % | |
| Recommended Texts | <ol style="list-style-type: none"> How to Study a Novel by John Peck Published: Macmillan, 1995 Edition: 2, illustrated ISBN- 0333639944, 9780333639948 How to study a Charles Dickens novel by Keith Selby Published: Macmillan Education, 1989 ISBN- 0333467280, 9780333467282 How to Study a Jane Austen Novel by Vivien Jones Published: Palgrave MacMillan, 1997, ISBN- 0333670744, 9780333670743 | | | |

| Module Code and Name | | ID5211 Climate Change | | |
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| Credits | 2 | Lectures | L (hrs) | 24 |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 06 |
| Semester | 4 / 6 / 8 | Lab / Field / Design work | P (hrs) | 06 |
| Prerequisite | None | Core (C)/Elective (E) | | E |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | |
| ILO-1: Describe the causes and evidence of climate change and the possible impacts of climate change | | | | |
| ILO-2: Explain the basic principles of carbon economy, carbon print and greenhouse gas emissions inventories. | | | | |
| ILO-3: Explore and analyse both technological and policy responses to the challenge of climate change. | | | | |
| Course Content | ILO | Allocated Hours | | |
| | | L | T | P |
| 1. Basics of Climate Change <ul style="list-style-type: none"> • Introduction to Weather and Climate • Understanding Climate Change Through Time • Climate Variability and Sensitivity • Atmospheric and Oceanic Circulations • The Greenhouse Gases and Greenhouse Effect CO₂, CH₄, NO₂, CFC₁₁, CFC₁₂, H₂O. | 1 | 4 | 1 | - |
| 2. Global Climate Change: The Evidence <ul style="list-style-type: none"> • Extreme Climate Change in the Past • The Role of Living Things • The climate change and Human impacts • Vulnerability to climate change impacts • Vulnerable groups | 1 | 4 | 1 | - |
| 3. Causes of Climate Change <ul style="list-style-type: none"> • Emissions of Green House Gases • Drivers of climate change • Human development activities • Radioactive Forcing • Volcanic eruption • Population growth • Deforestation • Forest fire etc. | 2 | 4 | 1 | - |
| 4. Climate Change Predictions and Impacts <ul style="list-style-type: none"> • The Environmental and Socio-Economic Impacts of Climate Change • Global Warming • Sea Level Rise • Biodiversity loss • Drought • Flood • Extreme weather conditions (El - Nino, La- Nino) • Migration (Vulnerable Populations) | 2 | 4 | 1 | - |

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| 5. Economic aspects of climate change <ul style="list-style-type: none"> • Main climate change issues • Climate change and development challenges • Impacts of climate change on trade, growth and development | | 3 | 4 | 1 | - |
| 6. International action on climate change adaptation and mitigation <ul style="list-style-type: none"> • Adaptation and Mitigation • Responses for Mitigation • Responses for Adaptation • Adaptation planning in developing countries • Sustainable development • Global Warming Mitigation Strategies • Geoengineering | | 3 | 4 | 1 | 6 |
| Total | | 24 | 06 | 06 | |
| Continuous Assessment | 1. Project assignments / Design Work (ILOs 1 / 3) 2. Quiz / Tutorial (ILOs 1/ 2/ 3) | | | | |
| Method of Assessment | Continuous Assessment: 30 % Assignment / Design Work 20% Quiz / Tutorial 10% End of Semester Examination: 70 % | | | | |
| Recommended Texts | 1. Climate Change: The Science of Global Warming and Our Energy Future by Edmond Mathez, Publisher: Columbia University Press (1st edition, 2009), ISBN: 0231146426 2. Climate Change: Picturing the Science by Gavin Schmidt, Joshua Wolfe, and Jeffrey D. Sachs, Publisher: W. W. Norton & Company (1 edition, 2009), ISBN: 0393331253 3. The Science of Climate Change, M. R. Islam M. M. Khan, First published: 29 April 2019, Print ISBN: 9780470626122 Online ISBN: 9781119522850 DOI: 10.1002/9781119522850, Wiley online library | | | | |

| Module Code and Name | | ID5212 Disaster Management | | | |
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| Credits | 2 | Lectures | L (hrs) | 24 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 06 | |
| Semester | 4 / 6 / 8 | Lab / Field / Design work | P (hrs) | 06 | |
| Prerequisite | None | Core (C)/Elective (E) | | E | |
| <p>Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to:</p> <p>ILO-1: Explain the disaster management terms and concepts.</p> <p>ILO-2: Describe and analyse the relationship between vulnerability, disasters, disaster prevention and risk reduction.</p> <p>ILO-3: Classify the approaches of Disaster Risk Reduction and their components.</p> <p>ILO-4: Demonstrate the basic ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity.</p> | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| <p>1. Introduction to Disasters</p> <ul style="list-style-type: none"> • Concepts and definitions <ul style="list-style-type: none"> ○ Disaster, ○ Hazard, ○ Vulnerability, ○ Resilience, ○ Risks • Characteristics and types of Disasters • Causes and effects • Disaster: A Global View • Disaster Management cycle | | 1 | 3 | - | - |
| <p>2. Disaster Management Concept</p> <ul style="list-style-type: none"> • Disaster Management models <ul style="list-style-type: none"> ○ Prevention ○ Preparedness and ○ Mitigation • Disaster Preparedness: Concept & Nature • Disaster Preparedness Plan • Disaster Preparedness for People and Infrastructure • Community based Disaster Preparedness Plan | | 2 | 3 | - | - |
| <p>3. Technologies for Disaster Management</p> <ul style="list-style-type: none"> • Role of IT in Disaster Preparedness • Remote Sensing, GIS and GPS • Use and Application of Emerging Technologies • Application of Modern Technologies for the Emergency communication | | 2 | 3 | 1 | 6 |
| <p>4. Disaster Mitigation</p> <ul style="list-style-type: none"> • Disaster Mitigation: Definition and concepts • Disaster Mitigation Strategies • Emerging Trends in Disaster Mitigation • Mitigation management • Role of Team and Coordination | | 3 | 3 | 1 | - |

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| 5. Reconstruction and Rehabilitation as Means of Development <ul style="list-style-type: none"> • Damage Assessment • Role of various Agencies in Disaster Management and Development • Information Management Structure • Development of Physical and Economic Infrastructure | | 3 | 3 | 1 | - |
| 6. Education and Awareness <ul style="list-style-type: none"> • Dealing with Victims' Psychology • Role of Information Dissemination • Participative Rehabilitation Process | | 4 | 3 | 1 | - |
| 7. Role of Various Agencies in Recovery Measures <ul style="list-style-type: none"> • Monitoring and Evaluation of Rehabilitation Work • Constraints in Monitoring and Evaluation • Long-term Recovery • Long-term Counter Disaster Planning | | 4 | 3 | 1 | - |
| 8. Response Essential Components <ul style="list-style-type: none"> • Disaster Response Plan • Communication, Participation and Activation of Emergency Preparedness Plans • Search, Rescue, Evacuation & other logistic management • Needs and Damage Assessment; Types and Technique | | 4 | 3 | 1 | - |
| Total | | 24 | 06 | 06 | |
| Continuous Assessment | 1. Project assignment/Design work (ILOs 3 / 4) 2. Quiz/Tutorial (ILOs 1 / 2 / 3) | | | | |
| Method of Assessment | Continuous Assessment: 30 % Project assignment/Design work 20% Quiz/Tutorial 10% End of Semester Examination: 70 % | | | | |
| Recommended Texts | <ol style="list-style-type: none"> 1. Disaster Management Process: Law, Policy and Strategy by Prabhas C Sinha, Publisher: Sbs Publishers & Distributors, 2006, ISBN: 8190309870, 9788190309875 2. Bhattacharya, T. (2012). Disaster Science and Management. Tata McGraw-Hill Education. ISBN: 9781259007361; 1259007367 3. Kieffer, S. W. (2013). The dynamics of disaster. WW Norton & Company, ISBN: 9780393080957 4. Sri Lanka Disaster Management Reference Handbook (December 2017) Report, from Center for Excellence in Disaster Management and Humanitarian Assistance, Published on 31 Dec 2017 5. Davis Jan and Robert Lambert, Engineering in Emergencies (2002): A Practical Guide for Relief Workers, .London: ITDG | | | | |

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|---------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------------------|----------|----------|
| Module Code and Name | | ID5213 Psychology for Life | | | |
| Credits | 2 | Lectures | L (hrs) | 25 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 10 | |
| Semester | 4 / 6 / 8 | Lab / Field / Design work | P (hrs) | - | |
| Prerequisite | None | Core (C)/Elective (E) | | E | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO-1: Explain the basic psychological concepts to understand themselves and others in a working environment. | | | | | |
| ILO-2: Analyse and solve the problems and difficulties facing in their lives. | | | | | |
| ILO-3: Develop a good attitude and personality in the social context. | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Basic Psychological concepts and human behaviour | | 1 | 2 | 2 | - |
| 2. Understanding human behaviour through body language | | 1, 2 | 2 | | - |
| 3. Personality structure | | 1, 2 | 2 | 2 | - |
| 4. Learning | | 2, 3 | 3 | 2 | - |
| 5. Perception | | 2, 3 | 4 | | - |
| 6. Development psychology | | 2, 3 | 4 | | - |
| 7. Social psychology | | 3 | 4 | 2 | - |
| 8. Emotional Intelligence | | 2, 3 | 4 | 2 | |
| | | Total | 25 | 10 | - |
| Continuous Assessment | Assignment (ILO-1) Case Study Presentation (ILO-2) Quiz (ILOs 1, 2, 3) | | | | |
| Method of Assessment | Continuous Assessment: 30 % Assignment 10% Presentation 10% Quiz 10% End of Semester Examination: 70 % | | | | |
| Recommended Texts | 1. Duffy K.G. & Atwater E. (2000), " Psychology for living- adjustment, Growth, and Behaviour Today" 8th edition 2. Robbert A.B. (2001), "Psychology" 5th edition, Prentice Hall. | | | | |

| Module Code and Name | | ID5214 Ethnic Cohesion and Peace Building | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|-----------------|----|---|
| Credits | 2 | Lectures | L (hrs) | 23 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 08 | |
| Semester | 4 / 6 / 8 | Lab / Field / Design work | P (hrs) | 06 | |
| Prerequisite | None | Core (C)/Elective (E) | | E | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO-1: Describe the nature of the discipline of peace and harmony. | | | | | |
| ILO-2: Apply the basic ideas of ethnic cohesion and peace building in every day social life. | | | | | |
| ILO-3: Recognize the importance of maintaining peace and harmony within and outside the university. | | | | | |
| ILO-4: Apply the concepts and practice in the organisational context. | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Introduction to Ethnic Cohesion and Peace Building Diversity and Identity, Dealing with Diversity | | 1 | 5 | 1 | - |
| 2. Attitudes and behaviours in living harmony Perception and Prejudices Team building and co-existence Understanding gender issues Communication skills Non-violent Action Rights and social responsibility | | 1, 2 | 5 | 2 | - |
| 3. Conflict and conflict resolution Understanding conflict and peace Work place conflict Conflict analysis and mapping Conflict handling mechanism | | 2, 3 | 5 | 2 | 6 |
| 4. Reconciliation | | 3 | 3 | 1 | - |
| 5. Community Mediation Practices | | 3 | 3 | 1 | - |
| 6. Organisational conflict and Negotiation in practice | | 4 | 2 | 1 | - |
| | | Total | 23 | 8 | 6 |
| Continuous Assessment | Rake tour and reporting (ILO- 3) Class room activities (Case study, role paly, games) (ILOs 2, 4) Written assignments (2 Nos) (ILOs 2, 3) | | | | |
| Method of Assessment | Continuous Assessment 40 % Rake tour and reporting 10%, Class room activities 20%, Written assignments 10% End of Semester Examination : 60 % | | | | |
| Recommended Texts | 1. Peace and conflict studies by P.B. David and P.W. Charls, Publisher: Sage Publication India Pvt, 2nd Edition 2002, ISBN-13: 978-1-4129-6120-2 2. Conflict resolution: theory, research and [practices by James A. Schellenberg, Publisher: State University of New York: 1996 ISBN-13: 0-7914-3102-9 | | | | |

| Module Code and Name | | EE5201 Energy Studies | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------------------|---------|----|
| Credits | 2 | Lectures | L (hrs) | 30 |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | |
| Semester | 7/8 | Lab / Field / Design work | P (hrs) | |
| Prerequisite | None | Core (C)/Elective (E) | | E |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | |
| <p>ILO-1: Evaluate the primary energy sources, their limitations and costs.</p> <p>ILO-2: Assess the world/Sri Lanka energy demand and the demand growth.</p> <p>ILO-3: Explain the different energy conversion processes, their efficiencies and associated economics.</p> <p>ILO-4: Explain the Sri Lanka energy policy.</p> <p>ILO-5: Evaluate the relationship between economic development and energy. Energy as a catalyst to all sectors of a macro economy.</p> <p>ILO-6: Describe the importance of energy planning; Integrated Energy planning.</p> <p>ILO-7: Explain the necessity of moving towards more sustainable energy sources such as Non-Conventional Renewable Energy. Environmental Impacts of Conventional Energy sources.</p> | | | | |
| Course Content | ILO | Allocated Hours | | |
| | | L | T | P |
| 1. Conventional Energy Resource Major hydro, coal, oil, natural gas, uranium; major reserves, depletion rates | 1 | 4 | | - |
| 2. Non-Conventional Energy Resources (NCRE) , biomass, tidal, Small hydro, solar, wind geothermal; their limitations, barriers for commercial deployment. | 1 | 2 | | - |
| 3. Energy consumption in developed and developing countries, regional consumption patterns, per capita consumption. Global/Sri Lanka demand for energy, demand growth patterns and forecasts. | 2 | 4 | | - |
| 4. Energy conversion processes, primary conversion processes, oil refining, gasification of coal and bio fuels, energy conversion processes at end use, their efficiencies, costs of conversion | 3 | 4 | | - |
| 5. Energy Policy Need of an energy policy, Energy policy elements; Implementing Strategies, Specific Targets, Milestones and Institutional Responsibilities | 4 | 4 | | - |
| 6. Energy planning, energy management, energy data bases, Integrated energy planning, supply side and demand side energy management | 6 | 4 | | - |
| 7. Economic comparison of energy supply systems, energy economics, energy pricing | 5 | 4 | | - |
| 8. Environmental impacts of energy projects and related costs. Regulatory requirements, International protocols, carbon trading, Clean Development Mechanism (CDM) | 7 | 4 | | - |
| Total | | 30 | - | - |

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|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----|--------------------|-----|----------------------------------------|-----|
| Continuous Assessment | Assignments (1,2,5 ILOs) Quizzes (3,4,6,7 ILOs) | | | | | | |
| | <table> <tr> <td>Continuous Assessment:</td> <td>30%</td> </tr> <tr> <td>Assignment & Quiz:</td> <td>30%</td> </tr> <tr> <td>End of Semester Examination (3 hours):</td> <td>70%</td> </tr> </table> | Continuous Assessment: | 30% | Assignment & Quiz: | 30% | End of Semester Examination (3 hours): | 70% |
| Continuous Assessment: | 30% | | | | | | |
| Assignment & Quiz: | 30% | | | | | | |
| End of Semester Examination (3 hours): | 70% | | | | | | |
| Recommended Texts | <p>[1] M. Munasinghe, <i>Energy Analysis and Policy</i>. Oxford: Elsevier Science, 2014.</p> <p>[2] P. Nag, <i>Power plant engineering</i>. Patel Nagar, New Delhi: Tata McGraw Hill, 2012.</p> <p>[3] [4]"Energy Policy", <i>Ministry of Power and Energy</i>, 2020. [Online]. Available: http://powermin.gov.lk/english/?page_id=1394. [Accessed: 03- Mar- 2020].</p> | | | | | | |

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|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------------|------------------------|----------|----------|
| Module Code and Name | | EE5202 High Voltage Engineering | | | |
| Credits | 2 | Lectures | L (hrs) | 27 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | | |
| Semester | 7/8 | Lab / Field / Design work | P (hrs) | 06 | |
| Prerequisite | EE2206 Electromagnetics | Core (C)/Elective(E) | | E | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| LO-1: Understand theoretically the failure of various dielectrics. LO-2: Understand the lightning phenomena, Design surge protection systems . LO-3: Carry out a theoretical design of a cable based on current carrying capacity and minimising its stress distribution. LO-4: Analyse transients in high voltage transmission lines. LO-5: Measure high voltages used for testing and do calibrations on testing equipment. LO-6: Analyse circuits producing high voltages for testing purposes. | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. High Voltage Breakdown Phenomena Breakdown of Gaseous Insulation: Ionization of Gases: Ionization and breakdown processes in gases. Time lags of Spark breakdown. Electron Avalanche mechanism Townsend Breakdown process Streamer Mechanism Time lags of Spark breakdown, Corona Discharges: Mechanism of corona formation and Power Loss due to Corona, Breakdown of Liquid and Solid Insulation: Breakdown in Liquids: Breakdown of Commercial liquids; Breakdown due to gaseous inclusions, liquid globules, solid particles. Purification of a liquid for testing. Breakdown of Solid Insulating Materials. Electro mechanical, Surface , chemical breakdown internal discharges Breakdown of Composite Insulation | | 1,2 | 5 | | 2 |
| 2. Lightning Phenomena Mechanism of Lightning: Frequency of occurrence of lightning flashes. Calculation based on Isokeraunic level, Lightning Problem for Transmission Lines. Shielding by overhead ground wires, Effects of Lightning on a Transmission Line, Strokes to phase conductor, Conductor with no earth wire , earth wire, nearby objects, (Indirect strokes) | | 4, 6 | 4 | | - |
| 3. High Voltage Cables High Voltage Cables: Power loss in the cable. Impregnated paper insulation. Insulation Resistance, Capacitance, Copper Space Factor. Dielectric stress in a single core cable, Cable Grading for Uniform Stress Distribution. Pressurized voltage cables. Thermal design of cables. High voltage bushings | | 2,3, 4 | 4 | | 2 |
| 4. High Voltage Transient Analysis Surges on Transmission Lines: Travelling wave solutions Surge Impedance and Velocity of Propagation, Reflection and Transmission of Travelling waves at a junction, Bewley Lattice Diagram. Representation of Lumped Parameters. Digital computer implementation, Transform Methods of solving | | 3 | 6 | | - |

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| Transients | | | | | |
| 5. Measurement of High Voltage Direct Measurement of High Voltages: Electrostatic Voltmeters, Sphere gaps. Transformer and potential divider methods of measurement. Matching of Potential dividers. Measurement of Surges. Detection of internal discharges | | 5 | 2 | | 2 |
| 6. High Voltage Generators for Testing Generation of High Alternating Voltages: Cascade arrangement of transformers, Resonant Transformers. Generation of High Direct Voltages: Rectifier circuits, Voltage Multiplier circuits, High Voltage Surge Generators: High Voltage Impulse Generators: Single exponential waveform, Double exponential waveform, Calculation of coefficients from resistance and capacitance values, Definition of Wave front and Wave tail times of practical waveforms. Operation of the Marx Impulse Generator. Generation of chopped impulse waveforms. Voltage distribution in a transformer winding Surge Protection-Spark gaps, surge diverters, Lightning arrestors, High Voltage Testing: General tests carried out on High voltage equipment. Testing of solid dielectric materials. Type tests, Sample Tests, Routine Tests. Tests on typical voltage equipment | | 5,6 | 6 | | - |
| Total | | | 27 | - | 06 |
| Continuous Assessment | Laboratory Exercise 1: Breakdown of air gap (ILO-5) Laboratory Exercise 2: Breakdown of Transformer Oil (ILO-1,2) Laboratory Exercise 2: Partial Discharge Measurements (ILO-3,4,5) Assignments and Quizzes (ILOs 1- 6) | | | | |
| | Continuous Assessment: 30% Laboratory exercises 20% Assignments & Quizzes: 10% End of Semester Examination (3 hours): 70% | | | | |
| Recommended Texts | [1] J. Kuffel and P. Kuffel, <i>High Voltage Engineering Fundamentals, 2nd Edition.</i> [2] M S Naidu and V Kamaraju, <i>High-Voltage Engineering</i> McGraw-Hill, 2013. [3] Farouk A.M. Rizk and Giao N. Trinh <i>High Voltage Engineering</i> , CRC Press, 2014 | | | | |

| Module Code and Name | | EE5203 Electrical Machines and Drives II | | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-----------------|----|---|
| Credits | 2 | Lectures | L (hrs) | 25 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 6 | |
| Semester | 7/8 | Lab / Field / Design work | P (hrs) | 4 | |
| Prerequisite | EE3308 Electrical Machines and Drives I | Core (C)/Elective (E) | | E | |
| <p>Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to:</p> <p>ILO-1: Demonstrate the knowledge of transient behaviour of a synchronous generator. ILO-2: Design and implement a three-phase induction motor drive system covering wide speed range. ILO-3: Identify where and how to apply brushless and synchronous motor drives in industry. ILO-4: Select the type and size of a motor to serve a given application. ILO-5: Perform thermal calculations for motors and generators. ILO-6: Demonstrate the knowledge of AC and DC windings and associated calculations.</p> | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Transient performance of synchronous generators Sub transient, transient, and steady state reactance and time constants, Sudden short circuit current analysis, parameter estimation using short circuit oscillogram, sudden open circuit performance, slip test | | 1 | 3 | 2 | - |
| 2. AC and DC windings Concentrated and distributed windings, winding factors. | | 6 | 3 | 2 | - |
| 3. Brushless DC motor drives Principle of operation of and construction of Trapezoidal motor, Drive system, performance calculation, open and closed loop control, multi-quadrant operation. | | 3 | 5 | | 2 |
| 4. Three-phase induction motor drives Variable voltage variable frequency control of speed, initial voltage boosting, high speed control, Closed loop drives with slip regulation and direct current limiting techniques, independent flux and current control (field oriented control), open loop drives with ramp limiters, Coordination between motor and power electronic inverter, voltage and current waveforms at low and high speeds, multi-quadrant operation. | | 2 | 5 | | - |
| 5. Synchronous motor drives Large synchronous motor drives using load commutated inverters, Self-controlled synchronous motor drives. | | 3 | 4 | 2 | - |
| 6. Operational aspects Rating plate data, safe operation, temperature rise calculations, Sizing of motors for given load cycle, General and special purpose motors. | | 4,5 | 5 | | 2 |
| | | Total | 25 | 6 | 4 |
| Continuous Assessment | Laboratory Exercise 1: 4Q DC machine (ILO-03) Laboratory Exercise 2: Temperature rise of an electrical machine (ILO-05) Assignments (ILOs) 1 & 5 | | | | |

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| | Quizzes (ILOs) 2, 4 and 6 |
| | <p>Continuous Assessment: 30%</p> <p>Laboratory Exercise: 20%</p> <p>Assignment & Quiz: 10%</p> <p>End of Semester Examination (3 hours): 70%</p> |
| Recommended Texts | <p>[1] <i>Power electronics and AC drives</i>. USA: Prentice-Hall, 1987.</p> <p>[2] J. Murphy and F. Turnbull, <i>Power electronic control of AC motors</i>. Oxford [etc.]: Pergamon Press, 1988.</p> <p>[3] A. Fitzgerald, C. Kingsley and S. Umans, <i>Electric machinery</i>. Boston, Mass: McGraw-Hill, 2009.</p> <p>[4] C. Gray, <i>Electrical machines and drive systems</i>. Essex, England: Longman Scientific & Technical, 1989.</p> <p>[5] W. Leonhard, <i>Control of Electrical Drives</i>. Berlin, Heidelberg: Springer Berlin Heidelberg, 2001.</p> |

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| Module Code and Name | | EE5204 Electronic Instrumentation | | | |
| Credits | 2 | Lectures | L (hrs) | 25 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 4 | |
| Semester | 7/8 | Lab / Field / Design work | P (hrs) | 6 | |
| Prerequisite | EE2205 Electrical Measurements | Core (C)/Elective (E) | | E | |
| <p>Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to:</p> <p>ILO-1: Explain the operational principles of various electronic instruments and decide on a suitable sensor / transducer system to a given application requirement.</p> <p>ILO-2: Analyze measurement errors associated with instruments, and perform calibration as required.</p> <p>ILO-3: Select instruments to suit a given measurement environment and given accuracy.</p> <p>ILO-4: Implement a microcontroller based measurement and control system.</p> | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| <p>1. General Measurement Theory Measurement errors and error reduction techniques, Factors influencing measurement errors, Static and dynamic characteristics of instruments</p> | | 2 | 5 | 2 | 2 |
| <p>2. Operational principles of electronic instrument Voltmeters and ammeters (analog and digital) Signal sources and function generators, Oscilloscopes and associated accessories, Electronic counters, Power supplies, Spectrum and network analyzers, Logic analyzers</p> | | 1 | 10 | 2 | - |
| <p>3. Instrument usage Grounding and shielding of instruments, Signal conditioning, Modern data acquisition systems, Microcontroller based measurement and control, Distributed control systems and SCADA.</p> | | 3, 4 | 10 | - | 4 |
| Total | | | 25 | 4 | 6 |
| Continuous Assessment | <p>Laboratory exercises: Calibration of instruments (ILO-1, 2) Modern data acquisition systems (ILO-3,4) Microcontroller based systems (ILO-4) Assignments (ILOs 2,3,4) Quizzes (ILOs 1,3)</p> | | | | |
| | <p>Continuous Assessment: 30%</p> <p>Assignments & Quizzes: 15%</p> <p>Laboratory exercises: 15%</p> <p>End of Semester Examination (2 hours): 70%</p> | | | | |
| Recommended Texts | <p>[1] M. Anand, <i>Electronic instruments and instrumentation technology</i>. New Delhi: Prentice-Hall of India, 2004.</p> <p>[2] A. Ghosh, <i>Introduction to measurements and instrumentation</i>. Delhi: PH Learning, 2013.</p> | | | | |

| Module Code and Name | | EE5205 Industrial Electronics | | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------|----|------|
| Credits | 2 | Lectures | L (hrs) | 27 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | | |
| Semester | 7/8 | Lab / Field / Design work | P (hrs) | 6 | |
| Prerequisite | None | Core (C)/Elective (E) | | E | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO-1: Specify the characteristics of sensors and actuators required for an automated system design. | | | | | |
| ILO-2: Model a control system. | | | | | |
| ILO-3: Select and integrate different modules to work in different environments. | | | | | |
| ILO-4: Implement a control system for a real world application. | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 1. Types of sensors and actuators Digital sensors, analog sensors, and sensor specifications. Introduction to different types of actuators including, Servomotors, dc motors, ac motors, grippers, manipulators, linear actuators, hydraulic and pneumatic types, Digital approximation of analog controllers. | | 1 | 6 | - | 2(*) |
| 2. System modeling and control Control systems and control techniques, Systems identification and modelling | | 2 | 8 | - | 2(*) |
| 3. Type of systems SCADA systems and PLCs, Peripheral devices and data communication standard | | 3 | 10 | - | - |
| 4. Systems Integration Sensors, actuators and signal processing, Internal lightning protection systems | | 4 | 6 | - | 2(*) |
| Total | | | 30 | - | 6(*) |
| Continuous Assessment | (*) Laboratory Exercise: Conducted as a Mini-project Assignments (ILOs 1,2,3,4) Quizzes (ILOs 1,2,3,4) | | | | |
| | Continuous Assessment: | | 30% | | |
| | Laboratory exercises | 20% | | | |
| | Assignment & Quiz: | 10% | | | |
| | End of Semester Examination (2 hours): | | 70% | | |
| Recommended Texts | [1] J. Rehg and G. Sartori, <i>Industrial electronics</i> . Upper Saddle River, N.J.: Pearson / Prentice hall, 2006. | | | | |

| Module Code and Name | | EE5206 Digital System Design | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|------------------------------|---------|------|
| Credits | 2 | Lectures | L (hrs) | 27 |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | |
| Semester | 7/8 | Lab / Field / Design work | P (hrs) | 6 |
| Prerequisite | 2350 Digital Electronics | Core (C)/Elective (E) | | E |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | |
| ILO-1: Demonstrate the required skills in Hardware Description Language that facilitates rapid prototyping of digital systems. | | | | |
| ILO-2: Design sequential systems using RTL based approach. | | | | |
| ILO-3: Describe different approaches available for processor design. | | | | |
| ILO-4: Analyse the requirements of a system to decide whether a custom- made processor is required. | | | | |
| ILO-5: Design a custom-made processor. | | | | |
| Course Content | ILO | Allocated Hours | | |
| | | L | T | P |
| 1. Hardware Description Languages Introduction to reconfigurable computing, Circuit specification using hardware description languages, Use of HDL packages | 1 | 6 | | 2(*) |
| 2. RTL based System Design Introduction to RTL based design, Data paths and controllers | 2 | 4 | | 2(*) |
| 3. RISC Architecture Features of RISC architecture, Pipelining, register windows, register renaming | 3 | 4 | | - |
| 4. Processor Design Instruction set architecture, Hardwired and microprogramming approaches to processor design | 4,5 | 8 | | - |
| 5. Memory Design RAM, ROM, EPROM, SRAM, DRAM, Memory cells and memory organization, Cache memory design and memory interfacing | 3 | 4 | | - |
| 6. Asynchronous Sequential System Design Introduction to asynchronous sequential systems, Race conditions, stability issues, State reduction techniques | 3 | 4 | | 2(*) |
| Total | | 30 | | 6(*) |
| Continuous Assessment | (*) Laboratory Exercise: Conducted as a Mini-project Assignments (ILOs 1,2,5,6) Quizzes (ILOs 3,4,7) | | | |
| | Continuous Assessment: | 30% | | |
| | Assignments & Quizzes: | 30% | | |
| | End of Semester Examination (3 hours): | 70% | | |

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| Recommended Texts | [1] M. Mano, <i>Digital design</i> . New Delhi: Prentice-Hall of India, 1991. [2] J. Carpinelli, <i>Computer systems organization & architecture</i> . Boston, MA: Addison-Wesley, 2001. |
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| Module Code and Name | | EE5207 Digital Communications | | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-------------------------------|-----------------|----|---|
| Credits | 2 | Lectures | L (hrs) | 26 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 4 | |
| Semester | 7/8 | Lab / Field / Design work | P (hrs) | 4 | |
| Prerequisite | EE3302 Communication Theory | Core (C)/Elective (E) | | E | |
| <p>Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to:</p> <p>ILO-1: Analyze different digital modulation techniques theoretically.</p> <p>ILO-2: Design optimum receivers for linear modulation schemes in AWGN channels.</p> <p>ILO-3: Design signals for communication over bandwidth constrained channels.</p> <p>ILO-4: Derive BER performance in multipath fading channels.</p> <p>ILO-5: Design a lossless source code for a given discrete memory-less source</p> <p>ILO-6: Apply error control coding for the improvement of reliability of digital communication systems.</p> | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| <p>1. Digital Carrier Modulation Techniques</p> <p>Bandpass signals and systems: complex envelope representation and signal-space representation, linear and non-linear digital modulation techniques: ASK, PSK, and QAM. OQPSK and $\pi/4$-QPSK, FSK, MSK, and GMSK, power spectra and spectral efficiencies, transmitter and receiver architectures.</p> | | 1 | 5 | 1 | 2 |
| <p>2. Receiver Design for AWGN Channel and Performance</p> <p>Optimal detection of signals in noise: detection signal space, correlation detector, matched-filter detector, maximum a posteriori and maximum likelihood detectors, performance of optimum receivers for linear modulation schemes: optimal decision regions and error probability.</p> | | 2 | 5 | 1 | - |
| <p>3. Signal Design for Bandwidth-Constrained Channels</p> <p>Characterization of band limited channels, signal design for band-limited channels: band-limited signals for zero ISI, Nyquist criterion, band-limited signals with controlled ISI-partial response signals, and detection of duo binary signalling and differential encoding, channel equalization: need for equalization, and ZF and MMSE equalizers, eye diagrams.</p> | | 3 | 6 | 1 | - |
| <p>4. Communication over fading wireless channel</p> | | 4 | 4 | - | - |

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| Multipath wireless channel models, BER evaluation methods for fading channels, principles of multicarrier modulation and spread spectrum communications. | | | | |
| 5. Source and Channel Coding Introduction to information theory, review of information measures: entropy, relative entropy, and mutual information, source coding: Lossless coding for discrete memoryless sources: Huffman coding, run-length coding, and Lempel-Ziv coding. Audio compression and video compression, channel coding: Introduction to error control coding. Linear block codes, cyclic codes, error detection and correction capabilities, introduction to advanced error control techniques: HARQ, turbo codes, and LDPC codes. | | 5,6 | 6 | 1 2 |
| Total | | | 26 | 04 04 |
| Continuous Assessment | Laboratory Exercise 1: Digital modulation and demodulation (ILO-1, 2) Laboratory Exercise 2: Source and channel coding (ILO-5,6) Assignments (ILOs 1,2,3,4,5,6) Quizzes (ILOs 1,2,3,4,5,6) | | | |
| | Continuous Assessment: 30% Laboratory exercises: 20% Assignment & Quiz: 10% End of Semester Examination (3 hours): 70% | | | |
| Recommended Texts | [1] B.P. Lathi and Zhi Ding, <i>Modern Digital and Analog Communication Systems</i> , 4th ed., Oxford University Press, 2010. [2] S. Haykin and M. Moher, <i>Communication systems</i> , 5th ed., Hoboken, N.J.: J. Wiley, 2009. [3] S. Haykin, <i>Communication systems</i> , 4th ed., John Wiley, 2006. | | | |

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| Module Code and Name | | EE5208 Digital Image Processing | | | |
| Credits | 2 | Lectures | L (hrs) | 15 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | - | |
| Semester | 7/8 | Lab / Field / Design work | P (hrs) | 30 | |
| Prerequisite | - | Core (C)/Elective(E) | | E | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO-1: Recognize the importance and modern applications of image processing techniques ILO-2: Understand spatial and frequency domain operations of image processing ILO-3: Perform image enhancement operations ILO-4: Apply image segmentation operations ILO-5: Implement basic image pattern classifications | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | T | P |
| 7. Digital image fundamentals | | 1 | 2 | - | 4 |
| Background, Applications Elements of a digital image processing system - Image acquisition, Storage, Processing, Transmission and display. Human vision system, Sampling and quantization, Pixels and their relationships | | | | | |
| 8. Digital image processing techniques | | 2, 3 | 7 | | 14 |
| Image enhancement and restoration - Pixel point processing, Pixel group processing, Frequency domain processing, Geometric transformations | | | | | |
| 9. Image analysis | | 3, 4 | 2 | | 4 |
| Segmentation, Feature extraction, Morphological processing, Image compression and transmission, An introduction to codes and coding systems, handling of error, Image coding systems, Run length, Huffman, Wavelets, bit plane, Data transmission protocols | | | | | |
| 10. Color image processing | | 2, 4 | 1 | | 2 |
| Definitions, color systems, color to grayscale conversion Surges. Detection of internal discharges | | | | | |
| 11. Pattern recognition in image processing | | 4, 5 | 3 | | 6 |
| Feature space, classification algorithms, minimum distance classifier, Mahalanobis distance, other measures | | | | | |
| | | Total | 15 | - | 30 |
| Continuous Assessment | Laboratory exercises: 1. Introduction to image processing (ILO-1) 2. Histogram processing (ILO-2) 3. Smoothing and sharpening (ILO-3) | | | | |

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|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | 4. Frequency domain filtering (ILO-3) 5. Noise models (ILO-3) 6. Projections 2D to 3D and vice-versa (ILO-4) 7. Haar transform (ILO-4) 8. Erosion and dilation, Graph-cuts (ILO-4) 9. PCA, SIFT (ILO-5) 10. Pattern recognition example (ILO-5) Quizzes (ILOs 1-2) |
| | Continuous Assessment: 50% Laboratory exercises 40% Assignments & Quizzes: 10% End of Semester Examination (2 hours): 50% |
| Recommended Texts | [4] R.C. Gonzalez and R.E. Woods, <i>Digital image processing</i> , Pearson, 2018. [5] R.C. Gonzalez, R.E. Woods, and S.I. Eddins, <i>Digital image processing using Matlab</i> , Gatesmark Publishing, 2020. |

| Module Code and Name | | ME4304 Building Services Engineering | | | |
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| Credits | 3 | Lectures | L (hrs) | 38 | |
| GPA/NGPA | GPA | Tutorials / Assignment | A (hrs) | 04 | |
| Semester | 8 | Lab / Field / Design work | D (hrs) | 10 | |
| Prerequisite | None | Core (C)/Elective(E) | | E | |
| <p>Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to:</p> <p>ILO 1: Describe goals and general attributes of Building Services Engineering (BSE) and interdisciplinary nature of the subject area</p> <p>ILO 2: Recognize basic terms in building lighting systems and suitable light sources for the applications</p> <p>ILO 3: Design a suitable lighting arrangement as per the customer requirements for domestic and commercial buildings.</p> <p>ILO 4: Demonstrate the knowledge of Indoor Air Quality and selection of a suitable HVAC system for buildings.</p> <p>ILO 5: Describe practices of plumbing and of efficient water resource utilization related to buildings</p> <p>ILO 6: Design water storage tanks and septic tanks as per customer requirements and the local regulations for domestic houses.</p> <p>ILO 7: Describe practices of electricity distribution and ancillary services related to buildings.</p> <p>ILO 8: Explain the practices of building waste management, on-site renewable energy generation and green buildings.</p> <p>ILO 9: Explain the basics of building related firefighting systems, acoustics and control and automation systems.</p> | | | | | |
| Course Content | | ILO | Allocated Hours | | |
| | | | L | A | D |
| <p>1. Introduction to BSE Principal attributes of building services engineering Scope, advantages of multi-disciplinary nature of building services engineering and its goals in professional practising</p> | | 1 | 2 | - | - |
| <p>2. Lighting System Basic terms and definitions: Spectral Power Density, Luminous Flux, Luminous Intensity, Luminous Efficacy, Correlated Colour Temperature, Colour Rendering Index, Illuminance, Luminance, Light Source Characterization and cross comparison in terms of principal parameters: Incandescence, Luminescence, Solid State, Introduction to Lumen method for determining number of artificial light sources for a simple application</p> | | 2,3 | 4 | 1 | 5 |
| <p>3. HVAC and Internal Air Quality Commonly used layouts of heating, air-conditioning and ventilation systems of local applications: Unitary, Package & Central systems; All-air, Hydronic systems; Ducted mechanical ventilation systems; Basic principles of system selection, Sources of indoor air pollutants: Material originated, human action originated; Practices of addressing IAQ issues, Designing air conditioning system</p> | | 4 | 7 | 1 | - |
| <p>4. Plumbing and Water Efficiency Introduction to basic practices of plumbing: use of pumps, auxiliaries, expansion devices, storage, Designing of</p> | | 5 | 6 | 1 | 5 |

| | | | | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-----------|----------|-----------|
| plumbing systems(cold water, hot water and sewer waste system, Description of water efficient end use devices Introduction to practices of rain water harvesting and design. | | | | | |
| 5. Electricity Distribution and lightning protection system and Ancillary Services Introduction and design to basic practices of electricity distribution in buildings: Transformer placement, Distribution boards, main and sub feeder circuits, safety features, Lifts and auxiliaries | | 7 | 6 | - | - |
| 6. Building Acoustics Basic of building acoustics, Introduction to basic practices of acoustics related to buildings | | 9 | 3 | - | - |
| 7. Building Controls and Automation Description of controllers used in buildings, Integration of automation into building operations | | 9 | 2 | - | - |
| 8. Fire safety systems in buildings Fire detection system, Fire protection system, Sprinkler system, Passive fire protection system | | 9 | 6 | 1 | - |
| 9. On site Renewable Energy Generation Waste Disposal and Management Integration of Solar PV and Wind based on-site electricity generation into buildings, Basic elements in waste disposal management and aspects of Green Buildings | | 8 | 2 | | |
| Total | | | 38 | 4 | 10 |
| Continuous Assessment | 04 In class Assignments (ILO: 2, 3, 4, & 8)/02 Design Work (ILO: 3,6) | | | | |
| Method of Assessment | <ul style="list-style-type: none"> • Continuous Assessment: 30 % <li style="padding-left: 20px;">Design Work 10% <li style="padding-left: 20px;">In class Assignments 20% • End of Semester Examination: 70 % | | | | |
| Recommended Texts | <ol style="list-style-type: none"> 1. Mechanical and Electrical Equipment for Buildings by W.T. Grondzik, A. G. Kwok, B. Stein and J. S. Reynolds, Publisher: Wiley, 11th Edition 2009 ISBN-13: 978-0470195659 2. Building Services Engineering by D.V. Chadderton, Publisher: Routledge, 6th Edition 2013 ISBN-13: 978-0415699327 3. Energy Efficient Building Systems: Green Strategies for Operation & Maintenance by L. Jayamaha, Publisher: Mc-Graw Hill Professional, 1st Edition 2006 ISBN-13: 978-0071482820 4. Understanding Building Automation Systems by R.A. Carlson <u>R. A. DiGiandomenico</u>, Publisher: R.S. Means Company, Inc., 1991 ISBN-13: 978-0876292112 | | | | |

| Module Code and Name | | CS5301 Operating Systems | | | |
|------------------------------------------------------------------------------------------------------------------------------------|------|---------------------------|---------|----|--|
| Credits | 3 | Lectures | L (hrs) | 30 | |
| GPA/NGPA | GPA | Tutorials / Assignment | T (hrs) | 04 | |
| Semester | 5 | Lab / Field / Design work | P (hrs) | 26 | |
| Prerequisite | None | Core (C)/Elective (E) | E | | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO 1: Describe the fundamental components of a computer operating system. | | | | | |
| ILO 2: Discuss the concepts in scheduling, deadlocks, memory management, synchronization, system calls, and file systems. | | | | | |
| ILO 3: Extrapolate the interactions among the various components of computing systems. | | | | | |
| ILO 4: Implement the OS components such as system calls, schedulers, memory management systems, Virtual Memory and Paging systems. | | | | | |
| ILO 5: Explain and compare security mechanisms for conventional operating systems | | | | | |
| Course Content | ILO | Allocated Hours | | | |
| | | L | T | P | |
| 1. Operating System as a virtual machine and a resource manager (2 h) | | | | | |
| 1.1. Discussion of various aspects of computer Operating System implementations | 1 | 1.5 | - | 6 | |
| 1.2. Structure of a system call. | 1 | 0.5 | 0.5 | 3 | |
| | | | | | |
| 2. Processes and Threads(4 h) | | | | | |
| 2.1. Process in Windows and Linux OSs | 2 | - | - | 6 | |
| 2.2. Process and Thread models. | 2 | 3 | - | - | |
| 2.3. Inter-process communication and synchronization. | 2 | 1 | - | - | |
| 2.4. Comparing Processes and Threads. | 3 | 0.5 | 0.5 | - | |
| 3. Process and Thread scheduling (5 h) | | | | | |
| 3.1. Scheduling algorithms. | 2 | 2 | - | 3 | |
| 3.2. Uni-processor scheduling. | 2 | 1 | - | - | |
| 3.3. Multi-processor scheduling. | 2 | 1 | 0.5 | - | |
| 3.4. Real-time systems | 2 | 1 | - | - | |
| 4. Mutual Exclusion and Synchronization(4 h) | | | | | |
| 4.1. Principles of concurrency. | 2 | 1.5 | - | - | |
| 4.2. Mutual exclusion: Hardware support. | 3 | 0.5 | - | - | |
| 4.3. Semaphores. | 3 | 0.5 | - | - | |
| 4.4. Monitors. | 3 | 0.5 | 0.5 | - | |
| 4.5. Deadlocks | 3 | 1 | - | - | |
| 5. Memory management (5 h) | | | | | |
| 6.1. Memory model. | 2 | 0.5 | - | 3 | |
| 6.2. Memory allocation and management techniques. | 2 | 1 | - | - | |

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|----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-----|-----|----|
| 6.3. Segmentation and paging. | | 3 | 1 | - | - |
| 6.4. Page table Operations and design considerations. | | 2 | 0.5 | - | - |
| 6.5. Virtual memory. | | 2 | 1 | - | - |
| 6.6. Page replacement algorithms. | | 3 | 0.5 | - | - |
| 6.7. TLB implementation. | | 3 | 0.5 | 0.5 | - |
| 6. I/O management and Disk scheduling (4 h) | | | | | |
| 7.1. Hardware aspects of I/O management. | | 2 | 1 | - | - |
| 7.2. I/O management in OS, buffering and error handling. | | 2 | 1 | - | - |
| 7.3. Hardware aspects of disk I/O, disk scheduling and disk caching. (2 h) | | 3 | 2 | 0.5 | - |
| 7. File Systems [4 h] | | | | | |
| 8.1. Concept of files and directories | | 1 | 1 | - | 3 |
| 8.2. Directory structure. | | 1 | 1 | - | - |
| 8.3. File system implementation. | | 2 | 1 | - | - |
| 8.4. Unix and Windows file systems. | | 3 | 1 | 0.5 | - |
| 8. Protection and security (2 h) | | | | | |
| 8.1. Types of security threats. | | 5 | 1 | - | - |
| 8.2. Access control. | | 5 | 0.5 | - | 2 |
| 8.3. Intrusion detection and prevention. | | 5 | 0.5 | 0.5 | - |
| Total | | | 30 | 4 | 26 |
| Continuous Assessment | Computer Laboratory Sessions | | | | |
| | <ol style="list-style-type: none"> 1. Installing Windows in a Virtual Machine (ILO 1) 2. Installing Linux in a Virtual Machine (ILO 2) 3. Process, Memory and File Systems in Windows (ILO 3) 4. Process, Memory and File systems in Ubuntu (ILO 3) 5. System Calls in Linux (ILO 4) 6. Process and Threads in Linux (ILO 4) 7. Memory management in Linux (ILO 4) 8. Linux File System (ILO 3) 9. Access control in Linux (ILO 5) | | | | |
| Quizzes (ILOs 1, 2, 3 & 5) | | | | | |
| Method of Assessment | <ul style="list-style-type: none"> ● Continuous Assessment: 50 % <li style="padding-left: 20px;">Laboratory Sessions: 40% <li style="padding-left: 20px;">Quizzes: 10% ● End of Semester Examination: 50 % | | | | |
| Recommended Texts | 1. Operating Systems: Internals and Design Principles, 6/E or latest, William Stallings , Prentice Hall, 2008 | | | | |

| Module Code and Name | | CS5302 Machine Learning | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------------|---------|-----|
| Credits | 3 | Lectures | L (hrs) | 30 |
| GPA/NGPA | GPA (Elective) | Tutorials / Assignment | T (hrs) | - |
| Semester | 7 | Lab / Field / Design work | P (hrs) | 30 |
| Prerequisite | None | Core (C)/Elective (E) | | E |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | |
| ILO 1: Identify the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc. | | | | |
| ILO 2: Explain the strengths and weaknesses of popular machine learning approaches. | | | | |
| ILO 3: Demonstrate the use of supervised, unsupervised, and reinforced learning approaches. | | | | |
| ILO 4: Experiment various machine learning algorithms in real-world applications. | | | | |
| ILO 5: Solve real-world application using deep learning method. | | | | |
| Course Content | ILO | Allocated Hours | | |
| | | L | T | P |
| 1. Introduction | | | | |
| 1.1. Why machine learning? | 1 | 1 | - | - |
| 1.2. Types of machine learning: supervised, reinforcement, and unsupervised learning | 2 | 1 | - | - |
| 1.3. Building machine learning systems: preprocessing, training and selecting a predictive model, evaluating models and predicting unseen data instances | 4 | 4 | - | 6 |
| 2. Supervised learning | | | | |
| 2.1. Classification and regression | 3 | 1 | - | - |
| 2.2. Relation of model complexity to dataset size | 3 | 1 | - | - |
| 2.3. Supervised machine learning algorithms <ul style="list-style-type: none"> • k-nearest neighbors | 4 | 2 | - | 3 |
| 2.4. Uncertainty estimates from classifiers | 3 | 2 | - | 3 |
| 3. Unsupervised learning and pre-processing | | | | |
| 3.1. Types of unsupervised learning | 3 | 1 | - | - |
| 3.2. Preprocessing and scaling | 3 | 1 | - | - |
| 3.3. dimensionality reduction and feature extraction <ul style="list-style-type: none"> • principal component analysis | 4 | 2 | - | 3 |
| 3.4. Clustering <ul style="list-style-type: none"> • k-means clustering | 4 | 2 | - | 3 |
| 4. Model evaluation and improvement | | | | |
| 4.1. cross validation | 1 | 2 | - | 1.5 |
| 4.2. grid search | 1 | 2 | - | 1.5 |
| 4.3. evaluating metrics and evaluation | 1 | 2 | - | 3 |
| 5. Deep learning | | | | |
| 5.1. Convolution neural networks | 5 | 6 | - | 6 |

| | | Total | 30 | 0 | 30 |
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| Continuous Assessment | <p>Computer Laboratory Sessions</p> <ol style="list-style-type: none"> 1. Introduction to tools, tensorflow, keras, torch, pytorch (ILO 1, ILO 2) 2. Supervised learning, knn (ILO 3) 3. Unsupervised learning, pca, k means (ILO 3) 4. Evaluating metrics (ILO 4) 5. Deep learning, cnn (ILO 5) <p>Quizzes (ILOs 1, 2, 3 & 4)</p> | | | | |
| Method of Assessment | <ul style="list-style-type: none"> • Continuous Assessment: 50 % <li style="padding-left: 20px;">Laboratory Sessions: 40% <li style="padding-left: 20px;">Quizzes: 10% • End of Semester Examination (2 hours): 50 % | | | | |
| Recommended Texts | <ol style="list-style-type: none"> 1. Introduction to Machine Learning with Python: A Guide for Data Scientists 1st Edition, by Andreas C. Müller,, Sarah Guido | | | | |

| Module Code and Name | | CS5303 Data Science for Engineers | | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-----------------------------------|---------|-----|----|
| Credits | 3 | Lectures | L (hrs) | 30 | |
| GPA/NGPA | GPA (Elective) | Tutorials / Assignment | T (hrs) | 00 | |
| Semester | 7 | Lab / Field / Design work | P (hrs) | 30 | |
| Prerequisite | None | Core (C)/Elective (E) | | E | |
| Intended Learning Outcomes (ILOs): On successful completion of the module, students should be able to: | | | | | |
| ILO 1: Describe a flow process for data science problems | | | | | |
| ILO 2: Classify data science problems into standard typology | | | | | |
| ILO 3: Develop R codes for data science solutions | | | | | |
| ILO 4: Correlate results to the solution approach followed | | | | | |
| ILO 5: Assess the solution approach | | | | | |
| ILO 6: Construct use cases to validate approach and identify modifications required | | | | | |
| Course Content | ILO | Allocated Hours | | | |
| | | L | T | P | |
| 1. Introduction to R | 1 | 2 | - | 3 | |
| 2. Linear algebra for data science | | | | | |
| 2.1. Algebraic view - vectors, matrices, product of matrix & vector, rank, null space, solution of overdetermined set of equations and pseudo-inverse | 2 | 2 | - | 1.5 | |
| 2.2. Geometric view - vectors, distance, projections, eigenvalue decomposition | 2 | 2 | - | 1.5 | |
| 3. Statistics Descriptive statistics, notion of probability, distributions, mean, variance, covariance, covariance matrix, understanding univariate and multivariate normal distributions, introduction to hypothesis testing, confidence interval for estimates | 5 | 2 | - | 3 | |
| 4. Optimization | 3 | 3 | - | 3 | |
| 5. Typology of data science problems and a solution framework | 3 | 3 | - | 3 | |
| 6. Regression | | | | | |
| 6.1. Simple linear regression and verifying assumptions used in linear regression | 4 | 4 | - | 3 | |
| 6.2. Multivariate linear regression, model assessment, assessing importance of different variables, subset selection | 4 | 4 | - | 3 | |
| 7. Classification | | | | | |
| 7.1. Classification using logistic regression | 6 | 2 | - | 3 | |
| 7.2. Classification using kNN and k-means clustering | 6 | 4 | - | 6 | |
| | | Total | 30 | 0 | 30 |
| Continuous Assessment | Computer Laboratory Sessions 1. Introduction to R (ILO 1) 2. Linear algebra (ILO 2) | | | | |

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|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | 3. Statistics (ILO 5) 4. Optimization (ILO 3) 5. Typology of data science problems (ILO 3) 6. Regression (2 labs) (ILO 4) 7. Classification (3 labs) (ILO 6) Quizzes (ILOs 1, 2, 3 & 4) |
| Method of Assessment | <ul style="list-style-type: none"> • Continuous Assessment: 50 % Laboratory Sessions: 40% Quizzes: 10% • End of Semester Examination (2 hours): 50 % |
| Recommended Texts | 1. Strang, G. (2000). Introduction to linear algebra. 2. Montgomery, Douglas C., and George C. Runger. Applied statistics and probability for engineers. John Wiley & Sons, 2010. |

| Module Code and Name | | IT3301 Industrial Training I (12 Weeks) and IT4301 Industrial Training II (12 Weeks) | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-----------------------------------------------------------------------------------------|---------|------------|
| Credits | 3 (IT3301) + 3 (IT4301) | Lectures | L (hrs) | - |
| GPA/NGPA | NGPA | Tutorials / Assignment | T (hrs) | - |
| Semester | - | Duration | (weeks) | 24 |
| Prerequisite | - | Core (C)/Elective (E) | | C |
| <p>Intended Learning Outcomes (ILOs): On successful completion of the industrial training, students should be able to:</p> <p>ILO-1: Demonstrate competency in the respective field with problem identification, formulation, and solution adhering to health and safety standards and sustainable development concepts</p> <p>ILO-2: Effectively communicate on complex engineering activities with all levels of staff</p> <p>ILO-3: Understand the organizational cultures and administrative functions in a workplace</p> <p>ILO-4: Develop a capacity for critical reasoning and self-learning</p> <p>ILO-5: Understand and apply the ethical basis/conduct of professional practice in a workplace</p> <p>ILO-6: Demonstrate ability to function as a member or leader of a team in multi-cultural setting</p> | | | | |
| Course Content: During the industrial training period, students are expected to get exposure in the following areas; | | | | ILO |
| <p>10. Engineering Procedural Work</p> <p>Understand the stages of work/product from its conceptual stage to completion stage. The main focus areas of engineering procedural work are 1) concept and feasibility; 2) strategy and design; 3) procurement; 4) planning and control; 5) testing and commissioning; 6) operation and maintenance.</p> | | | | 1 |
| <p>11. Technical Report Preparation</p> <p>Improve report writing skills and equip with the knowledge, skills, and capabilities in order to gather and collate data, and then draw up a professional and accurate technical report.</p> | | | | 2 |
| <p>12. Management Skills</p> <p>Demonstrate broad knowledge and understanding of management and business practices, including financial management, risk and change management, contract administration, and project formulation.</p> | | | | 2, 3, 4 |
| <p>13. Sustainable Development Concepts</p> <p>Understand the impact of engineering work in societal and environmental context and demonstrate a broader knowledge of sustainable development concepts and practices required to deal with contemporary issues related to professional engineering practice.</p> | | | | 1, 4 |
| <p>14. Work Ethics</p> <p>Demonstrate broad knowledge of ethical responsibilities, commit to professional ethics and standards of engineering practice, and advance several qualities that contribute to gaining a strong work ethic such as</p> | | | | 5 |

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| accountability, discipline, honesty, humility, integrity, being organized, quality work, responsibility, teamwork, and time management. | | | | | | | | |
| 15. Health and Safety Management Understand the importance of health and safety practices at working places with a strong emphasis on 1) Prevent workplace injuries and illnesses; 2) Improve compliance with laws and regulations; 3) Engage workers; 4) Enhance social responsibility goals; 5) Increase productivity and enhance overall business operations. | | 1, 4 | | | | | | |
| 16. Interpersonal Skill Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. | | 2, 6 | | | | | | |
| Continuous Assessment | Assignments: 3 Nos of report (every four weeks) for IT3301, 3 Nos of report (every four weeks) for IT4301 | | | | | | | |
| Method of Assessment | <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Daily diary</td> <td style="width: 40%;">20%</td> </tr> <tr> <td>Training Report</td> <td>30%</td> </tr> <tr> <td>Oral Examination</td> <td>50%</td> </tr> </table> <p>Marks are allocated on a percentage basis, and a pass / fail is awarded. A minimum of 50% of marks should be obtained for each component of assessment: Daily diary, Training Report, and an oral examination (viva) for a pass.</p> | | Daily diary | 20% | Training Report | 30% | Oral Examination | 50% |
| Daily diary | 20% | | | | | | | |
| Training Report | 30% | | | | | | | |
| Oral Examination | 50% | | | | | | | |
| Recommended Texts | <ol style="list-style-type: none"> 1. Guidelines for Industrial Training, Industrial Training Unit, Faculty of Engineering, South Eastern University of Sri Lanka (Version 2: February 2018) 2. Industrial Training Standards, Industrial Training Unit, Faculty of Engineering, South Eastern University of Sri Lanka (Version 1: 2019 August) | | | | | | | |