

| Course Code | Course Name | L-T-P-Credits | Year of Introduction |
|-------------|---------------------|---------------|----------------------|
| CE369 | DISASTER MANAGEMENT | 3-0-0-3 | 2016 |

Prerequisite: NIL

Course objectives:

- To provide an overview of the common hazards and their dynamics
- To inculcate the basic concepts of disaster management

Syllabus :

Fundamental concepts of hazards and disasters: Relationship between disasters and development, implications. Introduction to key concepts and terminology of hazard, vulnerability, exposure, risk, crisis, emergencies, Disasters, Resilience.

Types of Natural Disasters I- Earth quakes, Landslides. Classification of Disasters and nature of Impacts.

Types of Natural Disasters II- Floods, Coastal disasters-Tidal waves, Cyclones, Tsunamis. Classification of Disasters and nature of Impacts.

Types of Anthropogenic Disasters I – Soil degradation and desertification.

Types of Anthropogenic Disasters II- Fundamental concepts of water and atmospheric pollution.

Hazard and disaster management plans for floods, cyclones, tidal waves.

Expected Outcomes:

The students will

- i. gain the general ideas about the processes involved in natural and anthropogenic disasters
- ii. understand the concepts of disaster management and measures taken to mitigate and contain common episodes of disasters

References :

1. Andrew, S., "Environmental Modeling with GIS and Remote Sensing", John Wiley, 2002
2. Ariyabandu, M. and Sahni P. "Disaster Risk Reduction in South Asia", Prentice-Hall (India), 2003.
3. Bell, F.G., "Geological Hazards: Their assessment, avoidance and mitigation", E & FN SPON Routledge, London. 1999
4. Bossler, J.D., "Manual of Geospatial Science and Technology", Taylor and Francis, 2001
5. David Alexander, "Natural Disasters", Research Press, New Delhi, 1993
6. Matthews, J.A., "Natural hazards and Environmental Change", Bill McGuire, Ian Mason, 2002
7. Mitigating Natural Disasters, Phenomena, Effects and options, A Manual for policy makers and planners, United Nations. New York, 1991
8. Nick Carter. W., "Disaster Management - A Disaster Manager's Handbook". Asian Development Bank, Philippines. 1991

COURSE PLAN

| Module | Contents | Hours | Sem. Exam Marks % |
|--------|----------|-------|-------------------|
| | | | |

| | | | |
|------------------------------------|---|---|----|
| I | Fundamental concepts of hazards and disasters: Relationship between disasters and development, implications. Introduction to key concepts and terminology of hazard, vulnerability, exposure, risk, crisis, emergencies, Disasters, Resilience. | 7 | 15 |
| II | Types of Natural Disasters I- Earth quakes, Landslides. Classification and nature of impacts. | 7 | 15 |
| FIRST INTERNAL EXAMINATION | | | |
| III | Types of Natural Disasters II- Floods, Coastal disasters- Cyclones, Tsunamis. Classification and nature of impacts. | 7 | 15 |
| IV | Types of Anthropogenic Disasters I- soil and soil degradation, desertification. | 7 | 15 |
| SECOND INTERNAL EXAMINATION | | | |
| V | Types of Anthropogenic Disasters II-Fundamental concepts of water and atmospheric pollution. | 7 | 20 |
| VI | Hazard and disaster management plans for floods, cyclones, tidal waves. | 7 | 20 |
| END SEMESTER EXAMINATION | | | |

QUESTION PAPER PATTERN (End semester examination)

Maximum Marks :100

Exam Duration: 3 Hrs

Part A -Module I & II : 2 questions out of 3 questions carrying 15 marks each

Part B - Module III & IV: 2 questions out of 3 questions carrying 15 marks each

Part C - Module V & VI : 2 questions out of 3 questions carrying 20 marks each

Note : 1.Each part should have at least one question from each module

2.Each question can have a maximum of 4 subdivisions (a, b, c, d)

| Course Code | Course Name | L-T-P-Credits | Year of Introduction |
|-------------|----------------------------------|---------------|----------------------|
| CE371 | Environment and Pollution | 3-0-0-3 | 2016 |

Prerequisites: Nil

Course objectives:

- To understand the various types of environmental and industrial pollution, pollutants, related diseases and their causes
- To impart the various management techniques available for pollution abatement

Syllabus

Pollution, Environmental and industrial, Types. Air pollution-sources, effects, types of pollutants. Water pollution, characteristics of water pollutants, water borne diseases, water quality standards. Solid wastes, sources, types, control methods, soil pollution, urbanization, land degradation, pesticide pollution. Noise pollution, sources, effects, control measures, industrial pollution, occupational health hazards, industrial hygiene

Expected Outcomes:

- To have a basic knowledge of various pollution sources and their effects
- To have an awareness of the various methods of prevention and reduction of pollutant

Text Books / References:

1. B.C.Bhartia, Environmental Pollution and Control in Chemical Process Industries, Khanna Publishers, Delhi, 2001.
2. Danny D Reible, Fundamentals of Environmental Engineering, CRC Press, 1998
3. Gilbert M Masters, Wendell P Ela, Introduction to Environmental Engineering and Science, Pearson Education, 2007
4. Howard S Peavy, Donald R Rowe, George Tchobanoglous, Environmental Engineering, McGrawHill Education , 1984
5. Kurian Joseph & R.Nagendran, Essentials of Environmental Studies, Pearson Education (Singapore) Pvt.Ltd, New Delhi, 2004.
6. N.N Basak, Environmental Engineering, McGrawHill Education, Reprint 2015
7. P.AarneVesiland, Introduction to Environmental Engineering, PWS publishing company Boston, 1997.
8. Suresh K Dhameja, Environmental Engineering and Management, S.K.Kataria& Sons, Delhi, 2010.

COURSE PLAN

| Module | Contents | Hours | Sem. Exam Marks % |
|--------|--|-------|-------------------|
| I | Environment-Introduction-Multidisciplinary Nature Components of Environment, Ecology, Ecosystem- Material Cycling- Carbon and Nitrogen cycles Introduction: Classification of Pollution and Pollutants of environment, Pollution related Diseases, Basic requirements for healthy environment | 6 | 15 |

| | | | |
|------------------------------------|---|---|----|
| II | Air Pollution: Primary and Secondary Pollutants, Industrial Pollution, Ambient Air Quality Standards, Types of air pollutants-sulfur dioxide, nitrogen dioxide, carbon monoxide, particulate matter. Effects of air pollutants on human, vegetation and environment | 6 | 15 |
| FIRST INTERNAL EXAMINATION | | | |
| III | Water Pollution: Point and Non-point Source of Pollution, Major Pollutants of Water, Physical, chemical and biological characteristics of water , Water borne diseases, Water Quality standards | 7 | 15 |
| IV | Solid Waste: Classification of Solid Waste, Composition and Characteristics of Solid Waste, Plastic wastes; Segregation of Solid waste, recycling and reuse of solid wastes, E-waste: Sources of generation, | 7 | 15 |
| SECOND INTERNAL EXAMINATION | | | |
| V | Land/Soil Pollution: Effects of urbanization on land degradation, Impact of Modern Agriculture on Soil, pesticide pollution, Effect on Environment and Life sustenance, Abatement measures | 8 | 20 |
| VI | Noise pollution: Sources of Noise, Effects of Noise, measurement of noise, Equivalent sound pressure level, Control measures | 8 | 20 |
| END SEMESTER EXAMINATION | | | |

QUESTION PAPER PATTERN (End semester examination)

Maximum Marks :100

Exam Duration: 3 Hrs

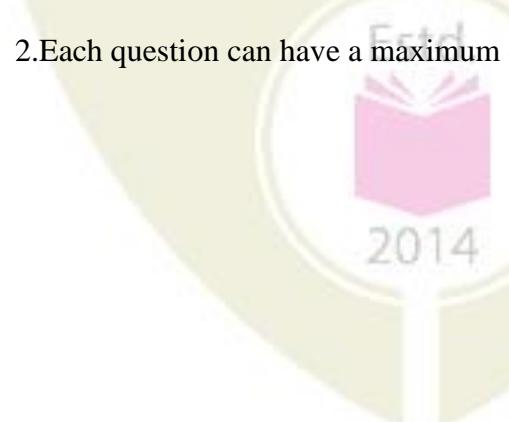
Part A -Module I & II : 2 questions out of 3 questions carrying 15 marks each

Part B - Module III & IV: 2 questions out of 3 questions carrying 15 marks each

Part C - Module V & VI : 2 questions out of 3 questions carrying 20 marks each

Note : 1.Each part should have at least one question from each module

2.Each question can have a maximum of 4 subdivisions (a,b,c,d)



| Course Code | Course Name | L-T-P-Credits | Year of Introduction |
|-------------|--------------------------------|---------------|----------------------|
| CE402 | ENVIRONMENTAL ENGINEERING – II | 3-0-0-3 | 2016 |

Prerequisites: CE405 Environmental Engineering- I

Course objectives:

- To understand the various sources and characteristics of wastewater
- To know the various treatment methods available for wastewater treatment

Syllabus : Wastewater, sources, characteristics, oxygen demand Design of sewers, Circular sewers, Partial flow and full flow conditions. Sewer appurtenances, Disposal of wastewater, Streeter Phelps equation, Oxygen sag curve, Treatment methods, Aerobic and anaerobic methods, Design of various treatment units-Screening, Grit chamber, Sedimentation tank, Activated Sludge process, Trickling filter, Rotating biological contactor, Septic tanks, Imhoff tanks, Oxidation ditches, Oxidation ponds, Upflow anaerobic sludge blanket reactors, Sludge digestion, Sludge drying bed.

Course Outcomes:

The students will

- i. have an understanding of the various types of treatment methods for wastewater
- ii. know the design aspects of various treatment units in a wastewater treatment plant.

Text Books

1. B.C Punmia , “Waste Water Engineering”, Laxmi Publications Pvt. Ltd, 2012
2. Howard S Peavy, Donald R Rowe, George Tchobanoglous, Environmental Engineering, Mc Graw Hill Education, 1984
3. P N Modi, “Sewage Treatment & Disposal and Waste water Engineering”, Standard Book House, NewDelhi, 2e, 2008.
4. S.K. Garg , “Sewage disposal and Air pollution Engineering”, Khanna Publishers, 2008
5. G S Birdie, Water Supply and Engineering, Dhanpat Rai Publishing Company, 2014

References

1. G. L. Karia, R.A. Christian, Wastewater treatment: Concepts And Design Approach, PHI learning Pvt Ltd, 2013
2. J. Arceivala, Shyam R. Asolekar, Wastewater Treatment for Pollution Control and Reuse, McGrawhill Education, 2007
3. K N Duggal, Elements of Environmental Engineering, S Chand Publications, 2007
4. Mackenzie L Davis, Introduction to Environmental Engineering, McGraw Hill Education (India), 5e, 2012
5. Metcalf and Eddy, “Waste Water Engineering”, Tata McGraw Hill publishing Co Ltd, 2003

COURSE PLAN

| Module | Contents | Hours | Sem. Exam Marks % |
|--------|---|-------|-------------------|
| I | Wastewater- Sources and flow rates, Domestic wastewater, Estimation of quantity of wastewater, Dry weather flow, storm water flow, Time of concentration Sewers, Design of circular sewers under full and partial flow | 6 | 15 |

| | | | |
|----|---|---|----|
| | conditions | | |
| II | Sewer appurtenances-Man holes, Catch basin, flushing devices, Inverted siphon. Ventilation of sewers. Sewage, Sewerage, Systems of sewerage Sewage characteristics- Physical, chemical and biological parameters, Biological oxygen demand, first stage BOD, Chemical oxygen demand, Relative stability, Population equivalent. | 7 | 15 |

FIRST INTERNAL EXAMINATION

| | | | |
|-----|---|---|----|
| III | Waste water disposal systems- Self purification of streams, Dilution -Oxygen sag curve, Streeter Phelp's Equation, land treatment Treatment of sewage-Preliminary and Primary treatment -Theory and design of Screen, Grit chamber, Detritus chamber, Flow equalization tank and Sedimentation tank. | 6 | 15 |
| IV | Secondary treatment methods-Contact bed, Intermittent sand filter, Theory and design of Trickling filter, Activated sludge process, Trickling filter-High rate, standard. Rotating biological contactor | 7 | 15 |

SECOND INTERNAL EXAMINATION

| | | | |
|----|---|---|----|
| V | Design of Septic tank and Imhoff tank, Principle and working of Oxidation ditch and oxidation ponds. Aerated lagoons, Design of upflow anaerobic sludge blanket reactors | 8 | 20 |
| VI | Sludge treatment and disposal-Methods of thickening, Sludge digestion- Anaerobic digestion, Design of sludge digestion tanks and Sludge drying beds, methods of sludge disposal | 8 | 20 |

END SEMESTER EXAMINATION

- **EXTERNAL EVALUATION:**

Maximum Marks :100

Exam Duration: 3 Hrs

QUESTION PAPER PATTERN (External Evaluation) :

Part A -Module I & II : 2 questions out of 3 questions carrying 15 marks each

Part B - Module III & IV: 2 questions out of 3 questions carrying 15 marks each

Part C - Module V & VI : 2 questions out of 3 questions carrying 20 marks each

Note : 1.Each part should have at least one question from each module

2.Each question can have a maximum of 4 subdivisions (a,b,c,d)

| Course Code | Course Name | L-T-P-Credits | Year of Introduction |
|-------------|------------------------------|---------------|----------------------|
| CE405 | ENVIRONMENTAL ENGINEERING- I | 3-0-0-3 | 2016 |

Pre-requisites: CE203 Fluid Mechanics -I

Course objectives:

- To study the significance of water resources and the factors affecting the quality and quantity of water
- To study the various types of treatment techniques adopted for a public water supply system

Syllabus :

Water sources, demand, factors, Quantity estimation, Population forecasting, Quality of water. Water treatment- Physical methods, Chemical methods. Design of sedimentation tank, flocculator, clariflocculator, filters, Membrane treatment techniques. Disinfection- methods. Distribution of water, Pumps, Hardy Cross method of analysis

Expected Outcomes:

The students will

- i. become aware of the various pollutants affecting water quality
- ii. know about the different treatment units available in a water treatment plant and their design procedures

Text Books:

1. B.C Punmia, "Water Supply Engineering", Laxmi Publications Pvt. Ltd., 2016
2. G S Birdie, Water Supply and Engineering, Dhanapat Rai Publishing Company, 2014
3. P.N. Modi, "Water Supply Engineering", Standard Book House, New Delhi
4. Peavy H S, Rowe, D.R. Tchobanaglous "Environmental Engineering" Mc GrawHill Education, 1984
5. S.K.Garg, "Water Supply Engineering", Khanna Publishers. 2010

References

1. K N Dugal, Elements of Environmental Engineering, S Chand and Company Pvt Ltd, 2007
2. Mackenzie L Davis, Introduction to Environmental Engineering, McGrawhill Education (India), 2012
3. Metcalf & Eddy , "Waste Water Engineering", Tata Mc Grawhill Publishing Co Ltd, 2003
4. P Venugopala Rao, Environmental Engineering, PHI Learning Pvt Ltd, 2002
5. Subhash Verma, Varinder Kanwar, Siby John, Water supply Engineering, Vikash Publishing, 2015

COURSE PLAN

| Module | Contents | Hours | Sem. Exam Marks % |
|--------|---|-------|-------------------|
| I | Introduction of environment- sources of water supply-Water demand, quantification of water demand through population forecasting – Factors affecting consumption-Fluctuations in demand | 7 | 15 |

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|------------------------------------|--|---|----|
| II | Types of intakes-Conveyors, pumps and location of pumping station-Quality of water - Drinking water standards - Physical, chemical and biological analysis. | 6 | 15 |
| FIRST INTERNAL EXAMINATION | | | |
| III | Treatment of water-Theory and principles of Sedimentation tanks-Stoke's law-Types of settling (Type I & Type II only)-Coagulation-Mixing-Flocculation, Design of Sedimentation tanks (circular and rectangular)-Clariflocculators | 7 | 15 |
| IV | Filtration-Types of filters- Working and Design of Rapid and Slow sand filters. Loss of head in filters, Pressure filters | 7 | 15 |
| SECOND INTERNAL EXAMINATION | | | |
| V | Disinfection of water - Methods, Chlorination-Types, Factors affecting - Chlorine demands. Miscellaneous treatment-Ion exchange, Lime-soda process, Electro dialysis - Colour, Taste and Odour removal-Adsorption-Aeration-Fluoridation-Defluoridation | 7 | 20 |
| VI | Lay out of water distribution network-Methods of distribution-Hardy cross method-Equivalent pipe method-Pipe appurtenances. | 8 | 20 |
| END SEMESTER EXAMINATION | | | |

QUESTION PAPER PATTERN (End semester examination)

Maximum Marks :100

Exam Duration: 3 Hrs

Part A -Module I & II : 2 questions out of 3 questions carrying 15 marks each

Part B - Module III & IV: 2 questions out of 3 questions carrying 15 marks each

Part C - Module V & VI : 2 questions out of 3 questions carrying 20 marks each

Note :

1. Each part should have at least one question from each module
2. Each question can have a maximum of 4 subdivisions (a, b, c, d)

| Course Code | Course Name | L-T-P-Credits | Year of Introduction |
|-------------|---------------------------------|---------------|----------------------|
| CE469 | ENVIRONMENTAL IMPACT ASSESSMENT | 3-0-0-3 | 2016 |

Prerequisites: Nil

Course objectives:

- To know the various types of environmental pollution
- To make aware the impact due to various types of pollutants and their assessment technique

Syllabus : Pollution, Types. Air pollution-sources, effects, types of pollutants. Water pollution, characteristics of water pollutants, Solid wastes, sources, types, soil pollution, pesticide pollution. Noise pollution, Impacts, positive and negative Environmental impact assessment, steps of doing EIA, methodology adopted, EIA procedure in India, Case studies.

Expected Outcomes:

- The students will gain basic knowledge of various pollution sources and their impacts

Text Books / References:

1. A K Srivastava, Environment impact Assessment, APH Publishing, 2014
2. John Glasson, Riki Therivel & S Andrew Chadwick "Introduction to EIA" University College London Press Limited, 2011
3. Larry W Canter, "Environmental Impact Assessment", McGraw Hill Inc. , New York, 1995.
4. Ministry of Environment & Forests, Govt. of India 2006 EIA Notification
5. Rau G J and Wooten C.D "EIA Analysis Hand Book" Mc Graw Hill
6. Robert A Corbett "Standard Handbook of Environmental Engineering" McGraw Hill, 1999.

COURSE PLAN

| Module | Contents | Hours | Sem. Exam Marks % |
|--------|--|-------|-------------------|
| I | INTRODUCTION: Classification of Pollution and Pollutants, – Evolution of EIA (Global and Indian Scenario)- Elements of EIA — Screening – Scoping - Public Consultation - Environmental Clearance process in India - Key Elements in 2006 EIA(Govt. of India) Notification | 6 | 15 |
| II | AIR POLLUTION: Primary and Secondary Types of Pollutants, sulfur dioxide- nitrogen dioxide, carbon monoxide, WATER POLLUTION: Point and Non-point Source of Pollution, Major Pollutants of Water, Impact of pollutants | 6 | 15 |

FIRST INTERNAL EXAMINATION

| | | | |
|-----|---|---|----|
| III | SOLID WASTE: Classification and sources of Solid Waste, Characteristics, effects, e waste, : Effects of urbanization on land degradation, pesticide pollution NOISE POLLUTION: Sources of Noise, Effects of Noise, | 7 | 15 |
|-----|---|---|----|

| | | | |
|------------------------------------|--|---|-----|
| | Control measures | | |
| IV | Impacts of pollutants, types, scale of impact-Global, local pollutants. Climate change, Ozone layer depletion, Deforestation, land degradation , Impact of development on vegetation and wild life | 7 | 15, |
| SECOND INTERNAL EXAMINATION | | | |
| V | Socio-economic impacts - Impact assessment Methodologies- Overlays, Checklist, Matrices, Fault Tree Analysis, Event Tree Analysis- Role of an Environmental Engineer- Public Participation | 8 | 20 |
| VI | Standards for Water, Air and Noise Quality - Environmental Management Plan- EIA- Case studies of EIA | 8 | 20 |
| END SEMESTER EXAMINATION | | | |

QUESTION PAPER PATTERN (External Evaluation) :

Maximum Marks :100

Exam Duration: 3 Hrs

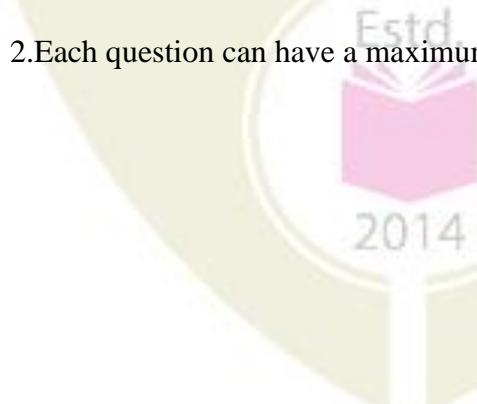
Part A -Module I & II : 2 questions out of 3 questions carrying 15 marks each

Part B - Module III & IV: 2 questions out of 3 questions carrying 15 marks each

Part C - Module V & VI : 2 questions out of 3 questions carrying 20 marks each

Note : 1.Each part should have at least one question from each module

2.Each question can have a maximum of 4 subdivisions (a, b, c, d)



| Course Code | Course Name | L-T-P-Credits | Year of Introduction |
|-------------|---------------------------------|---------------|----------------------|
| CE492 | ENVIRONMENTAL HEALTH AND SAFETY | 3-0-0-3 | 2016 |

Pre-requisites: Nil

Course Objectives:

- To introduce the different types of hazards in industries and the management of hazards.
- To learn the various types of pollution.

Syllabus:

Occupational health and toxicology- Lead-nickel, chromium and manganese toxicity-gas poisoning- Industrial hygiene, Physical, chemical and biological hazards, Safety and Health Management, noise-effects, source, Electrical Hazards and Hazards in Construction Industry, Air pollution, Water pollution, Hazardous Waste Management, pollution control in different industries

Expected Outcomes:

The students will

- i. Be able to understand the various occupational hazards and the techniques that can be adopted for managing hazards and related problems
- ii. Become aware regarding air pollution and water pollution problems and pollution control in industries

Text Books / References:

1. Gerard Kiely, Environmental Engineering, McGraw hill Education
2. Mackenzie L Davis, Introduction to Environmental Engineering, McGraw hill Education (India)
3. National Safety Council , Hand book of Occupational Safety and Health, Chicago, 1982
4. R.K.Jain and Sunil S.Rao , Industrial Safety , Health and Environment Management Systems, Khanna publishers , New Delhi (2006)
5. S.P.Mahajan, “Pollution control in process industries”, Tata McGraw Hill Publishing Company, New Delhi, 1993
6. Slote.L, Handbook of Occupational Safety and Health, John Willey and Sons, New York

COURSE PLAN

| Module | Contents | Hours | End Sem. Exam Marks |
|--------|--|-------|---------------------|
| I | Occupational Health And Toxicology : occupational related diseases, silicosis, asbestosis, pneumoconiosis, etc. lead, nickel, chromium and manganese toxicity, effects and prevention –Industrial toxicology, local, systemic and chronic effects, temporary and cumulative effects. Industrial Hygiene. | 7 | 15% |

| | | | |
|------------------------------------|---|---|-----|
| II | Noise, noise exposure regulation. Ionizing radiation, types, effects. Chemical hazards-dust, fumes, mist, vapour, fog, gases, Methods of Control. Biological hazards-Classification of Biohazardous agents – bacterial agents, viral agents, fungal, parasitic agents, infectious diseases. | 7 | 15% |
| FIRST INTERNAL EXAMINATION | | | |
| III | Radiation and Industrial Hazards, Types and effects of radiation on human body, disposal of radioactive waste Air Pollution - air pollutants from industries, effecton human health, animals, Plants and Materials - concept of clean coal combustion technology - depletion of ozone | 6 | 15% |
| IV | Electrical Hazards, Protection against voltage fluctuations, Effects of shock on human body. Introduction of Construction industry, Scaffolding and Working platform, Welding and Cutting, Excavation Work, Concreting and Cementing work, Transportation of men and material, | 6 | 15% |
| SECOND INTERNAL EXAMINATION | | | |
| V | Water Pollution -water pollutants-health hazards - effluent quality standards,tannery, textile effluents Hazardous Waste Management -waste identification, characterization and classification, health hazards-toxic and radioactive wastes-recycling and reuse. | 8 | 20% |
| VI | Pollution Control In Process Industries - Pollution control in process industries like cement, paper, petroleum products-textile, tanneries- thermal power plants – dyeing and pigment industries - eco-friendly energy. | 8 | 20% |
| END SEMESTER EXAMINATION | | | |

QUESTION PAPER PATTERN (External Evaluation) :

Maximum Marks :100

Exam Duration: 3 Hrs

Part A -Module I & II : 2 questions out of 3 questions carrying 15 marks each

Part B - Module III & IV: 2 questions out of 3 questions carrying 15 marks each

Part C - Module V &VI : 2 questions out of 3 questions carrying 20 marks each

Note : 1.Each part should have at least one question from each module

2.Each question can have a maximum of 4 subdivisions (a,b,c,d)



APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Modified Curriculum for B.Tech Degree Semesters I and II **2016**

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SEMESTER I

| Slot | Course No. | Subject | L-T-P | Hours | Credits |
|-------------------|---|--|---------------------|-----------|-----------------|
| A | MA101 | Calculus | 3-1-0 | 4 | 4 |
| B (1/2) | PH100 | Engineering Physics | 3-1-0 | 4 | 4 |
| | CY100 | Engineering Chemistry | 3-1-0 | 4 | 4 |
| C (1/2) | BE100 | Engineering Mechanics | 3-1-0 | 4 | 4 |
| | BE110 | Engineering Graphics | 1-1-3 | 5 | 3 |
| D | BE101-0X | Introduction to _____ Engineering | 2-1-0 | 3 | 3 |
| E | BE103 | Introduction to Sustainable Engineering | 2-0-1 | 3 | 3 |
| F (1/4) | CE100 | Basics of Civil Engineering | 2-1-0 | 3 | 3 |
| | ME100 | Basics of Mechanical Engineering | 2-1-0 | 3 | 3 |
| | EE100 | Basics of Electrical Engineering | 2-1-0 | 3 | 3 |
| | EC100 | Basics of Electronics Engineering | 2-1-0 | 3 | 3 |
| S (1/2) | PH110 | Engineering Physics Lab | 0-0-2 | 2 | 1 |
| | CY110 | Engineering Chemistry Lab | 0-0-2 | 2 | 1 |
| T (2/4) | CE110/ME110/ EE110/EC110/ CS110/CH110 | Basic Engineering Workshops (CS110 for CS and related branches and CH110 for CH and related branches only) | 0-0-2 + 0-0-2 | 2 2 | 1 1 |
| U | | U100 Language lab/CAD Practice/Bridge courses/Micro Projects etc | 0-0-(2/3) | (2/3) | |
| | | | | 30 | 24/23 |
| V | | V100 Entrepreneurship/TBI/NCC/NSS/ Physical Edn. etc | 0-0-2 | 2 | Activity points |

Notes:

1. Basic Engineering course of the parent branch included as Introduction to _____ Engineering. (3 credits)

List of Courses offered under BE 101-0X and Branches associated with each course

- 1. BE101-01 Introduction to Civil Engineering**

Civil Engineering

- 2. BE101-02 Introduction to Mechanical Engineering Sciences**

Aeronautical Engineering, Automobile Engineering, Food Technology,

Industrial Engineering, Mechanical Engineering, Mechanical Engineering

(Automobile), Mechanical Engineering (Production), Mechatronics, Metallurgy,

Naval Architecture & Ship Building , Production Engineering.

- 3. BE101-03 Introduction to Electrical Engineering**

Electrical & Electronics Engineering.

- 4. BE101-04 Introduction to Electronics Engineering**

Applied Electronics & Instrumentation Engineering, Biomedical Engineering,

Electronics & Biomedical Engineering, Electronics & Communication

Engineering, Electronics & Instrumentation Engineering, Instrumentation &

Control Engineering.

- 5. BE101-05 Introduction to Computing and Problem Solving**

Computer Science & Engineering, Information Technology.

- 6. BE101-06 Introduction to Chemical Engineering**

Biotechnology/ Biotechnology & Biochemical Engineering, Chemical Engineering,

2. Institutions can recommend one of four other Basic Engineering courses offered during this semester for every branch. However, the basic course selected should exclude the one corresponding to their branch of specialization. eg. Student who took Introduction to Civil Engineering should not take Basics of Civil Engineering; student who took Introduction to Electrical Engineering should not take Basics of Electrical Engineering

3. The six basic engineering workshops will be connected with the Introductory or Basics of Engineering courses offered. The students should attend two workshops in Semester 1 and **two in Semester 2.**

For example, students opting *Introduction to Civil Engineering* or Basics of Civil Engineering should attend the *Civil Engineering Workshop*, students opting *Introduction to Mechanical Engineering* or Basics of Mechanical Engineering should attend the *Mechanical Engineering Workshop*, students opting *Introduction to Chemical Engineering* should attend the *Chemical Engineering Workshop* and students opting *Introduction to Computing and Problem Solving* should attend the *Computer Science Workshop* etc. In addition, the students should attend one more workshop course in Semester 1, corresponding to the other Basic Engineering course they had been assigned by the institution. The workshop courses corresponding to both introductory and basic courses are same. However, the institutions may allot exercises or experiments listed in the syllabus based on the contents of corresponding theory course.

4. Engineering Physics and Engineering Chemistry shall be offered in both semesters. Institutions can advise students belonging to about 50% of the number of branches in the institution to opt for Engineering Physics in S1 and Engineering Chemistry in S2 and vice versa. Students opting for Engineering Physics in S1 should attend Engineering Physics Lab in S1 and students opting for Engineering Chemistry in S1 should opt for Engineering Chemistry Lab in S1.

5. Engineering Mechanics and Engineering Graphics shall be offered in both semesters. Institutions can advise students belonging to about 50% of number of branches in the institution to opt for Engineering Mechanics in Semester 1 and Engineering Graphics in Semester 2 and vice versa.

6. It may be noted that for items 4 and 5 above, all students belonging to a particular branch of study must be assigned the same course during one semester. For example, all students belonging to Electrical and Electronics Engineering in an institution may be assigned Engineering Physics and Engineering Physics lab, while all students in Electronics and Communication Engineering branch may be assigned Engineering Chemistry and Chemistry lab. Likewise, all students in Civil Engineering branch may be assigned Engineering Graphics, while all students in Mechanical Engineering branch may be allotted the Engineering Mechanics in Semester 1 and vice versa in Semester 2.

7. For **Course U**, the Institutions should conduct **diagnostic tests** to identify the training requirements of each student and advise them to attend the suitable programme. The students who excel in all diagnostic tests can be assigned **Micro projects** under the guidance of faculty members. The classes for which BE110 Engineering Graphics is offered under slot C may be divided into two batches and these batches shall attend CAD Practice lab & Language Lab in alternate weeks.

8. **Course V** is for earning activity points outside academic hours, the details are covered in rules and regulations of KTU.



SEMESTER II

| Slot | Course No. | Subject | L-T-P | Hours | Credits |
|----------------------|-----------------------------|---|-----------|-----------|--------------------|
| A | MA102 | Differential Equations | 3-1-0 | 4 | 4 |
| B (1/2) | PH100 | Engineering Physics | 3-1-0 | 4 | 4 |
| | CY100 | Engineering Chemistry | 3-1-0 | 4 | 4 |
| C (1/2) | BE100 | Engineering Mechanics | 3-1-0 | 4 | 4 |
| | BE110 | Engineering Graphics | 1-1-3 | 5 | 3 |
| D | BE102 | Design & Engineering | 2-0-2 | 4 | 3 |
| E, F (2/4) | CE 100 | Basics of Civil Engineering | 2-1-0 | 3 | 3 |
| | ME 100 | Basics of Mechanical Engineering | 2-1-0 | 3 | 3 |
| | EE 100 | Basics of Electrical Engineering | 2-1-0 | 3 | 3 |
| | EC 100 | Basics of Electronics Engineering | 2-1-0 | 3 | 3 |
| | CS 100 | Computer Programming (Only for CSE & IT branches) | 2-1-0 | 3 | 3 |
| S (1/2) | PH110 | Engineering Physics Lab | 0-0-2 | 2 | 1 |
| | CY110 | Engineering Chemistry Lab | 0-0-2 | 2 | 1 |
| T (2/4) | CE110/ME110/ EE110/EC110 | Basic Engineering Workshops | 0-0-2 | 2 | 1 |
| | CS 120 | Computer Programming Lab (only for CSE & IT Branches) | 0-0-2 | 2 | 1 |
| U | | U100 Language lab / CAD Practice/ Bridge courses/ Micro Projects etc | 0-0-(1/2) | (1/2) | |
| | | | | 30 | 24/23 |
| V | | V100 Entrepreneurship /TBI/NCC/NSS/ Physical Edn. etc | 0-0-2 | 2 | Activity points |

Note 1: Institutions can assign **two of four** of Basics of Engineering courses not already taken by the student in the previous semester and the corresponding Workshop courses in Semester 2. CS 100 Basics of Computer Programming & CS120 Computer Programming Lab are mandatory for Computer Science & Engineering and Information Technology branches. Other branches are not allowed to opt these courses.

Note 2: **For Course U**, the classes for which BE110 Engineering Graphics is offered under slot C may be divided into two batches and these batches shall attend CAD Practice lab & Language Lab in alternate weeks.



Note: The Curriculum for Semesters I and II 2015 is slightly modified. The modifications are highlighted in red colour. The modified curriculum will not affect failed students of 2015 batch

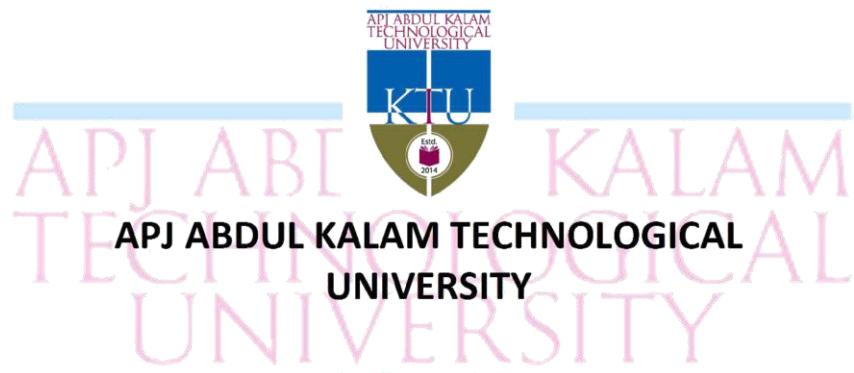
API ARDI II KALAM
TECHNOLOGICAL
UNIVERSITY



APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY



B. Tech. Syllabus



Modified Syllabus for I & II Semester B. Tech. Degree



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Table of Contents

| Code | Subject | Page |
|-----------|---|------|
| MA 101 | Calculus | 04 |
| PH 100 | Engineering Physics | 08 |
| CY 100 | Engineering Chemistry | 11 |
| BE 100 | Engineering Mechanics | 13 |
| BE 110 | Engineering Graphics | 15 |
| BE 101-01 | Introduction to Civil Engineering | 19 |
| BE 101-02 | Introduction to Mechanical Engineering Sciences | 21 |
| BE 101-03 | Introduction to Electrical Engineering | 24 |
| BE 101-04 | Introduction to Electronics Engineering | 27 |
| BE 101-05 | Introduction to Computing and Problem Solving | 29 |
| BE 101-06 | Introduction to Chemical Engineering | 33 |
| BE 103 | Introduction to Sustainable Engineering | 35 |
| CE 100 | Basics of Civil Engineering | 38 |
| ME 100 | Basics of Mechanical Engineering | 41 |
| EE 100 | Basics of Electrical Engineering | 43 |
| EC 100 | Basics of Electronics Engineering | 46 |
| MA102 | Differential Equations | 49 |
| BE 102 | Design and Engineering | 52 |
| PH 110 | Engineering Physics Lab | 56 |
| CY 110 | Engineering Chemistry Lab | 58 |
| CE 110 | Civil Engineering Workshop | 59 |
| ME 110 | Mechanical Engineering Workshop | 61 |
| EE 110 | Electrical Engineering Workshop | 62 |
| EC 110 | Electronics Engineering Workshop | 63 |
| CS 110 | Computer Science Workshop | 65 |
| CH 110 | Chemical Engineering Workshop | 67 |
| CS 100 | Computer Programming | 68 |
| CS 120 | Computer Programming Lab | 70 |

| COURSE NO. | COURSE NAME | CREDITS | YEAR OF INTRODUCTION |
|------------|-------------|---------|----------------------|
| MA 101 | CALCULUS | 4 | 2016 |

Course Objectives

In this course the students are introduced to some basic tools in Mathematics which are useful in modelling and analysing physical phenomena involving continuous changes of variables or parameters. The differential and integral calculus of functions of one or more variables and of vector functions taught in this course have applications across all branches of engineering. This course will also provide basic training in plotting and visualising graphs of functions and intuitively understanding their properties using appropriate software packages.

Syllabus

Single Variable Calculus and Infinite series, Functions of more than one variable, Partial derivatives and its applications, Calculus of vector valued functions, Multiple Integrals.

Expected outcome

At the end of the course the student will be able to (i) check convergence of infinite series (ii) find maxima and minima of functions two variables (iii) find area and volume using multiple integrals (iv) apply calculus of vector valued functions in physical applications and (v) visualize graphs and surfaces using software or otherwise.

Text Books

- (1)Anton, Bivens, Davis: Calculus, John Wiley and Sons, 10th ed
- (2)Thomas Jr., G. B., Weir, M. D. and Hass, J. R., Thomas' Calculus, Pearson

References:

1. Sengar and Singh, Advanced Calculus, Cengage Learning, 1st Edition
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India edition, 10th ed.
3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi.
4. N. P. Bali, Manish Goyal, Engineering Mathematics, Lakshmy Publications
5. D. W. Jordan, P Smith. Mathematical Techniques, Oxford University Press, 4th

Edition.

6. A C Srivastava, P K Srivastava, Engineering Mathematics Vol 1. PHI Learning
Private Limited, New Delhi.

| | COURSE NO: MA101 COURSE NAME: CALCULUS | L-T-P:3-1-0 CREDITS:4 | |
|--------|---|--------------------------|--------------------|
| MODULE | CONTENT | HRS | END SEM. MARK % |
| I | Single Variable Calculus and Infinite series (Book I –sec 9.3,9.5,9.6,9.8) Basic ideas of infinite series and convergence - .Geometric series- Harmonic series-Convergence tests-comparison, ratio, root tests (without proof). Alternating series- Leibnitz Test-Absolute convergence, Maclaurins series-Taylor series - radius of convergence. (For practice and submission as assignment only: Sketching, plotting and interpretation of hyperbolic functions using suitable software. Demonstration of convergence of series bysoftware packages) | 9 | 15% |
| II | Partial derivatives and its applications(Book I –sec. 13.3 to 13.5 and 13.8) Partial derivatives–Partial derivatives of functions of more than two variables - higher order partial derivatives - differentiability, differentials and local linearity - The chain rule – Maxima and Minima of functions of two variables - extreme value theorem (without proof)-relative extrema . | 5 4 | 15% |

| FIRST INTERNAL EXAM | | | | |
|----------------------|---|---|---|-----|
| III | <p>Calculus of vector valued functions(Book I- 12.1,12.2,12.4&12.6,13.6 &13.7)</p> <p>Introduction to vector valued functions-parametric curves in 3-space</p> <p>Limits and continuity – derivatives - tangent lines – derivative of dot and cross product-definite integrals of vector valued functions-</p> <p>unit tangent-normal- velocity-acceleration and speed-Normal and tangential components of acceleration.</p> <p>Directional derivatives and gradients-tangent planes and normal vectors</p> <p>(For practice and submission as assignment only: Graphing parametric curves and surfaces using software packages)</p> | 3 | 3 | 15% |
| IV | <p>Multiple integrals</p> <p>(Book I-sec. 14.1, 14.2, 14.3, 14.5)</p> <p>Double integrals- Evaluation of double integrals – Double integrals in non-rectangular coordinates- reversing the order of integration-</p> <p>Area calculated as a double integral-</p> <p>Triple integrals(Cartesian co ordinates only)-volume calculated as a triple integral-(applications of results only)</p> | 4 | 2 | 15% |
| SECOND INTERNAL EXAM | | | | |
| | <p>Topics in vector calculus</p> <p>(Book I-15.1, 15.2, 15.3)</p> <p>Vector and scalar fields- Gradient fields –</p> | 2 | | |

| | | | |
|-------------------|---|------------------|-----|
| V | conservative fields and potential functions – divergence and curl - the operator - the Laplacian ∇^2 , Line integrals - work as a line integral- independence of path-conservative vector field – (For practice and submission as assignment only: graphical representation of vector fields using software packages) | 2 2 2 2 | 20% |
| VI | Topics in vector calculus (continued) (Book I sec., 15.4, 15.5, 15.7, 15.8) Green's Theorem (without proof- only for simply connected region in plane), surface integrals – Divergence Theorem (without proof for evaluating surface integrals) , Stokes' Theorem (without proof for evaluating line integrals) (All the above theorems are to be taught in regions in the rectangular co ordinate system only) | 2 2 3 3 | 20% |
| END SEMESTER EXAM | | | |

Open source software packages such as gnuplot, maxima, scilab ,geogebra or R may be used as appropriate for practice and assignment problems.

TUTORIALS: Tutorials can be ideally conducted by dividing each class in to three groups. Prepare necessary materials from each module that are to be taught using computer. Use it uniformly to every class.

| Course No. | Course Name | L-T-P-Credits | Year of Introduction |
|-------------------|----------------------------|----------------------|-----------------------------|
| PH100 | ENGINEERING PHYSICS | 3-1-0-4 | 2016 |

Course Objectives

Most of the engineering disciplines are rooted in Physics. In fact a good engineer is more or less an applied physicist. This course is designed to provide a bridge to the world of technology from the basics of science and to equip the students with skills in scientific inquiry, problem solving, and laboratory techniques.

Syllabus

Harmonic Oscillations: Damped and Forced Harmonic Oscillations. Waves: One Dimensional and Three Dimensional waves, Interference: Interference in thin films (Reflected system) Diffraction: Fraunhofer and Fresnel Diffraction, Grating, Polarization of Light: Double refraction, production and detection of polarized light, Superconductivity: Properties and Applications. Quantum Mechanics: Schrodinger Equations- Formulation and Solution, Operators, Applications. Statistical Mechanics: Microstates and macro states Maxwell - Boltzmann, Bose-Einstein and Fermi Dirac statistics. Fermi level and its significance. Acoustics: Intensity of sound, Reverberation and design concepts, Ultrasonics: Production, Detection and Applications, NDT methods, Lasers: Properties, Working Principles, Practical Lasers. Photonics: Basics of Solid State lighting, Photo detectors, Solar Cells, Fiber Optics.

Expected outcome

Familiarity with the principles of Physics and its significance in engineering systems and technological advances.

References:

- Aruldhas, G., Engineering Physics, PHI Ltd.
- Beiser, A., Concepts of Modern Physics, McGraw Hill India Ltd.
- Bhattacharya and Tandon, Engineering Physics , Oxford India
- Brijlal and Subramanyam, A Text Book of Optics, S. Chand & Co.
- Dominic and Nahari, A Text Book of Engineering Physics, Owl Books Publishers
- Hecht, E., Optics, Pearson Education
- Mehta, N., Applied Physics for Engineers, PHI Ltd
- Palais, J. C., Fiber Optic Communications, Pearson Education
- Pandey, B. K. and Chathurvedi, S., Engineering Physics, Cengage Learning
- Philip, J., A Text Book of Engineering Physics, Educational Publishers
- Premlet, B., Engineering Physics, Mc GrawHill India Ltd
- Sarin, A. and Rewal, A., Engineering Physics, Wiley India Pvt Ltd
- Sears and Zemansky, University Physics , Pearson
- Vasudeva, A. S., A Text Book of Engineering Physics, S. Chand & Co

Web:www.physics.orgwww.howstuffworks.comwww.physics.about.com**Course Plan**

| Module | Contents | Hours | Sem. Exam Marks |
|----------------------------|---|--------------|--------------------------------|
| I | Harmonic Oscillations: Differential equation of damped harmonic oscillation, forced harmonic oscillation and their solutions- Resonance, Q factor, Sharpness of resonance- LCR circuit as an electrical analogue of Mechanical Oscillator (Qualitative) | 5 | 15% |
| | Waves: One dimensional wave - differential equation and solution. Three dimensional waves - Differential equation & its solution. (No derivation) Transverse vibrations of a stretched string. | 4 | |
| II | Interference: Coherence. Interference in thin films and wedge shaped films (Reflected system) Newton's rings-measurement of wavelength and refractive index of liquid Interference filters. Antireflection coating. | 5 | 15% |
| | Diffraction Fresnel and Fraunhofer diffraction. Fraunhofer diffraction at a single slit. Plane transmission grating. Grating equation - measurement of wavelength. Rayleigh's criterion for resolution of grating- Resolving power and dispersive power of grating. | 4 | |
| FIRST INTERNAL EXAM | | | |
| III | Polarization of Light: Types of polarized light. Double refraction. Nicol Prism. Quarter wave plate and half wave plate. Production and detection of circularly and elliptically polarized light. Induced birefringence- Kerr Cell - Polaroid & applications. | 4 | 15% |
| | Superconductivity: Superconducting phenomena. Meissner effect. Type-I and Type-II superconductors. BCS theory (qualitative). High temperature superconductors - Applications of superconductors. | 5 | |
| IV | Quantum Mechanics: Uncertainty principle and its applications- formulation of Time dependent and Time independent Schrödinger equations- physical meaning of wave function- Energy and momentum Operators-Eigen values and functions- One dimensional infinite square well potential .Quantum mechanical Tunnelling (Qualitative) | 6 | 15% |
| | Statistical Mechanics: Macrostates and Microstates. Phase space. Basic postulates of Maxwell- Boltzmann, Bose-Einstein and Fermi Dirac | 3 | |

| | | | |
|-----------------------------|---|---|-----|
| | statistics. Distribution equations in the three cases (no derivation). Fermi Level and its significance. | | |
| SECOND INTERNAL EXAM | | | |
| V | Acoustics: Intensity of sound- Loudness-Absorption coefficient - Reverberation and reverberation time- Significance of reverberation time- Sabine's formula (No derivation) -Factors affecting acoustics of a building. | 3 | 20% |
| | Ultrasonics: Production of ultrasonic waves - Magnetostriction effect and Piezoelectric effect - Magnetostriction oscillator and Piezoelectric oscillator - Detection of ultrasonics - Thermal and piezoelectric methods- Applications of ultrasonics - NDT and medical. | 4 | |
| VI | Laser: Properties of Lasers, absorption, spontaneous and stimulated emissions, Population inversion, Einstein's coefficients, Working principle of laser, Optial resonant cavity. Ruby Laser, Helium-Neon Laser, Semiconductor Laser (qualitative). Applications of laser, holography (Recording and reconstruction) | 5 | 20% |
| | Photonics: Basics of solid state lighting - LED – Photodetectors - photo voltaic cell, junction & avalanche photo diodes, photo transistors, thermal detectors, Solar cells- I-V characteristics - Optic fibre-Principle of propagation-numerical aperture-optic communication system (block diagram) - Industrial, medical and technological applications of optical fibre. Fibre optic sensors - Basics of Intensity modulated and phase modulated sensors. | 5 | |
| END SEMESTER EXAM | | | |



| Course No. | Course Name | L-T-P-Credits | Year of Introduction |
|-------------------|------------------------------|----------------------|-----------------------------|
| CY100 | ENGINEERING CHEMISTRY | 3-1-0-4 | 2016 |

Course Objectives

To enable the students to acquire knowledge in the concepts of chemistry for engineering applications and to familiarize the students with different application oriented topics like new generation engineering materials, storage devices, different instrumental methods etc. And to develop abilities and skills that are relevant to the study and practice of chemistry.

Syllabus

Spectroscopy - Principles and Applications, Electrochemistry - Electrodes, Electrochemical series and applications, Nernst Equation, Potentiometric titration and application, Cells, Instrumental Methods- Thermal Analysis, Chromatography; Conductivity, Chemistry of Engineering Materials, Copolymers, Conducting Polymers, Advanced Polymers, Nano materials, Fuels and Calorific value; Lubricants and their properties, Water Technology - Hardness, Water softening methods, Sewage water Treatment.

Expected outcome

The student will be able to apply the knowledge of chemistry and will be equipped to take up chemistry related topics as part of their project works during higher semester of the course.

References Books:

- Ahad, J., Engineering Chemistry, Jai Publications
- Dara, S. S., Engineering Chemistry, S Chand Publishers
- Fernandez, A., Engineering Chemistry, Owl Book Publishers, ISBN 9788192863382
- Jain and Jain, Engineering Chemistry, Dhanpat Rai Publishers
- Kaurav, Engineering Chemistry with Laboratory Experiments. PHI, ISBN 9788120341746
- Manjooran K. S., Modern Engineering Chemistry, Kannatheri Publication
- Seymour, R. B., Introduction to Polymer Chemistry, McGraw Hill
- Rath, P., Engineering Chemistry, Cengage Learning, ISBN 9788131526699
- Wiley India, Engineering Chemistry, ISBN 9788126543205

Course Plan

| Module | Contents | Hours | Sem. Exam Marks |
|---------------|---|--------------|------------------------|
| I | Spectroscopy: Introduction, Beer Lamberts Law (no derivations)(Numericals) | 1 | 15% |
| | UV-visible spectroscopy - Principle, Instrumentation and applications | 2 | |
| | IR spectroscopy - Principle and applications (Numericals) | 2 | |
| | ¹ H NMR spectroscopy - Principle, chemical shift - spin - spin splitting and applications including MRI(brief), Spectral Problems | 4 | |
| II | Electrochemistry: Different types of electrodes (general) – SHE, Calomel electrode, Glass electrode and determination of E ⁰ using SHE & Calomel | 2 | 15% |

| | | | |
|-----------------------------|--|---|-----|
| | electrode | | |
| | Electrochemical series and its applications.(Numericals) | 1 | |
| | Nernst equation - Derivation, application & numericals | 2 | |
| | Potentiometric titration - Acid-base and redox titration | 2 | |
| | Lithium ion cell and Fuel cell. | 1 | |
| FIRST INTERNAL EXAM | | | |
| III | Instrumental Methods: Thermal analysis - Principle, instrumentation and applications of TGA and DTA. | 3 | 15% |
| | Chromatographic methods - Basic principles, column, TLC. Instrumentation and principles of GC and HPLC. | 4 | |
| | Conductivity - Measurement of conductivity | 1 | |
| IV | Chemistry of Engineering Materials: Copolymers - BS, ABS - Structure and Properties. | 1 | 15% |
| | Conducting Polymers - Polyaniline, Polypyrrole - Preparation, Structure and Properties. | 2 | |
| | OLED – An introduction | 1 | |
| | Advanced Polymers – Kevlar, Polybutadiene rubber and silicone rubber: Preparation, Structure and Properties. | 2 | |
| | Nanomaterials – Definition, Classification, chemical methods of preparation - hydrolysis and reduction | 2 | |
| | Properties and Applications – Carbon Nano Tubes and fullerenes. | 1 | |
| SECOND INTERNAL EXAM | | | |
| V | Fuels and Lubricants: Fuels - Calorific Value, HCV and LCV - Determination of calorific value of a solid and liquid fuel by Bomb calorimeter - Dulongs formula and Numericals. | 3 | 20% |
| | Liquid fuel - Petrol and Diesel - Octane number & Cetane number | 1 | |
| | Biodiesel - Natural gas. | 2 | |
| | Lubricant - Introduction, solid, semisolid and liquid lubricants. | 1 | |
| | Properties of lubricants - Viscosity Index, Flash point, Fire point, Cloud point, Pour point and Aniline point. | 2 | |
| | | | |
| VI | Water Technology: Types of hardness, Units of hardness, Estimation of Hardness – EDTA method. Numericals based on the above | 3 | 20% |
| | Water softening methods - Ion exchange process - Principle. Polymer ion exchange. | 2 | |
| | Reverse Osmosis - Disinfection method by chlorination and UV | 1 | |
| | Dissolved oxygen, BOD and COD. | 2 | |
| | Sewage water Treatment - Trickling Filter and UASB process. | 1 | |
| END SEMESTER EXAM | | | |

| Course No. | Course Name | L-T-P-Credits | Year of Introduction |
|-------------------|------------------------------|----------------------|-----------------------------|
| BE100 | ENGINEERING MECHANICS | 3-1-0-4 | 2016 |

Course Objectives

1. To apply the principles of mechanics to practical engineering problems.
2. To identify appropriate structural system for studying a given problem and isolate it from its environment.
3. To develop simple mathematical model for engineering problems and carry out static analysis.
4. To carry out kinematic and kinetic analyses for particles and systems of particles.

Syllabus

Statics: Fundamental concepts and laws of mechanics; Force systems; Principle of moments; Resultant of force and couple systems; Equilibrium of rigid body; Free body diagram; Equilibrium of a rigid body in three dimension; Support reactions; Properties of surfaces and solids - Centroid, Moment of inertia, Polar moment of inertia, Mass moment of inertia, Product of inertia and Principal moment of inertia; Theorems of Pappus – Guldinus; Friction; Principle of virtual work.

Dynamics: Rectangular and cylindrical coordinate system; Combined motion of rotation and translation; Newton's second law in rectilinear translation; D' Alembert's principle; Mechanical vibration; Simple harmonic motion; Spring-mass model.

Expected outcome

1. Students will be able to apply and demonstrate the concepts of mechanics to practical engineering problems.
2. Students will be able to determine the properties of planes and solids.
3. Students will be able to apply fundamental concepts of dynamics to practical problems.

Text Books:

- Shames, I. H., Engineering Mechanics - Statics and Dynamics, Pearson Prentice
- Timoshenko, S. & Young D. H., Engineering Mechanics, McGraw Hill

References Books:

- Babu, J., Engineering Mechanics, Pearson Prentice Hall
- Beer and Johnson, Vector Mechanics for Engineers - Statics and Dynamics, Tata McGraw Hill Publishing Company Limited
- Benjamin J., Engineering Mechanics, Pentex Book Publishers and Distributors
- Bhavikkatti, S. S., Engineering Mechanics, New Age International Publishers
- Hibbeler, R. C., Engineering Mechanics: Statics and Dynamics. Pearson Prentice Hall
- Kumar, K. L., Engineering Mechanics, Tata McGraw Hill Publishing Company Limited
- Merriam J. L. and Kraige L. G., Engineering Mechanics – Vol. I and II, John Wiley
- Rajasekaran S. and Sankarasubramanian, G., Engineering Mechanics, Vikas Publishing House Private Limited
- Tayal, A. K., Engineering Mechanics- Statics and Dynamics, Umesh Publications

| Course Plan | | | |
|-----------------------------|---|-------|-----------------------|
| Module | Contents | Hours | Sem. Exam Marks |
| I | Statics: Fundamental concepts and laws of mechanics – Rigid body – Principle of transmissibility of forces | 2 | 15% |
| | Coplanar force systems - Moment of a force – Principle of moments | 2 | |
| | Resultant of force and couple system | 4 | |
| | Equilibrium of rigid body – Free body diagram – Conditions of equilibrium in two dimensions – Two force and three force members. | 3 | |
| II | Types of supports – Problems involving point loads and uniformly distributed loads only. | 5 | 15% |
| | Force systems in space – Degrees of freedom – Free body diagram – Equations of equilibrium – Simple resultant and Equilibrium problems. | 4 | |
| FIRST INTERNAL EXAM | | | |
| III | Properties of planar surfaces – Centroid and second moment of area (Derivations not required) - Parallel and perpendicular axis theorem – Centroid and Moment of Inertia of composite area. | 3 | 15% |
| | Polar Moment of Inertia – Radius of gyration – Mass moment of inertia of cylinder and thin disc (No derivations required). | 2 | |
| | Product of inertia – Principal Moment of Inertia (conceptual level). | 3 | |
| | Theorems of Pappus and Guldinus. | 1 | |
| IV | Friction – Characteristics of dry friction – Problems involving friction of ladder, wedges and connected bodies. | 6 | 15% |
| | Definition of work and virtual work – Principle of virtual work for a system of connection bodies – Problems on determinate beams only. | 4 | |
| SECOND INTERNAL EXAM | | | |
| V | Dynamics: Rectangular and Cylindrical co-ordinate system | 1 | 20% |
| | Combined motion of rotation and translation – Concept of instantaneous centre – Motion of connecting rod of piston and crank of a reciprocating pump. | 4 | |
| | Rectilinear translation – Newton's second law – D'Alembert's Principle – Application to connected bodies (Problems on motion of lift only). | 4 | |
| VI | Mechanical vibrations – Free and forced vibration - Degree of freedom. | 1 | 20% |
| | Simple harmonic motion – Spring-mass model – Period – Stiffness – Frequency – Simple numerical problems of single degree of freedom. | 7 | |
| END SEMESTER EXAM | | | |

| Course No: | Course Name | L-T-P Credits | Year of Introduction |
|--|------------------------|---------------|----------------------|
| BE110 | * ENGINEERING GRAPHICS | 1-1-3-3 | 2016 |
| <p>* As this course is practical oriented, the evaluation is different from other lecture based courses.</p> <p>Points to note:</p> <ul style="list-style-type: none"> (1) End semester examination will be for 50 marks and of 3 hour duration. (2) End semester exam will include all modules except Module IV. (3) 100 marks are allotted for internal evaluation: first internal exam 40 marks, second internal exam 40 marks(CAD Lab Practice) and class exercises 20 marks. (4) The first internal exam will be based on modules I and II and the second internal exam will be a practical exam in CAD based on Module IV alone. Second internal exam may be conducted at the end of the semester. | | | |
| <p>Course Objectives</p> <p>To enable the student to effectively communicate basic designs through graphical representations as per standards.</p> | | | |
| <p>Syllabus</p> <p>Introduction to Engineering Graphics; Orthographic projections of lines and solids, Isometric projection, Freehand sketching, Introduction to CAD, Sections of solids, Development of surfaces, Perspective projection.</p> | | | |
| <p>Expected outcome</p> <p>Upon successful completion of this course, the student would have accomplished the following abilities and skills:</p> <ol style="list-style-type: none"> 1. Fundamental Engineering Drawing Standards. 2. Dimensioning and preparation of neat drawings and drawing sheets. 3. Interpretation of engineering drawings 4. The features of CAD software | | | |

References Books:

- Agrawal, B. and Agrawal, C. M., Engineering Drawing, Tata McGraw Hill Publishers
- Anilkumar, K. N., Engineering Graphics, Adhyuth Narayan Publishers
- Benjamin, J., Engineering Graphics, Pentex Publishers
- Bhatt, N., D., Engineering Drawing, Charotar Publishing House Pvt Ltd.
- Duff, J. M. and Ross, W. A., Engineering Design and Visualization, Cengage Learning, 2009
- John, K. C., Engineering Graphics, Prentice Hall India Publishers
- Kirstie Plantenberg, Engineering Graphics Essentials with AutoCAD 2016 Instruction, 4th Ed., SDC Publications
- Kulkarni, D. M., Rastogi, A. P. and Sarkar, A. K., Engineering Graphics with AutoCAD, PHI 2009
- Luzadder, W. J. and Duff, J. M., Fundamentals of Engineering Drawing, PHI 1993
- Parthasarathy, N. S., and Murali, V., Engineering Drawing, Oxford University Press
- Varghese, P. I., Engineering Graphics, V I P Publishers
- Venugopal, K., Engineering Drawing & Graphics, New Age International Publishers

Course Plan

| Module | Contents | Hours | Sem. Exam Marks |
|--------|--|-------|-----------------|
| I | <p>6 exercises</p> <p>Introduction to Engineering Graphics: Need for engineering drawing.</p> <p>Drawing instruments; BIS code of practice for general engineering drawing.</p> <p>Orthographic projections of points and lines:-Projections of points in different quadrants; Projections of straight lines inclined to one of the reference planes, straight lines inclined to both the planes; True length and inclination of lines with reference planes; Traces of lines.</p> | 14 | 20% |

| | | | |
|--|---|--|----------|
| II | <p>12 exercises</p> <p>Orthographic projections of solids:-Projections of simple solids* in simple positions, projections of solids with axis inclined to one of the reference planes and axis inclined to both the reference planes.</p> | 11 | 20% |
| FIRST INTERNAL EXAM | | | |
| III | <p>12 exercises</p> <p>Isometric Projections:-Isometric projections and views of plane figures simple* and truncated simple* solids in simple position including sphere and hemisphere and their combinations.</p> <p>Freehand sketching: Freehand sketching of real objects, conversion of pictorial views into orthographic views and vice versa.</p> | 09 | 20% |
| IV | <p>6 exercises</p> <p>Introduction to Computer Aided Drafting - familiarizing various coordinate systems and commands used in any standard drafting software - drawing of lines, circle, polygon, arc, ellipse, etc. Creating 2D drawings.</p> <p>Transformations: move, copy, rotate, scale, mirror, offset and array, trim, extend, fillet, chamfer. Dimensioning and text editing. Exercises on basic drafting principles, to create technical drawings. Creation of orthographic views of simple solids from pictorial views. Creation of isometric views of simple solids from orthographic views. Solid modelling and sectioning of solids, extraction of 2D drawings from solid models. (For internal examination only, not for University Examination).</p> | 15 (Additional hours are allotted in U slot for CAD practice) | Internal |
| SECOND INTERNAL EXAM (to be conducted only after finishing CAD Practice.) | | | |
| V | <p>9 exercises</p> <p>Sections and developments of solids: - Sections of simple* solids in simple vertical positions with section plane inclined to one of the reference planes - True shapes of sections. Developments of surfaces of these solids.</p> | 12 | 20% |

| | | | |
|---|---|----|-----|
| VI | <p>6 exercises</p> <p>Intersection of surfaces: - Intersection of prism in prism and cylinder in cylinder - axis bisecting at right angles only.</p> <p>Perspective projections: - perspective projections of simple* solids.</p> | 09 | 20% |
| *Triangular, square, pentagonal and hexagonal prisms, pyramids, cones and cylinders. | | | |
| END SEMESTER EXAM | | | |

Note:

1. First angle projection is to be followed.
2. CAD Practice is mandatory and shall be conducted in the time slot allotted for U slot in addition to 15 hours allotted for Module IV

Question Paper Pattern: Question Paper shall contain eight questions of 10 marks each out of which five questions are to be answered as explained below. The duration of examination is 3 hours.

Part A: Three questions from Modules I & II out of which two are to be answered.

Part B: Five questions from Modules III, V & VI out of which three are to be answered.

The questions are to be answered in A4 size booklet containing grid/plain sheets supplied by the university. Drawing sheets are not needed.

The evaluation of answers shall be based on the correctness of solution, judging the knowledge of student in concepts and principles of Engineering Graphics. Accuracy and neatness shall not be criteria for evaluation.

| Course No. | Course Name | L-T-P-Credits | Year of Introduction |
|-------------------|--|----------------------|-----------------------------|
| BE101-01 | INTRODUCTION TO CIVIL ENGINEERING | 2-1-0-3 | 2016 |

Course Objectives

1. To provide the students an overview of the profession of Civil Engineering.
2. To give the students an illustration of the use and properties of various building materials and explain the building construction aspects.

Syllabus

Civil Engineering as a profession; General introduction to history of Civil Engineering; types and classification of buildings; setting out of a building; Building materials - Stones, Bricks, Tiles, Cement, Aggregate, Cement mortar, Timber, Steel; Building Construction - Stone Masonry, Brick Masonry, Floors and flooring, Roofs and roof coverings.

Expected outcome

Students will be able to explain the importance of Civil Engineering in the infrastructural development of the society.

1. They will be able to illustrate the types, uses and properties of various building materials.
2. Students will be able to explain the method of construction of different components of a building.

References Books:

- Chen, W. F. and Liew, J. Y. R., (Eds.), The Civil Engineering Handbook, Second Edition, CRC Press (Taylor and Francis)
- Dalal, K. R., Essentials of Civil Engineering, Charotar Publishing House
- Gopi, S., Basic Civil Engineering, Pearson Publishers
- Kandy, A. A., Elements of Civil Engineering, Charotar Publishing house
- Mamlouk, M. S. and Zaniewski, J. P., Materials for Civil and Construction Engineering, Pearson Publishers.
- McKay, W. B. and McKay, J. K., Building Construction Volumes 1 to 4, Pearson India Education Services
- Rangwala, S. C. and Dalal, K. B., Engineering Materials, Charotar Publishing house
- Rangwala, S. C. and Dalal, K. B., Building Construction, Charotar Publishing house

Course Plan

| Module | Contents | Hours | Sem. Exam Marks |
|---------------|--|--------------|--------------------------------|
| 1 | General introduction to Civil Engineering - History of Civil Engineering - Relevance of Civil Engineering in the overall infrastructural development of the country. Types and classification of structures - buildings, towers, chimneys, bridges, dams, retaining walls, water tanks, silos, roads, railways, | 2 3 | 15% |

| | | | |
|-----------------------------|--|---|-----|
| | runways and pipelines (Brief description only) | | |
| | Definition and types of buildings as per National Building Code of India (brief description only). | 1 | |
| | Selection of site - Components of a building and their functions - Setting out of a building. | 2 | |
| II | Stones: Classification of stones - Qualities of good building stones - Quarrying - Dressing - Tests - Specifications - Uses of common building stones. | 2 | 15% |
| | Bricks: Composition of good brick earth - Classification - Qualities of good bricks - Field and laboratory tests - Specifications. | 2 | |
| | Tiles: Classification - Manufacture - Properties - Tests - Specifications | 3 | |
| FIRST INTERNAL EXAM | | | |
| III | Cement: Basic Ingredients – Manufacturing process - Grades - Properties - Tests - Specifications. | 4 | 15% |
| | Aggregates: Fine and coarse aggregate - Properties - Uses - Tests. | 3 | |
| | Cement Mortar: Types and preparation. | 1 | |
| IV | Stone Masonry: Types - Details of Ashlar, Random Rubble, Coarse Rubble and Dry Rubble Masonry. | 3 | 15% |
| | Brick Masonry: Types - Bond - Introduction to all types of bonds - English bond in detail (1, 1½ and 2 brick walls) - Comparison of stone and brick masonry. | 4 | |
| SECOND INTERNAL EXAM | | | |
| V | Timber: Properties - Uses - Classification - Seasoning - Defects - Preservation - Tests; Hard board and Particle board - Manufacture and use. | 3 | 20% |
| | Steel: Structural steel and steel as reinforcement - Types - Properties - Uses - Market forms. | 3 | |
| VI | Floors and Flooring materials: Different types and selection of floors and floor coverings. | 3 | 20% |
| | Roofs and roof coverings: Different types of roofs - Suitability - Types and selection of roofing materials. | 3 | |
| END SEMESTER EXAM | | | |

| Course No: | Course Name | L-T-P Credits | Year of Introduction |
|---|---|---------------|----------------------|
| BE101-02 | INTRODUCTION TO MECHANICAL ENGINEERING SCIENCES | 2-1-0-3 | 2016 |
| Course Objectives | | | |
| <ol style="list-style-type: none"> 1. To introduce different disciplines of Mechanical Engineering 2. To kindle interest in Mechanical Engineering 3. To impart basic mechanical engineering principles | | | |
| Syllabus | | | |
| Thermodynamics & Power sources, Thermal Engineering, Refrigeration and Air Conditioning, Automobile & Aeronautical Engineering, Engineering Materials and manufacturing. | | | |
| Expected Outcome | | | |
| At the end of the course, the students will have exposed to the different areas of Mechanical Engineering; gained idea about nature, scope and applications of Mechanical Engineering principles. | | | |
| References Books: | | | |
| <p>Dossat, R. J., Principles of Refrigeration, PHI</p> <p>Heywood, J., Internal Combustion Engine Fundamentals, McGraw Hill Publishers</p> <p>Holman, J. P., Thermodynamics, McGraw Hill Co.</p> <p>Jain, K. K. and Asthana, R. B., Automobile Engineering, TTTI Bhopal</p> <p>Jonathan Wickert, Introduction to Mechanical Engineering, Cengage Learning</p> <p>Kalpakjian, S. and Schmid, S. R., Manufacturing Processes for Engineering Materials, Pearson education</p> <p>Maines, R., Landmarks in Mechanical Engineering, ASME</p> <p>Peng, W. W., Principles of Turbomachinery, John Wiley & Sons</p> <p>Pita, E. G., Air Conditioning Principles & Systems, PHI.</p> <p>Spalding, D. B. and Cole, E. H., Engineering Thermodynamics, ELBS & Edward Arnold (Pub) Ltd.</p> <p>Stone, R. and Ball, T. K., Automotive Engineering Fundamentals, SAE International</p> <p>Sutton, G. P. and Ross, D. M., Rocket Propulsion Elements, John Wiley & Sons</p> <p>Von Karman, T., Aerodynamics: Selected Topics in the Light of Their Historical Development, Courier Corporation</p> <p>Online course on Refrigeration & Air conditioning, IIT Kharagpur www.nptel.ac.in</p> | | | |

| Course Plan | | | |
|----------------------|--|-------|-----------------------|
| Module | Contents | Hours | Sem. Exam Marks |
| I | Thermodynamics: Nature and scope of thermodynamics; Basic concepts ; Laws of thermodynamics- Discovery, Significance & Applications; Qualitative ideas on Entropy, Available energy, Irreversibility, Principle of increase of entropy & Carnot engine; Limitations of Thermodynamics; Sources of power; history of power production; power production in the future. | 8 | 15% |
| II | Thermal Engineering: Historical development of steam engine, steam turbines, gas turbines and hydraulic turbines; Principle of turbomachinery; History of IC engines; two stroke and four stroke engines-working, applications; Air compressors- types and uses; Principles of Rocket propulsion, chemical rockets, Indian space programme | 8 | 15% |
| FIRST INTERNAL EXAM | | | |
| III | Refrigeration & Air Conditioning: History & scope of refrigeration; applications of refrigeration; Food preservation, refrigerated storage; applications in chemical and process industries; special applications; Air conditioning- Principles & systems; scope of air conditioning; Psychrometric properties of air; Human comfort; comfort standards. | 7 | 15% |
| IV | Automobile & Aeronautical Engineering: Introduction to an Automobile; history of the automobile; Indian Automobiles; Types of automobiles; Major components and their functions; Manufacturers of motor vehicles in India; Fundamentals of aerodynamics; drag force and lift force; jet engines types and applications. | 7 | 15% |
| SECOND INTERNAL EXAM | | | |
| V | Engineering Materials: Introduction and history of materials; Basic crystallography; metals, alloys, composites, ceramics, polymers; mechanical properties and testing of engineering materials. | 5 | 20% |
| VI | Manufacturing Engineering : | 7 | 20% |

| | | |
|--|---|--|
| | Methods of manufacturing; casting, forging, rolling, extrusion; machining operations – turning, milling, drilling, grinding, shaping, planing; Joining operations – soldering, brazing & welding; Introduction to CNC machines(elementary idea only); examples of typical products manufactured by above methods. | |
|--|---|--|

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Question Paper Pattern:

Part A: Modules I and II – three questions of 15 marks each – out of which two questions are to be answered.

Part B: Modules III and IV – three questions of 15 marks each – out of which two questions are to be answered.

Part C: Modules V and VI – three questions of 20 marks each – out of which two questions are to be answered.

Each question can have maximum of four subdivisions (a,b,c,d).



| Course No. | Course Name | L-T-P Credits | Year of Introduction |
|---|--|---------------|----------------------|
| BE101-03 | INTRODUCTION TO ELECTRICAL ENGINEERING | 2-1-0-3 | 2016 |
| Course Objective | | | |
| The objective of this course is to set a firm and solid foundation in Electrical Engineering with strong analytical skills and conceptual understanding of basic laws and analysis methods in electrical and magnetic circuits. | | | |
| Syllabus | | | |
| Fundamental Concepts of Circuit Elements and Circuit variables, Real and Ideal independent voltage and current sources, V-I relations; Basic Circuit Laws, Analysis of resistive circuits, Magnetic Circuits, Electromagnetic Induction; Alternating current fundamentals, Phasor Concepts, Complex representation, Phasor analysis of RL, RC, RLC circuit, admittances; Complex Power, Resonance in series and parallel circuits; Three-phase systems, analysis of balanced and unbalanced star and delta connected loads. | | | |
| Expected outcome | | | |
| The course will enable students to learn advanced topics in Electrical Engineering | | | |
| References Books: | | | |
| Bhattacharya, S. K., Basic Electrical & Electronics Engineering, Pearson | | | |
| Bird, J., Electrical Circuit Theory and Technology, Routledge, Taylor & Francis Group | | | |
| Edminister, J., Electric Circuits, Schaum's Outline Series, Tata McGraw Hill | | | |
| Hayt, W. H., Kemmerly, J. E., and Durbin, S. M., Engineering Circuit Analysis, Tata McGraw Hill | | | |
| Hughes, Electrical and Electronic Technology, Pearson Education | | | |
| Parker and Smith, Problems in Electrical Engineering, CBS Publishers and Distributors | | | |
| Sudhakar and Syam Mohan, Circuits and Networks Analysis and Synthesis, Tata McGraw Hill | | | |
| Suresh Kumar, K. S, Electric Circuits and Networks, Pearson Education | | | |

| Course Plan | | | |
|-------------|--|-------|------------------|
| Module | Contents | Hours | Sem. Exam. Marks |
| I | Fundamental Concepts of Circuit Elements and Circuit variables: Electromotive force, potential and voltage. Resistors, Capacitors | 1 | 15% |
| | Inductors- terminal V-I relations | 2 | |
| | Electromagnetic Induction: Faraday's laws, Lenz's law, statically and dynamically induced EMF, self and mutual inductance, coupling coefficient-energy stored in inductance | 1 | |
| | Real and Ideal independent voltage and current sources, V-I relations. Passive sign convention | 2 | |
| II | Numerical Problems (Module I) | 2 | |
| | Basic Circuit Laws: Kirchhoff's current and voltage laws, analysis of resistive circuits-mesh analysis –super mesh analysis | 2 | 15% |
| | Node analysis-super node analysis, star delta transformation | 2 | |
| III | Numerical problems (Module II) | 2 | |
| | FIRST INTERNAL EXAMINATION | | |
| | Magnetic Circuits: Magneto motive force, flux, reluctance, permeability -comparison of electric and magnetic circuits, analysis of series magnetic circuits | 2 | 15% |
| IV | Parallel magnetic circuits, magnetic circuits with air-gaps. | 2 | |
| | Numerical problems (Module III) | 2 | |
| | Alternating current fundamentals:-Generation of Alternating voltages-waveforms, Frequency, Period, RMS and average values, peak factor and form factor of periodic waveforms (pure sinusoidal) and composite waveforms | 3 | 15% |

| | | | |
|-----------------------------|--|---|-----|
| | Phasor Concepts, Complex representation (exponential, polar and rectangular forms) of sinusoidal voltages and currents phasor diagrams | 2 | |
| | Complex impedance - series and parallel impedances and admittances, Phasor analysis of RL, RC, RLC circuits | 2 | |
| | Numerical problems. (Module IV) | 2 | |
| SECOND INTERNAL EXAMINATION | | | |
| V | Complex Power : Concept of Power factor: active , reactive and apparent power | 1 | 20% |
| | Resonance in series and parallel circuits | 2 | |
| | Energy, bandwidth and quality factor, variation of impedance and admittance in series and parallel resonant circuits | 2 | |
| | Numerical problems (Module V) | 2 | |
| VI | Three phase systems: Star and delta connections, three-phase three wire and three-phase four-wire systems | 2 | 20% |
| | Analysis of balanced and unbalanced star and delta connected loads | 2 | |
| | Power in three-phase circuits. Active and Reactive power measurement by one, two, and three wattmeter methods | 2 | |
| | Numerical problems (Module VI) | 2 | |
| END SEMESTER EXAMINATION | | | |

| Course No. | Course Name | L-T-P-Credits | Year of Introduction |
|-------------------|--|----------------------|-----------------------------|
| BE101-04 | INTRODUCTION TO ELECTRONICS ENGINEERING | 2-1-0-3 | 2016 |

Course Objectives

1. To get basic idea about types, specification and common values of passive components
2. To familiarize the working and characteristics of diodes, transistors and MOSFETS
3. To understand working of diodes in circuits and in rectifiers
4. To familiarize some measuring instruments

Syllabus

Evolution and Impact of Electronics, Familiarization of Resistors, Capacitors, Inductors, Transformers and Electro mechanical components, Semiconductors, PN junction diode, Zener diode, LED, photo diode, Bipolar Junction Transistors: Structure, principle of operation, different configurations, load line and operating point, biasing and stabilization, Transistor as amplifier, switch, Junction Field Effect Transistors: Structure, principle of operation, characteristics MOSFET: Structure, principle of operation, characteristics, Principle of operation of Photo transistor, UJT, SCR, Diode circuits and power supplies: Series and parallel diode circuits, Half-wave & full wave rectifiers, capacitor filter, zener voltage regulator, Electronic Measurements and measuring Instruments: Performance parameters, Analog and digital multimeter, CRO, DSO, function generator, Testing of Electronic components.

Expected outcome

Student can identify the active and passive electronic components and can design and setup simple circuits using diodes and transistors. Voltage and currents can be measured and monitored using electronic measuring instruments

References Books:

- Bell, D. A., Electronic Devices and Circuits, Oxford University Press
- Boylested, R. L. and Nashelsky, L., Electronic Devices and Circuit Theory, Pearson Education
- Kal, S., Basic Electronics: Devices, Circuits and its Fundamentals, PHI Learning
- Millman, J., Halkias, C. and Parikh, C. D., Integrated Electronics, Tata Mc Graw Hill
- Neaman, D. A., Electronic Circuits Analysis and Design, McGraw Hill
- Sedra, A. S. and Smith, K. C., Microelectronic Circuits, Oxford University Press

Course Plan

| Module | Contents | Hours | Sem. Exam Marks |
|---------------|--|--------------|--------------------------------|
| I | Evolution of Electronics, Impact of Electronics in industry and in society. | 1 | 15% |
| | Resistors, Capacitors: types, specifications. Standard values, marking, colour coding. | 3 | |
| | Inductors and Transformers: types, specifications, Principle of working. | 2 | |

| | | | |
|-----------------------------|---|---|-----|
| | Electro mechanical components: relays and contactors. | 1 | |
| II | Diodes: Intrinsic and extrinsic semiconductors, PN junction diode, barrier potential, V-I characteristics, Effect of temperature. Equivalent circuit of a diode. Piece wise linear model. | 3 | 15% |
| | Specification parameters of diodes and numbering. | 1 | |
| | Zener diode, Varactor diodes, characteristics, working principle of LED, photo diode, solar cell. | 3 | |
| FIRST INTERNAL EXAM | | | |
| III | Bipolar Junction Transistors: Structure, typical doping, Principle of operation, concept of different configurations. Detailed study of input and output characteristics of common base and common emitter configuration, current gain, comparison of three configurations. | 3 | 15% |
| | Concept of load line and operating point. Need for biasing and stabilization, voltage divider biasing, Transistor as amplifier, switch, RC coupled amplifier and frequency response | 3 | |
| | Specification parameters of transistors and type numbering | 1 | |
| IV | Junction Field Effect Transistors: Structure, principle of operation, characteristics, comparison with BJT. | 2 | 15% |
| | MOSFET: Structure, principle of operation of Enhancement type MOSFET, Current voltage characteristics, Depletion-type MOSFET. | 2 | |
| | Principle of operation of Photo transistor, UJT, SCR. | 3 | |
| SECOND INTERNAL EXAM | | | |
| V | Diode circuits and power supplies: Series and parallel diode circuits, Clippers, Clampers, Voltage multipliers | 3 | 20% |
| | Half-wave and full wave (including bridge) rectifiers, Derivation of V_{rms} , V_{dc} , ripple factor, peak inverse voltage, rectification efficiency in each case, capacitor filter, working and design of a simple zener voltage regulator. | 4 | |
| | Block diagram description of a DC Power supply, Principle of SMPS | | |
| VI | Electronic Measurements and measuring Instruments. | 2 | 20% |
| | Generalized performance parameters of instruments: error, accuracy, sensitivity, precision and resolution. | | |
| | Principle and block diagram of analog and digital multimeter, Block diagram of CRO, Measurements using CRO, Lissajous patterns, Principle and block diagram of DSO, function generator. | 4 | |
| END SEMESTER EXAM | | | |

| Course No. | Course Name | L-T-P-Credits | Year of Introduction |
|--|--|----------------------|-----------------------------|
| BE101-05 | INTRODUCTION TO COMPUTING AND PROBLEM SOLVING | 2-1-0-3 | 2016 |
| Course Objectives | | | |
| 1. To learn basics of digital computers 2. To develop problem solving skills 3. To learn programming and to solve problems using computers | | | |
| Syllabus Introduction to digital computer, Introduction to programming languages, Operating systems, Problem Solving strategies, Examples for algorithms and flow charts, Introduction to Python language, functions, parameters and arguments, Boolean Expressions, logical operators and control statements Strings, lists, tuples and dictionaries, operations, Files, introduction to objects, attributes and instances | | | |
| Expected outcome | | | |
| 1. Ability to design algorithmic solution to problems. 2. Ability to convert algorithms to Python programs. 3. Ability to design modular Python programs using functions 4. Ability to design programs with Interactive Input and Output, utilizing arithmetic expression repetitions, decision making, arrays. 5. Ability to design programs using file Input and Output. 6. Ability to develop recursive solutions. | | | |
| Text Books: | | | |
| <ul style="list-style-type: none"> • Downey, A. et al., How to think like a Computer Scientist: Learning with Python, John Wiley, 2015 • Goel, A., Computer Fundamentals, Pearson Education • Lambert K. A., Fundamentals of Python - First Programs, Cengage Learning India, 2015 • Rajaraman, V., Computer Basics and C Programming, Prentice-Hall India | | | |
| References Books: | | | |
| <ul style="list-style-type: none"> • Barry, P., Head First Python, , O' Reilly Publishers • Dromy, R. G., How to solve it by Computer, Pearson India • Guzdial, M. J., Introduction to Computing and Programming in Python, Pearson India • Perkovic, L., Introduction to Computing Using Python, 2/e, John Wiley, 2015 • Sprankle , M., Problem Solving & Programming Concepts, Pearson India • Venit, S. and Drake, E., Prelude to Programming: Concepts & Design, Pearson India • Zelle, J., Python Programming: An Introduction to Computer Science, Franklin, Beedle & Associates Inc. | | | |

| Web links: <ul style="list-style-type: none"> <input type="checkbox"/> https://archive.org/details/MIT6.00SCS11 <input type="checkbox"/> https://www.coursera.org/course/pythonlearn | | | |
|--|--|-------|-----------------------|
| Course Plan | | | |
| Module | Contents | Hours | Sem. Exam Marks |
| I | <p>Introduction to digital computer – Von Neumann concept – A simple model of computer, acquisition of data, storage of data, processing of data, output of processed data. Details of functional units of a computer. Storage – primary storage and secondary storage.</p> <p><i>(The discussion should focus more on the functionalities of the units and their interaction than on specific hardware details. However, concepts like memory cells and their addressability (need not be binary), registers, interconnections (buses) have to be introduced at an abstract level. For storage devices – primary and secondary –, various categories have to be introduced along with their distinguishing features. For I-O devices also, various categories are to be introduced. The Von Neumann concept should be effectively introduced. History computers need not be taught. However, students have to be encouraged to read the relevant sections of the text book. Chapters 1 – 4 of ‘Goel’ may be used to support teaching -learning.)</i></p> <p>Introduction to programming languages:- types of programming languages - high level language , assembly language and machine language, System software - Operating systems – objectives of operating systems, compiler, assembler and interpreter.</p> <p><i>(For all the above topics, focus should be more on the concepts, significance and objectives. Chapter 6 and 7 (up to 7.4) of ‘Goel’ may be used to support the teaching-learning process.)</i></p> | 8 | 15% |
| II | <p>Problem Solving strategies – Problem analysis – formal definition of problem – Solution – top- down design – breaking a problem into sub problems- overview of the solution to the sub problems by writing step by step procedure (algorithm) - representation of procedure by flowchart - Implementation of algorithms – use of procedures to achieve modularity.</p> <p><i>(For this part the instructor has to initially use suitable analogies of real world problems to explain the concepts, before delving into computer-solvable problems.)</i></p> <p>Examples for algorithms and flow charts - at least 10 problems (starting</p> | 8 | 15% |

| | | | |
|--|---|--|--|
| | with non-numerical examples, and numeric problems like factorial, largest among three numbers, largest among N, Fibonacci etc.; <i>to be introduced with progressive levels of difficulty</i>) must be discussed in detail. (<i>Class assignments and/or tutorials may be used to strengthen understanding of this part. Chapters 4 and 5 of the 'Rajaraman' may be used for the teaching-learning process.</i>) | | |
|--|---|--|--|

FIRST INTERNAL EXAM

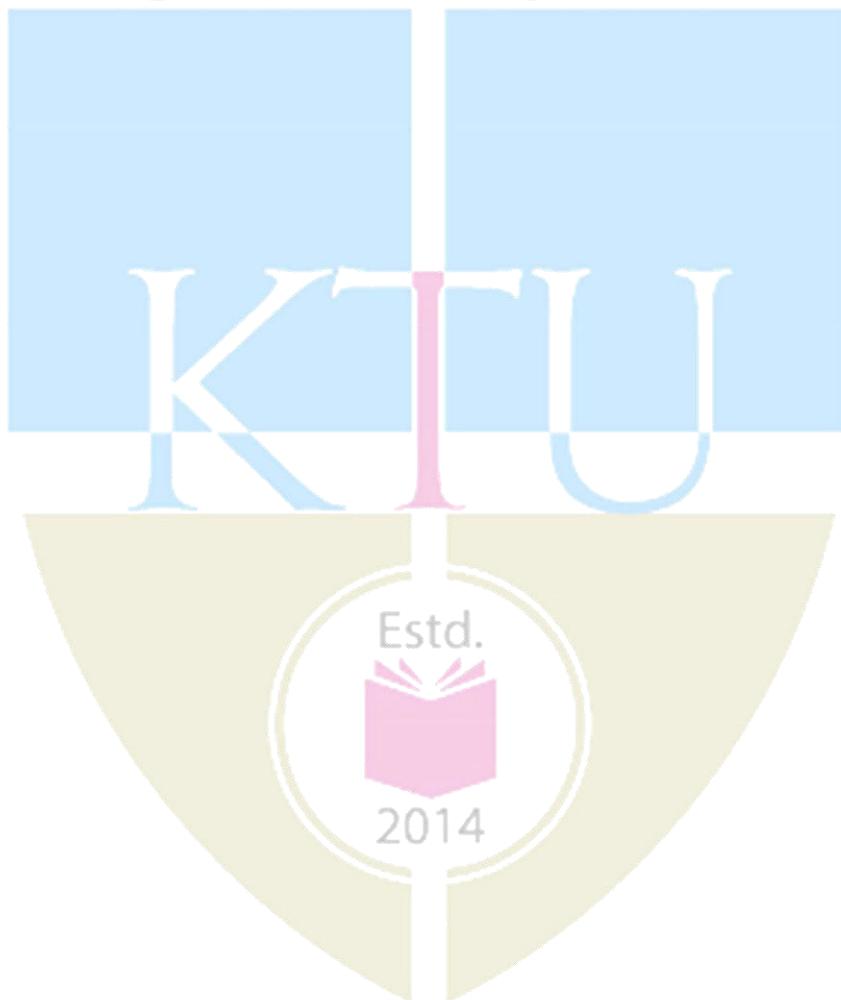
| | | | |
|------------|--|---|-----|
| III | <p>Introduction to Python – variables, expressions and statements, evaluation of expressions, precedence, string operations</p> <p>(Note:- <i>the instructor can demonstrate simple programs to the students and encourage them to develop similar ones. In particular, before attempting programs containing functions, the students should be given enough support and time to develop python code containing long sequence of statements for the simple flowcharts developed earlier. This will strengthen the students' understanding of instruction sequencing. Chapters 1 and 2 of 'Downey' have to be covered. Chapter 1 & 2 of 'Lambert' can also be used.)</i> Control statements, Boolean expressions and logical operators, conditional and alternative executions (Note: - <i>Chapter 4 of 'Downey' up to Section 4.9 has to be covered. The instructor should demonstrate each of these concepts with real examples and encourage students to develop as many as possible. Chapter 3 of 'Lambert' can be used for detailed discussion and self-study</i>) Iteration - while statement and tables. (Note: - <i>Chapter 6 of 'Downey' has to be covered. Chapter 3 of 'Lambert' can be used for detailed discussion and self-study.</i>)</p> | 8 | 15% |
| IV | <p>Functions, calling functions, type conversion and coercion, composition of functions, mathematical functions, user-defined functions, parameters and arguments.</p> <p>(Note: - <i>Chapter 3 of 'Downey' has to be covered. The instructor should demonstrate each aspect of the function with real examples and encourage students to develop their own. Chapter 6 (up to 6.3) of 'Lambert' can be used for detailed discussion and self-study.</i>)</p> | 6 | 15% |

SECOND INTERNAL EXAM

| | | | |
|----------|--|---|-----|
| V | <p>Strings and lists – string traversal and comparison with examples.</p> <p>(Note: - <i>Chapter 7 of 'Downey' has to be covered. Section 4.1 of 'Lambert' can be used for detailed discussion and self-study.</i>) List operations with examples (Note: - <i>Chapter 8 of 'Downey' up to Section 8.6 has to be covered. Section 5.1 of 'Lambert' can be used for detailed discussion and self-study.</i>); tuples and dictionaries – operations and examples (Note: -</p> | 6 | 20% |
|----------|--|---|-----|

| | | | |
|-----------|--|--|--|
| | <i>Chapters 9 & 10 of the third text have to be covered. Section 5.4 of 'Lambert' can be used for detailed discussion and self-study.)</i> | | |
| VI | Files and exceptions - text files, directories <i>(Note: - Chapter 11 of 'Downey' has to be covered)</i> Introduction to classes and objects - attributes, instances <i>(Note: - Chapter 12 of 'Downey' up to Section 12.6 has to be covered)</i> | | |

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| Course No. | Course Name | L-T-P-Credits | Year of Introduction |
|-------------------|---|----------------------|-----------------------------|
| BE101-06 | INTRODUCTION TO CHEMICAL ENGINEERING | 2-1-0-3 | 2016 |

Course Objectives

1. To instil in students the interest, excitement, and urge to learn the subject of Chemical Engineering
2. To introduce the profession of Chemical Engineering
3. To introduce the purpose of learning important subjects in Chemical Engineering for meeting the requirement of various professional fields in Chemical Engineering.

Syllabus

Introduction to Chemical Engineering, profession, plant operation, Basic concepts of units and equations of state, Overview of unit operations and processes, Modes of heat transfer, chemical reactions, DCDA process, basic concepts of P&I diagram. Introduction to process instrumentation and control, Introduction to safety in chemical process industries, introduction to Environmental Engineering, Challenges of Chemical Engineer, Introduction to novel materials and their development.

Expected outcome

The student will demonstrate the ability to understand the basic concepts of Chemical Engineering

References Books:

- Badger and Banchero, Introduction to Chemical Engineering, McGraw Hill
- McCabe, W. L., Smith, J.C. and Harriott, P., Unit Operations in Chemical Engineering, McGraw Hill
- Pushpavanam, S., Introduction to Chemical Engineering, PHI Learning Pvt. Ltd.
- Smith, R., Chemical Process Design and Integration, Wiley

Course Plan

| Module | Contents | Hours | Sem. Exam Marks |
|----------------------------|---|--------------|------------------------|
| I | Introduction to Chemical Engineering: history of Chemical Engineering, role of Chemical Engineering— a broad overview; chemical industries in India; introduction to Chemical Engineering profession; introduction to chemical plant operation; process development and process design. | 6 | 15% |
| II | Basic concepts: units and dimensions, systems of units, conversion and conversion factors of units, concept of mole, weight percent, mole percent, normality, molarity, molality, vapor pressure, partial pressure, concept of ideal gas and equations of state. | 7 | 15% |
| FIRST INTERNAL EXAM | | | |
| III | Overview of unit operations such as distillation, evaporation, absorption, | 8 | 15% |

| | | | |
|-----------------------------|--|---|-----|
| | adsorption, extraction, crystallization, drying, leaching, size separation and size reduction. Overview of unit processes like saponification, polymerization, biodiesel formation and hydrogenation. | | |
| IV | Modes of heat transfer-principles of conduction, convection and radiation, heat exchangers. Fluid flow- laminar and turbulent flow. Introduction to transportation of fluids. Classification of chemical reactions, order of reaction, rate equation, Arrhenius equation, conversion and yield, batch reactor, mixed reactor and plug flow reactor. | 8 | 15% |
| SECOND INTERNAL EXAM | | | |
| V | Block diagram, process flow diagram for DCDA process for Sulphuric acid manufacture, basic concepts of P&I diagram. Introduction to process instrumentation and control: common methodologies of measurements, measuring instruments: thermocouple, venturimeter, U-tube manometer, elements of feedback control loop, introduction to control of a distillation column. | 7 | 20% |
| VI | Introduction to safety in chemical process industries – basic concepts, Case study: Bhopal gas tragedy. Introduction to Environmental Engineering - basic concepts, Typical wastewater, air and solid waste management system. Case study: Effect of Aerial Spraying of Endosulfan on Residents 6 20% of Kasargod, Kerala. Challenges of Chemical Engineer –need for sustainable alternatives for processes; products with environment friendly life-cycle. Introduction to novel materials and their development. | | |
| END SEMESTER EXAM | | | |



| Course No. | Course Name | L-T-P-Credits | Year of Introduction |
|-------------------|--|----------------------|-----------------------------|
| BE103 | INTRODUCTION TO SUSTAINABLE ENGINEERING | 2-0-1-3 | 2016 |

Course Objectives

- To have an increased awareness among students on issues in areas of sustainability
- To understand the role of engineering and technology within sustainable development;
- To know the methods, tools, and incentives for sustainable product-service system development
- To establish a clear understanding of the role and impact of various aspects of engineering and engineering decisions on environmental, societal, and economic problems.

Syllabus

Sustainability- need and concept, challenges, Environment acts and protocols, Global, Regional and Local environmental issues, Natural resources and their pollution, Carbon credits, Zero waste concept ISO 14000, Life Cycle Analysis, Environmental Impact Assessment studies, Sustainable habitat, Green buildings, green materials, Energy, Conventional and renewable sources, Technology and sustainable development, Sustainable urbanization, Industrial Ecology.

Expected outcome

The student will be

- Able to understand the different types of environmental pollution problems and their sustainable solutions
- Able to work in the area of sustainability for research and education
- Having a broader perspective in thinking for sustainable practices by utilizing the engineering knowledge and principles gained from this course

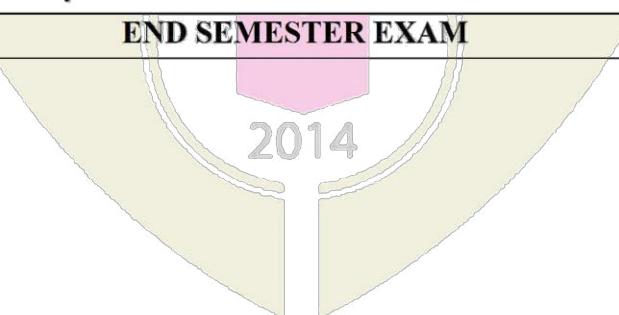
Reference Books:

- Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
- Bradley. A.S; Adebayo,A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning
- Environment Impact Assessment Guidelines, Notification of Government of India, 2006
- Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998
- ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications-Rating System, TERI Publications - GRIHA Rating System
- Ni bin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, McGraw-Hill Professional.
- Twidell, J. W. and Weir, A. D., Renewable Energy Resources, English Language Book Society (ELBS).

- Purohit, S. S., Green Technology - An approach for sustainable environment, Agrobios publication

| Course Plan | | | |
|----------------------------|---|--------------|--------------------------------|
| Module | Contents | Hours | Sem. Exam Marks |
| I | Sustainability - Introduction, Need and concept of sustainability, Social-environmental and economic sustainability concepts. Sustainable development, Nexus between Technology and Sustainable development, Challenges for Sustainable Development. Multilateral environmental agreements and Protocols - Clean Development Mechanism (CDM), Environmental legislations in India - Water Act, Air Act. | L4 | 15% |
| | Students may be assigned to do at least one project eg: a) Identifying/assessment of sustainability in your neighbourhood in education, housing, water resources, energy resources, food supplies, land use, environmental protection etc. b) Identify the threats for sustainability in any selected area and explore solutions for the same | P1 | |
| II | Air Pollution, Effects of Air Pollution; Water pollution- sources, Sustainable wastewater treatment, Solid waste - sources, impacts of solid waste, Zero waste concept, 3 R concept. Global environmental issues- Resource degradation, Climate change, Global warming, Ozone layer depletion, Regional and Local Environmental Issues. Carbon credits and carbon trading, carbon foot print. | L6 | 15% |
| | Students may be assigned to do at least one project for eg: a) Assessing the pollution status of a small area b) Programmes for enhancing public environmental awareness c) Observe a pond nearby and think about the different measures that can be adopted for its conservation | P3 | |
| FIRST INTERNAL EXAM | | | |
| III | Environmental management standards, ISO 14000 series, Life Cycle Analysis (LCA) - Scope and Goal, Bio-mimicking, Environment Impact Assessment (EIA) - Procedures of EIA in India. | L4 | 15% |
| | Students may be assigned to do at least one project eg: a) Conducting LCA of products (eg. Aluminium cans, PVC bottles, cars etc. or activities (Comparison of land filling and open burning) b) Conducting an EIA study of a small project (eg. Construction of a building) | P2 | |

| | | | |
|---|--|--------------|-----|
| IV | Basic concepts of sustainable habitat, Green buildings, green materials for building construction, material selection for sustainable design, green building certification, Methods for increasing energy efficiency of buildings. Sustainable cities, Sustainable transport. | L5 P2 | 15% |
| | Students may be assigned to do at least one project eg: a) Consider the design aspects of a sustainable building for your campus b) Explore the different methods that can be adopted for maintaining a sustainable transport system in your city. | | |
| TECHNICAL SECOND INTERNAL EXAM | | | |
| V | Energy sources: Basic concepts-Conventional and non-conventional, solar energy, Fuel cells, Wind energy, Small hydro plants, bio-fuels, Energy derived from oceans, Geothermal energy. | L5 P2 | 20% |
| | Students may be assigned to do at least one project eg: a) Find out the energy savings that can be achieved by the installation of a solar water heater b) Conduct a feasibility study for the installation of wind mills in Kerala | | |
| VI | Green Engineering, Sustainable Urbanisation, industrialisation and poverty reduction; Social and technological change, Industrial Processes: Material selection, Pollution Prevention, Industrial Ecology, Industrial symbiosis. | L5 P3 | 20% |
| | Students may be assigned to do a group project eg: a) Collect details for instances of climate change in your locality b) Find out the carbon credits you can gain by using a sustainable transport system (travelling in a cycle or car pooling from college to home) c) Have a debate on the topics like: Industrial Ecology is a Boon or Bane for Industries?/Are we scaring the people on Climate Change unnecessarily?/Technology enables Development sustainable or the root cause of unsustainability? | | |
| END SEMESTER EXAM | | | |



2014

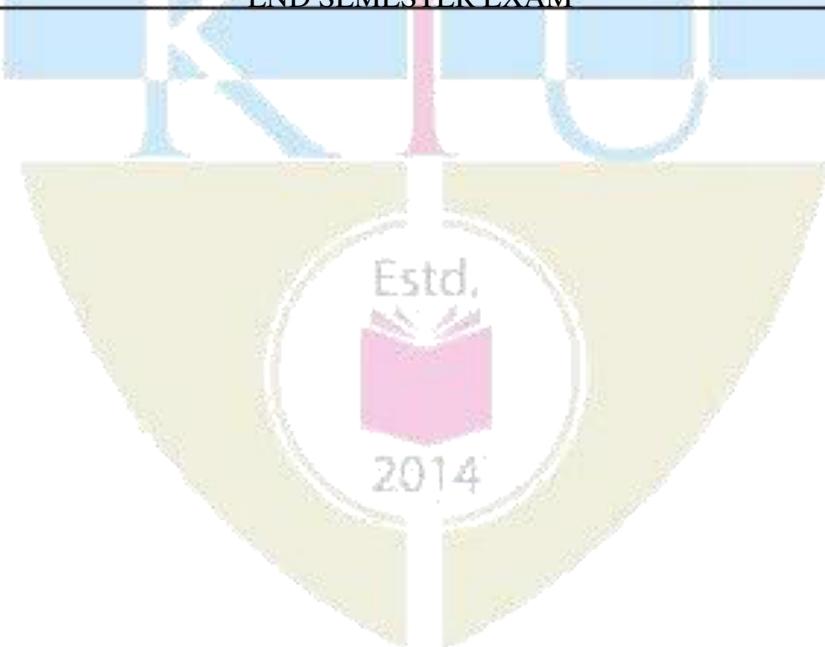
| Course No. | Course Name | L-T-P-Credits | Year of Introduction |
|---|------------------------------------|----------------------|-----------------------------|
| CE100 | BASICS OF CIVIL ENGINEERING | 2-1-0-3 | 2016 |
| Course Objectives | | | |
| <ol style="list-style-type: none"> 1. To inculcate the essentials of Civil Engineering field to the students of all branches of Engineering. 2. To provide the students an illustration of the significance of the Civil Engineering Profession in satisfying societal needs. | | | |
| Syllabus | | | |
| <p>General introduction to Civil Engineering - Introduction to types of buildings, Components of a residential building, Introduction to industrial buildings; Introduction to planning of residential buildings - Simple building plans; Introduction to the various building area terms; Setting out of a building; Surveying – Principles, Objectives, Horizontal measurements with tapes, Ranging; Levelling – Instruments, Reduction of levels; Modern surveying instruments; Building materials – Bricks, cement blocks, Cement, Cement mortar, Steel; Building construction – Foundations, Brick masonry, Roofs, Floors, Decorative finishes, Plastering, Paints and Painting; Basic infrastructure and services – Elevators, Escalators, Ramps, Air conditioning, Sound proofing, Towers, Chimneys, Water Tanks; Intelligent buildings.</p> | | | |
| Expected outcome | | | |
| <ol style="list-style-type: none"> 1. The students will be able to illustrate the fundamental aspects of Civil Engineering. 2. The students will be able to plan and set out a building. 3. Students will be able to explain the concepts of surveying for making horizontal and vertical measurements. 4. They will be able to illustrate the uses of various building materials and explain the method of construction of different components of a building. 5. Students will be able to discuss about various services in a building. | | | |
| References Books: | | | |
| <ul style="list-style-type: none"> • Chudley, R., Construction Technology, Vol. I to IV, Longman Group, England • Chudley, R. and Greeno, R., Building Construction Handbook, Addison Wesley, Longman Group, England • Gopi, S., Basic Civil Engineering, Pearson Publishers • Kandy, A. A., Elements of Civil Engineering, Charotar Publishing house • Mamlouk, M. S., and Zaniewski, J. P., Materials for Civil and Construction Engineering, Pearson Publishers | | | |

- McKay, W. B. and McKay, J. K., Building Construction Volumes 1 to 4, Pearson India Education Services
- Minu, S., Basic Civil Engineering, Karunya Publications
- Rangwala, S. C., Essentials of Civil Engineering, Charotar Publishing House
- Rangwala, S. C. and Dalal, K. B., Engineering Materials, Charotar Publishing house
- Rangwala, S. C. and Dalal, K. B., Building Construction, Charotar Publishing house

Course Plan

| Module | Contents | Hours | Sem. Exam Marks |
|----------------------------|--|-------|-----------------------|
| I | General Introduction to Civil Engineering - Various disciplines of Civil engineering, Relevance of Civil engineering in the overall infrastructural development of the country. | 2 | 15% |
| | Introduction to types of buildings as per NBC; Selection of site for buildings. | 2 | |
| | Components of a residential building and their functions. Introduction to industrial buildings – office / factory / software development office / power house /electronic equipment service centre (any one related to the branch of study) | 2 | |
| | Students have to visit one such building and submit an assignment about the features of any one of the listed building related to their branch (Not included for exam). | 1 | |
| II | Building planning - Introduction to planning of residential buildings- Site plan, Orientation of a building, Open space requirements, Position of doors and windows, Size of rooms; Preparation of a scaled sketch of the plan of a single storeyed residential building in a given site plan. | 4 | 15% |
| | Introduction to the various building area terms - Computation of plinth area / built up area, Floor area / carpet area - for a simple single storeyed building; Setting out of a building. | 3 | |
| FIRST INTERNAL EXAM | | | |
| III | Surveying - Principles and objectives of surveying; | 1 | 15% |
| | Horizontal measurements – instruments used – tape, types of tapes; | 3 | |
| | Ranging (direct ranging only) – instruments used for ranging. | 3 | |
| | Levelling - Definitions, principles, Instruments (brief discussion only) - Level field book - Reduction of levels - problems on levelling (height of collimation only). | 3 | |
| | Modern surveying instruments – Electronic distance meter, digital level, total station, GPS (Brief discussion only). | 1 | |
| IV | Building materials - Bricks, cement blocks - Properties and specifications. | 2 | 15% |

| | | | |
|-----------------------------|---|---|-----|
| | Cement – OPC, properties, grades; other types of cement and its uses (in brief). | 1 | |
| | Cement mortar – constituents, preparation. | 1 | |
| | Concrete – PCC and RCC – grades. | 1 | |
| | Steel - Use of steel in building construction, types and market forms. | 1 | |
| SECOND INTERNAL EXAM | | | |
| V | Building construction – Foundations; Bearing capacity of soil (definition only); Functions of foundations, Types - shallow and deep (sketches only). Brick masonry – header and stretcher bond, English bonds – Elevation and plan (one brick thick walls only). | 2 | |
| | Roofs – functions, types, roofing materials (brief discussion only). | 1 | 20% |
| | Floors – functions, types; flooring materials (brief discussion only). | 1 | |
| | Decorative finishes – Plastering – Purpose, procedure. | 1 | |
| | Paints and Painting – Purpose, types, preparation of surfaces for painting (brief discussion only). | 2 | |
| VI | Basic infrastructure and services - Elevators, escalators, ramps, air conditioning, sound proofing (Civil engineering aspects only) | 2 | 20% |
| | Towers, Chimneys, Water tanks (brief discussion only). | 1 | |
| | Concept of intelligent buildings. | 2 | |
| END SEMESTER EXAM | | | |



| Course No. | Course Name | L-T-P-Credits | Year of Introduction |
|-------------------|---|----------------------|-----------------------------|
| ME100 | BASICS OF MECHANICAL ENGINEERING | 2-1-0-3 | 2016 |

Course Objectives

To expose the students to the thrust areas in Mechanical Engineering and their relevance by covering the fundamental concepts.

Syllabus

Thermodynamics, laws of thermodynamics, implications, cycles, energy conversion devices, steam and water machines, engines, turbo machines, refrigeration and air conditioning, power transmission devices in automobiles, latest trends, engineering materials and manufacturing processes, types of materials, alloys, shape forming methods, machine tools.

Expected outcome

The student will be able to understand the inter dependence of the thrust areas in Mechanical Engineering and their significance leading to the development of products, processes and systems.

References Books:

- Balachandran, Basic Mechanical Engineering, Owl Books
- Benjamin, J., Basic Mechanical Engineering, Pentex Books
- Clifford, M., Simmons, K. and Shipway, P., An Introduction to Mechanical Engineering Part I - CRC Press
- Crouse, Automobile Engineering, Tata Mc-Graw-Hill, New Delhi
- Gill, Smith and Zuirys, Fundamentals of IC Engines, Oxford and IBH publishing company Pvt. Ltd. New Delhi. Crouse, Automobile Engineering, Tata Mc-Graw-Hill, New Delhi.
- Nag, P. K., Basic and Applied Thermodynamics, Tata McGraw-Hill
- Pravin Kumar, Basic Mechanical Engineering
- Roy and Choudhary, Elements of Mechanical Engineering, Media Promoters & Publishers Pvt. Ltd., Mumbai.
- Sawhney, G. S., Fundamentals of Mechanical Engineering, PHI

Course Plan

| Module | Contents | Hours | Sem. Exam Marks |
|---------------|--|--------------|------------------------|
| I | Thermodynamics: Laws of Thermodynamics, significance and Applications of thermodynamics, entropy, Ideal and real gas equations; Analysis of Carnot cycle, Otto cycle , Diesel cycle; Efficiency of these cycles. | 7 | 15% |
| II | Energy conversion devices: Boilers, Steam turbines, Gas turbines; Working principle of two stroke and four stroke I.C. | 7 | 15% |

| | | | |
|-----------------------------|--|---|-----|
| | Engines (SI and CI), Fuels, CRDI, MPFI, Hybrid Engines, Reciprocating pumps, centrifugal pumps and hydraulic turbines. (Elementary ideas only) | | |
| FIRST INTERNAL EXAM | | | |
| III | Refrigeration and Air Conditioning: Vapour compression refrigeration systems, Heat Pump, COP, Study of household refrigerator, Energy Efficiency Rating, Psychrometry, Psychrometric processes, window air conditioner, split air conditioner. Refrigerants and their impact on environment. | 7 | 15% |
| IV | Automobiles and Power Transmission Devices, Different types of automobiles, types of power units in automobiles; major components and their functions (brief description only); Belts and belt drives; Chain drive; Rope drive; Gears and gear trains; friction clutch (cone and single plate), brakes (types and applications only). | 7 | 15% |
| SECOND INTERNAL EXAM | | | |
| V | Materials and manufacturing processes: Engineering materials, Classification, properties, Alloys and their Applications; Casting, Sheet metal forming, Sheet metal cutting, Forging, Rolling, Extrusion; Metal joining processes - soldering, brazing and welding; Powder metallurgy. (Elementary ideas only). | 7 | 20% |
| VI | Machine Tools (Basic elements, Working principle and types of operations), Lathe, Drilling Machine, Shaper, planer, slotter, Milling Machine, Grinding machine; Introduction to CNC machines. | 7 | 20% |

END SEMESTER EXAM

Question Paper Pattern:

Part A: Modules I and II – three questions of 15 marks each – out of which two questions are to be answered.

Part B: Modules III and IV – three questions of 15 marks each – out of which two questions are to be answered.

Part C: Modules V and VI – three questions of 20 marks each – out of which two questions are to be answered.

Each question can have maximum of four subdivisions (a,b,c,d).

| Course No. | Course Name | L-T-P Credits | Year of Introduction |
|------------|---|---------------|----------------------|
| EE100 | BASICS OF ELECTRICAL ENGINEERING | 2-1-0-3 | 2016 |

Course Objectives

To impart a basic knowledge in Electrical Engineering with an understanding of fundamental concepts.

Elementary concepts of electric circuits, Kirchhoff's laws, constant voltage and current sources, Matrix representation; Magnetic circuits, energy stored in magnetic circuits, Electromagnetic induction, Alternating current fundamentals; AC circuits, phasor representation of alternating quantities-rectangular, polar; Three phase systems, star and delta connection; Generation of power, power transmission and distribution; Transformers, Electric Machines-DC Machines, AC Motors.

The course will enable the students to gain preliminary knowledge in basic concepts of Electrical Engineering.

- Bhattacharya, S. K., Basic Electrical & Electronics Engineering, Pearson
- Bird, J., Electrical Circuit Theory and Technology, Routledge, Taylor & Francis Group
- Del Toro, V., Electrical Engineering Fundamentals, Prentice Hall of India.
- Hayt, W. H., Kemmerly, J. E., and Durbin, S. M., Engineering Circuit Analysis, Tata McGraw Hill
- Hughes, Electrical and Electronic Technology, Pearson Education
- Mehta, V.K. and Mehta, R., Basic Electrical Engineering, S. Chand Publishing
- Parker and Smith, Problems in Electrical Engineering, CBS Publishers and Distributors
- Sudhakar and Syam Mohan, Circuits and Networks Analysis and Synthesis, Tata McGraw Hill
- Suresh Kumar, K. S, Electric Circuits and Networks, Pearson Education

Course Plan

| Module | Contents | Hours | Sem. Exam. Marks |
|--------|--|-------|------------------|
| I | Elementary concepts of electric circuits: Kirchhoff's laws, constant voltage and current sources-Problems | 2 | 15% |
| | Formation of network equations by mesh current and node voltage methods-matrix representation-solution of network equations by matrix methods-problems | 3 | |
| | star-delta conversion(resistive networks only-derivation is not needed)-problems | 1 | |

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| II | Magnetic Circuits: MMF, field strength, flux density, reluctance(definition only)-comparison between electric and magnetic circuits | 2 | 15% |
| | Energy stored in magnetic circuits, magnetic circuits with air gap-Numerical problems on series magnetic circuits | 2 | |
| | Electromagnetic Induction: Faraday's laws, lenz's laws- statically induced and dynamically induced emfs-self inductance and mutual inductance, coefficient of coupling (derivation not needed) | 2 | |
| FIRST INTERNAL EXAMINATION | | | |
| III | Alternating Current fundamentals: Generation of alternating voltages-waveforms, frequency, period, average , RMS values and form factor of periodic waveform(pure sinusoidal)- Numerical Problems | 2 | 15% |
| | AC Circuits: Phasor representation of alternating quantities- rectangular and polar representation | 1 | |
| | Analysis of simple AC circuits: concept of impedance, power and power factor in ac circuits-active, reactive and apparent power | 2 | |
| | solution of RL,RC and RLC series circuits-Numerical problems | 2 | |
| | Three phase systems: Generation of three phase voltages- advantages of three phase systems, star and delta connection (balanced only), relation between line and phase voltages, line and phase currents | 3 | |
| | three phase power measurement by two wattmeter method (derivation is not required) - Numerical problems | 1 | |
| IV | Generation of power: Block schematic representation of generating stations- hydroelectric power plants | 1 | 15% |
| | Block schematic representation of Thermal and nuclear power plants | 1 | |
| | Renewable energy sources: solar, wind, tidal and geothermal (Block diagram and working only- No Problems) | 1 | |
| | Power transmission: Typical electrical power transmission scheme-need for high voltage transmission-(Derivation is not needed, No Problems) | 1 | |
| | Power Distribution: substation equipments, primary and secondary transmission and distribution systems- feeder, service | 1 | |

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| | mains | | |
| SECOND INTERNAL EXAMINATION | | | |
| V | Electric Machines: DC Generator and Motor-Construction- working principle- Back EMF | 2 | 20% |
| | Types of motor-shunt, series, compound (short and long)- principle of operation of dc motor, applications-numerical problems (voltage -current relations only) | 3 | |
| | Transformer: Construction of single phase and three phase Transformers (core type only)-EMF equation and related numerical problems | 2 | |
| | Losses and efficiency of transformer for full load –numerical problems (no equivalent circuit) | 2 | |
| VI | AC Motors: Three phase induction motor-squirrel cage and slip ring induction motor | 1 | 20% |
| | Working principle-synchronous speed, slip and related numerical problems. (no equivalent circuit) | 1 | |
| | AC Motors: Construction, principles of operation of single phase induction motor (no equivalent circuit) | 1 | |
| | Starting methods in single phase induction motors -split phase and capacitor start | 2 | |
| END SEMESTER EXAMINATION | | | |

| Course No: | Course Name | L-T-P Credits | Year of Introduction |
|--|-----------------------------------|---------------|----------------------|
| EC100 | BASICS OF ELECTRONICS ENGINEERING | 2-1-0-3 | 2016 |
| Course Objectives | | | |
| <ol style="list-style-type: none"> 1) To get basic idea about types, specification and common values of passive and active components. 2) To familiarize the working of diodes, transistors, MOSFETS and integrated circuits. 3) To understand the working of rectifiers, amplifiers and oscillators. 4) To get a basic idea about measuring instruments 5) To get a fundamental idea of basic communication systems and entertainment electronics | | | |
| Syllabus | | | |
| <p>Evolution and Impact of Electronics in industries and in society, Familiarization of Resistors, Capacitors, Inductors, Transformers and Electro mechanical components, PN Junction diode: Structure, Principle of operation, Zener diode, Photo diode, LED, Solar cell, Bipolar Junction Transistors: Structure, Principle of operation, characteristics, Rectifiers and power supplies: Half wave and full wave rectifier, capacitor filter, zener voltage regulator, Amplifiers and Oscillators: common emitter amplifier, feedback, oscillators, RC phase shift oscillator, Analogue Integrated circuits: operational amplifier, inverting and non-inverting amplifier, Electronic Instrumentation: digital multimeter, digital storage oscilloscope, function generator, Radio communication: principle of AM & FM, Super heterodyne receiver, Satellite communication: geo-stationary satellite system, Mobile communication: cellular communications, Optical communication: system, principle of light transmission through fiber, Entertainment Electronics: Cable TV, CCTV system.</p> | | | |
| Expected Outcome | | | |
| <p>Student can identify the active and passive electronic components. Student can setup simple circuits using diodes and transistors. Student will get fundamental idea about basic communication systems and entertainment electronics.</p> | | | |
| Text Books: | | | |
| <p>Bell, D. A., Electronic Devices and Circuits, Oxford University Press Tomasy, W., Advanced Electronic Communication system, PHI Publishers</p> | | | |
| References Books: | | | |
| <p>Boylested, R. L. and Nashelsky, L., Electronic Devices and Circuit Theory, Pearson Education Frenzel, L. E., Principles of Electronic Communication Systems, Mc Graw Hill Kennedy, G. and Davis, B., Electronic Communication Systems, Mc Graw Hill</p> | | | |

| Rajendra Prasad, Fundamentals of Electronic Engineering, Cengage Learning Course Plan | | | |
|--|---|-------|------------|
| Module | Contents | Hours | Sem. Marks |
| I | Evolution of Electronics, Impact of Electronics in industry and in society. | 1 | 10% |
| | Resistors, Capacitors: types, specifications. Standard values, marking, colour coding. | 3 | |
| | Inductors and Transformers: types, specifications, Principle of working. | 2 | |
| | Electro mechanical components: relays and contactors. | 1 | |
| II | PN Junction diode: Intrinsic and extrinsic semiconductors, Principle of operation, V-I characteristics, principle of working of Zener diode, Photo diode, LED and Solar cell. | 4 | 20% |
| | Bipolar Junction Transistors: PNP and NPN structures, Principle of operation, input and output characteristics of common emitter configuration (npn only). | 3 | |
| FIRST INTERNAL EXAM | | | |
| III | Rectifiers and power supplies: Block diagram description of a dc power supply ,Half wave and full wave (including bridge) rectifier, capacitor filter, working of simple zener voltage regulator. | 4 | 15% |
| | Amplifiers and Oscillators: Circuit diagram and working of common emitter amplifier, Block diagram of Public Address system, concepts of feedback, working principles of oscillators, circuit diagram & working of RC phase shift oscillator. | 4 | |
| IV | Analogue Integrated circuits: Functional block diagram of operational amplifier, ideal operational amplifier, inverting and non-inverting Amplifier. | 3 | 15% |
| | Digital ICs: Logic Gates. | 1 | |
| | Electronic Instrumentation: Principle and block diagram of digital multimeter, digital storage | 2 | |

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| | oscilloscope, and function generator. | | |
| SECOND INTERNAL EXAM | | | |
| V | Radio communication: principle of AM & FM, frequency bands used for various communication systems, block diagram of super heterodyne receiver. | 3 | 20% |
| | Satellite communication: concept of geo-stationary Satellite system. | 2 | |
| VI | Mobile communication: basic principles of cellular communications, concepts of cells, frequency reuse. | 2 | 20% |
| | Optical communication: block diagram of the optical communication system, principle of light transmission through fiber, advantages of optical communication systems. | 2 | |
| | Entertainment Electronics Technology: Basic principles and block diagram of cable TV, CCTV, DTH system. | 2 | |
| END SEMESTER EXAM | | | |

Note: Analysis is not required in this course.

| Course No. | Course Name | L-T-P-Credits | Year of Introduction |
|------------|------------------------|---------------|----------------------|
| MA102 | DIFFERENTIAL EQUATIONS | 3-1-0-4 | 2016 |

Course Objectives

This course introduces basic ideas of differential equations, both ordinary and partial, which are widely used in the modelling and analysis of a wide range of physical phenomena and has got applications across all branches of engineering. The course also introduces Fourier series which is used by engineers to represent and analyse periodic functions in terms of their frequency components.

Syllabus

Homogeneous linear ordinary differential equation, non-homogeneous linear ordinary differential equations, Fourier series, partial differential equation, one dimensional wave equation, one dimensional heat equation.

Expected Outcome

At the end of the course students will have acquired basic knowledge of differential equations and methods of solving them and their use in analysing typical mechanical or electrical systems. The included set of assignments will familiarise the students with the use of software packages for analysing systems modelled by differential equations.

TEXT BOOKS

Erwin Kreyszig: Advanced Engineering Mathematics, 10th ed. Wiley

A C Srivastava, P K Srivastava, Engineering Mathematics Vol 2. PHI Learning Private Limited, New Delhi.

REFERENCES:

Simmons: Differential Equation with Applications and its historical Notes,2e
McGrawHill Education India 2002

Datta, Mathematical Methods for Science and Engineering. CengageLearing,1st. ed
B. S. Grewal. Higher Engineering Mathematics, Khanna Publishers, New Delhi.

N. P. Bali, Manish Goyal. Engineering Mathematics, Lakshmy Publications

D. W. Jordan, P Smith. Mathematical Techniques, Oxford University Press, 4th Edition.

C. Henry Edwards, David. E. Penney. Differential Equations and Boundary Value Problems. Computing and Modelling, 3rd ed. Pearson

| COURSE PLAN | | | |
|---------------------|--|--------------------------|----------------------------------|
| | COURSE NO: MA102 COURSE NAME: DIFFERENTIAL EQUATIONS | L-T-P:3-1-0 CREDITS:4 | |
| MODULE | CONTENT | HRS | END SEM. EXAM MARKS (OUT OF 100) |
| I | HOMOGENEOUS DIFFERENTIAL EQUATIONS (Text Book 1 : Sections 1.7, 2.1, 2.2, 2.6, 3.2) Existence and uniqueness of solutions for initial value problems, Homogenous linear ODEs of second order. Homogenous linear ODEs with constant coefficients, Existence and Uniqueness of solutions Wronskian, Homogenous linear ODEs with constant Coefficients (Higher Order) (For practice and submission as assignment only: Modelling of free oscillations of a mass – spring system) | 3 4 | 17 |
| II | NON-HOMOGENEOUS LINEAR ORDINARY DIFFERENTIAL EQUATIONS (Text Book 2: Sections 1.2.7 to 1.2.14) The particular Integral (P.I.), Working rule for P.I. when $g(x)$ is x^m , To find P.I. when $g(x) = e^{ax} \cdot V_1(x)$, Working rule for P.I. when $g(x) = x \cdot V(x)$, Homogeneous Linear Equations, PI of Homogenous equations Legendre's Linead eQuations Method of variation of parameters for finding PIs (For practice and submission as assignments only: Modelling forced oscillations, resonance, electric circuits) | 7 2 3 | 17 |
| FIRST INTERNAL EXAM | | | |
| III | FOURIER SERIES (Text Book 2 - Sections 4.1,4.2,4.3,4.4) Periodic functions ,Orthogonally of Sine and Cosine functions (Statement only), Fourier series and Euler's formulas Fourier cosine series and Fourier sine series (Fourier series of even and Odd functions) Half range expansions (All results without proof) | 3 3 3 | 17 |

| | | | |
|----------------------|--|------------------------------|----|
| | (For practice and submission as assignment only: Plots of partial sums of Fourier series and demonstrations of convergence using plotting software) | | |
| IV | PARTIAL DIFFERENTIAL EQUATIONS (Text Book 2 : Sections : 5.1, 5.1.1, 5.1.2, 5.1.5, 5.2.6- 5.2.10) Introduction to partial differential equations , formation of PDE, Solutions of first order PDE(Linear only) Lagrange's Method Linear PDE with constant coefficients , Solutions of Linear Homogenous PDE with constant coefficients , Shorter method for finding PI when $g(x,y)=f(ax+by)$, Method of finding PI when $g(x,y) = x^m y^n$, method of find PI when $g(x,y) = e^{ax+by} V(x,y)$ | 3 3 6 | 17 |
| SECOND INTERNAL EXAM | | | |
| V | ONE DIMENSIONAL WAVE EQUATION (Text Book 2: Sections :6.1-- 6.4) Method of separation of variables The wave Equation Vibrations of a stretched string Solutions of one dimensional wave equation using method of separation of variables and problems | 2 1 1 4 | 16 |
| VI | ONE DIMENSIONAL HEAT EQUATION (Text Book 2: sections 6.7, 6.8 ,6.9, 6.9.1 ,6.9.2) The equation of Heat conduction One dimensional Heat transfer equation. Solutions of One Dimensional Heat transfer equation, A long insulated rod with ends at zero temperatures, A long insulated rod with ends at non zero temperatures | 1 1 6 | 16 |
| END SEMESTER EXAM | | | |

TUTORIALS: Tutorials can be ideally conducted by dividing each class into three groups. Prepare necessary materials from each module that can be practiced using computer software. Use them uniformly in every class.

| Course No. | Course Name | L-T-P-Credits | Year of Introduction |
|-------------------|-------------------------------|----------------------|-----------------------------|
| BE102 | DESIGN AND ENGINEERING | 2-0-2-3 | 2016 |

Course Objectives

The purpose of this course is:-

1. To excite the student on creative design and its significance;
2. To make the student aware of the processes involved in design;
3. To make the student understand the interesting interaction of various segments of humanities, sciences and engineering in the evolution of a design;
4. To get an exposure as to how to engineer a design.

Syllabus

Design and its objectives; Role of science, engineering and technology in design; Engineering as a business proposition; Creative design and the Design Process; Design evaluation and communication of designs; Design for function and strength; Material selection and design detailing; Role of standards in design Engineering the design; Design for “X”; Product centered and user centered design; Aesthetics and ergonomics; Concepts of value engineering, concurrent engineering and reverse engineering in design; Culture based design; Modular design; Design optimization needs; User interface; Intelligent and autonomous products; Internet of things; Advanced products and human psychology; Life cycle design; Product and its environment; Design as a marketing tool; Products and IPR; Product liability.

Expected outcome

The student will be:-

- Able to appreciate the different elements involved in good designs and to apply them in practice when called for.
- Aware of the product oriented and user oriented aspects that make the design a success.
- Will be capable to think of innovative designs incorporating different segments of knowledge gained in the course;
- Students will have a broader perspective of design covering function, cost, environmental sensitivity, safety and other factors other than engineering analysis.

References Books:

- Balmer, R. T., Keat, W. D., Wise, G., and Kosky, P., Exploring Engineering, Third Edition: An Introduction to Engineering and Design - [Part 3 - Chapters 17 to 27], ISBN-13: 978-0124158917 ISBN-10: 0124158919
- Dym, C. L., Little, P. and Orwin, E. J., Engineering Design - A Project based introduction - Wiley, ISBN-978-1-118-32458-5
- Eastman, C. M. (Ed.), Design for X Concurrent engineering imperatives, 1996, XI, 489 p. ISBN 978-94-011-3985-4 Springer
- Haik, Y. And Shahin, M. T., Engineering Design Process, Cengage Learning, ISBN-13: 978-0-495-66816-9
- Pahl, G., Beitz, W., Feldhusen, J. and Grote, K. H., Engineering Design: A Systematic Approach, 3rd ed. 2007, XXI, 617p., ISBN 978-1-84628-319-2
- Dieter and Schmidt, Engineering Design, McGraw Hill Education(India) Edition 2013

- Voland, G., Engineering by Design, ISBN 978-93-325-3505-3, Pearson India

Web pages:

1. E-Book (Free download): <http://opim.wharton.upenn.edu/~ulrich/designbook.html>
2. http://www2.warwick.ac.uk/fac/sci/wmg/ftmsc/modules/modulelist/peuss/designforx/design_for_x_notes_section_5.pdf

| Course Plan | | | |
|----------------------------|---|--------------|------------------------|
| Module | Contents | Hours | Sem. Exam Marks |
| I | Design and its objectives; Design constraints, Design functions, Design means and Design from; Role of Science, Engineering and Technology in design; Engineering as a business proposition; Functional and Strength Designs. Design form, function and strength; | L2 | 15% |
| | How to initiate creative designs? Initiating the thinking process for designing a product of daily use. Need identification; Problem Statement; Market survey-customer requirements; Design attributes and objectives; Ideation; Brain storming approaches; arriving at solutions; Closing on to the Design needs. | L3 | |
| | An Exercise in the process of design initiation. A simple problem is to be taken up to examine different solutions-Ceiling fan? Group Presentation and discussion. | P4 | |
| II | Design process- Different stages in design and their significance; Defining the design space; Analogies and “thinking outside of the box”; Quality function deployment-meeting what the customer wants; Evaluation and choosing of a design. | L2 | 15% |
| | Design Communication; Realization of the concept into a configuration, drawing and model. Concept of “Complex is Simple”. Design for function and strength. Design detailing- Material selection, Design visualisation- Solid modelling; Detailed 2D drawings; Tolerancing; Use of standard items in design; Research needs in design; Energy needs of the design, both in its realization and in the applications. | L3 | |
| | An exercise in the detailed design of two products (Stapler/ door/clock) | P4 | |
| FIRST INTERNAL EXAM | | | |
| III | Prototyping- rapid prototyping; testing and evaluation of design; Design modifications; Freezing the design; Cost analysis. | L2 | 15% |
| | Engineering the design – From prototype to product. Planning; Scheduling; Supply chains; inventory; handling; | L3 | |

| | | | |
|-----------------------------|---|------------------------|-----|
| | manufacturing/construction operations; storage; packaging; shipping; marketing; feed-back on design. List out the standards organizations. Prepare a list of standard items used in any engineering specialization. Develop any design with over 50% standard items as parts. | P4 | |
| IV | Design for “X”; covering quality, reliability, safety, manufacturing/construction, assembly, maintenance, logistics, handling; disassembly; recycling; re-engineering etc. List out the design requirements(x) for designing a rocket shell of 3 meter diameter and 8 meter length. Design mineral water bottles that could be packed compactly for transportation. | L4 P4 | 15% |
| SECOND INTERNAL EXAM | | | |
| V | Product centred and user centred design. Product centred attributes and user centred attributes. Bringing the two closer. Example: Smart phone. Aesthetics and ergonomics. Value engineering, Concurrent engineering, Reverse engineering in design; Culture based design; Architectural designs; Motifs and cultural background; Tradition and design; Study the evolution of Wet grinders; Printed motifs; Role of colours in design. | L2 L4 P6 | 20% |
| VI | Modular design; Design optimization; Intelligent and autonomous products; User interfaces; communication between products; autonomous products; internet of things; human psychology and the advanced products. Design as a marketing tool; Intellectual Property rights – Trade secret; patent; copy-right; trademarks; product liability. Group presentation of any such products covering all aspects that could make or mar it. | L3 P6 | 20% |
| END SEMESTER EXAM | | | |

Evaluation Scheme:

First internal exam – closed book exam – 25 marks

Second internal exam – open book exam – 25 marks

Assignment/projects – 50 marks (iv) End semester exam – open book exam – 50 marks (2 hours duration – conducted by the University)

First Test: Marks: 25 Closed Book;

Questions may cover:-

Topics covered in the lectures.

How to arrive at the design details for a specific need gap given.

Sketching the design of a product that is to meet the given user requirements.

Second Test: Marks: 25 Open Book:

Students are permitted to bring in class notes, own notes, text books and other books (Maximum 3/4 books) for the test. Access to internet and mobile phones is NOT permitted.

Assignments: Marks: 20 Two assignments are to be given (10 marks each). These assignments are to cover specific design/s, sketching of the design, and a short but well written write-up on the design.

Projects: Marks: 30 Two mini projects are to be assigned. One is to be a group project and the other an individual one. A group of 3 or 4 students can take up the group project. Each project is to be evaluated for 15 marks.

The Group Project is to be done in the practical hours given for the course. Projects including the group projects are to be evaluated based on individual presentations and answers to the questions raised. These presentations could be done during the practical hours.

Question Paper Pattern for End Semester Examination (Open Book)

Part A – Eight questions of each 5 marks, out of which six questions are to be answered.

Part B – Three questions of each 10 marks, out of which two questions are to be answered.

| Course No. | Course Name | L-T-P-Credits | Year of Introduction |
|--------------|--------------------------------|----------------|----------------------|
| PH110 | ENGINEERING PHYSICS LAB | 0-0-2-1 | 2016 |

Course Objectives

This course is designed (i) to impart practical knowledge about some of the phenomena they have studied in the Engineering Physics course and (ii) to develop the experimental skills of the students.

List of Exercises / Experiments (Minimum of 8 mandatory)

Basics

1. Study of application of Cathode Ray Oscilloscope (CRO) for Frequency and Amplitude measurements. Lissajeous figures (useful for different types of polarized light.)
2. Temperature measurement – Thermocouple
3. Measurement of strain using strain gauge and Wheatstones bridge.

Waves, Oscillations and Ultrasonics

4. Wave length and velocity measurement of ultrasonic waves in a liquid using ultrasonic diffractometer.
5. The LCR Circuit – Forced and damped harmonic oscillations.
6. Meldes string apparatus. Measurement of frequency in the transverse and longitudinal mode.

Interference

7. Wave length measurement of a monochromatic source of light using Newton's Rings method.
8. Determination of refractive index of a liquid using Newton's Rings apparatus.
9. Determination of diameter of a thin wire or thickness of a thin strip of paper using air wedge method.

Diffraction

10. To determine the slit or pinhole width.
11. To measure wavelength using a millimeter scale as a grating.
12. Determination the wavelength of He-Ne laser or any standard laser using diffraction grating.
13. To determine the wavelength of monochromatic light using grating.
14. Determination of dispersive power and resolving power of a plane transmission grating.

Polarisation

15. Kerr Effect - To demonstrate the Kerr effect in nitrobenzene solution and to measure the light intensity as a function of voltage across the Kerr cell using photo detector.
16. To measure the light intensity of plane polarised light as a function of the analyzer position.
17. Laurent's Half Shade Polarimeter -To observe the rotation of the plane of polarization of monochromatic light by sugar solution and hence to determine the concentration of solution of optically active substance.

Laser & Photonics

18. To determine the speed of light in air using laser.
19. Calculate the numerical aperture and study the losses that occur in optical fiber cable.
20. Determination of the particle size of lycopodium powder.
21. I-V characteristics of solar cell
22. To measure Planck's constant using photo electric cell.
23. Measurement of wavelength of laser using grating.

Reference Books:

- Avadhanulu, M. N., Dani, A. A. and Pokley, P. M., Experiments in Engineering Physics, S. Chand & Co.
- Gupta, S. K., Engineering Physics Practicals, Krishna Prakashan Pvt. Ltd.
- Koser, A. A., Practical Engineering Physics, Nakoda Publishers and Printers India Ltd
- Rao, B. S. and Krishna, K. V., Engineering Physics Practicals, Laxmi Publications
- Sasikumar, P. R. Practical Physics, PHI.

Website:

- <http://www.indosawedu.com>

| Course No. | Course Name | L-T-P-Credits | Year of Introduction |
|--|---------------------------|---------------|----------------------|
| CY 110 | ENGINEERING CHEMISTRY LAB | 0-0-2-1 | 2016 |
| List of Exercises / Experiments (Minimum of 8 mandatory) | | | |
| 1. Estimation of Total Hardness – EDTA method. 2. Estimation of Iron in Iron ore. 3. Estimation of Copper in Brass. 4. Estimation of dissolved oxygen by Winklers method. 5. Estimation of chloride in water. 6. Preparation of Urea formaldehyde and Phenol-formaldehyde resin. 7. Determination of Flash point and Fire point of oil by Pensky Martin Apparatus. 8. Determination of wavelength of absorption maximum and colorimetric estimation of Fe ³⁺ in solution. 9. Determination of molar absorptivity of a compound other than Fe ³⁺ . 10. Analysis of IR spectra of any three organic compounds. 11. Analysis of ¹ H NMR spectra of any three organic compounds. 12. Calibration of pH meter and determination of pH of a solution. 13. Verification of Nernst equation for electrochemical cell. 14. Potentiometric titrations: acid – base and redox titrations 15. Conductivity measurements of salt solutions. 16. Flame photometric estimation of Na ⁺ to find out the salinity in sand. | | | |
| Expected outcome The student will be able to apply and demonstrate the theoretical concepts of Engineering Chemistry. | | | |
| References: <ul style="list-style-type: none"> Practical Engineering Chemistry Lab Manual, Owl book publishers | | | |

| Course No. | Course Name | L-T-P-Credits | Year of Introduction |
|--------------|-----------------------------------|----------------|----------------------|
| CE110 | CIVIL ENGINEERING WORKSHOP | 0-0-2-1 | 2016 |

List of Exercises / Experiments (Minimum of 8 mandatory)

(For Civil Engineering Branch)

Setting out of a building: The student should set out a building (single room only) as per the given building plan using tape only.

Setting out of a building: The student should set out a building (single room only) as per the given building plan using tape and cross staff.

Construct a wall of height 50 cm and wall thickness 1½ bricks using English bond (No mortar required) - corner portion – length of side walls 60 cm.

Construct a wall of height 50 cm and wall thickness 2 bricks using English bond (No mortar required) - corner portion – length of side walls 60 cm.

Compute the area and/or volume of various features of a building/structure such as door and window size, number of bricks required to construct a wall of a building, diameter of bars used in windows etc. – To create an awareness of measurements and units (use tape or other simple measuring instruments like vernier caliper, screw gauge etc.).

Testing of building materials: The student should do the compression testing of any three construction materials and compare the strength (brick, hollow block, laterite block, cement concrete cube, stone block, and so on).

Computation of Centre of gravity and Moment of inertia of a given rolled steel section by actual measurements.

Introduction to simple plumbing and sanitary fittings.

Home assignment 1: Preparation of a building model - The students in batches should prepare and submit a building model for a given plinth area in a given site plan constrained by a boundary wall. The minimum requirements of a residential building viz., drawing cum dining room, one bed room and a kitchen should be included. The concept of an energy efficient building should also be included in the model.

Home assignment 2: Report preparation -The student should collect the construction details of any one unique Civil Engineering structure, prepare and submit a detailed report with neat illustrations.

Home assignment 3: Report preparation - The students should collect samples of building materials, prepare and submit a detailed report including their market rates.

(For branches other than Civil Engineering)

Setting out of a building: The student should set out a building (single room only) as per the given building plan using tape only.

Setting out of a building: The student should set out a building (single room only) as per the

given building plan using tape and cross staff.

Building area computation: The student should prepare a rough sketch of a given single storeyed building and by taking linear measurements compute plinth area and carpet area of the given building.

Construct a wall of at least a height of 500mm and wall thickness 1brick using English bond (No mortar required) - corner portion – length of side walls at least 600mm.

Compute the area and/or volume of various features of a building/structure such as door and window size, number of bricks required to construct a wall of a building, diameter of bars used in windows etc. – To create an awareness of measurements and units (use tape or other simple measuring instruments like vernier calipers, screw gauge etc.).

Horizontal measurements: Find the area of an irregular polygon set out on the field.

Vertical measurements: Find the level difference between any two points.

Computation of Centre of gravity and Moment of inertia of a given rolled steel section by sketching and measurements.

Home assignment 1: Preparation of a building model - The students in batches should prepare and submit a building model for a given plinth area in a given site plan constrained by a boundary wall. The minimum requirements of a residential building viz., drawing cum dining room, one bed room and a kitchen should be included. The concept of an energy efficient building should also be included in the model.

Home assignment 2: Report preparation - The student should collect the construction details of an industrial building related to their branch of study, prepare and submit a detailed report with neat illustrations.

Home assignment 3: Report preparation - The students should collect samples of building materials, prepare and submit a detailed report about their market rates.

Estd.



| Course No. | Course Name | L-T-P-Credits | Year of Introduction |
|--------------|--|----------------|----------------------|
| ME110 | MECHANICAL ENGINEERING WORKSHOP | 0-0-2-1 | 2016 |

Course Objectives

Introduction to manufacturing processes and applications. Familiarization of various tools, measuring devices, practices and machines used in various workshop sections.

List of Exercises / Experiments (Minimum of 8 mandatory)

| Sl. No. | Name of No. Shop floor | Exercises | No of sessions |
|---------|------------------------|--|----------------|
| 1 | General | Studies of mechanical tools, components and their applications: (a) Tools: screw drivers, spanners, Allen keys, cutting pliers etc. And accessories (b) Components: Bearings, seals, O-rings, circlips, keys etc. | 1 |
| 2 | Carpentry | Any one model from the following: 1. T-Lap joint 2. Cross lap joint 3. Dovetail joint 4. Mortise joint (a) Demonstrating the forgability of different materials (MS, Al, Alloy steel and Cast steel) in cold and hot states. (b) Observing the qualitative differences in the hardness of these materials | 2 |
| 3 | Smithy | (c) Determining the shape and dimensional variations of Al test specimen due to forging under different states by visual inspection and measurements | 2 |
| 4 | Foundry | Any one exercise from the following 1. Bench moulding 2. Floor moulding 3. Core making | 2 |
| 5 | Sheet metal | Any one exercise from the following Making 1. Cylindrical 2. Conical 3. Prismatic shaped jobs from sheet metal | 2 |
| 6 | Welding | Any one exercise from the following Making joints using Electric arc welding. Bead formation in horizontal, vertical and overhead positions | 2 |
| 7 | Fitting and Assembly | Filing exercise and any one of the following exercises Disassembling and reassembling of 1. Cylinder piston assembly 2. Tail stock assembly 3. Time piece/clock 4. Bicycle or any machine. | 2 |
| 8 | Machines | Demonstration and applications of Drilling machine, Grinding machine, Shaping machine, Milling machine and lathe | 2 |

| Course No. | Course Name | L-T-P-Credits | Year of Introduction |
|------------|--|----------------|----------------------|
| EE110 | ELECTRICAL ENGINEERING WORKSHOP | 0-0-2-1 | 2016 |

Course Objectives

The objective of this course is to familiarize the students with commonly used components, accessories and measuring equipment in Electrical installations. The course also provides hands on experience in setting up of simple wiring circuits.

List of Exercises / Experiments (Minimum of 8 mandatory)

- Identify different types of cables/wires and switches and their uses.
- Identify different types of fuses & fuse carriers, MCB and ELCB, MCCB with ratings and usage.
- Wiring of simple light circuit for controlling light/fan point (PVC conduit wiring).
- Wiring of light/fan circuit using Two way switches (Staircase wiring)
- Wiring of fluorescent lamps and light sockets (6 A)
- Wiring of Power circuit for controlling power device (16A socket)
- Godown wiring / Tunnel wiring
- Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, Main switch and Energy meter.
- Measurement of voltage, current and power in single phase circuit using voltmeter, ammeter and wattmeter. Calculate the power factor of the circuit.
- Wiring of backup power supply including inverter, battery and load for domestic installations.
- Demonstration and measurement of power consumption of electric iron, mixer grinder, single phase pump, exhaust fan, etc.
- Energy meter reading and tariff calculation

Expected outcome

- Familiarity with supply arrangements and their limitations, knowledge of standard voltages and their tolerances, safety aspects of electrical systems and importance of protective measures in wiring systems.
- Knowledge about the types of wires, cables and other accessories used in wiring. Creating awareness of energy conservation in electrical systems.
- Students should be able to wire simple lighting circuits for domestic buildings, distinguish between light and power circuits.
- To measure electrical circuit parameters and current, voltage and power in a circuit.
- Familiarity with backup power supply in domestic installation.

| Course No. | Course Name | L-T-P-Credits | Year of Introduction |
|--------------|---|----------------|----------------------|
| EC110 | ELECTRONICS ENGINEERING WORKSHOP | 0-0-2-1 | 2016 |

Course Objectives

This course gives the basic introduction of electronic hardware systems and provides hands-on training with familiarization, identification, testing, assembling, dismantling, fabrication and repairing such systems by making use of the various tools and instruments available in the Electronics Workshop.

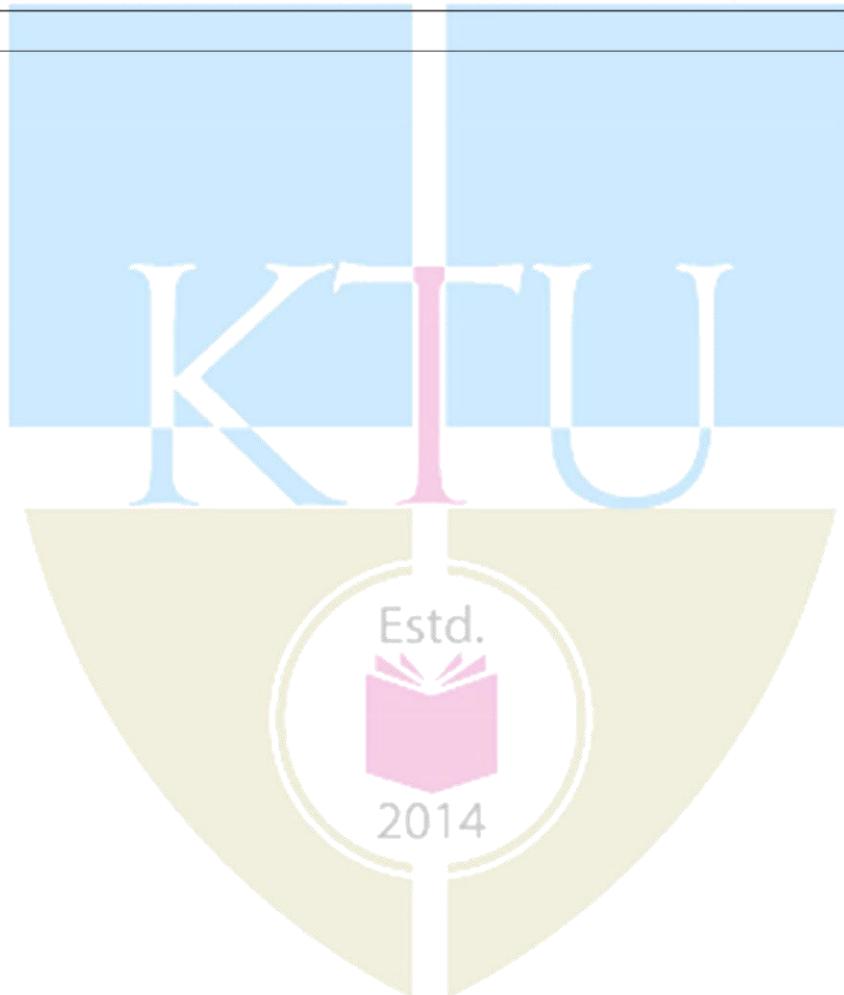
List of Exercises / Experiments (Minimum of 8 mandatory)

1. Familiarization/Identification of electronic components with specification (Functionality, type, size, colour coding, package, symbol, cost etc. [Active, Passive, Electrical, Electronic, Electro-mechanical, Wires, Cables, Connectors, Fuses, Switches, Relays, Crystals, Displays, Fasteners, Heat sink etc.)
2. Drawing of electronic circuit diagrams using BIS/IEEE symbols and introduction to EDA tools, Interpret data sheets of discrete components and IC's, Estimation and costing.
3. Familiarization/Application of testing instruments and commonly used tools. [Multimeter, Function generator, Power supply, CRO etc.] [Soldering iron, De-soldering pump, Pliers, Cutters, Wire strippers, Screw drivers, Tweezers, Crimping tool, Hot air soldering and de-soldering station etc.]
4. Testing of electronic components [Resistor, Capacitor, Diode, Transistor, UJT and JFET using multimeter.]
5. Inter-connection methods and soldering practice. [Bread board, Wrapping, Crimping, Soldering - types - selection of materials and safety precautions, soldering practice in connectors and general purpose PCB, Crimping.]
6. Printed circuit boards (PCB) [Types, Single sided, Double sided, PTH, Processing methods, Design and fabrication of a single sided PCB for a simple circuit with manual etching (Ferric chloride) and drilling.]
7. Assembling of electronic circuit/system on general purpose PCB, test and show the functioning(**Any Four circuits**)
 1. Fixed voltage power supply with transformer, rectifier diode, capacitor filter, zener/IC regulator.
 2. LED blinking circuit using a stable multi-vibrator with transistor BC 107.
 3. Square wave generation using IC 555 timer in IC base.
 4. Sine wave generation using IC 741 OP-AMP in IC base.
 5. RC coupled amplifier with transistor BC 107.
 6. AND and NAND gates in diode transistor logic.
8. Familiarization of electronic systems (**Any three systems**)

1. Setting up of a PA system with different microphones, loud speakers, mixer etc.
2. Assembling and dismantling of desktop computer/laptop/mobile phones.
3. Coil/Transformer winding.
4. Identify the subsystems of TV, DTH, CCTV, Cable TV, CRO, Function generator etc.
5. Screen printing and PCB pattern transfer
6. Soldering & de-soldering of SMD using hot air soldering station.
7. Introduction to robotics- Familiarization of components (motor, sensors, battery etc.) used in robotics and assembling of simple robotic configurations.

Expected outcome

Student can identify the active and passive electronic components. Student gets hands-on assembling, testing, assembling, dismantling, fabrication and repairing systems by making use of the various tools and instruments available in the Electronics Workshop.



| Course No. | Course Name | L-T-P-Credits | Year of Introduction |
|------------|---------------------------|---------------|----------------------|
| CS110 | COMPUTER SCIENCE WORKSHOP | 0-0-2-1 | 2016 |

Course Objectives

1. To familiarize students with basic hardware and software tools
2. To implement algorithms studied in the course Introduction to Computing & Problem Solving.
3. To learn the implementation of control structures, Iterations and recursive functions, Lists, Tuples and Dictionaries.
4. To implement operations of files.
5. To implement a small micro project using Python

List of Exercises / Experiments (Minimum of 8 mandatory)

List of Exercises:

Introduction: Familiarization of hardware components of a desktop computer (motherboard, cards, memory, slots, power, cables etc.) Familiarization of Operating systems and various tools, particularly those for scientific computing, open source tools etc.

Programming exercises in Python based on the course Introduction To Computing and Problem Solving (BE 101-05). The exercises may include programs using the following concepts—

1. Decision making, branching and looping

1. Variables , Expressions & Conditional statements
2. Iteration statements (While , For etc.)

2. Function & Function calls

1. Function calls, Math functions
2. Parameters and arguments
3. Adding new functions, Recursion

3. Strings

1. String traversal
2. String searching, Comparison
3. Other important String methods

4. Lists, Tuples and Dictionaries

1. Traversing List, List Operations

2. Creation of Dictionary and Operations
3. Lists and Tuples

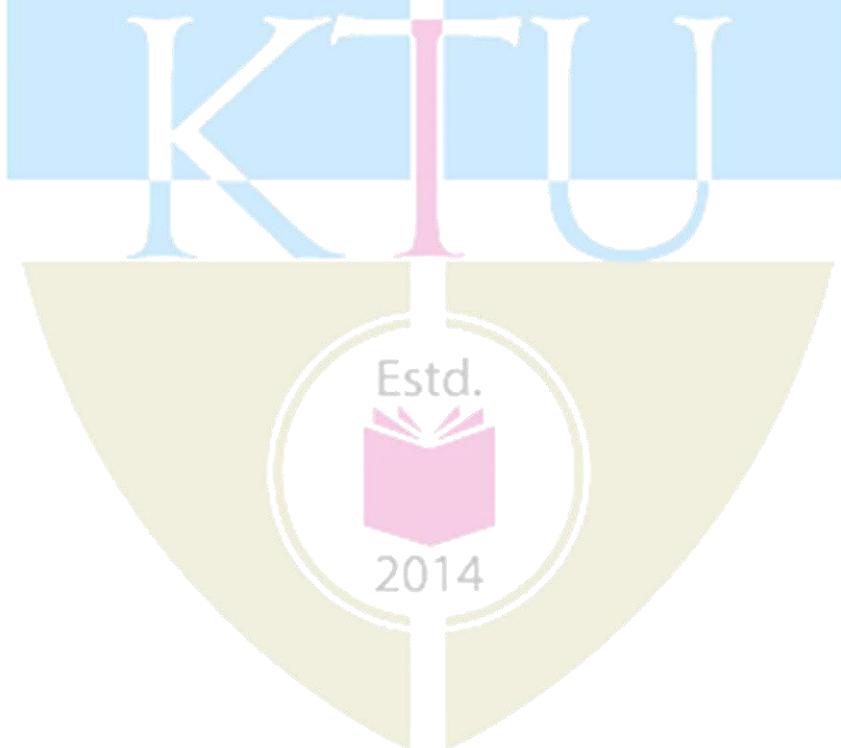
5. Files and Operations

1. Files - defining, opening/closing, operations
2. Pickling

6. Micro Project: Students are expected to do a micro project by using Python, preferably related to the Web

Expected outcome

1. Students are able to identify common hardware components and their purpose
2. Students gain sufficient awareness about latest software tools.
3. Students are able to develop programs in Python for common problems of reasonable complexity.



| Course No: | Course Name | L-T-P-Credits | Year of Introduction |
|---|----------------------------------|---------------|----------------------|
| CH110 | CHEMICAL ENGINEERING WORKSHOP | 0-0-2-1 | 2016 |
| Course Objectives | | | |
| To impart in students the basic knowledge in chemical engineering through simple experiments and demonstrations. | | | |
| List of Exercises / Experiments (Minimum of 8 mandatory) | | | |
| <ol style="list-style-type: none"> 1. Preparation of soap 2. Determination of flash and fire point 3. Preparation of Biodiesel 4. Specific gravity measurement 5. Fabrication of FRP laminates/ Study of filtration equipments 6. Study of distillation column 7. Study of absorption column 8. Study of heat exchanger 9. Study of size reduction equipment 10. Preparation of Pigment | | | |
| Expected outcome | | | |
| Students will have a thorough understanding of the basic concepts that they learn in the theory paper “Introduction to Chemical Engineering”. | | | |

| Course No. | Course Name | L-T-P-Credits | Year of Introduction |
|-------------------|---|---------------|--|
| CS100 | Computer Programming | 2-1-0 | 2016 |
| Course Objectives | | | <i>To understand the fundamental concept of C programming and use it in problem solving.</i> |
| Syllabus | | | Introduction to C language; Operators and expressions; Sorting and searching; Pointers; Memory allocation; Stacks and Queues. |
| Course Outcomes | | | <ol style="list-style-type: none"> Identify appropriate C language constructs to solve problems. Analyze problems, identify subtasks and implement them as functions/procedures. Implement algorithms using efficient C-programming techniques. Explain the concept of file system for handling data storage and apply it for solving problems Apply sorting & searching techniques to solve application programs. |
| References | | | <ol style="list-style-type: none"> Rajaraman V., Computer Basics and Programming in C, PHI. Anita Goel and Ajay Mittal, Computer fundamentals and Programming in C., Pearson. Gottfried B.S., Programming with C, Schaum Series, Tata McGraw Hill. Horowitz and Sahni, Fundamentals of data structures - Computer Science Press. Gary J. Bronson, ANSI C Programming, CENGAGE Learning India. Stewart Venit and Elizabeth Drake, Prelude to Programming – Concepts & Design, Pearson. Dromy R.G., How to Solve it by Computer, Pearson. Kernighan and Ritche D.M., The C. Programming Language, PHI. |
| COURSE PLAN | | | |
| Module | Contents | Contact Hours | Sem.ExamM arks;% |
| I | Introduction to C Language: Preprocessor directives, header files, data types and qualifiers. Operators and expressions. Data input and output, control statements. | 7 | 15% |

| | | | |
|-----------------------------|--|---|-----|
| II | Arrays and strings- example programs. Two dimensional arrays - matrix operations. Structure, union and enumerated data type. | 8 | 15% |
| III | Pointers: Array of pointers, structures and pointers. Example programs using pointers and structures. | 7 | 15% |
| FIRST INTERNAL EXAM | | | |
| IV | Functions – function definition and function prototype. Function call by value and call by reference. Pointer to a function –. Recursive functions. | 7 | 15% |
| SECOND INTERNAL EXAM | | | |
| V | Sorting and Searching : Bubble sort, Selection sort, Linear Search and Binary search. Scope rules Storage classes. Bit-wise operations. | 6 | 20% |
| VI | Data files – formatted, unformatted and text files. Command line arguments – examples. | 7 | 20% |
| END SEMESTER EXAM | | | |

| Course code | Course Name | L-T-P-Credits | Year of Introduction |
|---|--------------------------|---------------|----------------------|
| CS120 | Computer Programming Lab | | 2016 |
| Course Objective: | | | |
| To implement algorithms studied in the course Computer Programming | | | |
| To learn the implementation of control structures, Iterations and recursive functions. | | | |
| To implement operations on different types of files. | | | |
| List of Exercises / Experiments (For Computer Science and Engineering Branch) | | | |
| The exercises may include the Programs using the following concepts. | | | |
| 1. Decision making, branching and looping | | | |
| <ul style="list-style-type: none"> - if, if else statements - switch, goto statements - while, do, for | | | |
| statements 2. Arrays and strings | | | |
| <ul style="list-style-type: none"> - one-dimensional, two-dimensional, multidimensional arrays - reading/writing strings - operations on strings - string handling | | | |
| 3. Functions | | | |
| <ul style="list-style-type: none"> - user defined functions - function calls, arguments & return values - nesting of functions - recursive functions - passing arrays and strings to functions | | | |
| 4. Structures and unions | | | |
| <ul style="list-style-type: none"> - copying and comparing structure variables - arrays of structures - arrays within structures - structures within structures - structures and functions - unions | | | |
| 5. Pointers | | | |
| <ul style="list-style-type: none"> - pointers and arrays - pointers and character strings - array of pointers - pointers and functions - pointers and structures | | | |
| 6. Files, memory allocation, bit-level programming -files -defining, opening/closing, input -output operations -command line arguments | | | |
| -memory allocation functions | | | |
| Course Outcome | | | |
| Students will be able to analyse a problem, find appropriate programming language construct should be used and implement C program for the problem. | | | |