## Amendments approved in the 26th Academic Council Meeting held on 25 July 2014

**B. Tech Mechatronics Engineering**
**Curriculum and Syllabus – 2013-14**

**III Semester**

**Against the following entry**

| Course code | Category | Course name | L | T | P | C |
|---|---|---|---|---|---|---|
| MA1013 | B | FOURIER SERIES, PARTIAL DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS | 4 | 0 | **0** | **4** |

**Read the following amended entry**

| Course code | Category | Course name | L | T | P | C |
|---|---|---|---|---|---|---|
| **MA1003** | **B** | **TRANSFORMS AND BOUNDARY VALUE PROBLEMS.** | **4** | **0** | **0** | **4** |

**The corresponding syllabus is as shown below:**

| | | | | | |
|---|---|---|---|---|---|
| MA1003 | TRANSFORMS AND BOUNDARY VALUE PROBLEMS | L | T | P | C |
| | Total Contact Hours - 60 | 4 | 0 | 0 | 4 |
| | (Common to CSE, SWE, ECE, EEE, ICE, EIE, TCE & MECT) | | | | |

| | |
|---|---|
| PURPOSE | |
| To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering. | |
| INSTRUCTIONAL OBJECTIVES | |
| 1. | To know to formulate and solve partial differential equations |
| 2. | To have thorough knowledge in Fourier series |
| 3. | To be familiar with applications of partial differential equations |
| 4. | To gain good knowledge in the application of Fourier transform |
| 5. | To learn about Z- transforms and its applications |

UNIT I PARTIAL DIFFERENTIAL EQUATIONS (12 hours)

Formation – Solution of standard types of first order equations – Lagrange's equation – Linear homogeneous partial differential equations of second and higher order with constant coefficients - Classification of second order linear partial differential equations including the reduction to the above types – Separable Variable Method.

UNIT II FOURIER SERIES (12 hours)

Dirichlet's conditions – General Fourier series – Half range Sine and Cosine series – Parseval's identity – Harmonic Analysis.

UNIT III ONE DIMENSIONAL WAVE & HEAT EQUATION (12 hours)

Boundary and initial value problems - Transverse vibrations of elastic string with fixed ends – Fourier series solutions – One dimensional heat equation - Steady and transient states – problems – Excluding thermally insulated ends.

UNIT IV FOURIER TRANSFORMS (12 hours)

Statement of Fourier integral theorem(proof omitted) – Fourier transform pairs – Fourier Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity – Integral equations.

UNIT V - Z-TRANFORMS AND DIFFERENCE EQUATIONS (12 hours)

Z-transform – Elementary properties – Inverse Z-transfrom – Convolution theorem – Formation of Difference equations – Solution of difference equations using Z-transform.

TEXT BOOKS


1. Kreyszig.E, "*Advanced Engineering Mathematics"*, 10th edition, John Wiley & Sons. Singapore, 2012.
2. Grewal B.S, *"Higher Engg Maths",* Khanna Publications, 42nd Edition, 2012.


REFERENCES:


1. Kandasamy Petal. *"Engineering Mathematics",* Vol. II & Vol. III (4th revised edition), Chand.S & Co., New Delhi, 2000.
2. Narayanan.S, Manicavachagom Pillay.T.K, Ramanaiah.G, *"Advanced Mathematics for Engineering students"*, Volume II & III (2nd edition), Viswanathan.S, Printers and Publishers, 1992.
3. Venkataraman.M.K, *"Engineering Mathematics"* – Vol.III – A & B (13th edition), National Publishing Co., Chennai, 1998.
4. Sankara Rao, "*Introduction to Partial Differential Equations"*, 2nd Edition, PHI Learning Pvt. Ltd., 2006.
5. Sivaramakrishna Das.P and Vijayakumari.C, *"A text book of Engineering Mathematics-III"*,Viji's Academy, 2010


<table>
<tr><td colspan="13">MA1003 TRANSFORMS AND BOUNDARY VALUE PROBLEMS</td></tr>
<tr><td colspan="2">Course Designed by</td><td colspan="11">Department of Mathematics</td></tr>
<tr><td rowspan="2">1.</td><td rowspan="2">Student Outcome</td><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td><td>i</td><td>j</td><td>k</td></tr>
<tr><td>x</td><td></td><td></td><td></td><td>x</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.</td><td>Mapping of instructional objectives with student outcome</td><td>1-5</td><td></td><td></td><td></td><td>1-5</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">3.</td><td rowspan="2">Category</td><td colspan="2">General (G)</td><td colspan="3">Basic Sciences(B)</td><td colspan="3">Engineering Sciences and Technical Arts (E)</td><td colspan="3">Professional Subjects (P)</td></tr>
<tr><td colspan="2">--</td><td colspan="3">x</td><td colspan="3">--</td><td colspan="3">--</td></tr>
<tr><td>4.</td><td>Approval</td><td colspan="11">23rd meeting of academic council, May 2013</td></tr>
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SRM UNIVERSITY
(Under section 3 of UGC Act 1956)

# B.Tech. (Full Time) - Mechatronics Engineering

## Curriculum & Syllabus

## 2013 – 2014

### Volume – I

(all courses except open electives)

**FACULTY OF ENGINEERING AND TECHNOLOGY**
**SRM UNIVERSITY**
**SRM NAGAR, KATTANKULATHUR – 603 203**

## STUDENT OUTCOMES

The curriculum and syllabus for B.Tech programs (2013) conform to outcome based teaching learning process. In general, **ELEVEN STUDENT OUTCOMES** (a-k) have been identified and the curriculum and syllabus have been structured in such a way that each of the courses meets one or more of these outcomes. Student outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire as they progress through the program. Further each course in the program spells out clear instructional objectives which are mapped to the student outcomes.

**The student outcomes are:**

(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**Curriculum – 2013**

**(Applicable for students admitted from the academic year 2013-14 onwards)**

| SEMESTER I | | | | | | |
|---|---|---|---|---|---|---|
| **COURSE CODE** | **CATEGORY** | **COURSE NAME** | **L** | **T** | **P** | **C** |
| LE1001 | G | ENGLISH | 1 | 2 | 0 | 2 |
| PD1001 | G | SOFT SKILLS I | 1 | 0 | 1 | 1 |
| MA1001 | B | CALCULUS AND SOLID GEOMETRY | 3 | 2 | 0 | 4 |
| PY1001 | B | PHYSICS | 3 | 0 | 0 | 3 |
| PY1002 | B | PHYSICS LABORATORY | 0 | 0 | 2 | 1 |
| CY1003 | B | PRINCIPLES OF ENVIRONMENTAL SCIENCE | 2 | 0 | 0 | 2 |
| **Courses from Table I** | | | | | | |
| *Student shall register for minimum 20 credits in I semester and minimum 20 credits in II semester. However student shall have registered for all the courses enlisted under Semester I and II as well the courses in Table I by the time the registration process is complete in II semester.*<br>*Keeping this in mind student shall register for the courses in I and II semesters.* | | | | | | |

**Legend:**

**L** - Number of lecture hours per week
**T** - Number of tutorial hours per week
**P** - Number of practical hours per week
**C** - Number of credits for the course

**Category of courses:**

**G** - General
**B** - Basic Sciences
**E** - Engineering Sciences and Technical Arts
**P** - Professional Subjects

| SEMESTER II | | | | | | |
|---|---|---|---|---|---|---|
| **COURSE CODE** | **CATEGORY** | **COURSE NAME** | **L** | **T** | **P** | **C** |
| LE1002 | G | VALUE EDUCATION | 1 | 0 | 0 | 1 |
| PD1002 | G | SOFT SKILLS II | 1 | 0 | 1 | 1 |
| MA1002 | B | ADVANCED CALCULUS AND COMPLEX ANALYSIS | 3 | 2 | 0 | 4 |
| PY1003 | B | MATERIALS SCIENCE | 2 | 0 | 2 | 3 |
| CY1001 | B | CHEMISTRY | 3 | 0 | 0 | 3 |
| CY1002 | B | CHEMISTRY LAB | 0 | 0 | 2 | 1 |
| CE1001 | E | BASIC CIVIL ENGINEERING | 2 | 0 | 0 | 2 |
| MH1001 | P | ENGINEERING MECHANICS FOR MECHATRONICS SYSTEMS | 3 | 0 | 0 | 3 |
| **Courses from Table I** | | | | | | |
| Student shall register for minimum 20 credits in I semester and minimum 20 credits in II semester. However student shall have registered for all the courses enlisted under Semester I and II as well the courses in Table I by the time the registration process is complete in II semester.<br>Keeping this in mind student shall register for the courses in I and II semesters. | | | | | | |

## TABLE I

## COURSES WHICH CAN BE REGISTERED FOR EITHER IN I OR II SEMESTER

| SEMESTER I / II | | | | | | |
|---|---|---|---|---|---|---|
| **COURSE CODE** | **CATEGORY** | **COURSE NAME** | **L** | **T** | **P** | **C** |
| CS1001 | G | PROGRAMMING USING MATLAB | 0 | 1 | 2 | 2 |
| BT1001 | B | BIOLOGY FOR ENGINEERS | 2 | 0 | 0 | 2 |
| EE1001 | E | BASIC ELECTRICAL ENGINEERING | 2 | 0 | 0 | 2 |
| EC1001 | E | BASIC ELECTRONICS ENGINEERING | 2 | 0 | 0 | 2 |
| ME1001 | E | BASIC MECHANICAL ENGINEERING | 2 | 0 | 0 | 2 |
| ME1004 | E | WORKSHOP PRACTICE | 0 | 0 | 3 | 2 |
| ME1005 | E | ENGINEERING GRAPHICS | 0 | 1 | 4 | 3 |
| NC1001/ NS1001/ SP1001/ YG1001 | G | *NCC/NSS/NSO/YOGA | 0 | 0 | 1 | 1 |

*NCC-National Cadet Corps
NSS-National Service Scheme
NSO-National Sports Organization (India)

| SEMESTER III | | | | | | |
|---|---|---|---|---|---|---|
| **COURSE CODE** | **CATEGORY** | **COURSE NAME** | **L** | **T** | **P** | **C** |
| LE1003/ LE1004/ LE1005/ LE1006/ LE1007 | G | GERMAN LANGUAGE PHASE I/ FRENCH LANGUAGE PHASE I/ JAPANESE LANGUAGE PHASE I/ KOREAN LANGUAGE PHASE I / CHINESE LANGUAGE PHASE I | 2 | 0 | 0 | 2 |
| PD1003 | G | APTITUDE I | 1 | 0 | 1 | 1 |
| MA1013 | B | FOURIER SERIES, PARTIAL DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS | 4 | 0 | 0 | 4 |
| MH1002 | P | ELECTRICAL MACHINES | 3 | 0 | 0 | 3 |
| MH1003 | P | ELECTRONIC CIRCUITS | 3 | 0 | 0 | 3 |
| MH1004 | P | MATERIALS TECHNOLOGY | 3 | 0 | 0 | 3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| MH1005 | P | FUNDAMENTALS OF THERMODYNAMICS | 3 | 0 | 0 | 3 |
| MH1006 | P | MECHANICS OF SOLIDS AND FUNDAMENTALS OF FLUIDS | 3 | 0 | 0 | 3 |
| MH1007 | P | ELECTRICAL MACHINES LAB | 0 | 0 | 2 | 1 |
| MH1008 | P | ELECTRONIC CIRCUITS LAB | 0 | 0 | 2 | 1 |
| MH1009 | P | MECHANICS OF SOLIDS AND FLUIDS LAB | 0 | 0 | 2 | 1 |
| **TOTAL** | | | **22** | **0** | **7** | **25** |
| **Total contact hours** | | | **29** | | | |

| **SEMESTER IV** | | | | | | |
|---|---|---|---|---|---|---|
| **COURSE CODE** | **CATEGORY** | **COURSE NAME** | **L** | **T** | **P** | **C** |
| LE1008/ LE1009/ LE1010/ LE1011/ LE1012 | G | GERMAN LANGUAGE PHASE II / FRENCH LANGUAGE PHASE II/ JAPANESE LANGUAGE PHASE II / KOREAN LANGUAGE PHASE II / CHINESE LANGUAGE PHASE II | 2 | 0 | 0 | 2 |
| PD1004 | G | APTITUDE II | 1 | 0 | 1 | 1 |
| MA1004 | B | NUMERICAL METHODS | 4 | 0 | 0 | 4 |
| MH1010 | P | FLUID POWER SYSTEMS AND CONTROL | 3 | 0 | 0 | 3 |
| MH1011 | P | INSTRUMENTATION ENGINEERING | 3 | 0 | 0 | 3 |
| MH1012 | P | LINEAR INTEGRATED CIRCUITS | 3 | 0 | 0 | 3 |
| MH1013 | P | THEORY OF MACHINES | 3 | 2 | 0 | 4 |
| MH1014 | P | FLUID POWER SYSTEMS AND CONTROL LABORATORY | 0 | 0 | 2 | 1 |
| MH1015 | P | INSTRUMENTATION ENGINEERING LABORATORY | 0 | 0 | 2 | 1 |
| MH1016 | P | LINEAR INTEGRATED CIRCUITS LABORATORY | 0 | 0 | 2 | 1 |
| | P | Dep. Elective -I | 3 | 0 | 0 | 3 |
| **TOTAL** | | | **22** | **2** | **7** | **26** |
| **Total contact hours** | | | **31** | | | |

| SEMESTER V | | | | | | |
|---|---|---|---|---|---|---|
| **COURSE CODE** | **CATEGORY** | **COURSE NAME** | **L** | **T** | **P** | **C** |
| PD1005 | G | APTITUDE III | 1 | 0 | 1 | 1 |
| MA1005 | B | PROBABILITY AND STATISTICS | 4 | 0 | 0 | 4 |
| MH1017 | P | CONTROL ENGINEERING | 3 | 0 | 0 | 3 |
| MH1018 | P | DESIGN OF MACHINE ELEMENTS | 3 | 0 | 0 | 3 |
| MH1019 | P | SENSORS AND ACTUATORS | 3 | 0 | 0 | 3 |
| MH1020 | P | MANUFACTURING AND ASSEMBLY DRAWING | 1 | 0 | 2 | 2 |
| MH1021 | P | CONTROL ENGINEERING LABORATORY | 0 | 0 | 2 | 1 |
| MH1022 | P | SENSORS AND ACTUATORS LABORATORY | 0 | 0 | 2 | 1 |
| MH1047 | P | INDUSTRIAL TRAINING I (Training to be undergone after IV semester) | 0 | 0 | 1 | 1 |
| | P | Dep. Elective -II | 3 | 0 | 0 | 3 |
| | | Open Elective I | *3* | *0* | *0* | *3* |
| **TOTAL** | | | **21** | **0** | **8** | **25** |
| **Total Contact hours** | | | **29** | | | |

| SEMESTER VI | | | | | | |
|---|---|---|---|---|---|---|
| **COURSE CODE** | **CATEGORY** | **COURSE NAME** | **L** | **T** | **P** | **C** |
| PD1006 | G | APTITUDE IV | 1 | 0 | 1 | 1 |
| MH1023 | P | MANUFACTURING TECHNOLOGY | 3 | 0 | 0 | 3 |
| MH1024 | P | MICROPROCESSOR AND MICROCONTROLLER | 3 | 0 | 0 | 3 |
| MH1025 | P | PLC AND ITS APPLICATIONS | 3 | 0 | 0 | 3 |
| MH1026 | P | MANUFACTURING TECHNOLOGY LAB | 0 | 0 | 2 | 1 |
| MH1027 | P | MICROPROCESSOR AND MICROCONTROLLER LAB | 0 | 0 | 2 | 1 |
| MH1028 | P | PLC AND ITS APPLICATIONS LAB | 0 | 0 | 2 | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| MH1049 | P | MINOR PROJECT | 0 | 0 | 2 | 1 |
| | P | Dep. Elective III | 3 | 0 | 0 | 3 |
| | | Open Elective II | 3 | 0 | 0 | 3 |
| | | Open Elective III | 3 | 0 | 0 | 3 |
| **TOTAL** | | | **19** | **0** | **9** | **23** |
| **Total contact hours** | | | **28** | | | |

| **SEMESTER VII** | | | | | | |
|---|---|---|---|---|---|---|
| **COURSE CODE** | **CATEGORY** | **COURSE NAME** | **L** | **T** | **P** | **C** |
| MH1029 | P | INDUSTRIAL ORGANISATION | 3 | 0 | 0 | 3 |
| MH1030 | P | FUNDAMENTALS OF CAD/CAM | 3 | 0 | 0 | 3 |
| MH1031 | P | DESIGN OF MECHATRONICS SYSTEMS | 3 | 0 | 0 | 3 |
| MH1032 | P | POWER ELECTRONICS | 3 | 0 | 0 | 3 |
| MH1033 | P | FUNDAMENTALS OF CAD/CAM LAB | 0 | 0 | 2 | 1 |
| MH1034 | P | DESIGN OF MECHATRONICS SYSTEMS LAB | 0 | 0 | 2 | 1 |
| MH1035 | P | POWER ELECTRONICS LAB | 0 | 0 | 2 | 1 |
| MH1048 | P | INDUSTRIAL TRAINING II (Training to be undergone after VI semester) | 0 | 0 | 1 | 1 |
| | P | *Dep. Elective IV* | 3 | 0 | 0 | 3 |
| | P | *Dep. Elective V* | 3 | 0 | 0 | 3 |
| **TOTAL** | | | **18** | **0** | **7** | **22** |
| **Total contact hours** | | | **25** | | | |

| **SEMESTER VIII** | | | | | | |
|---|---|---|---|---|---|---|
| **COURSE CODE** | **CATEGORY** | **COURSE NAME** | **L** | **T** | **P** | **C** |
| MH1050 | P | MAJOR PROJECT / PRACTICE SCHOOL | 0 | 0 | 24 | 12 |
| **TOTAL** | | | 0 | 0 | 24 | 12 |
| **Total contact hours** | | | **24** | | | |

| DEPARTMENT ELECTIVES | | | | | | |
|---|---|---|---|---|---|---|
| **COURSE CODE** | **CATEGORY** | **COURSE NAME** | **L** | **T** | **P** | **C** |
| MH1101 | P | DRIVES AND CONTROLS FOR AUTOMATION | 3 | 0 | 0 | 3 |
| MH1102 | P | INTELLIGENT MANUFACTURING TECHNOLOGY | 3 | 0 | 0 | 3 |
| MH1103 | P | FLEXIBLE MANUFACTURING SYSTEMS | 3 | 0 | 0 | 3 |
| MH1104 | P | CNC SYSTEMS: DESIGN AND APPLICATIONS | 3 | 0 | 0 | 3 |
| MH1105 | P | ADVANCED ELECTRICAL DRIVES | 3 | 0 | 0 | 3 |
| MH1106 | P | INDUSTRIAL ENGINEERING | 3 | 0 | 0 | 3 |
| MH1107 | P | PROCESS PLANNING AND COST ESTIMATION | 3 | 0 | 0 | 3 |
| MH1108 | P | FACTORY AUTOMATION | 3 | 0 | 0 | 3 |
| MH1109 | P | DIGITAL SIGNAL PROCESSING | 3 | 0 | 0 | 3 |
| MH1110 | P | DIGITAL ELECTRONICS | 3 | 0 | 0 | 3 |
| MH1111 | P | ADVANCED CONTROL ENGINEERING | 3 | 0 | 0 | 3 |
| MH1112 | P | CONSUMER ELECTRONICS | 3 | 0 | 0 | 3 |
| MH1113 | P | INTELLIGENT CONTROLLERS | 3 | 0 | 0 | 3 |
| MH1114 | P | ROBOTICS ENGINEERING | 3 | 0 | 0 | 3 |
| MH1115 | P | AUTOMOTIVE ELECTRONICS | 3 | 0 | 0 | 3 |
| MH1116 | P | MICRO ELECTRO MECHANICAL SYSTEMS | 3 | 0 | 0 | 3 |
| MH1117 | P | INDUSTRIAL ELECTRONICS | 3 | 0 | 0 | 3 |

| SUMMARY OF CREDITS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Category** | **I** | **II** | **III** | **IV** | **V** | **VI** | **VII** | **VIII** | **Total** | **%** |
| **G (Excluding open and departmental electives)** | 5 | 3 | 3 | 3 | 1 | 1 | | | 16 | 8.9 |
| **B (Excluding open and departmental electives)** | 12 | 11 | 4 | 4 | 4 | | | | 35 | 19.5 |
| **E (Excluding open and departmental electives)** | 7 | 6 | | | | | | | 13 | 7.2 |
| **P (Excluding open and departmental electives)** | - | 3 | 18 | 16 | 14 | 13 | 16 | 12 | 92 | 51.1 |
| **Open Elective** | | | | | 3 | 6 | | | 9 | 5 |
| **Dep. Elective** | | | | 3 | 3 | 3 | 6 | | 15 | 8.3 |
| **Total** | **24** | **23** | **25** | **26** | **25** | **23** | **22** | **12** | **180** | **100** |

**SEMESTER I**

| | | | | | |
|---|---|---|---|---|---|
| **LE1001** | **ENGLISH** | **L** | **T** | **P** | **C** |
| | Total Contact Hours-45 | **1** | **2** | **0** | **2** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To help students achieve proficiency in English and develop their professional communication skills to meet the demand in the field of global communication to enable them to acquire placement anywhere with ease and confidence.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To enable students improve their lexical, grammatical and communicative competence. |
| 2. | To enhance their communicative skills in real life situations. |
| 3. | To assist students understand the role of thinking in all forms of communication. |
| 4. | To equip students with oral and appropriate written communication skills. |
| 5. | To assist students with employability and job search skills. |

**UNIT I - INVENTIONS** **(9 hours)**

1. Grammar and Vocabulary – Tense and Concord:
2. Listening and Speaking – Common errors in Pronunciation (Individual sounds); Process description (Describing the working of a machine, and the manufacturing process)
3. Writing – Interpretation of data (Flow chart, Bar chart)
4. Reading -- (Reading Comprehension -- Answering questions)

**UNIT II - ECOLOGY** **(9 hours)**

1. Grammar and Vocabulary – Error Analysis – Synonyms and Antonyms, Parallelisms
2. Listening and Speaking - Conducting Meetings
3. Writing – Notice, Agenda, Minutes , letters to the editor via email : Email etiquette
4. D Reading Comprehension – Summarizing and Note-making

**UNIT III - SPACE** **(9 hours)**

1. Grammar and Vocabulary – tense and concord; word formation
2. Listening and Speaking – Distinction between native and Indian English (Speeches by TED and Kalam) – accent, use of vocabulary and rendering;
3. Writing – Definitions and Essay writing
4. Reading Comprehension – Predicting the content

**UNIT IV - CAREERS** **(9 hours)**

1. Grammar and Vocabulary –Homonyms and Homophones
2. Listening and Speaking – – Group Discussion
3. Writing Applying for job, cover letter and resume
4. Reading, etymology (roots ; idioms and phrases), Appreciation of creative writing.

**UNIT V - RESEARCH** **(9 hours)**

1. Grammar and Vocabulary – Using technical terms, Analogies
2. Listening and Speaking -- Presentation techniques (Speech by the learner)
3. Writing – Project Proposal
4. Reading Comprehension -- Referencing Skills for Academic Report Writing (Research Methodology – Various methods of collecting data) Writing a report based on MLA Handbook

**TEXTBOOK**

1. Department of English and Foreign Languages. "*English for Engineers*", SRM University Publications, 2013.

**REFERENCES**

1. Dhanavel .S.P, "*English and Communication Skills for Students of Science and Engineering*"*,* Orient Blackswan Ltd., 2009.
2. Meenakshi Raman and Sangeetha Sharma,"*Technical Communication-Principles and Practice*", Oxford University Press, 2009.
3. Day .R.A, Scientific English:"*A Guide for Scientists and Other Professionals*", 2nd ed. Hyderabad: Universities Press, 2000.

| LE1001 ENGLISH | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of English and Foreign Languages** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | | | x | | x | x | | x | | |
| 2. | Mapping of instructional objectives with student outcome | | | | 1-5 | | 1-5 | 1-5 | | 1-5 | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts (E) | | | | Professional Subjects (P) | | |
| | | x | | -- | | -- | | | | -- | | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| PD1001 | SOFT SKILLS-I | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 30 | 1 | 0 | 1 | 1 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To enhance holistic development of students and improve their employability skills.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To develop inter personal skills and be an effective goal oriented team player. |
| 2. | To develop professionals with idealistic, practical and moral values. |
| 3. | To develop communication and problem solving skills. |
| 4. | To re-engineer attitude and understand its influence on behavior. |

**UNIT I - SELF ANALYSIS** **(4 hours)**

SWOT Analysis, Who am I, Attributes, Importance of Self Confidence, Self Esteem.

**UNIT II - ATTITUDE** **(4 hours)**

Factors influencing Attitude, Challenges and lessons from Attitude.

**Change Management**

Exploring Challenges, Risking Comfort Zone, Managing Change

**UNIT III - MOTIVATION** **(6 hours)**

Factors of motivation, Self talk, Intrinsic & Extrinsic Motivators.

**UNIT IV - GOAL SETTING** **(6 hours)**

Wish List, SMART Goals, Blue print for success, Short Term, Long Term, Life Time Goals.

**Time Management**

Value of time, Diagnosing Time Management, Weekly Planner To do list, Prioritizing work.

**UNIT V - CREATIVITY** **(10 hours)**

Out of box thinking, Lateral Thinking

**Presentation**

**ASSESSMENT**

1. A practical and activity oriented course which has continuous assessment for 75 marks based on class room interaction, activities etc.
2. Presentation – 25 marks.

**TEXT BOOK**

1. INSIGHT, 2012, Career Development Centre, SRM Publications.

**REFERENCES**


1. Covey Sean, *Seven Habits of Highly Effective Teens*, New York, Fireside Publishers, 1998.
2. Carnegie Dale, *How to win Friends and Influence People*, New York: Simon & Schuster, 1998.
3. Thomas A Harris, *I am ok, You are ok* , New York-Harper and Row, 1972.
4. Daniel Coleman, *Emotional Intelligence*, Bantam Book, 2006.


| PD1001 SOFT SKILLS-I | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Career Development Centre** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | | | x | | x | x | | x | | |
| 2. | Mapping of instructional objectives with student outcome | | | | 1 | | 2 | 3 | | 4 | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | | Engineering Sciences and Technical Arts(E) | | | Professional Subjects(P) | | |
| | | x | | -- | | | -- | | | -- | | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| | CALCULUS AND SOLID GEOMETRY | L | T | P | C |
|---|---|---|---|---|---|
| MA1001 | Total Contact Hours-75 | 3 | 2 | 0 | 4 |
| | (Common to all Branches of Engineering except Bio group) | | | | |

**PURPOSE**

To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To apply advanced matrix knowledge to Engineering problems. |
| 2. | To equip themselves familiar with the functions of several variables. |
| 3. | To familiarize with the applications of differential equations. |
| 4. | To improve their ability in solving geometrical applications of differential calculus problems. |
| 5. | To expose to the concept of three dimensional analytical geometry. |

**UNIT I - MATRICES (15 Hours)**

Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of Eigen values – Cayley – Hamilton theorem orthogonal reduction of a symmetric matrix to diagonal form – Orthogonal matrices – Reduction of quadratic form to canonical form by orthogonal transformations.

**UNIT II - FUNCTIONS OF SEVERAL VARIABLES (15hours)**

Function of two variables – Partial derivatives – Total differential – Taylor's expansion – Maxima and Minima – Constrained Maxima and Minima by Lagrangian Multiplier method – Jacobians – Euler's theorem for homogeneous function.

**UNIT III - ORDINARY DIFFERENTIAL EQUATIONS (15hours)**

Linear equations of second order with constant and variable coefficients – Homogeneous equation of Euler type – Equations reducible to homogeneous form – Variation of parameter – Simultaneous first order with constant co-efficient.

**UNIT IV - GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS (15 hours)**

Curvature – Cartesian and polar coordinates – Circle of curvature – Involutes and Evolutes – Envelopes – Properties of envelopes.

**UNIT V - THREE DIMENSIONAL ANALYTICAL GEOMETRY (15 hours)**

Equation of a sphere – Plane section of a sphere – Tangent Plane – Orthogonal Sphere - Equation of a cone – Right circular cone – Equation of a cylinder – Right circular cylinder.

**TEXT BOOKS**


1. Kreyszig.E, "*Advanced Engineering Mathematics*", John Wiley & Sons. Singapore, 10th edition, 2012.
2. Ganesan.K, Sundarammal Kesavan,Ganapathy Subramanian.K.Sand Srinivasan.V, "*Engineering Mathematics*",Gamma publications, Revised Edition, 2013.


**REFERENCES**


1. Grewal.B.S, *"Higher Engineering Mathematics"*, Khanna Publications, 42nd Edition, 2012.
2. Veerajan.T, "*Engineering Mathematics I*", Tata McGraw Hill Publishing Co, New Delhi, 5th edition, 2006.
3. Kandasamy.P etal. "*Engineering Mathematics*", Vol.I (4th revised edition), S.Chand &Co., New Delhi, 2000.
4. Narayanan.S, Manicavachagom Pillay.T.K, Ramanaiah.G, "*Advanced Mathematics for Engineering students*", Volume I (2nd edition), S.Viswanathan Printers and Publishers, 1992.
5. Venkataraman.M.K, "*Engineering Mathematics*" – First Year (2nd edition), National Publishing Co., Chennai, 2000.


| MA1001 CALCULUS AND SOLID GEOMETRY | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mathematics | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | | | | x | | | | | | |
| 2. | Mapping of instructional objectives with student outcome | 1-5 | | | | 1-5 | | | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | |
| | | -- | | x | | | -- | | | | -- | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| | PHYSICS | L | T | P | C |
|---|---|---|---|---|---|
| PY1001 | Total Contact Hours-45 | 3 | 0 | 0 | 3 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

The purpose of this course is to provide an understanding of physical concepts and underlying various engineering and technological applications. In addition, the course is expected to develop scientific temperament and analytical skill in students, to enable them logically tackle complex engineering problems in their chosen area of application.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To understand the general scientific concepts required for technology |
| 2. | To apply the Physics concepts in solving engineering problems |
| 3. | To educate scientifically the new developments in engineering and technology |
| 4. | To emphasize the significance of Green technology through Physics principles |

**UNIT I - MECHANICAL PROPERTIES OF SOLIDS AND ACOUSTICS (9 hours)**

**Mechanical properties of solids:** Stress-strain relationship – Hooke's law – Torsional Pendulum – Young's modulus by cantilever – Uniform and non-uniform bending — Stress-strain diagram for various engineering materials – Ductile and brittle materials – Mechanical properties of Engineering materials (Tensile strength, Hardness, Fatigue, Impact strength, Creep) – Fracture – Types of fracture (Elementary ideas).

**Acoustics:** Intensity – Loudness – Absorption coefficient and its determination – Reverberation – Reverberation time – Factors affecting acoustics of buildings and their remedies – Sources and impacts of noise – Sound level meter – Strategies on controlling noise pollution – Ultrasonic waves and properties – Methods of Ultrasonic production (Magnetostriction and Piezoelectric) – Applications of Ultrasonics in Engineering and medicine.

**UNIT II - ELECTROMAGNETIC WAVES, CIRCUITS AND APPLICATIONS (9 hours)**

Del operator – grad, div, curl and their physical significances - displacement current –Maxwell's equations (derivation) – Wave equation for electromagnetic waves – Propagation in free space – Poynting theorem – Characteristic of Transverse electric and magnetic waves – Skin depth – Rectangular and circular waveguides – High powered vacuum-based cavity magnetrons – Applications including radars, microwave oven and lighting systems.

**UNIT III - LASERS AND FIBER OPTICS (9 hours)**

**Lasers:** Characteristics of Lasers – Einstein's coefficients and their relations – Lasing action – Working principle and components of $CO_2$ Laser, Nd-YAG Laser, Semiconductor diode Laser, Excimer Laser and Free electron Laser – Applications in Remote sensing, holography and optical switching – Mechanism of Laser cooling and trapping.

**Fiber Optics:** Principle of Optical fiber – Acceptance angle and acceptance cone – Numerical aperture – V-number – Types of optical fibers (Material, Refractive index and mode) – Photonic crystal fibers – Fiber optic communication – Fiber optic sensors.

**UNIT IV - QUANTUM MECHANICS AND CRYSTAL PHYSICS (9 hours)**

**Quantum mechanics:** Inadequacies of Classical Mechanics – Duality nature of electromagnetic radiation – De Broglie hypothesis for matter waves – Heisenberg's uncertainty principle –Schrödinger's wave equation – Particle confinement in 1D box (Infinite Square well potential). **Crystal Physics:** Crystal directions – Planes and Miller indices – Symmetry elements – Quasi crystals – Diamond and HCP crystal structure – Packing factor – Reciprocal lattice – Diffraction of X-rays by crystal planes – Laue method and powder method – Imperfections in crystals.

**UNIT V - GREEN ENERGY PHYSICS (9 hours)**

Introduction to Green energy – **Solar energy:** Energy conversion by photovoltaic principle – Solar cells – **Wind energy:** Basic components and principle of wind energy conversion systems – **Ocean energy:** Wave energy – Wave energy conversion devices – Tidal energy – single and double basin tidal power plants – Ocean Thermal Electric Conversion (OTEC) – **Geothermal energy:** Geothermal sources (hydrothermal, geo-pressurized hot dry rocks, magma) – **Biomass:** Biomass and bio-fuels – bio-energies from wastages – **Fuel cells**: $H_2O_2$ – **Futuristic Energy:** Hydrogen – Methane Hydrates – Carbon capture and storage (CCS).

* One problem sheet consisting of 10 to 15 problems is to be prepared for each unit and discussed in the class.
* Few problems based on design considerations related to appropriate branches of engineering can be incorporated in each problem sheet.

**TEXT BOOKS**

1. Thiruvadigal.J.D, Ponnusamy.S, Sudha.D and Krishnamohan.M, "*Physics for Technologists"*, Vibrant Publication, Chennai, 2013.
2. Dattu R.Joshi, "Engineering Physics",Tata McGraw- Hill,New Delhi,2010.

**REFERENCES**


1. Wole Soboyejo, "*Mechanical Properties of Engineered Materials*", Marcel Dekker Inc., 2003.
2. Frank Fahy, "*Foundations of Engineering Acoustics*", Elsevier Academic Press, 2005.
3. Alberto Sona, "*Lasers and their applications*", Gordon and Breach Science Publishers Ltd., 1976.
4. David J. Griffiths, "*Introduction to electrodynamics*", 3rd ed., Prentice Hall, 1999.
5. Leonard. I. Schiff, "*Quantum Mechanics"*, Third Edition, Tata McGraw Hill, 2010.
6. Charles Kittel, "*Introduction to Solid State Physics*", Wiley India Pvt. Ltd, 7th ed., 2007.
7. Godfrey Boyle, "*Renewable Energy: Power sustainable future*", 2nd edition, Oxford University Press, UK, 2004.


| PY1001 PHYSICS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Physics and Nanotechnology** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | | x | | x | | | | | | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | | 4 | | 2 | | | | | | 3 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | -- | | x | | -- | | | | -- | | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| PY1002 | PHYSICS LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 30 | **0** | **0** | **2** | **1** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

The purpose of this course is to develop scientific temper in experimental techniques and to reinforce the physics concepts among the engineering students

| INSTRUCTIONAL OBJECTIVES | |
|---|---|
| 1. | To gain knowledge in the scientific methods and learn the process of measuring different Physical variables |
| 2. | Develop the skills in arranging and handling different measuring instruments |
| 3. | Get familiarized with experimental errors in various physical measurements and to plan / suggest on how the contributions could be made of the same order, so as to minimize the errors. |

**LIST OF EXPERIMENTS**

1. Determination of Young's modulus of a given material – Uniform / Non-uniform bending methods.
2. Determination of Rigidity modulus of a given material – Torsion pendulum
3. Determination of dispersive power of a prism – Spectrometer
4. Determination of laser parameters – divergence and wavelength for a given laser source –laser grating/ Particle size determination using laser
5. Study of attenuation and propagation characteristics of optical fiber cable
6. Calibration of voltmeter / ammeter using potentiometer
7. Construction and study of IC regulation properties of a given power supply
8. Study of electrical characteristics of a solar cell
9. Mini Project – Concept based Demonstration

**TEXT BOOKS**


1. Thiruvadigal.J.D, Ponnusamy.S, Sudha.D and Krishnamohan.M, "*Physics for Technologists"*, Vibrant Publication, Chennai, 2013
2. Shukla .R.K and Anchal Srivastava, "*Practical Physics*", 1st Edition, New Age International (P) Ltd, New Delhi, 2006.


**REFERENCES**


1. Souires.G.L, "*Practical Physics*", 4th Edition, Cambridge University, UK, 2001.
2. Chattopadhyay.D, Rakshit.P.C and Saha.B, "*An Advanced Course in Practical Physics*", 2nd ed., Books & Allied Ltd., Calcutta, 1990.

| PY1002 PHYSICS LABORATORY | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Physics and Nanotechnology | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | | x | | | | | | |
| 2. | Mapping of instructional objectives with student outcome | 1 | 3 | | | 2 | | | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | -- | | x | | -- | | | | -- | | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| CY1003 | PRINCIPLES OF ENVIRONMENTAL SCIENCE | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 30 | 2 | 0 | 0 | 2 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

The course provides a comprehensive knowledge in environmental science, environmental issues and the management.

**INSTRUCTIONAL OBJECTIVES**

To enable the students

| | |
|---|---|
| 1. | To gain knowledge on the importance of environmental education and ecosystem. |
| 2. | To acquire knowledge about environmental pollution- sources, effects and control measures of environmental pollution. |
| 3. | To understand the treatment of wastewater and solid waste management. |
| 4. | To acquire knowledge with respect to biodiversity, its threats and its conservation and appreciate the concept of interdependence. |
| 5. | To be aware of the national and international concern for environment for protecting the environment. |

**UNIT I - ENVIRONMENTAL EDUCATION AND ECOSYSTEMS (6 hours)**

Environmental education: Definition and objective. Structure and function of an ecosystem – ecological succession –primary and secondary succession - ecological pyramids – pyramid of number, pyramid of energy and pyramid of biomass.

**UNIT II - ENVIRONMENTAL POLLUTION (6 hours)**

Environmental segments – structure and composition of atmosphere - Pollution – Air, water, soil , thermal and radiation – Effects – acid rain, ozone layer depletion and green house effect – control measures – determination of BOD, COD, TDS and trace metals.

**UNIT III - WASTE MANAGEMENT (6 hours)**

Waste water treatment (general) – primary, secondary and tertiary stages.
Solid waste management: sources and effects of municipal waste, bio medical waste - process of waste management.

**UNIT IV - BIODIVERSITY AND ITS CONSERVATION (6 hours)**

Introduction: definition - genetic, species and ecosystem diversity – bio diversity hot spots - values of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - threats to biodiversity: habitat loss, poaching of wildlife – endangered and endemic species of India, Conservation of biodiversity: in-situ and ex-situ conservations.

**UNIT V - ENVIRONMENTAL PROTECTION (6 hours)**

National concern for environment: Important environmental protection acts in India – water, air (prevention and control of pollution) act, wild life conservation and forest act – functions of central and state pollution control boards - international effort – key initiatives of Rio declaration, Vienna convention, Kyoto protocol and Johannesburg summit.

**TEXT BOOKS**


1. Kamaraj.P and Arthanareeswari.M, "*Environmental Science – Challenges and Changes"*, 4th Edition, Sudhandhira Publications, 2010.
2. Sharma.B.K and Kaur, "*Environmental Chemistry",* Goel Publishing House, Meerut, 1994.


**REFERENCES**


1. De.A.K, "*Environmental Chemistry"*, New Age International, New Delhi, 1996.
2. Helen P Kavitha, "*Principles of Environmental Science*", Sci tech Publications, 2nd Edition, 2008.

| CY1003 PRINCIPLES OF ENVIRONMENTAL SCIENCE | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Chemistry** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | | x | | x | x | | x | x | x | |
| 2. | Mapping of instructional objectives with student outcome | | | 5 | | 2 | 4 | | 1,3 | 3 | 2, 5 | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | -- | | x | | -- | | | | | -- | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

**SEMESTER II**

| | VALUE EDUCATION | L | T | P | C |
|---|---|---|---|---|---|
| **LE1002** | Total Contact Hours- 15 | **1** | **0** | **0** | **1** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To provide guiding principles and tools for the development of the whole person recognizing that the individual is comprised of Physical, Intellectual, Emotional and Spiritual dimensions.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To help individuals think about and reflect on different values. |
| 2. | To deepen understanding, motivation and responsibility with regard to making personal and social choices and the practical implications of expressing them in relation to themselves, others, the community and the world at large |
| 3. | To inspire individuals to choose their own personal, social, moral and spiritual values and be aware of practical methods for developing and deepening |

**UNIT I - INTRODUCTION** **(3 hours)**

Definition, Relevance, Types of values, changing concepts of values

**UNIT II - INDIVIDUAL AND GROUP BEHAVIOUR** **(3 hours)**

Personal values – Self – Strengths (self-confidence, self-assessment, self-reliance, self-discipline, determination, self-restraint, contentment, humility, sympathy and compassion, gratitude, forgiveness) Weaknesses (Influences -- Peer pressure, familial and societal expectations, media)

**UNIT III - SOCIETIES IN PROGRESS** **(3 hours)**

Definition of society; Units of society; Communities – ancient and modern – Agents of change – Sense of survival, security, desire for comfort and ease sense of belonging, social consciousness and responsibility

**UNIT IV - ENGINEERING ETHICS** **(3 hours)**

Definition- Societies for engineers – Code of Ethics – Ethical Issues involved in cross border research -- Ethical and Unethical practices – case studies – situational decision making

**UNIT V - SPIRITUAL VALUES** **(3 hours)**

What is religion? -- Role of religion – Misinterpretation of religion – moral policing – Consequences -- Religion as spiritual quest – Aesthetics and religion

**TEXT BOOK**

1. Department of English and Foreign Languages SRM University, "*Rhythm of Life",* SRM Publications, 2013.

**REFERENCE**

1. Values (Collection of Essays). Published by: Sri Ramakrishna Math, Chennai-4. 1996.

| LE1002 VALUE EDUCATION | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of English and Foreign Languages | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | | | | | x | | | x | | |
| 2. | Mapping of instructional objectives with student outcome | | | | | | 1-3 | | | 1-3 | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | | Engineering Sciences and Technical Arts(E) | | | Professional Subjects(P) | | |
| | | x | | -- | | | -- | | | -- | | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| PD1002 | SOFT SKILLS-II | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 30 | 1 | 0 | 1 | 1 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To enhance holistic development of students and improve their employability skills.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To develop inter personal skills and be an effective goal oriented team player. |
| 2. | To develop professionals with idealistic, practical and moral values. |
| 3. | To develop communication and problem solving skills. |
| 4. | To re-engineer attitude and understand its influence on behavior. |

**UNIT I - INTERPERSONAL SKILLS (6 hours)**

Understanding the relationship between Leadership Networking & Team work, Realizing Ones Skills in Leadership, Networking & Team Work, and Assessing Interpersonal Skills Situation description of Interpersonal Skill.

**Team Work**

Necessity of Team Work Personally, Socially and Educationally

**UNIT II - LEADERSHIP** **(4 hours)**

Skills for a good Leader, Assessment of Leadership Skills

**Change Management**

Exploring Challenges, Risking Comfort Zone, Managing Change

**UNIT III - STRESS MANAGEMENT** **(6 hours)**

Causes of Stress and its impact, how to manage & distress, Understanding the circle of control, Stress Busters.

**Emotional Intelligence**

What is Emotional Intelligence, emotional quotient why Emotional Intelligence matters, Emotion Scales, Managing Emotions.

**UNIT IV - CONFLICT RESOLUTION** **(4 hours)**

Conflicts in Human Relations – Reasons Case Studies, Approaches to conflict resolution.

**UNIT V - DECISION MAKING** **(10 hours)**

Importance and necessity of Decision Making, process of Decision Making, Practical way of Decision Making, Weighing Positives & Negatives.

**Presentation**

**ASSESSMENT**

1. A practical and activity oriented course which has a continuous assessment for 75 marks based on class room interaction, activities etc.,
2. Presentation - 25 marks

**TEXT BOOK**

1. INSIGHT, 2009. Career Development Centre, SRM Publications.

**REFERENCES**

1. Covey Sean, "*Seven Habit of Highly Effective Teens"*, New York, Fireside Publishers, 1998.
2. Carnegie Dale, "*How to win Friends and Influence People"*, New York: Simon & Schuster, 1998.
3. Thomas A Harris, "*I am ok, You are ok*", New York-Harper and Row, 1972
4. Daniel Coleman, "*Emotional Intelligence"*, Bantam Book, 2006.

| PD1002 SOFT SKILLS-II | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of English and Foreign Languages** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | | | x | | x | x | | x | | |
| 2. | Mapping of instructional objectives with student outcome | | | | 1 | | 2 | 3 | | 4 | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | | Engineering Sciences and Technical Arts(E) | | | Professional Subjects(P) | | |
| | | x | | -- | | | -- | | | -- | | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| | ADVANCED CALCULUS AND COMPLEX ANALYSIS | L | T | P | C |
|---|---|---|---|---|---|
| **MA1002** | Total Contact Hours -75 | **3** | **2** | **0** | **4** |
| | (Common to all Branches of Engineering except Bio group) | | | | |

**PURPOSE**

To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To have knowledge in multiple calculus |
| 2. | To improve their ability in Vector calculus |
| 3. | To equip themselves familiar with Laplace transform |
| 4. | To expose to the concept of Analytical function |
| 5. | To familiarize with Complex integration |

**UNIT I - MULTIPLE INTEGRALS** (**15 hours)**

Double integration in Cartesian and polar coordinates – Change of order of integration – Area as a double integral – Triple integration in Cartesian coordinates – Conversion from Cartesian to polar – Volume as a Triple Integral.

**UNIT II - VECTOR CALCULUS** **(15 hours)**

Gradient, divergence, curl – Solenoidal and irrotational fields – Vector identities (without proof) – Directional derivatives – Line, surface and volume integrals – Green's, Gauss divergence and Stoke's theorems (without proof) – Verification and applications to cubes and parallelopipeds only.

**UNIT III - LAPLACE TRANSFORMS (15 hours)**

Transforms of simple functions – Basic operational properties – Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – periodic functions – Applications of Laplace transforms for solving linear ordinary differential equations up to second order with constant coefficients only.

**UNIT IV - ANALYTIC FUNCTIONS (15 hours)**

Definition of Analytic Function – Cauchy Riemann equations – Properties of analytic functions - Determination of harmonic conjugate – Milne-Thomson's method – Conformal mappings: 1/z, az, az+b and bilinear transformation.

**UNIT V - COMPLEX INTEGRATION (15 hours)**

Line integral – Cauchy's integral theorem (without proof) – Cauchy's integral formulae and its applications – Taylor's and Laurent's expansions (statements only) – Singularities – Poles and Residues – Cauchy's residue theorem – Contour integration – Unit circle and semi circular contour.

**TEXT BOOKS**


1. Kreyszig.E, "*Advanced Engineering Mathematics*", 10th edition, John Wiley & Sons. Singapore, 2012.
2. Ganesan.K, Sundarammal Kesavan, Ganapathy Subramanian.K.S& Srinivasan.V, "*Engineering Mathematics*", Gamma publications, Revised Edition, 2013.


**REFERENCES**


1. Grewal.B.S, "*Higher Engg Maths*", Khanna Publications, 42nd Edition, 2012.
2. Veerajan.T, "*Engineering Mathematics I*", Tata McGraw Hill Publishing Co., New Delhi, 5th edition, 2006.
3. Kandasamy.P etal., "*Engineering Mathematics*", Vol.I (4th revised edition), S.Chand &Co., New Delhi, 2000.
4. Narayanan.S, Manicavachagom Pillay.T.K and Ramanaiah.G, "*Advanced Mathematics*" for Engineering students, Volume I (2nd edition), S.Viswanathan Printers and Publishers, 1992.
5. Venkataraman.M.K, "*Engineering Mathematics*" – First Year (2nd edition), National Publishing Co., Chennai, 2000.

| MA1002 ADVANCED CALCULUS AND COMPLEX ANALYSIS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mathematics | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | | | | x | | | | | | |
| 2. | Mapping of instructional objectives with student outcome | 1-5 | | | | 1-5 | | | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | |
| | | -- | | x | | | -- | | | | -- | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| PY1003 | MATERIALS SCIENCE | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 60 | 2 | 0 | 2 | 3 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

The course introduces several advanced concepts and topics in the rapidly evolving field of material science. Students are expected to develop comprehension of the subject and to gain scientific understanding regarding the choice and manipulation of materials for desired engineering applications.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To acquire basic understanding of advanced materials, their functions and properties for technological applications |
| 2. | To emphasize the significance of materials selection in the design process |
| 3. | To understand the principal classes of bio-materials and their functionalities in modern medical science |
| 4. | To get familiarize with the new concepts of Nano Science and Technology |
| 5. | To educate the students in the basics of instrumentation, measurement, data acquisition, interpretation and analysis |

**UNIT I - ELECTRONIC AND PHOTONIC MATERIALS (6 hours)**

**Electronic Materials:** Fermi energy and Fermi–Dirac distribution function – Variation of Fermi level with temperature in intrinsic and extrinsic semiconductors – Hall effect – Dilute Magnetic Semiconductors (DMS) and their applications

**Superconducting Materials:** Normal and High temperature superconductivity – Applications.

**Photonic Materials:** LED – LCD – Photo conducting materials – Photo detectors – Photonic crystals and applications – Elementary ideas of Non-linear optical materials and their applications.

**UNIT II - MAGNETIC AND DIELECTRIC MATERIALS (6 hours)**

**Magnetic Materials:** Classification of magnetic materials based on spin – Hard and soft magnetic materials – Ferrites, garnets and magnetoplumbites – Magnetic bubbles and their applications – Magnetic thin films – Spintronics and devices (Giant magneto resistance, Tunnel magneto resistance and Colossal magneto resistance).

**Dielectric Materials:** Polarization mechanisms in dielectrics – Frequency and temperature dependence of polarization mechanism – Dielectric loss – Dielectric waveguide and dielectric resonator antenna – Piezoelectric, pyroelectric and ferroelectric materials and their applications.

**UNIT III - MODERN ENGINEERING AND BIOMATERIALS (6 hours)**

**Modern Engineering Materials:** Smart materials – Shape memory alloys – Chromic materials (Thermo, Photo and Electro) – Rheological fluids – Metallic glasses – Advanced ceramics – Composites.

**Bio-materials:** Classification of bio-materials (based on tissue response) – Comparison of properties of some common biomaterials – Metallic implant materials (stainless steel, cobalt-based and titanium-based alloys) – Polymeric implant materials (Polyamides, polypropylene, Acrylic resins and Hydrogels) – Tissue replacement implants – Soft and hard tissue replacements – Skin implants – Tissue engineering – Biomaterials for organ replacement (Bone substitutes) – Biosensor.

**UNIT IV - INTRODUCTION TO NANOSCIENCE AND NANOTECHNOLOGY(6 hours)**

Basic concepts of Nanoscience and Nanotechnology – Quantum wire – Quantum well – Quantum dot – fullerenes – Graphene – Carbon nanotubes – Material processing by chemical vapor deposition and physical vapor deposition – Principle of SEM, TEM, AFM, Scanning near-field optical microscopy (SNOM) – Scanning ion-conducting microscopy (SCIM) – Potential uses of nanomaterials in electronics, robotics, computers, sensors, sports equipment, mobile electronic devices, vehicles and transportation – Medical applications of nanomaterials.

**UNIT V - MATERIALS CHARACTERIZATION (6 hours)**

X-ray diffraction, Neutron diffraction and Electron diffraction– X-ray fluorescence spectroscopy – Fourier transform Infrared spectroscopy (FTIR) – Ultraviolet and visible spectroscopy (UV-Vis) – Thermogravimetric Analysis (TGA) – Differential Thermal Analysis (DTA) – Differential Scanning Calorimetry (DSC).

**PRACTICAL EXPERIMENTS** **(30 hours)**

1. Determination of resistivity and band gap for a semiconductor material – Four probe method / Post-office box
2. Determination of Hall coefficient for a semiconducting material
3. To study V-I characteristics of a light dependent resistor (LDR)
4. Determination of energy loss in a magnetic material – B-H curve
5. Determination of paramagnetic susceptibility – Quincke's method
6. Determination of dielectric constant for a given material
7. Calculation of lattice cell parameters – X-ray diffraction
8. Measurement of glucose concentration – Electrochemical sensor
9. Visit to Advanced Material Characterization Laboratory (Optional)

**TEXT BOOKS**


1. Thiruvadigal,.J.D, Ponnusamy.S, Sudha.D and Krishnamohan.M, "*Materials Sciences"*, Vibrant Publication, Chennai, 2013
2. Rajendran.V, "*Materials Science*",Tata McGraw- Hill,New Delhi,2011


**REFERENCES**


1. Rolf.E. Hummel, "*Electronic Properties of Materials"*, 4th ed., Springer, New York, 2011.
2. DennisW Prather, "*Photonic Crystals: Theory, Applications, and Fabrication"*, John Wiley & Sons, Hoboken, 2009.
3. James R. Janesick, "*Scientific Charge-Coupled Devices",* Published by SPIE - The International Society for Optical Engineering, Bellingham, Washington, 2001.
4. David M Pozar, "*Microwave Engineering*", 3rd ed., John Wiley & Sons, 2005.
5. Silver.F and Dillion.C, "*Biocompatibility: Interactions of Biological and Implantable Materials*", VCH Publishers, New York, 1989.
6. Severial Dumitriu, "*Polymeric Biomaterials*" Marcel Dekker Inc, CRC Press, Canada 2001.
7. Cao.G, "*Nanostructures and Nanomaterials: Synthesis, Properties and Applications*", Imperial College Press, 2004.
8. Pradeep.T, "*A Text Book of Nanoscience and Nanotechnology*", Tata McGraw Hill, New Delhi, 2012.
9. Sam Zhang, "*Materials Characterization Techniques*", CRC Press, 2008.

| PY1003 MATERIALS SCIENCE | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Physics and Nanotechnology | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | x | x | | | | | | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | 5 | | 4 | 2 | | | | | | 3 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | -- | | x | | -- | | | | -- | | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| CY1001 | CHEMISTRY | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 45 | 3 | 0 | 0 | 3 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To enable the students to acquire knowledge in the principles of chemistry for engineering applications

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | The quality of water and its treatment methods for domestic and industrial applications. |
| 2. | The classification of polymers, different types of polymerizations, preparation, properties and applications of important polymers and FRPs. |
| 3. | The phase rule and its application to one and two component systems. |
| 4. | The principle, types and mechanism of corrosion and protective coatings. |
| 5. | The classification and selection of lubricants and their applications. |
| 6. | The basic principles, instrumentation and applications of analytical techniques |

**UNIT I - WATER TREATMENT** **(9 hours)**

Water quality parameters: Physical, Chemical & Biological significance - Hardness of water - estimation of hardness (EDTA method) - Dissolved oxygen – determination (Winkler's method), Alkalinity - determination - disadvantages of using hard water in boilers: Scale, sludge formation - disadvantages - prevention - treatment: Internal conditioning - phosphate, carbon and carbonate conditioning methods - External: Zeolite, ion exchange methods - desalination - reverse osmosis and electrodialysis - domestic water treatment.

**UNIT II - POLYMERS AND REINFORCED PLASTICS (9 hours)**

Classification of polymers - types of polymerization reactions - mechanism of addition polymerization: free radical, ionic and Ziegler - Natta - effect of structure on the properties of polymers - strength, plastic deformation, elasticity and crystallinity -Preparation and properties of important resins: Polyethylene, PVC, PMMA, Polyester, Teflon, Bakelite and Epoxy resins - compounding of plastics - moulding methods - injection, extrusion, compression and calendaring - reinforced plastics - FRP – Carbon and Glass- applications.

**UNIT III - PHASE EQUILIBRIA, LUBRICANTS AND ADHESIVES (9 hours)**

Phase rule: Statement - explanation of the terms involved - one component system (water system only). Condensed phase rule - thermal analysis - two component systems: simple eutectic, Pb-Ag; compound formation, Zn-Mg.

Lubricants: Classification –solid, semi solid, liquid, emulsion- properties – selection of lubricants for different purposes, Adhesives: classification-natural, synthetic, inorganic- Adhesive action - applications.

**UNIT IV - CORROSION AND ITS CONTROL (9 hours)**

Corrosion: Basic concepts - mechanism of chemical, electrochemical corrosion - Pilling Bedworth rule – Types of Electrochemical corrosion - galvanic corrosion - differential aeration corrosion - pitting corrosion - stress corrosion – Measurement of corrosion (wt. loss method only) - factors influencing corrosion. Corrosion control: Cathodic protection - sacrificial anodic method - corrosion inhibitors. Protective coatings: surface preparation for metallic coatings - electro plating (copper plating) and electroless plating (Nickel plating) - chemical conversion coatings - anodizing, phosphating & chromate coating.

**UNIT V - INSTRUMENTAL METHODS OF ANALYSIS (9 hours)**

Basic principles, instrumentation and applications of potentiometry, UV - visible spectroscopy, infrared spectroscopy, atomic absorption spectroscopy and flame photometry.

**TEXT BOOKS**


1. Kamaraj.P and Arthanareeswari.M, "*Applied Chemistry", 9th Edition*, Sudhandhira Publications, 2012.
2. Dara.S.S, *"A Text book of Engineering Chemistry"*, 10th Edition, S.Chand & Company Ltd., New Delhi, 2003.

**REFERENCES**


1. Jain.P.C and Monika Jain, "*Engineering Chemistry*", Danpat Rai publishing company (P) Ltd, New Delhi, 2010.
2. Helen P Kavitha, "*Engineering Chemistry – I", Scitech* Publications, 2nd edition, 2008.


| CY1001 CHEMISTRY | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Chemistry** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | x | | x | | | | | | x |
| 2. | Mapping of instructional objectives with student outcome | 1-6 | 1,5 | 3 | | 2 | | | | | | 4 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | -- | | x | | -- | | | | -- | | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| CY1002 | CHEMISTRY LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 30 | **0** | **0** | **2** | **1** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To apply the concepts of chemistry and develop analytical skills for applications in engineering.

**INSTRUCTIONAL OBJECTIVES**

1. To enable the students to understand the basic concepts involved in the analyses.

**LIST OF EXPERIMENTS**

1. Preparation of standard solutions
2. Estimation of total, permanent and temporary hardness by EDTA method
3. Conductometric titration - determination of strength of an acid
4. Estimation of iron by potentiometry.
5. Determination of molecular weight of polymer by viscosity average method
6. Determination of dissolved oxygen in a water sample by Winkler's method
7. Determination of Na / K in water sample by Flame photometry (Demonstration)
8. Estimation of Copper in ore
9. Estimation of nickel in steel
10. Determination of total alkalinity and acidity of a water sample
11. Determination of rate of corrosion by weight loss method.

**REFERENCES**


1. Kamaraj.R& Arthanareeswari.M, "*Practical Chemistry*" (work book), Sudhandhira Publications,2011.
2. Helen P. Kavitha "*Chemistry Laboratory Manual*", Scitech Publications, 2008.


| CY1002 CHEMISTRY LABORATORY | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Chemistry** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | | | | | | | | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | 1 | | | | | | | | | 1 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | -- | | x | | -- | | | | -- | | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| CE1001 | BASIC CIVIL ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 30 | 2 | 0 | 0 | 2 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To get exposed to the glimpses of Civil Engineering topics that is essential for an Engineer.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To know about different materials and their properties |
| 2. | To know about engineering aspects related to buildings |
| 3. | To know about importance of surveying and the transportation systems |
| 4. | To get exposed to the rudiments of engineering related to dams, water supply, and sewage disposal |

**UNIT I - BUILDING MATERILAS** **(6hours)**

Introduction – Civil Engineering – Materials: Bricks – composition – classifications – properties –uses. Stone – classification of rocks – quarrying – dressing – properties –uses. Timber - properties –uses –ply wood. Cement – grades –types – properties –uses. Steel – types – mild steel – medium steel – hard steel – properties – uses – market forms. Concrete – grade designation – properties – uses.

**UNIT II - MATERIAL PROPERTIES (6 hours)**

Stress – strain – types – Hook's law – three moduli of elasticity – poisons ratio – relationship – factor of safety. Centroid - center of gravity – problems in symmetrical sections only (I, T and channel sections). Moment of inertia, parallel, perpendicular axis theorems and radius of gyration (definitions only).

**UNIT III - BUILDING COMPONENTS (6hours)**

Building – selection of site – classification – components. Foundations –functions – classifications – bearing capacity. Flooring – requirements – selection – types – cement concrete marble – terrazzo floorings. Roof – types and requirements.

**UNIT IV - SURVEYING AND TRANSPORTATION (6hours)**

Surveying – objectives – classification – principles of survey. Transportation – classification – cross section and components of road – classification of roads. Railway – cross section and components of permanent way –functions. Water way – docks and harbor – classifications – components. Bridge – components of bridge.

**UNIT V - WATER SUPPLY AND SEWAGE DISPOSAL (6hours)**

Dams – purpose – selection of site – types –gravity dam (cross section only). Water supply – objective – quantity of water – sources – standards of drinking water – distribution system. Sewage – classification – technical terms – septic tank – components and functions.

**TEXT BOOKS**


1. Raju.K.V.B and Ravichandran.P.T, "*Basics of Civil Engineering"*, Ayyappa Publications, Chennai, 2012.
2. Rangwala,S.C," *Engineering Materials"*, Charotar Publishing House, Anand, 2012.


**REFERENCES**


1. Ramesh Babu, "*Civil Engineering"*, VRB Publishers, Chennai, 2000.
2. National Building Code of India, Part V, "*Building Material"s*, 2005.
3. Surendra Singh, "*Building Material"s*, Vikas Publishing Company, New Delhi, 1996.

| CE1001 BASIC CIVIL ENGINEERING | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Civil Engineering** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | | | | x | | | | | | x |
| 2. | Mapping of instructional objectives with student outcome | 1-4 | | | | 1-4 | | | | | | 2-4 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | -- | | -- | | x | | | | -- | | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| | ENGINEERING MECHANICS FOR MECHATRONICS SYSTEMS | L | T | P | C |
|---|---|---|---|---|---|
| **MH1001** | Total Contact Hours - 45 | 3 | 0 | 0 | 3 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To provide an adequate technical skill to understand the basic principles that govern the dynamics of particles and rigid bodies; as well as an ability to use that understanding in the solution of engineering problems.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Understand the scalar and vector analytical techniques for analysing forces in statically determinate structures. |
| 2. | Ability to apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems. |
| 3. | To prepare the students for higher level courses such as courses in Mechanics of Solids, Mechanical Design and Structural Analysis. |

**UNIT I - FUNDAMENTALS AND STATICS OF PARTICLES (10 hours)**

Fundamentals of engineering mechanics – Units and dimensions – Parallelogram law, Newton's law of motion, Lami's theorem – classification of system of forces – resolution of coplanar, collinear, concurrent forces – Moment of forces – Varignon's principle – types of parallel forces – resolution of force into a force and couple.

**UNIT II - ANALYSIS OF SUPPORTS AND FRAMES (8 hours)**

Conditions of equilibrium – free body diagram – Types of supports, loading and their reactions – Types of frames – Analysis of frames by Method of joints and Method of sections

.

**UNIT III - POWER TRANSMISSION SYSTEMS AND FRICTION (9 hours)**

Belt drive – Types of belt drive - Length of drive – Ratio of belt tension – power transmission of belt – rope drive – Chain drive.

Friction: Types of friction – Laws of friction – Analysis of friction in inclined plane – Wedge – Bearings – Flat bearing, Conical bearing, truncated bearing, Collar Bearing.

**UNIT IV - PROPERTIES OF SURFACES AND VOLUMES (9 hours)**

Centre of gravity or centroid of simple plane figure – 'T' Section, 'I' Section, 'L' section, Composite planes and Hollow sections, Centroid of sections Rectangle, Circle, Triangle by integration method, Pappus Guldinus theorem.

Moment of Inertia:

Moment of Inertia of simple plane figure – 'T' Section, 'I' Section, 'L' section, Composite planes and Hollow sections, Moment of Inertia of sections Rectangle, Circle, Triangle by integration method, Parallel axis theorem, Perpendicular axis theorem – Polar moment of Inertia

**UNIT V - DYNAMICS OF PARTICLES (9 hours)**

Kinematics of linear motion, curvilinear motion, General plane motion (GPM) – Projectiles

Collision of elastic bodies: Types of impact – Co-efficient of restitution - Impact (Direct, Indirect) of a body on a fixed plane.

**TEXT BOOKS**


1. Beer.F.P, Johnston and Vector.E.R, "*Mechanics for Engineers - Dynamics and Statics"*, Tata McGraw - Hill, New Delhi, 2001.
2. Palanichamy.M.S and Nagan.S, "*Engineering Mechanics (Statics and Dynamics)",* Tata McGraw Hill, New Delhi 2001.
3. Kumar.K.L, "*Engineering Mechanics",* Tata McGraw - Hill, New Delhi, 1998.


**REFERENCES**


1. Rajasekaran.S and Sankarasubramanian.G, "*Engineering Mechanics",* Vikas Publishing House Pvt Ltd, 2006.
2. Shames.I.H and Krishna Mohana Rao.G, "*Engineering Mechanics"* (Statics and Dynamics), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), 2006.

| MH1001ENGINEERING MECHANICS FOR MECHATRONICS SYSTEMS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | | x | | x | | | | | | X |
| 2. | Mapping of instructional objectives with student outcome | 1 | | 3 | | 2 | | | | | | 3 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | -- | | -- | | -- | | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | | Computing Sciences | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

**COURSES WHICH CAN BE REGISTERED FOR EITHER IN I OR II SEMESTER**

| | | | | | |
|---|---|---|---|---|---|
| **CS1001** | **PROGRAMMING USING MATLAB** | **L** | **T** | **P** | **C** |
| | Total Contact Hours - 45 | **0** | **1** | **2** | **2** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

This Lab Course will enable the students to understand the fundamentals and programming knowledge in MATLAB.

**INSTRUCTIONAL OBJECTIVES**

1. To learn the MATLAB environment and its programming fundamentals
2. Ability to write Programs using commands and functions
3. Able to handle polynomials, and use 2D Graphic commands

**LIST OF EXPERIMENTS**

1. Practicing MATLAB environment with simple exercises to familiarize Command Window, History, Workspace, Current Directory, Figure window, Edit window, Shortcuts, Help files.
2. Data types, Constants and Variables, Character constants, operators, Assignment statements.
3. Control Structures: For loops, While, If control structures, Switch, Break, Continue statements.
4. Input-Output functions, Reading and Storing Data.
5. Vectors and Matrices, commands to operate on vectors and matrices, matrix Manipulations.
6. Arithmetic operations on Matrices, Relational operations on Matrices, Logical operations on Matrices.
7. Polynomial Evaluation, Roots of Polynomial, Arithmetic operations on Polynomials.
8. Graphics: 2D plots, Printing labels, Grid & Axes box, Text in plot, Bar and Pie chart.

**TEXT BOOK**

1. Bansal.R.K, Goel.A.K and Sharma.M.K, "*MATLAB and its Applications in Engineering*", Pearson Education, 2012.

**REFERENCES**

1. Amos Gilat, *"MATLAB-An Introduction with Applications"*, Wiley India, 2009.
2. Stephen.J.Chapman, *"Programming in MATLAB for Engineers"*, Cengage Learning, 2011.

| CS1001 PROGRAMMING USING MATLAB | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Computer Science and Engineering** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | | | | | | | | x |
| 2. | Mapping of instructional objectives with student outcome | 2,3 | 1-3 | | | | | | | | | 1 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | x | | -- | | -- | | | | | -- | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| BT1001 | BIOLOGY FOR ENGINEERS | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 30 | 2 | 0 | 0 | 2 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

The purpose of this course is to provide a basic understanding of biological mechanisms of living organisms from the perspective of engineers. In addition, the course is expected to encourage engineering students to think about solving biological problems with engineering tools.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To familiarize the students with the basic organization of organisms and subsequent building to a living being |
| 2. | To impart an understanding about the machinery of the cell functions that is ultimately responsible for various daily activities. |
| 3. | To provide knowledge about biological problems that require engineering expertise to solve them |

**UNIT I - BASIC CELL BIOLOGY (6 hours)**

Introduction: Methods of Science-Living Organisms: Cells and Cell theory Cell Structure and Function, Genetic information, protein synthesis, and protein structure, Cell metabolism-Homoeostasis- Cell growth, reproduction, and differentiation.

**UNIT II - BIOCHEMISTRY AND MOLECULAR ASPECTS OF LIFE (5 hours)**

Biological Diversity --Chemistry of life: chemical bonds--Biochemistry and Human biology--Protein synthesis—Stem cells and Tissue engineering.

**UNIT III - ENZYMES AND INDUSTRIAL APPLICATIONS (5 hours)**

Enzymes: Biological catalysts, Proteases, Carbonic anhydrase, Restriction enzymes, and Nucleoside monophosphate kinases—Photosynthesis.

**UNIT IV - MECHANOCHEMISTRY (7 hours)**

Molecular Machines/Motors—Cytoskeleton—Bioremediation—Biosensors.

**UNIT V - NERVOUS SYSTEM, IMMUNE SYSTEM, AND CELL SIGNALING (7 hours)**

Nervous system--Immune system- General principles of cell signaling.

**TEXT BOOK**


1. S. ThyagaRajan, N. Selvamurugan, M. P. Rajesh, R. A. Nazeer, Richard W. Thilagaraj, S. Barathi, and M. K. Jaganathan, "*Biology for Engineers*," Tata McGraw-Hill, New Delhi, 2012.


**REFERENCES**


1. Jeremy M. Berg, John L. Tymoczko and Lubert Stryer, "*Biochemistry*," W.H. Freeman and Co. Ltd., 6th Ed., 2006.
2. Robert Weaver, "*Molecular Biology*," MCGraw-Hill, 5th Edition, 2012.
3. Jon Cooper, "*Biosensors A Practical Approach*" Bellwether Books, 2004.
4. Martin Alexander, "*Biodegradation and Bioremediation,"* Academic Press, 1994.
5. Kenneth Murphy, "*Janeway's Immunobiology*," Garland Science; 8th edition, 2011.
6. Eric R. Kandel, James H. Schwartz and Thomas M. Jessell, *"Principles of Neural Science"*, McGraw-Hill, 5th Edition, 2012.


| BT1001 BIOLOGY FOR ENGINEERS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Biotechnology** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | | | x | | | | | | x | |
| 2. | Mapping of instructional objectives with student outcome | 1 | | | 2 | | | | | | 3 | |
| 3. | Category | General (G) | | Basic Sciences(B) | | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | |
| | | -- | | x | | | -- | | | | -- | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| EE1001 | BASIC ELECTRICAL ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 30 | 2 | 0 | 0 | 2 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

This course provides comprehensive idea about circuit analysis, working principles of machines and common measuring instruments.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Understand the basic concepts of magnetic circuits, AC & DC circuits. |
| 2. | Explain the working principle, construction, applications of DC & AC machines and measuring instruments. |
| 3. | Gain knowledge about the fundamentals of wiring and earthing |

**UNIT I - FUNDAMENTALS OF DC CIRCUITS (6 hours)**

Introduction to DC and AC circuits, Active and passive two terminal elements, Ohms law, Voltage-Current relations for resistor, inductor, capacitor , Kirchhoff's laws, Mesh analysis, Nodal analysis, Ideal sources –equivalent resistor, current division, voltage division

**UNIT II - MAGNETIC CIRCUITS (6 hours)**

Introduction to magnetic circuits-Simple magnetic circuits-Faraday's laws, induced emfs and inductances

**UNIT III - AC CIRCUITS (6 hours)**

Sinusoids, Generation of AC, Average and RMS values, Form and peak factors, concept of phasor representation, J operator. Analysis of R-L, R-C, R-L-C circuits. Introduction to three phase systems - types of connections, relationship between line and phase values.

**UNIT IV - ELECTRICAL MACHINES & MEASURING INSTRUMENTS (6 hours)**

Working principle, construction and applications of DC machines and AC machines (1 - phase transformers, single phase induction motors: split phase, capacitor start and capacitor start & run motors). Basic principles and classification of instruments -Moving coil and moving iron instruments.

**UNIT V - ELECTRICAL SAFETY, WIRING &INTRODUCTION TO POWER SYSTEM (6 hours)**

Safety measures in electrical system- types of wiring- wiring accessories-staircase, fluorescent lamps & corridor wiring- Basic principles of earthing-Types of earthing- Simple layout of generation, transmission & distribution of power.

**TEXT BOOK**

1. Dash.S.S,Subramani.C andVijayakumar.K,*"BasicElectrical Engineering"*, First edition, Vijay Nicole Imprints Pvt.Ltd,2013

**REFERENCES**

1. Smarajt Ghosh, "*Fundamentals of Electrical & Electronics Engineering*", Second edition, PHI Learning, 2007.
2. Metha.V.K, Rohit Metha, "*Basic Electrical Engineering*", Fifth edition, S.Chand & Co, 2012.
3. Kothari .D.P and Nagrath IJ, "*Basic Electrical Engineering*", Second edition, Tata McGraw - Hill, 2009.
4. Bhattacharya.S.K, "*Basic Electrical and Electronics Engineering"*, First edition, Pearson Education, 2011.

| **EE1001 BASIC ELECTRICAL ENGINEERING** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Electrical and Electronics Engineering** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | | | | x | | | | | | |
| 2. | Mapping of instructional objectives with student outcome | 1-3 | | | | 1 | | | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | |
| | | -- | | -- | | | x | | | | -- | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| **EC1001** | **BASIC ELECTRONICS ENGINEERING** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| | Total Contact Hours – 30 | **2** | **0** | **0** | **2** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

This course provides comprehensive idea about working principle, operation and characteristics of electronic devices, transducers, Digital Electronics and Communication Systems.

**INSTRUCTIONAL OBJECTIVES**

At the end of the course students will be able to gain knowledge about the

| | |
|---|---|
| 1. | Fundamentals of electronic components, devices, transducers |
| 2. | Principles of digital electronics |
| 3. | Principles of various communication systems |

**UNIT I - ELECTRONIC COMPONENTS (4 hours)**

**Passive components** – resistors, capacitors & inductors (properties, common types, I-V relationship and uses).

**UNIT II - SEMICONDUCTOR DEVICES (7 hours)**

**Semiconductor Devices -** Overview of Semiconductors - basic principle, operation and characteristics of PN diode, zener diode, BJT, JFET, optoelectronic devices (LDR, photodiode, phototransistor, solar cell, optocouplers)

**UNIT III - TRANSDUCERS (5 hours)**

**Transducers -** Instrumentation – general aspects, classification of transducers, basic requirements of transducers, passive transducers - strain gauge, thermistor, Hall-Effect transducer, LVDT, and active transducers – piezoelectric and thermocouple.

**UNIT IV - DIGITAL ELECTRONICS (7 hours)**

Number systems – binary codes - logic gates - Boolean algebra, laws & theorems - simplification of Boolean expression - implementation of Boolean expressions using logic gates - standard forms of Boolean expression.

**UNIT V - COMMUNICATION SYSTEMS (7 hours)**

Block diagram of a basic communication system – frequency spectrum - need for modulation - methods of modulation - principles of AM, FM, pulse analog and pulse digital modulation – AM / FM transmitters & receivers (block diagram description only)

**TEXT BOOKS**


1. Thyagarajan.T, SendurChelvi.K.P and Rangaswamy.T.R, *"Engineering Basics: Electrical, Electronics and Computer Engineering"*, New Age International, Third Edition, 2007.
2. Somanathan Nair.B and Deepa.S.R, "*Basic Electronics",* I.K. International Pvt. Ltd., 2009.


**REFERENCES**


1. Thomas L. Floyd, *"Electronic Devices",* Pearson Education, 9th Edition, 2011.
2. Rajput.R.K, *"Basic Electrical and Electronics Engineering"*, Laxmi Publications, First Edition, 2007.

| EC1001 BASIC ELECTRONICS ENGINEERING | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Electronics and Communication Engineering** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | | | | | | | | | | |
| 2. | Mapping of instructional objectives with student outcome | 1,2,3 | | | | | | | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | -- | | -- | | x | | | | -- | | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| ME1001 | BASIC MECHANICAL ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 30 | 2 | 0 | 0 | 2 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To familiarize the students with the basics of Mechanical Engineering.

**INSTRUCTIONAL OBJECTIVES**

1. To familiarize with the basic machine elements
2. To familiarize with the Sources of Energy and Power Generation
3. To familiarize with the various manufacturing processes

**UNIT I - MACHINE ELEMENTS– I (5 hours)**

**Springs:** Helical and leaf springs – Springs in series and parallel. **Cams:** Types of cams and followers – Cam profile.

**UNIT II - MACHINE ELEMENTS– II (5 hours)**

**Power Transmission:** Gears (terminology, spur, helical and bevel gears, gear trains). Belt drives (types). Chain drives. Simple Problems.

**UNIT III - ENERGY (10 hours)**

**Sources:** Renewable and non-renewable (various types, characteristics, advantages/disadvantages). **Power Generation:** External and internal combustion engines – Hydro, thermal and nuclear power plants (layouts, element/component description, advantages, disadvantages, applications). Simple Problems.

**UNIT IV - MANUFACTURING PROCESSES - I (5 hours)**

**Sheet Metal Work:** Introduction – Equipments – Tools and accessories – Various processes (applications, advantages / disadvantages). **Welding:** Types – Equipments – Tools and accessories – Techniques employed -applications, advantages / disadvantages – Gas cutting – Brazing and soldering.

**UNIT V - MANUFACTURING PROCESSES– II (5 hours)**

**Lathe Practice:** Types - Description of main components – Cutting tools – Work holding devices – Basic operations. Simple Problems. **Drilling Practice:** Introduction – Types – Description – Tools. Simple Problems.

**TEXT BOOKS**


1. Kumar.T, Leenus Jesu Martin and Murali.G, *"Basic Mechanical Engineering"*, Suma Publications, Chennai, 2007.
2. Prabhu.T.J, Jai Ganesh.V and Jebaraj.S, *"Basic Mechanical Engineering"*, Scitech Publications, Chennai, 2000.


**REFERENCE BOOKS**


1. Hajra Choudhary, S.K. and HajraChoudhary, A. K., "*Elements of Workshop Technology", Vols. I & II*, Indian Book Distributing Company Calcutta, 2007.
2. Nag.P.K, "*Power Plant Engineering"*, Tata McGraw-Hill, New Delhi, 2008.
3. Rattan, S.S., "*Theory of Machines"*, Tata McGraw-Hill, New Delhi, 2010.


| **ME1001 BASIC MECHANICAL ENGINEERING** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechanical Engineering** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | | | | x | | | | | | |
| 2. | Mapping of instructional objectives with student outcome | 1- 3 | | | | 1- 3 | | | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | -- | | -- | | x | | | | | -- | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| ME1004 | WORKSHOP PRACTICE | L | T | P | C |
|---|---|---|---|---|---|
| | Total contact hours - 45 | 0 | 0 | 3 | 2 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To provide the students with hands on experience on different trades of engineering like fitting, carpentry, smithy, welding and sheet metal.

**INSTRUCTIONAL OBJECTIVES**

1. To familiarize with the basics of tools and equipments used in fitting, carpentry, sheet metal, welding and smithy
2. To familiarize with the production of simple models in the above trades.

**UNIT I - FITTING** **(9 hours)**

Tools & Equipments – Practice in filing.
Making Vee Joints, Square, Dovetail joints and Key making - plumbing.
Mini project – Assembly of simple I.C. engines.

**UNIT II - CARPENTRY** **(9 hours)**

Tools and Equipments- Planning practice.
Making Half Lap, Dovetail, Mortise &Tenon joints.
Mini project - model of a single door window frame.

**UNIT III - SHEET METAL** **(9 hours)**

Tools and equipments– practice.
Making rectangular tray, hopper, scoop, etc.
Mini project - Fabrication of a small cabinet, dust bin, etc.

**UNIT IV - WELDING** **(9 hours)**

Tools and equipments -
Arc welding of butt joint, Lap joint, Tee fillet.
Demonstration of gas welding, TIG & MIG welding.

**UNIT V - SMITHY** **(9 hours)**

Tools and Equipments –
Making simple parts like hexagonal headed bolt, chisel.

**TEXT BOOK**

1. Gopal.T.V, Kumar.T, and Murali.G, "*A first course on workshop practice – Theory, Practice and Work Book"*, Suma Publications, Chennai, 2005.

**REFERENCE BOOKS**


1. Kannaiah.P and Narayanan.K.C, "*Manual on Workshop Practice"*, Scitech Publications, Chennai, 1999.
2. Venkatachalapathy.V.S, "*First year Engineering Workshop Practice"*, Ramalinga Publications, Madurai, 1999.
3. Laboratory Manual.


| ME1004 WORKSHOP PRACTICE | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechanical Engineering** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | x | x | | | | x | | | | |
| 2. | Mapping of instructional objectives with student outcome | | 1, 2 | 1, 2 | | | | 1, 2 | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | -- | | -- | | x | | | | -- | | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| ME1005 | ENGINEERING GRAPHICS | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 75 | 0 | 1 | 4 | 3 |
| | Prerequisite | | | | |
| | Nil | | | | |

| **PURPOSE** | |
|---|---|
| 1. | To draw and interpret various projections of 1D, 2D and 3D objects. |
| 2. | To prepare and interpret the drawings of buildings. |
| **INSTRUCTIONAL OBJECTIVES** | |
| 1. | To familiarize with the construction of geometrical figures |
| 2. | To familiarize with the projection of 1D, 2D and 3D elements |
| 3. | To familiarize with the sectioning of solids and development of surfaces |
| 4. | To familiarize with the Preparation and interpretation of building drawing |

**First Angle Projection is to be followed - Practice with Computer Aided Drafting tools**

**UNIT I - FUNDAMENTALS OF ENGINEERING GRAPHICS (2 hours)**

Lettering – Two dimensional geometrical constructions – Conics – Representation of three-dimensional objects – Principles of projections – Standard codes – Projection of points.

**UNIT II - PROJECTION OF LINES AND SOLIDS (4 hours)**

Projection of straight lines – Projection of planes - Projection of solids – Auxiliary projections.

**UNIT III - SECTIONS AND DEVELOPMENTS (3 hours)**

Sections of solids and development of surfaces.

**UNIT IV - PICTORIAL PROJECTIONS (4 hours)**

Conversion of Projections: Orthographic projection – Isometric projection of regular solids and combination of solids.

**UNIT V - BUILDING DRAWING (2 hours)**

Plan, Elevation and section of single storied residential (or) office building with flat RCC roof and brick masonry walls having not more than 3 rooms (planning / designing is not expected in this course) with electrical wiring diagram.

**PRACTICAL (60 hours)**

**TEXT BOOKS**


1. Venugopal.K and Prabhu Raja.V, "*Engineering Graphics"*, Eighth Edition (Revised), New Age International Publishers, Chennai, 2007.
2. Natarajan.K.V, "*A Text Book of Engineering Graphics"*, 21st Edition, Dhanalakshmi Publishers, Chennai, 2012.
3. Jeyapoovan.T, "*Engineering Drawing and Graphics using AutoCAD"*, Vikas Publishing House Pvt. Ltd., New Delhi, 2010.


**REFERENCE BOOKS**


1. Bethune.J.D, "Engineering Graphics with AutoCAD 2013", PHI Learning Private Limited, Delhi, 2013.
2. Bhatt.N.D, "*Elementary Engineering Drawing (First Angle Projection)"*, Charotar Publishing Co., Anand, 1999.
3. Narayanan.K.L and Kannaiah.P, "*Engineering Graphics"*, Scitech Publications, Chennai, 1999.
4. *Shah.M.B and Rana.B.C, "Engineering Drawing", Pearson Education (Singapore) Pvt. Ltd., New Delhi*, 2005.

| ME1005 ENGINEERING GRAPHICS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechanical Engineering** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | x | x | | | | x | | | | |
| 2. | Mapping of instructional objectives with student outcome | | 1-4 | 1-4 | | | | 1-4 | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | -- | | -- | | x | | | | -- | | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| **NC1001/ NS1001/ SP1001/ YG1001** | **NATIONAL CADET CORPS (NCC)/ NATIONAL SERVICE SCHEME (NSS)/ NATIONAL SPORTS ORGANIZATION (NSO) / YOGA** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| | Total Contact Hours – 15 (minimum, but may vary depending on the course) | **0** | **0** | **1** | **1** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To imbibe in the minds of students the concepts and benefits of NCC/NSS/NSO/YOGA and make them practice the same.

**INSTRUCTIONAL OBJECTIVES**

1. To enable the students to gain knowledge about NCC/NSS/NSO/YOGA and put the same into practice.

**NATIONAL CADET CORPS (NCC)**

Any student enrolling as a member of National Cadet Core (NCC) will have to attend sixteen parades out of twenty parades each of four periods over a span of academic year.

Attending eight parades in first semester will qualify a student to earn the credits specified in the curriculum. Grading shall be done based on punctuality, regularity in attending the parades and the extent of active involvement.

**NATIONAL SERVICE SCHEME (NSS)**

A student enrolling as member of NSS will have to complete 60 hours of training / social service to be eligible to earn the credits specified in the curriculum.

Grading shall be done by the faculty member handling the course based on punctuality, regularity in attending the classes and the extent of active involvement.

**NATIONAL SPORTS ORGANIZATION (NSO)**

Each student must select one of the following games/sports events and practice for one hour per week. An attendance of 75% is compulsory to earn the credits specified in the curriculum. Grading shall be done by the faculty member handling the course based on punctuality, regularity in attending the classes and the extent of active involvement.

List of games/sports:

Basket Ball, Football, Volley Ball, Ball Badminton, Cricket, Throw-ball, Track events

Field events or any other game with the approval of faculty member.

**YOGA**

Benefits of Agnai Meditation -Meditation - Agnai, Asanas, Kiriyas, Bandas, Muthras

Benefits of santhi Meditation - Meditation Santhi Physical Exercises (I & II)

Lecture & Practice - Kayakalpa Yoga Asanas, Kiriyas, Bandas, Muthras

Analysis of Thought - Meditation Santhi Physical Exercises III & IV

Benefits of Thuriyam - Meditation Thuriyam Kayakalpa Asanas, Kiriyas, Bandas, Muthras

Attitude - Meditation Thuriyam Kayakalpa Asanas, Kiriyas, Bandas, Muthras

Importance of Arutkappy & Blessings - Meditation Thuriyam Kayakalpa Asanas, Kiriyas, Bandas, Muthras

Benefits of Blessings - Meditation Santhi Kayakalpa Asanas, Kiriyas, Bandas, Muthras

**Assessment**

An attendance of 75% is compulsory to earn the credits specified in the curriculum. Grading shall be done by the faculty member handling the course based on punctuality, regularity in attending the classes and the extent of active involvement.

**TEXT BOOKS**


1. Yogiraj Vethathiri Maharishi, "*Yoga for Modern Age*", Vethathiri Publishers, 1989.
2. Vethathiri Maharishi.T, "*Simplified Physical Exercises*", Vethathiri Publishers, 1987.

| NC1001/ NS1001/ SP1001/ YG1001 | | NATIONAL CADET CORPS (NCC)/ NATIONAL SERVICE SCHEME (NSS)/ NATIONAL SPORTS ORGANIZATION (NSO)/YOGA | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | NCC/NSS/NSO/YOGA PRACTITIONERS | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | | | x | | | | | x | | |
| 2. | Mapping of instructional objectives with student outcome | a | b | c | d | e | f | g | h | i | j | k |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | x | | -- | | -- | | | | | -- | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

**SEMESTER III**

| | | | | | |
|---|---|---|---|---|---|
| **LE1003** | **GERMAN LANGUAGE PHASE I** | **L** | **T** | **P** | **C** |
| | Total Contact Hours – 30 | **2** | **0** | **0** | **2** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

Germany offers infinite opportunities for students of engineering for higher studies, research and employment in Germany. B.Tech Students are offered German Language during their second year. Knowledge of the language will be helpful for the students to adjust themselves when they go for higher studies.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To introduce the language, phonetics and the special characters in German language |
| 2. | To introduce German culture & traditions to the students. |
| 3. | By the end of Phase – I, the students will be able to introduce themselves and initiate a conversation. |
| 4. | We endeavor to develop the ability among the students to read and understand small texts written in German |
| 5. | To enable the students to elementary conversational skills. |

**UNIT I** (**6 hours)**

**Wichtige Sprachhandlungen:** Phonetics – Sich begrüßen - Sich und andere vorstellen formell / informell - Zahlen von 1 bis 1 Milliarde - verstehen & sprechen **Grammatik:** regelmäßige Verben im Präsens - "sein" und haben im Präsens - Personalpronomen im Nominativ.

**UNIT II** **(6 hours)**

**Wichtige Sprachhandlungen** Telefon Nummern verstehen und sprechen Uhrzeiten verstehen und sagen Verneinung "nicht und kein" (formell und informell) **Grammatik** : Wortstellung – Aussagesatz – W-Frage und Satzfrage (Ja/Nein Frage) Nomen buchstabieren und notieren bestimmter und unbestimmter Artikel und Negativartikel im Nom. & Akkusativ.

**UNIT III** **(6 hours)**

**Wichtige Sprachhandlungen** Tageszeiten verstehen und über Termine sprechen -Verabredungen verstehen - Aufgaben im Haushalt verstehen **Grammatik** Personalpronomen im Akkusativ und Dativ - W-Fragen "wie, wer, wohin,wo, was usw.- Genitiv bei Personennamen - Modalverben im Präsens "können, müssen, möchten".

**UNIT IV** **(6 hours)**

**Wichtige Sprachhandlungen** Sich austauschen, was man kann, muss – Bezeichnungen Lebensmittel – Mengenangaben verstehen – Preise verstehen und Einkaufzettel schreiben.

**Grammatik** Wortstellung in Sätzen mit Modalverben – Konnektor "und" – "noch"-kein-------mehr – "wie viel, wie viele, wie alt, wie lange" –Possessivartikel im Nominativ.

**UNIT V** **(6 hours)**

**Wichtige Sprachhandlungen** Freizeitanzeigen verstehen – Hobbys und Sportarten Anzeigen für Freizeitpartner schreiben bzw. darauf antworten – Vorlieben und Abneigungen ausdrucken.

**Grammatik** Verben mit Vokalwechsel im Präsens – Modalverben im Präsens " dürfen, wollen und mögen - "haben und sein" im Präteritum – regelmäßige Verben im Perfekt – Konnektoren "denn, oder, aber.

**TEXT BOOK**

1. Studio d A1. Deutsch als Fremdsprache with CD.(Kursbuch und Sprach training).

**REFERENCES**

1. German for Dummies
2. Schulz Griesbach

| LE1003 GERMAN LANGUAGE PHASE I | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of English and Foreign Languages | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | | | | | | x | | | | |
| 2. | Mapping of instructional objectives with student outcome | | | | | | | 1-5 | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | x | | -- | | -- | | | | -- | | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| LE1004 | FRENCH LANGUAGE PHASE I | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 30 | 2 | 0 | 0 | 2 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To enable the student learners acquire a basic knowledge of the French language and concepts of general French for everyday interactions and technical French at the beginner's level and also to get to know the culture of France.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To enable students improve their grammatical competence. |
| 2. | To enhance their listening skills. |
| 3. | To assist students in reading and speaking the language. |
| 4. | To enhance their lexical and technical competence. |
| 5. | To help the students introduce themselves and focus on their communication skills. |

**UNIT I** **(6 hours)**

1. Grammar and Vocabulary: Usage of the French verb "se presenter", a verb of self- introduction and how to greet a person- "saluer"
2. Listening and Speaking – The authentic sounds of the letters of the French alphabet and the accents that play a vital role in the pronunciation of the words.
3. Writing – correct spellings of French scientific and technical vocabulary.
4. Reading -- Reading of the text and comprehension – answering questions.

**UNIT II** **(6 hours)**

1. Grammar and Vocabulary – Definite articles , "prepositions de lieu" subject pron ouns
2. Listening and Speaking – pronunciation of words like Isabelle, presentez and la liaison – vous etes, vous appelez and role play of introducing each other – group activity
3. Writing – particulars in filling an enrollment / registration form
4. Reading Comprehension – reading a text of a famous scientist and answering questions.

**UNIT III** **(6 hours)**

1. Grammar and Vocabulary – verb of possession "avoir' and 1st group verbs "er", possessive adjectives and pronouns of insistence- moi, lui..and numbers from 0 to 20.
2. Listening and Speaking –nasal sounds of the words like feminine, ceinture, parfum and how to ask simple questions on one's name, age, nationality, address mail id and telephone number.
3. Writing –conjugations of first group verbs and paragraph writing on self – introduction and introducing a third person.
4. Reading Comprehension – reading a text that speaks of one's profile and answering questions.

**UNIT IV** **(6 hours)**

1. Grammar and Vocabulary –negative sentences, numbers from 20 to 69, verb "aimer"and seasons of the year and leisure activities.
2. Listening and Speaking – To express one's likes and dislikes and to talk of one's pastime activities (sports activities), je fais du ping-pong and nasal sounds of words – janvier, champagne
3. Writing- conjugations of the irregular verbs – faire and savoir and their usage. Paragraph writing on one's leisure activity- (passé temps favori)
4. Reading- a text on seasons and leisure activities – answering questions.

**UNIT V** **(6 hours)**

1. Grammar and Vocabulary – les verbes de direction- to ask one's way and to give directions, verbes- pouvoir and vouloir and 2nd group verbs , a droite, la premiere a gauche and vocabulary relating to accommodation.
2. Listening and Speaking – to read and understand the metro map and hence to give one directions – dialogue between two people.
3. Writing –paragraph writing describing the accommodation using the different prepositions like en face de, derriere- to locate .
4. Reading Comprehension -- a text / a dialogue between two on location and directions- ou est la poste/ la pharmacie, la bibliotheque?.....

**TEXT BOOK**

1. Tech French

**REFERENCES**

1. French for Dummies.
2. French made easy-Goyal publishers
3. Panorama

| LE1004 FRENCH LANGUAGE PHASE I | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of English and Foreign Languages** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | | | | | | x | | | | |
| 2. | Mapping of instructional objectives with student outcome | | | | | | | 1-5 | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | |
| | | x | | -- | | | -- | | | | -- | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| LE 1005 | JAPANESE LANGUAGE PHASE I | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours- 30 | **2** | **0** | **0** | **2** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To enable students achieve a basic exposure on Japan, Japanese language and culture. To acquire basic conversational skill in the language.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To help students learn the Japanese scripts viz. hiragana and a few basic kanji. |
| 2. | To make the students acquire basic conversational skill. |
| 3. | To enable students to know about Japan and Japanese culture. |
| 4. | To create an advantageous situation for the students to have better opportunity for employability by companies who have association with Japan. |

**UNIT I** **(8 hours)**

1. Introduction to Japanese language. Hiragana Chart 1 - vowels and consonants and related vocabulary.
2. Self introduction
3. Grammar – usage of particles wa, no, mo and ka and exercises
4. Numbers (1-100)
5. Kanji – introduction and basic kanjis – naka, ue, shita, kawa and yama
6. Greetings, seasons, days of the week and months of the year
7. Conversation – audio
8. Japan – Land and culture

**UNIT II** (**8 hours)**

1. Hiragana Chart 1 (contd.) and related vocabulary
2. Grammar – usage of kore, sore, are, kono, sono, ano, arimasu and imasu. Particles – ni (location) and ga. Donata and dare.
3. Numbers (up to 99,999)
4. Kanji – numbers (1-10, 100, 1000, 10,000 and yen)
5. Family relationships and colours.
6. Conversation – audio
7. Festivals of Japan

**UNIT III** (**5 hours)**

Hiragana Charts 2&3, double consonants, vowel elongation and related vocabulary
Lesson 3
Grammar - particles ni (time), kara, made and ne. Koko, soko, asoko and doko.
Time expressions (today, tomorrow, yesterday, day before, day after)
Kanji – person, man, woman, child, tree and book
Directions – north, south, east and west

**UNIT IV** **(5 hours)**

Grammar - directions,-kochira, sochira, achira and dochira. Associated vocabulary (mae, ushiro, ue, shita, tonari, soba, etc.)
Conversation – audio
Japanese art and culture like ikebana, origami, etc.

**UNIT V** **(4hours)**

Kanji – hidari, migi, kuchi
Japanese sports and martial arts

**TEXT BOOK**

1. First lessons in Japanese, ALC Japan

**REFERENCES**

1. Japanese for dummies. Wiley publishing co. Inc., USA.
2. Kana workbook, Japan foundation.

| LE1005 JAPANESE LANGUAGE PHASE I | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of English and Foreign Languages | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | | | | | | x | | | | |
| 2. | Mapping of instructional objectives with student outcome | | | | | | | 1 - 4 | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | x | | -- | | -- | | | | | -- | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| LE1006 | KOREAN LANGUAGE PHASE I | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours- 30 | 2 | 0 | 0 | 2 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To enable students achieve a basic exposure on Korea, Korean language and culture. To acquire basic conversational skill in the language.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To help students learn the scripts. |
| 2. | To make the students acquire basic conversational skill. |
| 3. | To enable students to know about Korean culture. |
| 4. | To create an advantageous situation for the students to have better opportunity for employability by companies who have association with Korea. |

**UNIT I** **(6 hours)**

Lesson 1 < Introduction to Korean Language >, Lesson2 < Consonants and Vowels >, <Basic Conversation, Vocabularies and Listening >

**UNIT II** (**10 hours)**

Lesson 3<Usage of "To be" >, Lesson 4 < Informal form of "to be">, Lesson 5 <Informal interrogative form of "to be">, Lesson 6 <To be, to have, to stay>, < Basic Conversation, Vocabularies and Listening >

**UNIT III** (**10 hours)**

Lesson 7 < Interrogative practice and Negation >, < Basic Conversation, Vocabularies and Listening >

**UNIT IV** **(4 hours)**

Lesson 8 < Korean Culture and Business Etiquette >, < Basic Conversation, Vocabularies and Listening

**TEXT BOOK**

1. Korean Through English 1(Basic Korean Grammar and Conversation).

**REFERENCES**

1. Bharati Korean (Intermediate Korean Grammar).
2. Hand-outs.
3. Various visual mediums such Movie CD, Audio CD.
4. Collection of vocabularies for engineering field.

| LE1006KOREAN LANGUAGE PHASE I | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of English and Foreign Languages** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | | | | | | x | | | | |
| 2. | Mapping of instructional objectives with student outcome | | | | | | | 1 - 4 | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | x | | -- | | -- | | | | -- | | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| **LE1007** | **CHINESE LANGUAGE PHASE I** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| | Total contact hours- 30 | **2** | **0** | **0** | **2** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To enable students achieve a basic exposure on China, Chinese language and culture. To acquire basic conversational skill in the language.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To help students learn the Chinese scripts. |
| 2. | To make the students acquire basic conversational skill. |
| 3. | To enable students to know about China and Chinese culture. |
| 4. | To create an advantageous situation for the students to have better opportunity for employability by companies who have association with china. |

**UNIT I**

Introduction of Chinese Language

**UNIT II**

**Phonetics and Notes on pronunciation**

**a) 21 Initials:**

b p m f d t n l g k h j q x z c s zh ch sh r

**b) 37 Finals:**

| | | | | | |
|---|---|---|---|---|---|
| a | o | e | i | u | ü |
| ai | ou | ei | ia | ua | üe |
| an | ong | en | ian | uai | üan |
| ang | | eng | iang | uan | ün |
| ao | | er | iao | uang | |
| | | ie | uei(ui) | | |
| | in | uen(un) | | | |
| | ing | ueng | | | |
| | iong | uo | | | |
| | iou(iu) | | | | |

**c) The combination of Initials and Finals - Pinyin**

**UNIT III**

**Introduction of Syllables and tones**

a) syllable=initial+final+tone

b) There are four tones in Chinese: the high-and-level tone, the rising tone, the falling-and-rising tone, and the falling tone. And the markers of the different tones.

**UNIT IV**

**A. Tones practice**

**B. the Strokes of Characters**

1. Introduction of Chinese Characters
2. The eight basic strokes of characters

**UNIT V**

**1. Learn to read and write the Characters:**

八(eight) 不(not) 马(horse) 米(rice) 木(wood ).

**2. classes are organized according to several Mini-dialogues.**

**TEXT BOOK**

1. A New Chinese Course 1- Beijing Language and Culture University Press.

**REFERENCES**

1. New Practical Chinese Reader Textbook (1) – Beijing Language and Culture University Press.
2. 40 Lessons For Basic Chinese Course I – Shanghai Translation Press.
3. My Chinese Classroom - East China Normal University Press.

| **LE1007CHINESE LANGUAGE PHASE I** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of English and Foreign Languages** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | | | | | | x | | | | |
| 2. | Mapping of instructional objectives with student outcome | | | | | | | 1 - 4 | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | x | | -- | | -- | | | | | -- | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| **PD1003** | **APTITUDE-I** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| | Total Contact Hours - 30 | **1** | **0** | **1** | **1** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To enhance holistic development of students and improve their employability skills.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To improve aptitude, problem solving skills and reasoning ability of the student. |
| 2. | To collectively solve problems in teams & group. |

**UNIT I - NUMBERS** **(6 hours)**

Types and Properties of Numbers, LCM, GCD, Fractions and decimals, Surds

**UNIT II - ARITHMETIC – I** **(6 hours)**

Percentages, Profit & Loss, Simple Interest & Compound Interest, , Clocks & calendars

**UNIT III - ALGEBRA - I** **(6 hours)**

Logarithms, Problems on ages

**UNIT IV - MODERN MATHEMATICS - I** **(6 hours)**

Permutations, Combinations, Probability

**UNIT V - REASONING** **(6 hours)**

Logical Reasoning, Analytical Reasoning

**ASSESSMENT**

1. Objective type – Paper based / Online – Time based test

**REFERENCES**


1. Agarwal.R.S,*"Quantitative Aptitude for Competitive Examinations",* S.Chand Limited, 2011.
2. Abhijit Guha*, Quantitative Aptitude for Competitive Examinations,* Tata McGraw Hill, 3rd Edition*,* 2011.
3. Edgar Thrope, *Test of Reasoning for Competitive Examinations,* Tata McGraw Hill, 4th Edition, 2012.
4. *Other material related to quantitative aptitude.*


| PD1003 APTITUDE-I | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Career Development centre** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | | | x | | | | | | | |
| 2. | Mapping of instructional objectives with student outcome | 1 | | | 2 | | | | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | x | | -- | | -- | | | | -- | | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| | **FOURIER SERIES, PARTIAL DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| **MA1013** | Total contact hours 75 hours | **4** | **0** | **0** | **4** |
| | (Common to Auto, Aero, Mech, Nano, Civil & Chemical) | | | | |
| **PURPOSE** | | | | | |
| To inculcate the problem solving ability in the minds of students so as to apply the theoretical knowledge to the respective branches of Engineering. | | | | | |
| **INSTRUCTIONAL OBJECTIVES** | | | | | |

| | |
|---|---|
| 1. | To know to formulate and solve partial differential equations |
| 2. | To have thorough knowledge in Fourier series |
| 3. | To learn to solve boundary value problems |
| 4. | To be familiar with applications of PDE in two dimensional heat equation |
| 5. | To gain good knowledge in the application of Fourier transform |

**UNIT I - PARTIAL DIFFERENTIAL EQUATIONS (15 hours)**

Formation - Solution of standard types of first order equations - Lagrange's equation - Linear Homogeneous partial differential equations of second and higher order with constant coefficients.

**UNIT II - FOURIER SERIES (15 hours)**

Dirichlet's conditions - General Fourier series - Half range sine and cosine series- Parseval's identity - Harmonic analysis.

**UNIT III - BOUNDARY VALUE PROBLEMS (15 hours)**

Classification of second order linear partial differential equations - Solutions of one-dimensional wave equation - one-dimensional heat equation

**UNIT IV - TWO DIMENSIONAL HEAT EQUATION (15 hours)**

Steady state solution of two-dimensional heat equation - Fourier series solutions in Cartesian coordinates & Polar coordinates.

**UNIT V - FOURIER TRANSFORMS (15 hours)**

Statement of Fourier integral theorem (without proof) - Fourier transform pairs - Fourier Sine and Cosine transforms - Properties - Transforms of simple functions - Convolution theorem - Parseval's identity.

**TEXT BOOKS**


1. Kreyszig.E, Advanced Engineering Mathematics, 10th edition, John Wiley & Sons. Singapore,2012.
2. Grewal.B.S, *"Higher Engineering Mathematics"*, 42nd edition, Khanna Publishers, New Delhi, 2012.

**REFERENCES**


1. Sivaramakrishna Das .P and Vijayakumari.C, *"A text book of Engineering Mathematics-III"*,Viji's Academy,2010.
2. Kandasamy.P, etal., *"Engineering Mathematics"*, Vol. II & Vol. III (4th revised edition), S.Chand & Co., New Delhi, 2000.
3. Narayanan.S, Manickavachagom Pillay.T and Ramanaiah.G, *"Advanced Mathematics for Engineering students"*, Volume II & III (2nd edition), S.Viswanathan Printers and Publishers, 1992.
4. Venkataraman.M.K, *"Engineering Mathematics - Vol.III - A & B"* (13th edition), National Publishing Co., Chennai, 1998.
5. Sankara Rao, *"Introduction to Partial Differential Equations"*, 2nd Edition, PHI Learning Pvt. Ltd., 2006.


| **MA1013 FOURIER SERIES, PARTIAL DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mathematics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | | | | x | | | | | | |
| 2. | Mapping of instructional objectives with student outcome | 1-5 | | | | 1-5 | | | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) |
| | | -- | | x | | | -- | | | | | -- |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| **MH1002** | **ELECTRICAL MACHINES** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| | Total Contact Hours - 45 | **3** | **0** | **0** | **3** |
| | Prerequisite | | | | |
| | EE1001 | | | | |

**PURPOSE**

To familiarize the students with the basics principles of working, characteristics and applications of different Electrical Machines to mechatronics systems.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Understand the working principle and characteristics of various electrical machines. |
| 2. | Analyze the operation of various electrical machines to mechatronics applications. |
| 3. | Apply the principles of various electrical machines to mechatronics systems. |
| 4. | Able to conduct experiments on electrical machines and analyze the experimental data. |

**UNIT I - DC MACHINES** **(10 hours)**

Constructional details - Emf equation -Methods of excitation - Self and separately excited generators - Characteristics of series, shunt and compound generators - Principle of operation of D.C. motor - Back emf and torque equation - Characteristics of series, shunt and compound motors - Starting of D.C. motors - Types of starters - Speed control of D.C. motors- Applications to mechatronics systems.

**UNIT II - TRANSFORMERS** **(4 hours)**

Construction - Working principle - Emf equation - Voltage regulation - Introduction to three-phase transformers.

**UNIT III - AC MACHINES** **(12 hours)**

Production of rotating magnetic field - Torque equation- Torque - slip characteristics - Power stages and efficiency - Simple problems - Starters & methods of speed control (quantitative treatment only)- Principle and operation of single phase Induction motors- Capacitor start & capacitor run motors- Construction and Principle of operation of synchronous machines.

**UNIT IV - STEPPER MOTORS** **(10 hours)**

Constructional features -Principle of operation -Variable reluctance motor -Hybrid Motor-Single and multi stack configurations -Theory of torque predictions -Linear and non-linear analysis-Characteristics -Drive circuits-Applications to mechatronics systems.

**UNIT V - OTHER SPECIAL MACHINES** **(9 hours)**

Construction and Working principle of Servomotor-Types-Position, speed control-Applications to mechatronics systems-Universal motors -Permanent magnet DC motor- Switched reluctance motor.

**TEXT BOOKS**


1. Chapman.S, "*Electric Machinery Fundamentals"*, 4th Ed., McGraw-Hill, 2003.
2. Rajput.R.K, "*Electrical Machines"*, 3rd Ed., Laxmi Publications (P) Ltd., 2003.
3. Bhattacharya.S.K, "*Electrical Machines"'*, Tata McGraw Hill Publishing company ltd, second edition, 1998.
4. Theraja.B.L, Theraja.A.K,"*A TextBook of Electrical Technology"*, Vol.II "AC & DC Machines", publication division of Nirja construction & development (p) Ltd., New Delhi, 1994.
5. Kosow.I.L, "*Electrical Machinery and Transformers"*, 2nd Ed., Prentice- Hall of India Pvt. Ltd., 2003.

**REFERENCES**


1. Guru.Sand Hiziroglu.H.R, "*Electrical Machinery and Transformers"*, 3rd Ed., Oxford University Press, 2003.
2. Miller.T.J.E, "*Brushless Permanent Magnet and ReluctanceMotorDrives*",Clarendon Press, Oxford, 1989.
3. Kenjo.T, "*Stepping Motors and Their Microprocessor Controls"*, Clarendon Press London, 1984.


| **MH1002 ELECTRICAL MACHINES** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | x | x | | | | | x | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | 4 | | 3 | 2 | | | | | 3 | 4 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | x | | -- | | -- | | | | -- | | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| **MH1003** | **ELECTRONIC CIRCUITS** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| | Total Contact Hours - 45 | **3** | **0** | **0** | **3** |
| | Prerequisite | | | | |
| | EC1001 | | | | |

**PURPOSE**

To enable the students to have a fair knowledge about the h-parameters and r-parameters in the transistors, amplifiers, basic concepts of feedback, oscillators, power supply.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Understand and analyse about various transistor configurations and FET amplifiers. |
| 2. | Analyse the frequency response of amplifiers and different types of feedback. |
| 3. | Apply the principles of various electronic circuits to mechatronics systems. |
| 4. | Able to conduct experiments on electronic circuits and analyze the experimental data. |

**UNIT I - AMPLIFIERS (9 hours)**

Small signal models for transistors – Two port devices and network- H parameters, hybrid pi models, r-parameters, r-parameter equivalent circuits- Analysis of CE, CB and CC amplifiers- Small signal FET amplifier- Operation of JFET amplifier.

**UNIT II - DIFFERENTIAL AND TUNED AMPLIFIERS (9 hours)**

Classification of amplifiers- Distortion in amplifiers- Frequency response of an amplifier- Cascade and darlington connections- Operation and analysis of class A Power amplifier- Push pull amplifier- Class B amplifier- Class C amplifiers- Complementary symmetry power amplifier- Operation of emitter – Coupled differential amplifier- Single tuned and double tuned amplifier –Stagger tuned amplifier.

**UNIT III - FEEDBACK AMPLIFIERS AND WAVE SHAPING CIRCUITS (9 hours)**

Basic concepts of feedback- Four types of negative feedback – Effect of feedback on input resistance, output resistance- Voltage gain and current gain- Advantages of negative feedback-RC wave shaping circuits- Diode clippers and clampers- Voltage multipliers.

**UNIT IV - OSCILLATORS AND MULTIVIBRATORS (9 hours)**

**Oscillators:** Classification of oscillators – Barkhausen criterion operation and analysis of RC phase shift, Wien's bridge, Hartely, colpitts oscillators.

**Multivibrators:** Astable, monostable and bistable – Analysis of performance parameters of multivibrators using 68ehavio Trigger – Blocking oscillators.

**UNIT V - RECTIFIERS AND POWER SUPPLIES (9 hours)**

Single –phase, half-wave and full-wave rectifiers – Bridge rectifiers – Ripple factor, rectification efficiency-Transformer Utilisation Factor and regulation – Performance characteristics of rectifiers with filters – Regulated power supply – Series and shunt type voltage regulators – Switched mode power supplies.

**TEXT BOOKS**


1. Millman and Halkias.C, "*Electronic Devices and Circuits*", Tata McGraw Hill., 2001.
2. Mathur.S.P, Kulshreshtha.D.C and Chanda.P.R, "*Electronic Devices – Applications and Integrated circuits"* – Umesh Publications., 1999.
3. Malvino, "*Electronic Principles*", Tata McGraw Hill, 6th edition, 2000.
4. Boylestad & Nashelsky, "*Electronic Devices & Circuit Theory*", Eighth edition, Prentice Hall Of India (P) Ltd., 2003.

**REFERENCES**


1. Sedha.R.S, "*A Text Book of Applied Electronics*", Sultan chand Publishers, 1999.
2. Allen Mottershed, "*Electronic Devices & Circuits, An Introduction*" Prentice Hall Of India (P) Ltd, 1999.


| MH1003 ELECTRONIC CIRCUITS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | x | x | | | | | | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | 4 | | 3 | 2 | | | | | | 4 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | - | | - | | - | | | | x | | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | Computing sciences | | |
| | | -- | | x | | -- | | | | -- | | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1004 | MATERIALS TECHNOLOGY | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours – 45 | **3** | **0** | **0** | **3** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To provide an adequate knowledge on materials and their applications.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Different materials with their properties. |
| 2. | Various production techniques and applications. |
| 3. | Fracture analysis for different metals. |
| 4. | Strengthening mechanisms and Non-destructive Testing. |

**UNIT I - MECHANICAL PROPERTIES AND BEHAVIOUR OF MATERIALS (9 hours)**

Elastic and plastic 69ehavior of metals and polymers- Imperfections in crystals – Mechanism of plastic deformation- Deformation of single crystal by slip, Stress-strain curve – Yield point phenomenon – Mechanical properties of materials.

**UNIT II - MATERIAL TESTING AND FRACTURE BEHAVIOUR (9 hours)**

Fracture- Types of fracture and Griffth theory- Fatigue and fatigue testing- Impact testing, Creep ,Creep mechanism and creep testing – Hardness testing – Brinell and Rockwell hardness testing- Failure analysis .

**UNIT III - PHASE DIAGRAMS (9 hours)**

Constitution of alloys – Solid solutions, substituional and interstitial – Phase diagrams- Isomorphous, eutectoid, eutectic, peritectic and peritectoid reactions- Iron-carbide diagram- Classification of steel and cast iron- Microstructure, properties and applications.

**UNIT IV - NON METALLIC MATERIALS AND MODERN MATERIALS (9 hours)**

Polymeric materials – Formation of polymer structure – Production techniques, Composites –types, applications and production techniques, Ceramics – Types and applications. Dual phase alloys, Micro alloyed steels, High Strength Low alloy (HSLA) steel, Transformation Induced Plasticity ( TRIP) and nano crystalline materials.

**UNIT V - STRENGTHENING MECHANISMS AND NON-DESTRUCTIVE TESTING (9 hours)**

Refinement of grain size, Work hardening, Solid solution –Strengthening, dispersion strengthening, Precipitation hardening.

Magnetic particle inspection, dye penetrant inspection, ultrasonic inspection, radiography, eddy-current testing, acoustic emission inspection.

**TEXT BOOKS**


1. Kenneth GBudinski and Michael K.Budinski, "*Engineering Materials*" Prentice-Hall of India Private Limited, 4th Indian Reprint, 2002.
2. William D Callister, "*Material Science and Engineering*", John Wiley and Sons, 2007.
3. Raghavan.V, "*Materials Science and Engineering*", Prentice Hall of India Pvt., Ltd.,2007.
4. Sydney HAvner, "*Introduction to Physical Metallurgy*", McGraw Hill Book Company, 2007.
5. Dieter.G.E, "*Mechanical Metallurgy"*, Mc Graw Hill Book Company, 1988.
6. Khanna.O.P, *"A text book ofMaterials Science and Metallurgy"*, Khanna Publishers, 2003.

**REFERENCES**


1. Vijaya.M.S and Rangarajan.G, "*Material Science"*, Tata McGraw-Hill, 2007.
2. V.D. Kodgire.V.D and Kodgire.S.V, "*Material science and Metallurgy for Engineers"*, Everest Publishing House, Pune, 24th Edition, 2008.
3. Barry Hull and Vernon John, "*Non destructive testing*" MacMillon, 1988.
4. Dieter.G.E, "*Mechanical Metallurgy"*, Mc Graw Hill, 2001.


| MH1004 MATERIALS TECHNOLOGY | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mechatronics | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | | x | | | | | | | x | x |
| 2. | Mapping of instructional objectives with student outcome | 2 | | 2 | | | | | | | 1 | 3 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | - | | - | | - | | | | | x | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1005 | FUNDAMENTALS OF THERMODYNAMICS | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours – 45 | 3 | 0 | 0 | 3 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To impart knowledge to the students with the basics principles of heat energy and thermodynamic applications.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To be able to state the First Law and to define heat, work, thermal efficiency and the difference between various forms of energy. |
| 2. | To be able to apply the steady-flow energy equation to a system of thermodynamic components (heaters, coolers, pumps, turbines, pistons, etc.) to estimate required balances of heat, work and energy flow. |
| 3. | To be able to apply ideal cycle analysis to simple heat engine cycles to estimate thermal efficiency and work as a function of pressures and temperatures at various points in the cycle. |
| 4. | Analyze combustion processes and estimate pollutant emissions for internal combustion engines. |

**UNIT I - BASIC CONCEPTS AND FIRST LAW OFTHERMODYNAMICS (10 hours)**

Working substance – System – Ideal gas laws – Perfect gas – Property – State, process, path and cycle – Equilibrium – Zeroth law of Thermodynamics – Point and path functions – Quasi static process, reversible and irreversible processes- First law of thermodynamics- Energy – Specific heat – Internal energy and Enthalpy – Energy changes in non-flow processes – The flow equation.

**UNIT II - SECOND LAW OF THERMODYNAMICS (8 hours)**

Kelvin – Plank and Clausius statements- Basic concepts of Heat Engines and Heat pumps (efficiency and COP) – Corollaries of II Law – Absolute temperature scale, Entropy, Entropy change for a perfect gas, principle of entropy increase, Clausius inequaility.

**UNIT III - PROPERTIESOF PURE SUBSTANCE AND STEAM POWER CYCLE (10 hours)**

Properties of pure substances – Thermodynamic properties of pure substances in solid, liquid and vapour phases, phase rule, P-V, P-T, T-V, T-S, H-S diagrams, PVT surfaces, thermodynamic properties of steam. Calculations of work done and heat transfer in non-flow and flow processes. Standard Rankine cycle, Reheat and regenerative cycle.

**UNIT IV - PSYCHROMETRY (8 hours)**

Psychrometry- Psychrometric charts, property calculations of air vapour mixtures- Psychrometric process – Sensible heat exchange processes, Latent heat exchange processes, Adiabatic mixing, evaporative cooling, problems.

**UNIT V - I.C. ENGINES (9 hours)**

Classifications – Four stroke SI & CI engines, Two stroke SI & CI engines, Power developed by engines, Factors deciding power output, specific weight and specific volume, indicated and brake thermal efficiencies, Mechanical efficiency, Specific fuel consumption, Performance curves, Heat Balance – Comparison of two stroke and four stroke engines, SI and CI engines, Application of SI & CI engines.

**TEXT BOOKS**


1. Nag.P.K, "*Engineering Thermodynamics"*, 4th Ed., Tata McGraw-Hill, 2008.
2. Ballaney.P.L,"*Thermal Engineering",* 5th Ed.,Khanna Publishers, 2010**.**
3. Rajput.R.K, "*Engineering Thermodynamics*," 4th Ed., Laxmi Publications (P) Ltd., 2010.
4. Kumar.D.S, "*Engineering Thermodynamics"*, S.K. Kataria & Sons, second edition, 2012.
5. Yunus A Cengel and Michael A Boles, "*Thermodynamic"s*, 7th Ed., Tata McGraw-Hill, 2011.

**REFERENCES**


1. Holman.J.P, "*Thermodynamics",* 4th Ed., Tata McGraw Hill education.
2. Howard N Shapiroand Michael J Moran,"*Fundamentals of Engineering Thermodynamic"s*, 6th Ed., Wiley Publishers, 2010.
3. McConkey .T.D Eastop, "*Applied Thermodynamics for Engineering Technologists"*, 5th Ed., Pearson Publishers, 2002.


| MH1005 FUNDAMENTALS OF THERMODYNAMICS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | | x | | | x | | | |
| 2. | Mapping of instructional objectives with student outcome | 1 | 2 | | | 3 | | | 4 | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | Professional Subjects(P) | | | |
| | | - | | - | | - | | | x | | | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | Computing sciences | | | |
| | | -- | | -- | | x | | | -- | | | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| | MECHANICS OF SOLIDS AND FUNDAMENTALS OF FLUIDS | L | T | P | C |
|---|---|---|---|---|---|
| **MH1006** | Total Contact Hours – 45 | **3** | **0** | **0** | **3** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To understand the stresses and strains for different types of loads for various applications and to impart the knowledge about the properties of fluids.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Understand and estimate the stresses and deformation in solid bodies under the action of forces. |
| 2. | Understand and estimate the shear force and bending moment in different types of beams under the action of different types of loads. |
| 3. | Understand and estimate the displacement and stresses in deformable bodies under the action of forces and torque. |
| 4. | Understand the concepts and to solve problems in fluid statics, fluid kinematics and incompressible fluid dynamics. |

**UNIT I - STRESS, STRAIN AND DEFORMATION OF SOLIDS (10 hours)**

Concept of stress-strain- Hooke's law- Tension- Compression and shear- Stress-strain diagram, poisson's relation-Volumetric strain- Elastic constants and their relation- Stress in simple and composite bars subjected to axial loading and temperature- State of stress at a point-Principle plane- Principle stress-Normal and longitudinal stresses on a given plane-Mohr's circle of stresses.

**UNIT II - TRANSVERSE LOADING ON BEAMS, SHEAR FORCE AND BENDING MOMENT (8hours)**

Types of Beams- Transverse loading on beams shear force and Bending moment in beams – Cantilever- Simply supported, overhanging beam subjected to concentrated load and UDL – Maximum bending moment and point of contra flexure-Theory of simple bending and assumption – Derivation of formulae $M/I = F/Y = E/R$ and its applications to engineering – Leaf spring.

**UNIT III - TORSION, SPRINGS AND COLUMNS (10 hours)**

Theory of torsion and assumption – Torsion of circular shafts- solid & hollow – strain energy in torsion- Power transmission- Strength and stiffness of shafts- Types of springs- Stiffness stresses and deflection in helical spring- Columns – Buckling and stiffness due to axial loads – Euler, Rankin and Empirical formulae for columns with different conditions.

**UNIT IV - FLUID FLOW CONCEPTS AND DYNAMICS OF FLUIDS (8 hours)**

Flow characteristics- Concepts of system and control volume –Continuity equation – Application of control volume to continuity – Energy Equation – Euler's Equation – Bernoulli equation and Momentum Equation – simple problems.

**UNIT V - DIMENSIONAL ANALYSIS AND FLOW THROUGH CIRCULAR CONDUITS (9 hours)**

Dimension and units, Buckingham's Π theorem- Boundary layer concepts- Boundary layer thickness- Darcy-Weisbach equation- Friction factor and Moody diagram-Commercial pipes- Minor losses- Flow though pipes in series and in parallel.

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**TEXT BOOKS**


1. Ramamurtham.S and Narayanan.R, "*Strength of material"*, Dhanpat Rai Pvt. Ltd., New Delhi, 2001.
2. Bansal.R.K, "*Strength of Material"*, Lakshmi publications Pvt. Ltd., New Delhi, 1996.
3. Kumar.K.L, "*Engineering Fluid Mechanics"*, Eurasla publishers Home Ltd., New Delhi, 1995.
4. Bansal.R.K, "*Fluid Mechanics and Hydraulic Machines"* , Laxmi publications (P) Ltd., New Delhi, 1995.
5. Popov.E.P, "*Mechanics of Materials"*, Prentice Hall, 1982.
6. Timoshenko.S.P and Gere .M.J, "*Mechanics of Materials"*, C.B.S. publishers, 1986.


**REFERENCES**


1. Ferdinand P. Beer and Russell Johnston.E, "*Mechanics of Materials"*, SI metric Edition McGraw Hill, 1992
2. Srinath.L.N, "*Advanced Mechanics of Solids",*Tata McGraw Hill Ltd., New Delhi.
3. Ramamurthan.S, "*Fluid Mechanics and Hydraulics"*, Dhanpat Rai and Sons, Delhi, 1988.
4. Fox R.W and Mc. Donald .A.T, "*Introduction to fluid Mechanics"*, 5th Ed. John Wiley and Sons, 1999.


| MH1006 MECHANICS OF SOLIDS AND FUNDAMENTALS OF FLUIDS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mechatronics | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | | x | | x | | | | | | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | | 2 | | 3 | | | | | | 4 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | - | | - | | - | | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | | Computing sciences | |
| | | -- | | -- | | x | | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1007 | ELECTRICAL MACHINES LAB | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact hours – 30 | 0 | 0 | 2 | 1 |
| | Prerequisite | | | | |
| | EE1001 | | | | |

**PURPOSE**

To expose the students to the operation of Electrical Machines and transformers and give themexperimental skill.

**INSTRUCTIONAL OBJECTIVES**

1. To enable the students to understand the basic concepts involved in the Operation of Electrical machines.

**LIST OF EXPERIMENTS**

1. Load test on DC shunt motor
2. Load test on DC series motor
3. Speed control of DC shunt motor
4. Open circuit characteristics of DC generator
5. Load test on single phase transformer
6. Load test on 3-phase induction motor
7. Load test on 1-phase induction motor
8. Study of Three Phase Transformer connections
9. Study of Stepper motor
10. Study of Servo Motor
11. Speed control of PMBLDC

**REFERENCE**

1. Lab Manual

| MH1007 ELECTRICAL MACHINES LAB | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mechatronics | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | | | | | | | | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | 1 | | | | | | | | | 1 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | - | | - | | - | | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | | Computing sciences | |
| | | x | | -- | | -- | | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1008 | ELECTRONIC CIRCUITS LAB | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact hours - 30 | 0 | 0 | 2 | 1 |
| | Prerequisite | | | | |
| | EC1001 | | | | |

**PURPOSE**

To verify practically, the fundamental characteristics of Electron Devices

**INSTRUCTIONAL OBJECTIVES**

1. Design circuits using discrete components.
2. Analyze the performance characteristics of electronic devices and their applications.

**LIST OF EXPERIMENTS**

1. Characteristics of PN junction and Zener diode.
2. Input and Output characteristics of CB ,CE configuration.
3. Drain and Transfer characteristics of JFET.
4. Characteristics of SCR ,Triac, Diac & UJT.
5. Half wave Rectifier & Full Wave rectifier.
6. Series voltage regulator.
7. Design of RC coupled amplifier &FET Amplifier.
8. Hartley Oscillator & Colpitt's oscillator.
9. Astable, Monostable , Bistable Multivibrator.
10. Clippers & clampers.

**REFERENCE**

1. Lab Manual

| MH1008 ELECTRONIC CIRCUITS LAB | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mechatronics | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | | | | | | | | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | 2 | | | | | | | | | 1 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | - | | - | | - | | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | | Computing sciences | |
| | | -- | | x | | -- | | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1009 | MECHANICS OF SOLIDS AND FLUIDS LAB | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact hours - 30 | 0 | 0 | 2 | 1 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To expose the students about the concepts and operation of stress and strain measuring instrument and fluid flow meters

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Able to understand the procedures on torsional tests using mild steel specimens. |
| 2. | Determine the Young's modulus using deflection test on beams,tension and compression test on springs, bricks, and impact tests on steel. |
| 3. | To gain the knowledge of various flow meters and the concept of fluid mechanics. |

**LIST OF EXPERIMENTS**

1. Torsional test on mild steel
2. Deflection test on aluminium beam
3. Charpy and Izod impact test on steel specimen
4. Double shear test on steel specimen
5. Compression test on brick
6. Tension and compression test on helical springs
7. Determination of coefficient of discharge of orifice meter
8. Determination of coefficient of discharge of venturi meter
9. Major losses in pipe flow
10. Verification of Bernoulli's theorem
11. Minor losses - expansion and contraction losses in pipes

**REFERENCES**


1. Kazimi .S.M.A," *Solid Mechanics"*, First Revised Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 1994.
2. Laboratory Manual

| MH1009 MECHANICS OF SOLIDS AND FLUIDS LAB | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | x | | | x | | | | | x | |
| 2. | Mapping of instructional objectives with student outcome | | 2 | | | 3 | | | | | 1 | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | - | | - | | - | | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | | Computing sciences | |
| | | -- | | -- | | x | | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

**SEMESTER IV**

| | | | | | |
|---|---|---|---|---|---|
| **LE1008** | **GERMAN LANGUAGE PHASE II** | **L** | **T** | **P** | **C** |
| | Total Contact Hours- 30 | **2** | **0** | **0** | **2** |
| | Prerequisite | | | | |
| | LE1003-German Language Phase I | | | | |

**PURPOSE**

Familiarity in German language will be helpful for the students in preparing their resumes in German. Proficiency in the language will be an added asset for the students to have an edge in the present day highly competitive and global job market.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To enable the students to speak and understand about most of the activities in the day to day life. |
| 2. | The students will be able to narrate their experiences in Past Tense. |
| 3. | The students will be able to understand and communicate even with German Nationals. |
| 4. | By the end of Phase – II the students will have a reasonable level of conversational skills. |

**UNIT I** **(6 hours)**

Wichtige Sprachhandlungen: Zimmersuche, Möbel

**Grammatik**: Verben mit trennbaren Vorsilben im Präsens und Perfekt. Verben mit trennbaren Vorsilben und Modalverben imPräsens. Verben mit untrennbaren Vorsilben im Perfekt. Unregelmäßige und gemischte Verben im Perfekt.

**UNIT II** **(6 hours)**

Wichtige Sprachhandlungen: Kleidung ,Farben , Materialien.

**Grammatik :** formelle Imperativsätze mit “Sie” informelle Imperativsätze Vorschläge mit “wir” – “sollen/wollen wir”—Soll ich? Modalpartikeln “doch” “mal” “doch mal.

**UNIT III** **(6 hours)**

Wichtige Sprachhandlungen : Sehenswürdigkeite (Prater, Brandenburger Tör,Kolossium, Eifeltürm)

Grammatik : Ortsangaben mit Akk. und Dativ “alle”,”man” Indefinitepronomen “etwas”, “nichts”,

**UNIT IV** **(6 hours)**

Wichtige Sprachhandlungen : Wegbeschreibung/ Einladung interkulturelle Erfahrung.

Grammatik : Verwendung von Präsens für zukünftigen Zeitpunkt.

**UNIT V** **(6 hours)**

Wichtige Sprachhandlungen: Essen und Trinken im Restaurant , Partyvorbereitung und Feier

**Grammatik:**Nomen aus Adjektiven nach "etwas"und "nichts" Nomen aus dem Infinitiv von Verben, zusammegesetzte Nomen und ihre Artikel. Adjektive im Nom. und Akk. nach unbestimmten Artikel, Negativartikel und Possessivartikel.

**TEXT BOOK**

1. Studio d A1. Deutsch als Fremdsprache with CD.(Kursbuch und Sprachtraining).

**REFERENCES**

1. German for Dummies
2. Schulz Griesbach

| **LE1008 GERMAN LANGUAGE PHASE II** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of English and Foreign Languages** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | | | | | | x | | | | |
| 2. | Mapping of instructional objectives with student outcome | | | | | | | 1-4 | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | x | | -- | | -- | | | | | -- | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| **LE1009** | **FRENCH LANGUAGE PHASE II** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| | Total Contact Hours- 30 | **2** | **0** | **0** | **2** |
| | Prerequisite | | | | |
| | LE1004- French Language Phase I | | | | |
| **PURPOSE** | | | | | |
| To enable the students communicate effectively with any French speaker and have a competitive edge in the international market. | | | | | |

| INSTRUCTIONAL OBJECTIVES | |
|---|---|
| 1. | To enable students access information on the internet |
| 2. | To receive and send e mails |
| 3. | To assist students in gaining a certain level of proficiency to enable them to give the level 1 exam conducted by Alliance Française de Madras. |
| 4. | To enhance their lexical and technical competence. |

**UNIT I** **(6 hours)**

1. Grammar and Vocabulary: The second group verbs: Finir, rougir, grossir, grandir . "Les preposition de temps": à, en, le, de 7h à 8h, jusqu' à, vers.
2. Listening and Speaking – the semi- vowels: Voilà, pollutant. Writing –the days of the week. Months, technical subjects, time, "les spécialités scientifiques et l' année universitaire, paragraph writing about time table.
3. Reading -- Reading of the text and comprehension – answering questions

**UNIT II** **(6 hours)**

Grammar and Vocabulary – The adjectives, the nationality, feminine & masculine noun forms "les métiers scientifiques".
Listening and Speaking – Vowels: soirée, année, près de, très.
Writing – Countries name, nationality, "les métiers scientifiques", numbers from: 69 to infitive and some measures of unit.
Reading Comprehension – reading a text.

**UNIT III** **(6 hours)**

Grammar and Vocabulary – near future, The demonstrative adjectives, Express the aim by using the verb, Listening and Speaking –"La liaison interdite – en haut". Writing – some scientific terms, French expressions to accept an invitation. Sentence framing. Reading Comprehension – reading a text.

**UNIT IV** **(6 hours)**

Grammar and Vocabulary –the verbs: manger, boire , the partitive articles
Listening and Speaking – "le 'e' caduc Writing- the food, the ingredients, fruits, vegetables, expression of quantity, paragraph writing about food habits. Reading – reading a text.

**UNIT V** **(6 hours)**

Grammar and Vocabulary – " les prepositions de lieu": au à la, à l', chez, the reflexives verbs, verbs to nouns. Listening and Speaking – "le 'e' sans accents ne se prononce pas. C'est un "e" caduc. Ex: quatre, octobre. " les sons (s) et (z)- salut, besoin. Writing –paragraph writing about one's everyday life, French culture. Reading Comprehension -- reading a text or a song.

**TEXT BOOK**

1. Tech French

**REFERENCES**

1. French for Dummies
2. French made easy: Goyal publishers
3. Panorama

| LE1009 FRENCH LANGUAGE PHASE II | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of English and Foreign Languages** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | | | | | | x | | | | |
| 2. | Mapping of instructional objectives with student outcome | | | | | | | 1-4 | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | x | | -- | | -- | | | | | -- | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| LE 1010 | JAPANESE LANGUAGE PHASE II | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours- 30 | 2 | 0 | 0 | 2 |
| | Prerequisite | | | | |
| | LE1005- Japanese Language Phase I | | | | |

**PURPOSE**

To enable students to learn a little advanced grammar in order to improve their conversational ability in Japanese.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To help students learn Katakana script (used to write foreign words) |
| 2. | To improve their conversational skill. |
| 3. | To enable students to know about Japan and Japanese culture. |
| 4. | To improve their employability by companies who are associated with Japan. |

**UNIT I** **(8 hours)**

Introduction to Verbs; Ikimasu, okimasu, nemasu, tabemasu etc.
Grammar – usage of particles de, o, to, ga(but) and exercises
Common daily expressions and profession.
Katakana script and related vocabulary.
Religious beliefs, Japanese housing and living style.
Conversation – audio

**UNIT II** **(8 hours)**

Grammar :Verbs –Past tense, negative - ~mashita, ~masen deshita..
i-ending and na-ending adjectives - introduction
Food and transport (vocabulary)
Japanese food, transport and Japanese tea ceremony.
Kanji Seven elements of nature (Days of the week)
Conversation – audio

**UNIT III** **(6 hours)**

Grammar - ~masen ka, mashou
Adjectives (present/past – affirmative and negative)
Conversation – audio

**UNIT IV** **(4 hours)**

Grammar – ~te form
Kanji – 4 directions
Parts of the body
Japanese political system and economy
Conversation – audio

**UNIT V** **(4 hours)**

Stationery, fruits and vegetables
Counters – general, people, floor and pairs

**TEXT BOOK**

1. First lessons in Japanese, ALC Japan

**REFERENCES**

1. Japanese for dummies. Wiley publishing co. Inc., USA.
2. Kana workbook, Japan foundation

| LE1010 JAPANESE LANGUAGE PHASE II | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of English and Foreign Languages | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | | | | | | x | | | | |
| 2. | Mapping of instructional objectives with student outcome | | | | | | | 1 - 4 | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | x | | -- | | -- | | | | | -- | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| | KOREAN LANGUAGE PHASE II | L | T | P | C |
|---|---|---|---|---|---|
| LE1011 | Total Contact Hours-30 | 2 | 0 | 0 | 2 |
| | Prerequisite | | | | |
| | LE1006-Korean Language Phase I | | | | |

**PURPOSE**

To enable students achieve a basic exposure on Korea, Korean language and culture. To acquire basic conversational skill in the language.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To help students learn the scripts. |
| 2. | To make the students acquire basic conversational skill. |
| 3. | To enable students to know about Korean culture. |
| 4. | To create an advantageous situation for the students to have better opportunity for employability by companies who have association with Korea. |

**UNIT I** (**9 hours)**

Lesson 1 <Review of Vowels and Consonants>, Lesson2 < Various Usages of "To be">, Lesson3 < Informal form of "to be"><Basic Conversation, Vocabularies and Listening>

**UNIT II** (**9 hours)**

Lesson 4< Informal interrogative form of "to be">, Lesson 5 < To be, to have, to stay>, Lesson 5 < Advanced Interrogative practice>, Lesson 6 < Types of Negation>, <Basic Conversation, Vocabularies and Listening>

**UNIT III** (**9 hours)**

Lesson 7 < Honorific forms of noun and verb2>, Lesson8 < Formal Declarative2>, Lesson 9 < Korean Business Etiquette>, <Basic Conversation, Vocabularies and Listening>

**UNIT IV** (**3 hours)**

Lesson 10 <Field Korean as an Engineer1>, <Field Korean as an Engineer2><Basic Conversation, Vocabularies and Listening>

**TEXT BOOK**

1. Korean through English 2(Basic Korean Grammar and Conversation)

**REFERENCES**

1. Bharati Korean (Intermediate Korean Grammar)
2. Hand-outs
3. Various visual media such Movie CD, Audio CD, and music
4. Collection of vocabularies for engineering field.

| LE1011KOREAN LANGUAGE PHASE II | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of English and Foreign Languages** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | | | | | | x | | | | |
| 2. | Mapping of instructional objectives with student outcome | | | | | | | 1-4 | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | x | | -- | | -- | | | | -- | | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| **LE1012** | **CHINESE LANGUAGE PHASE II** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| | Total Contact Hours-30 | **2** | **0** | **0** | **2** |
| | Prerequisite | | | | |
| | LE1007-Chinese Language Phase I | | | | |

**PURPOSE**

To enable students achieve a basic exposure on China, Chinese language and culture. To acquire basic conversational skill in the language.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To help students learn the Chinese scripts. |
| 2. | To make the students acquire basic conversational skill. |
| 3. | To enable students to know about China and Chinese culture. |
| 4. | To create an advantageous situation for the students to have better opportunity for employability by companies who have association with china. |

**UNIT I**

**A)** Greetings
Questions and answers about names
Introducing oneself
Receiving a guest
Making corrections

**New**
**words:**你ˆyouˇ好ˆgood 'well ˇ工作ˆwork 'job ˇ人员ˆpersonnel 'st aff memberˇ请问ˆMay I ask…ˇ贵ˆexpensive 'valuable ˇ姓ˆone's family name is ˇ

**B)** Questions and answers about the number of people in a family
Expressing affirmation/negation
Questions and answers about the identity of a person same or not.
**New words:** 家ˆfamily 'home ˇ有ˆhave ˇ几ˆ several ˇ
爸爸 (fatherˇ妈妈 (mother) 哥哥 (elderly brotherˇ

**UNIT II**
**A.** About places
**B.** About numbers
**C.** if one knows a certain person
**D.** Expressing apology
**E.** Expressing affirmation/negation
**F.** Expressing thanks.
**New Words:**
客人ˆguest,visitorˇ这儿ˆhereˇ中文ˆChineseˇ对ˆright, correctˇ学生ˆstudentˇ多ˆmany, a lotˇ
**Grammar:** Sentences with a verbal predicate

**UNIT III**
Introducing people to each other
**A.** Exchanging amenities
**B.** Making/Negating conjectures
**C.** Questions and answers about nationality
**Grammar**: Sentences with an adjectival predicate

**UNIT IV**
A) About places to go
Indicating where to go and what to do
Referring to hearsay.
Saying good-bye
**B)** Making a request
Questions and answers about postcodes and telephone numbers
Reading dates postcodes and telephone numbers
Counting Renmibi
**Grammar:** Sentences with a subject-verb construction as its predicate

Sentences with a nominal predicate

**UNIT V**

A. Asking and answering if someone is free at a particular time
B. Making proposals
C. Questions about answers about time
D. Making an appointment
E. Telling the time
F. Making estimations

**TEXT BOOK**

1. A New Chinese Course 1- Beijing Language and Culture University Press

**REFERENCES**

1. New Practical Chinese Reader Textbook (1) – Beijing Language and Culture University Press
2. 40 Lessons For Basic Chinese Course I – Shanghai Translation Press
3. My Chinese Classroom - East China Normal University Press

| LE1012CHINESE LANGUAGE PHASE II | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of English and Foreign Languages** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | | | | | | x | | | | |
| 2. | Mapping of instructional objectives with student outcome | | | | | | | 1 - 4 | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | x | | -- | | -- | | | | -- | | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| | APTITUDE-II | L | T | P | C |
|---|---|---|---|---|---|
| **PD1004** | Total Contact Hours - 30 | **1** | **0** | **1** | **1** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To enhance holistic development of students and improve their employability skills.

| INSTRUCTIONAL OBJECTIVES | |
|---|---|
| 1. | To improve verbal aptitude, vocabulary enhancement and reasoning ability of the student. |

**UNIT I** **(6 hours)**

Critical Reasoning – Essay Writing

**UNIT II** **(6 hours)**

Synonyms – Antonyms - Odd Word - Idioms & Phrases

**UNIT III** **(6 hours)**

Word Analogy - Sentence Completion

**UNIT IV** **(6 hours)**

Spotting Errors - Error Correction - Sentence Correction

**UNIT V** **(6 hours)**

Sentence Anagram - Paragraph Anagram - Reading Comprehension

**ASSESSMENT**

1. Objective type – Paper based /Online – Time based test

**TEXT BOOK**

1. Personality Development -Verbal Work Book, Career Development Centre, SRM Publications

**REFERENCE**

1. Green Sharon Weiner .M.A & Wolf Ira K.*Barron's New GRE*, *19th Edition*. Barron's Educational Series, Inc, 2011.
2. Lewis Norman, *Word Power Made Easy*, Published by W.R.Goyal Pub, 2011.
3. Thorpe Edgar and Thorpe Showich, *Objective English.* Pearson Education 2012.
4. Murphy Raymond, *Intermediate English Grammar*, (Second Edition), Cambridge University Press, 2012.

| PD1004 APTITUDE-II | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Career Development Centre | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | | | | | | X | | | | |
| 2. | Mapping of instructional objectives with student outcome | | | | | | | 1 | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | x | | -- | | -- | | | | -- | | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| | NUMERICAL METHODS | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 60 | 4 | 0 | 0 | 4 |
| MA1004 | (Common to Auto, Aero, Mech, Mechatronics, EEE, Civil , Chemical, ICE & EIE ) | | | | |
| | Nil | | | | |

**PURPOSE**

To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To familiarise with numerical solution of equations |
| 2. | To get exposed to finite differences and interpolation |
| 3. | To be thorough with the numerical Differentiation and integration |
| 4. | To find numerical solutions of ordinary differential equations |
| 5. | To find numerical solutions of partial differential equations |

**UNIT I - CURVE FITTING AND NUMERICAL SOLUTION OF EQUATIONS**

**(12 hours)**

Method of Least Squares – Fitting a straight line – Fitting a parabola – Fitting an exponential curve – Fitting a curve of the form $y = ax^b$ – Calculation of the sum of the squares of the residuals.- Newton-Raphson method – Gauss Elimination method – Gauss Jacobi method – Gauss Seidel method.

**UNIT II - FINITE DIFFERENCES AND INTERPOLATION (12 hours)**

First and Higher order differences – Forward differences and backward differences and Central Differences – Differences of a polynomial – Properties of operators – Factorial polynomials – Shifting operator E – Relations between the operators. Interpolation – Newton-Gregory Forward and Backward Interpolation formulae - Divided differences – Newton's Divided difference formula – Lagrange's Interpolation formula – Inverse interpolation

**UNIT III - NUMERICAL DIFFERENTIATION AND INTEGRATION (12 hours)**

Newton's forward and backward differences formulae to compute first and higher order derivatives – The Trapezoidal rule – Simpson's one third rule and three eighth rule.

**UNIT IV - NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS (12 hours)**

Solution by Taylor's series – Euler's method – Improved and modified Euler method – Runge-Kutta methods of fourth order (No proof) – Milne's Method - Adam's Bashforth method.

**UNIT V - NUMERICAL SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS (12 hours)**

Classification of Partial differential equations of the second order - Difference quotients – Laplace's equation and its solution by Liebmann's process – Solution of Poisson's equation – Solutions of Parabolic and Hyperbolic equations.

**TEXT BOOKS**


1. Grewal.B.S, "*Numerical Methods in engineering and science"*, Khanna Publishers, 42nd edition, 2012.
2. Sastry.S.S, "*Introductory Methods of Numerical Analysis",* 4th edition, 2005.


**REFERENCES**


1. Dr. M.K. Venkataraman*, "Numerical Methods in Science and Engineering"*, National Publishing Co., 2005.
2. Balagurusamy.E, "*Computer Oriented Statistical and Numerical Methods"* – Tata McGraw Hill., 2000.
3. Jain.M.K, SRK Iyengar and Jain.R.L, "*Numerical Methods for Scientific and Engineering Computation"*, Wiley Eastern Ltd., 4th edition, 2003.
4. Jain.M.K, "*Numerical Solution of Differential Equations"*, 2nd edition (Reprint), 2002.
5. Kandasamy.P, etal., "*Numerical Methods"*, S.Chand & Co., New Delhi, 2003.

| MA1004 NUMERICAL METHODS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mathematics | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | | | | x | | | | | | |
| 2. | Mapping of instructional objectives with student outcome | 1-5 | | | | 1-5 | | | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | -- | | x | | -- | | | | -- | | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MA1010 | FLUID POWER SYSTEMS AND CONTROL | L | T | P | C |
|---|---|---|---|---|---|
| | Total contact hours - 45 | 3 | 0 | 0 | 3 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To expose the learner to the fundamentals of hydraulic and pneumatic power control and their circuits with industrial applications.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Understand the fundamentals of fluid power Principles, characteristics of the fluid power system components. |
| 2. | Analyze the fluid power system components for various application |
| 3. | Design and develop fluid power circuits to various mechatronic systems. |
| 4. | Apply the knowledge of fluid power in to various mechatronic applications. |
| 5. | Understand the fundamentals of fluid power Principles, characteristics of the fluid power system components. |

**UNIT I - HYDRAULIC COMPONENTS (11 hours)**

Introduction to fluid power system-Pascal's Law- Hydraulic fluids- Hydraulic pumps- Gear, Vane and Piston pumps- Pump Performance- Characteristics and Selection-actuators- valves-pressure control- flow control and direction control valves- Hydraulic accessories- Hydraulic Accumulator.

**UNIT II - PNEUMATIC COMPONENTS (9 hours)**

Introduction to Pneumatics- Compressors- types-. Air treatment-FRL unit- Air dryer- Control valves- Logic valves-Time delay valve and quick exhaust valve-Pneumatic Sensors – types- characteristics and applications.

**UNIT III - FLUID POWER CIRCUITS (9 hours)**

Circuit Design Methodology- Sequencing circuits- Overlapping signals-Cascade method- KV Map method-Industrial Hydraulic circuits- Double pump circuits-Speed control Circuits- Regenerative circuits- Safety circuits- Synchronizing circuits- Accumulator circuits.

**UNIT IV - ELECTRO- PNEUMATICS AND HYDRAULICS (8 hours)**

Relay, Switches- Solenoid- Solenoid operated valves- Timer- Counter- Servo and proportional control- Microcontroller and PLC based control- Design of electro-pneumatic and hydraulic circuits.

**UNIT V - APPLICATION, MAINTENANCE AND TROUBLE SHOOTING (8 hours)**

Development of hydraulic / pneumatic circuits applied to machine tools-Presses-Material handling systems- Automotive systems-Packaging industries-Manufacturing automation- Maintenance and trouble shooting of Fluid Power circuits- Safety aspects involved.

**TEXT BOOKS**


1. Anthony "*Esposito, Fluid Power with applications"*, Prentice Hall international – 1997.
2. Majumdar .S.R, "*Oil Hydraulics"*, Tata McGraw Hill, 2002.
3. Majumdar S.R, "*Pneumatic systems - principles and maintenance"*, Tata McGraw Hill 1995.
4. Werner Deppert / "*Kurt Stoll, Pneumatic Application*", Vogel verlag – 1986.


**REFERENCES**


1. John Pippenger, Tyler "*Hicks, Industrial Hydraulics"*, McGraw Hill International Edition, 1980
2. Andrew *Parr, "Hydraulics and pneumatics*", Jaico Publishing House, 2003
3. FESTO, "*Fundamentals of Pneumatics"*, Vol I, II, III.

| MH1010 FLUID POWER SYSTEMS AND CONTROL | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | x | | | | | x | | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | 2 | | 3 | | | | | 4 | | 4 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | -- | | x | | -- | | | | -- | | |
| 4. | Broad Area | Structural Engineering | | Geotechnical Engineering | | Water Resources Engineering | | | | Geomatics Engineering | | |
| | | -- | | -- | | x | | | | -- | | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| | INSTRUMENTATION ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| **MH1011** | Total Contact Hours - 45 | **3** | **0** | **0** | **3** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To provide knowledge in electronic and mechanical measurements necessary for any engineering research and development programme.

**INSTRUCTIONAL OBJECTIVES**

1. Understand the basic concepts of units and standards.
2. Significance of measurement of instruments
3. Understand the concepts of electrical and electronic instruments

**UNIT I - MEASUREMENT SYSTEM AND METEROLOGY (10 hours)**

Basic concept of measurement: sensitivity- stability- range, accuracy and precision- Errors- types of errors-standards of measurement. Limit gauges-slip gauge- Comparators: Mechanical- Electronic-optical and Pneumatic- Angular measurement: sine bar – Autocollimator, Measurement of straightness - Flatness - squareness – Roundness and Rotation.

**UNIT II - MECHANICAL MEASUREMENTS (10 hours)**

Measurement of surface finish: Terminology – Roughness – Waviness – Analysis of surface finish – stylus probe instrument –Talysurf. Screw thread metrology: errors in thread – Pitch error – Drunkenness – Measurement of various elements thread – Two and three wire method - Floating carriage micrometer- Measurement of gears — Measurement of various elements of gear – Tooth thickness – Constant chord and base tangent method – Parkinson Gear Tester.

**UNIT III - ELECTRICAL MEASUREMENTS (9 hours)**

Functional elements of an instrument – Static and dynamic characteristics – Errors in
measurement. Measurement of R, L, C – Wheatstone, Kelvin's double, Maxwell, Anderson
and Schering bridges. Measurement of high resistance – Megger – loss of charge method.

**UNIT IV - ELECTRICAL INSTRUMENTS (8.hours)**

Principle of operation and construction of PMMC, MI, Dynamometer, Induction, Thermal
and Rectifier type instruments – Measurement of voltage and current – Use of ammeter shunts
and voltmeter multiplier – Use of CT and PT for extending instrument ranges.

**UNIT V - ELECTRONIC INSTRUMENTS (8 hours)**

Electronic voltmeters – Digital voltmeter – Multimeter – Signal generator – Function.
Generator – Cathode ray Oscilloscope –Block diagram – CRT.

**TEXT BOOKS**


1. Jain .R.K, "*Engineering Metrology*", Khanna Publishers, 2005.
2. Sawhney AK, "*A course in Electrical and electronic Measurement and Instrumentation"*Dhanpat Rai & sons, New Delhi, 2001.
3. Thomas G Beckwith, Lienhard, Roy D. Marangoni, "*Mechanical measurements"*, Addison Wesley, 2000.
4. Gupta .S.C, "*Engineering Metrology*", Dhanpat rai Publications, 2005.
5. Doeblin .E.O, "*Measurement System Application and Design"*, Mc Graw Hill, 1973.


**REFERENCES**


1. Alan S. Morris, "*The Essence of Measurement*", Prentice Hall of India, 1997.
2. Golding EW and Widdies FW, "*Measurements & Measuring instruments"*, Sir Issar Pitman & sons (P) Ltd. 1998.
3. Albert D Halfride and William D Cooper, "*Modern Electronic instrumentation and measurement techniques"*, Prentice Hall of India Pvt Ltd. 1998.

| MH1011 INSTRUMENTATION ENGINEERING | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | x | x | x | | | | | | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | 2 | 2 | 3 | 2 | | | | | | 2 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | | Professional Subjects(P) |
| | | -- | | x | | -- | | | | | | -- |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | | | Computing sciences |
| | | -- | | x | | -- | | | | | | -- |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| | LINEAR INTEGRATED CIRCUITS | L | T | P | C |
|---|---|---|---|---|---|
| **MH1012** | Total Contact Hours - 45 | **3** | **0** | **0** | **3** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To introduce the concepts for realising functional building blocks in ICs, application of IC and fundamentals of Digital Circuits, combinational and sequential circuit.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Understand the characteristics of Opamp ICs. |
| 2. | Designing circuits for various applications. |
| 3. | Analyze the circuits for Designing Mechatronics systems. |

**UNIT I - CHARACTERISTICS OF OPAMP & ITS FUNDAMENTALS (9 hours)**

Ideal OP-AMP characteristics, DC characteristics, AC characteristics, offset voltage and current: voltage series feedback and shunt feedback amplifiers, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp - summer, differentiator and integrator, V/I &I/V converter.

**UNIT II - APPLICATIONS OF OPAMP (10hours)**

Sign Changer, Scale Changer, Phase Shift Circuits, Logarithmic amplifier, Precision rectifier, Instrumentation amplifier, Comparators, multivibrators, Schmitt trigger, waveform generators, clippers, clampers, peak detector, S/H circuit, First and Second order active filters, Low-pass, high-pass and band-pass Butterworth filters

**UNIT III - ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS**

**(9 hours)**

Analog and Digital Data Conversions, D/A converter – specifications – weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode R - 2R Ladder types - switches for D/A converters, high speed sample-and-hold circuits, A/D Converters – specifications – Flash type – Successive Approximation type – Single Slope type – Dual Slope type – A/D Converter using Voltage-to-Time Conversion – Over-sampling A/D Converters.

**UNIT IV - SPECIAL ICs & VOLTAGE REGULATORS (8 hours)**

555 Timer circuit - Functional block, characteristics & applications; 566-voltage controlled oscillator circuit, OP-Amp Voltage regulator-Series, Shunt and switching regulator.

**UNIT V - ANALOG MULTIPLIER AND PLL (9 hours)**

Analog Multiplier using Emitter Coupled Transistor Pair – Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing.

**TEXT BOOKS**


1. Ramakant AGayakward, "*Op-amps and Linear Integrated Circuits"*, IV edition, Pearson Education/ PHI , 2003.
2. Roy Choudhary.D, Sheil BJani, "*Linear Integrated Circuits"*, II edition, New Age, 2003.
3. Morris Mano.M, "*Digital Logic and Computer Design"*, Prentice Hall of India, 2002.
4. Robert FCoughlin, Fredrick F.Driscoll, "*Op-amp and Linear ICs"*, Pearson Education, 4th edition, / PHI 2002.


**REFERENCES**


1. David A.Bell, "*Op-amp & Linear ICs"*, Prentice Hall of India, 2nd edition, 1997.
2. Charles H.Roth, "*Fundamentals Logic Design"*, Jaico Publishing, IV edition, 2002.
3. Floyd, "*Digital Fundamentals"*, 8th edition, Pearson Education, 2003.

| MH1012 LINEAR INTEGRATED CIRCUITS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | | x | | | | | | |
| 2. | Mapping of instructional objectives with student outcome | 1 | 2 | | | 3 | | | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | -- | | -- | | -- | | | | x | | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | Mechatronics Engineering | | |
| | | -- | | x | | -- | | | | -- | | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1013 | THEORY OF MACHINES | L | T | P | C |
|---|---|---|---|---|---|
| | Total contact hours - 60 | 3 | 2 | 0 | 4 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To expose the students on fundamentals of various laws governing rigid bodies and its motions. To study vibration characteristics and balancing of mechanical machines.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To draw the profile of cams and its analysis |
| 2. | To understand concepts of gear and gear train calculations |
| 3. | To balance rotating and reciprocating masses. |

**UNIT I - BASIC ELEMENTS OF A MACHINE AND MECHANISMS (12 hours)**

Introduction-links-pairs-chain-Mechanism-Machine and structure-Inversion of mechanism- -degree of freedom-Four bar chains - Grashoff's law - Kutzback criterion, Inversions of a four bar chain, Analysis of simple mechanisms (Single slider crank mechanism and four bar mechanism) - Graphical Methods for displacement, velocity and acceleration- Turning moment diagrams - flywheels.

**UNIT II - CAM (6 hours)**

Classification of Cam and Follower - displacement diagrams -cam profile construction for Uniform velocity, Uniform acceleration, SHM and Cycloidal motion of follower.

**UNIT III - GEARS AND GEAR TRAINS (9 hours)**

Fundamentals of toothed gearing - Spur gear terminology and definition - Involute as a gear tooth profile - Interference and under cutting - Minimum number of teeth to avoid interference - contact ratio - Internal gears. Gear trains-Types-velocity ratio and torque calculations in epicyclic gear.

**UNIT IV - BALANCING OF ROTATING AND RECIPROCATING MASSES (9 hours)**

Static and dynamic balancing -Balancing of rotating and reciprocating masses - Balancing of single cylinder Engine - Balancing of multi cylinder inline Engine - Partial balancing in locomotive Engines - Hammer blow - Swaying couple - Tractive force-Balancing machines.

**UNIT V - VIBRATIONS (9 hours)**

Introduction - Types of Vibration – longitudinal, transverse- Dunkerley's method- - Critical speed of shafts - Frequency of undamped system - Viscous damping - Damped free vibration – Torsional vibrations, two rotor, three rotor and geared systems.

**TEXT BOOKS**


1. Ratan.S.S, "*Theory of Machines"*, Tata McGraw Hill Publishing Company Ltd., 1993.
2. Shigley .J.E, "*Theory of Machines and Mechanisms"*, McGraw Hill 1998.
3. Singiresu S.Rao, "*Mechanical Vibrations",* Nem Chand and Bros, 1998.
4. Thomas Beven, "*Theory of Machines*", CBS Publishers and Distributors, 3rd edition, 1988.
5. Ghosh .A and Mallick.A.K, "*Theory of Mechanisms and machines"* - Affiliated East - West Pvt. Ltd. New Delhi, 1998.


**REFERENCES**


1. Sing.V.P, "*Mechanical Vibrations"* -Dhanpat Rai and Co., 1998.
2. Rao.J.S and Dukkipati.R.V, "*Mechanism and Machine Theory*", Wiley Eastern Ltd., New Delhi, 1989.
3. John Hannah and Stephens.R.C, "*Mechnics of Machines, Viva Low Prices* student Edition, 1999.

| MH1013 THEORY OF MACHINES | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mechatronics | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | | | | | | | | x | | x |
| 2. | Mapping of instructional objectives with student outcome | 2 | | | | | | | | 1 | | 3 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | -- | | x | | -- | | | | -- | | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | Mechatronics Engineering | | |
| | | -- | | -- | | x | | | | -- | | |
| 5. | Assessment | In case the assessment method is different from the general method stipulated in the regulations, then the same shall be specified here. | | | | | | | | | | |
| 6. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1014 | FLUID POWER SYSTEMS AND CONTROL LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact hours - 30 | 0 | 0 | 2 | 1 |
| | Prerequisite | | | | |
| | NIL | | | | |

**PURPOSE**

To expose the students to the operation of Fluid Power control system and give them experimental skill.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To provide students with an understanding of the physical laws and principles that governs the behavior of fluid power systems. |
| 2. | To provide students with an understanding of the fluids and components utilized in modern industrial fluid power systems. |
| 3. | To develop within each student a measurable degree of competence in the design, construction and operation of fluid power circuits. |
| 4. | To provide students with knowledge of the applications of fluid power in process, construction and manufacturing industries. |

**LIST OF EXPERIMENTS**

1. Speed control circuits
2. Synchronous and asynchronous circuits
3. Continuous reciprocation of single acting and double acting cylinder
4. Sequencing circuits
5. Cascading circuits
6. Logic circuits - AND, OR, NOR
7. Circuits using servo valves
8. Circuits using sensors
9. Developing circuits using Electro pneumatics
10. Circuit using PLC
11. Circuit simulation using software

**REFERENCES**

1. Lab manual

| **MH1014FLUID POWER SYSTEMS AND CONTROL LAB** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | | x | | | | | | | x | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | | 3 | | | | | | | 4 | 2 |
| 3. | Category | General (G) | | Basic Sciences(B) | | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | |
| | | -- | | -- | | | -- | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | | Mechanical Engineering | | | | Computing sciences | |
| | | -- | | -- | | | x | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| **MH1015** | **INSTRUMENTATION ENGINEERING LABORATORY** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| | Total Contact hours - 30 | **0** | **0** | **2** | **1** |
| | Prerequisite | | | | |
| | MH 1011 | | | | |

**PURPOSE**

To provide the students hands on experience on measuring both mechanical and electronic instruments.

| INSTRUCTIONAL OBJECTIVES | |
|---|---|
| 1. | Use different measuring devices |

**LIST OF EXPERIMENTS**

1. Checking dimensions of part using slip gauge
2. Measurement of angle using sine bar
3. Measurement of straightness and flatness using autocollimator
4. Measurement of screw thread parameters
5. Measurement of Gear tooth dimensions
6. Measurement of resistance using Wheatstone bridge.
7. Measurement of resistance using Kelvin's double bridge.
8. Measurement of inductance using Maxwell bridge.
9. Measurement of inductance using Anderson bridge.
10. Measurement of capacitance using Schering bridge.

**REFERENCE**

1. Lab manual

| MH1015 INSTRUMENTATION ENGINEERING LABORATORY | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mechatronics | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | | | | | | | | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | 1 | | | | | | | | | 1 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | | Professional Subjects(P) |
| | | -- | | -- | | -- | | | | | | x |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | | | Computing sciences |
| | | -- | | x | | -- | | | | | | -- |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1016 | LINEAR INTEGRATED CIRCUITS LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact hours - 30 | 0 | 0 | 2 | 1 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To study various linear integrated circuits used in simple system configuration.

**INSTRUCTIONAL OBJECTIVES**

1. Analyze the circuits to various applications.
2. Apply the circuits in to various mechatronics systems.

**LIST OF EXPERIMENTS**

1. Op-amp characteristics - Slew rate verifications, CMRR, Input-Offset voltage
2. Application of Op-amp-I-Inverting, Non-Inverting, Adder & subtractor
3. Application of Op-amp II - Differential Amplifier, Comparator, Integrator & Differentiator
4. Instrumentation Amplifier
5. Timer IC application - NE555 timer in Astable, Monostable operation
6. Active low pass and band pass filter
7. Astable multivibrator & monostable multivibrator using IC741
8. Astable and monostable multivibrator using 555 timer
9. Frequency multiplier using PLL
10. Study of SMPS

**REFERENCE**

1. Lab manual

| MH1016 LINEAR INTEGRATED AND CIRCUITS LAB | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mechatronics | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | | x | | | | | | |
| 2. | Mapping of instructional objectives with student outcome | 1,2 | 1 | | | 2 | | | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | |
| | | -- | | -- | | | -- | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | | Mechanical Engineering | | | | Computing sciences | |
| | | -- | | x | | | -- | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

**SEMESTER V**

| | | | | | |
|---|---|---|---|---|---|
| **PD1005** | **APTITUDE-III** | **L** | **T** | **P** | **C** |
| | Total Contact Hours - 30 | **1** | **0** | **1** | **1** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To enhance holistic development of students and improve their employability skills.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Understand the importance of effective communication in the workplace. |
| 2. | Enhance presentation skills – Technical or general in nature. |
| 3. | Improve employability scope through Mock GD, Interview. |

**UNIT I** **(6 hours)**

Video Profile

**UNIT II** **(6 hours)**

Tech Talk / Area of Interest / Extempore / Company Profile

**UNIT III** **(6 hours)**

Curriculum Vitae

**UNITIV** **(6 hours)**

Mock Interview

**UNIT V** **(6 hours)**

Group Discussion / Case Study

**ASSESSMENT**

1. Objective type – Paper based / Online – Time based test
2. 50% marks based on test, 50 % based on Continuous Communication assessment

**REFERENCES**


1. Bovee Courtland and Throill John, *Business Communication Essentials: A skills-Based Approach to Vital Business English*. Pearson Education Inc., 2011
2. Dhanavel.S.P, *English & Communication Skills for Students of Science and Engineering*. Orient Black Swan, 2009
3. Rizvi M. Ashraf *Effective Technical Communication*, Tata McGraw-Hill Publishing Company Limited, 2006.


| PD1005 APTITUDE-III | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Career Development Centre** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | | | | | | X | | X | X | |
| 2. | Mapping of instructional objectives with student outcome | | | | | | | 1,2,3 | | 1,2 | | 2,3 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | x | | -- | | -- | | | | -- | | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MA1005 | PROBABILITY AND STATISTICS | L | T | P | C |
|---|---|---|---|---|---|
| | Total contact hours 60 hours | 4 | 0 | 0 | 4 |
| | (Common to Auto, Aero, Mech, Mectr, Civil, Chemical, ICE & EIE) | | | | |

**PURPOSE**

To develop an understanding of the methods of probability and statistics which are used to model engineering problems.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To apply the basic rules and theorems of probability theory such as Baye's Theorem, to determine probabilities that help to solve engineering problems and to determine the expectation and variance of a random variable from its distribution. |
| 2. | To appropriately choose, define and/or derive probability distributions such as the Binomial, Poisson and Normal etc to model and solve engineering problems. |
| 3. | To learn how to formulate and test hypotheses about means, variances and proportions and to draw conclusions based on the results of statistical tests. |
| 4. | To understand how regression analysis can be used to develop an equation that estimates how two variables are related and how the analysis of variance procedure can be used to determine if means of more than two populations are equal. |
| 5. | To understand the fundamentals of quality control and the methods used to control systems and processes. |

**UNIT I - PROBABILITY AND RANDOM VARIABLES (12 hours)**

Sample space, Random experiments and random variables, Concept of probability, Conditional probability, Addition and multiplication laws, Baye's theorem - One dimensional Random Variables- Expectation, Variance, Covariance, and Moments.

**UNIT II - THEORETICAL DISTRIBUTIONS (12 hours)**

Discrete: Binomial, Poisson, Geometric, Negative Binomial; Continuous: Exponential and Normal Distributions, their properties and applications to industrial problems.

**UNIT III - TESTING OF HYPOTHESIS (12 hours)**

Introduction – Large sample tests based on normal distribution - Test for single mean, difference between means, proportion, difference between proportions - Small sample tests based on t, F distributions- Test for single mean, difference between means, standard deviation, difference between standard deviation - Chisquare test for goodness of fit - Independence of attributes.

**UNIT IV - CORRELATION, REGRESSION AND ANALYSIS OF VARIANCE (12 hours)**

Pearson's Correlation coefficient- Spearman's Rank correlation coefficient. Regression-Concepts – Regression lines – Multiple correlation and regression. Analysis of Variance- One-way classification and two way classification.

**UNIT V - STATISTICAL QUALITY CONTROL (12 hours)**

Introduction – Process control – control charts for variables - X and R, X and S charts control charts for attributes: p chart, np chart, c chart and their applications in process control.

**TEXT BOOKS**


1. Gupta.S.C and Kapoor.V.K, Fundamentals of Mathematical Statistics, 11th extensively revised edition, Sultan Chand & Sons, 2007.
2. Veerarajan .T, *"Probability, Statistics and Random Processes"*, Tata McGraw Hill,3rd edition, 2008.

**REFERENCES**


1. Ross.S, *"A first Course in Probability"*, Fifth Edition, Pearson Education, Delhi 2002.
2. Johnson.R.A, *"Miller & Freund's Probability and Statistics for Engineers"*, Sixth Edition, Pearson Education, Delhi, 2000.
3. Walpole.R.E, Myers.R.H, Myers,R.S.L and Ye.K, *"Probability and Statistics for Engineers and Scientists"*, Seventh Edition, Pearsons Education, Delhi, 2002.
4. Lipschutz.S and Schiller.J, *"Schaum's outlines - Introduction to Probability and Statistics"*, McGraw-Hill, New Delhi, 1998.


| **MA1005 PROBABILITY AND STATISTICS** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mathematics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | | | | x | | | | | | |
| 2. | Mapping of instructional objectives with student outcome | 1-5 | | | | 1-5 | | | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | |
| | | -- | | x | | | -- | | | | -- | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| **MH1017** | **CONTROL ENGINEERING** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| | Total Contact Hours – 45 | **3** | **0** | **0** | **3** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To familiarize the students with concepts related to the operation analysis and stabilization of control systems.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To understand the open loop and closed loop (feedback) systems. |
| 2. | To understand and perform time domain and frequency domain analysis of control systems required for stability analysis. |
| 3. | To understand the compensation techniques that can be used to stabilize control systems. |
| 4. | To understand the fundamentals of modeling in state space and sampled data systems. |

**UNIT I - MODELING AND DYNAMICS OF PHYSICAL SYSTEMS (9 hours)**

Introduction to Physical Systems; Differential equation representation of physical systems - Definitions of Convolution Sum and Transfer function - Introduction to Control Systems; Open and Closed Loop Control Systems - Elements of an Automatic Control System - Mathematical Modeling of Mechanical, Electrical, Thermal and Fluidic Systems - Force-Voltage and Force-Current Analogy; Armature and Field Controlled DC Motor - Block diagram representation and reduction techniques - Signal Flow Graph; Transfer function determination using Mason's Gain Formula - Control System Components; Synchros, DC and AC Servomotors and Stepper Motors.

**UNIT II - TIME DOMAIN ANALYSIS AND ROOT LOCUS METHOD (9 hours)**

**Time Domain Analysis:** Standard test signals - First order system - Step, Ramp and Impulse Response analysis - Second Order systems; Step Response, Time domain Specifications - Transient and Steady State analysis - Steady State Errors - Generalized Error Coefficients.

**Root Locus Method:** Analysis using Root locus method - Properties of Root Locus - Stability Analysis using Root Locus; Routh-Hurwitz criterion - Effects of adding a pole and zero to a system.

**UNIT III - FREQUENCY DOMAIN ANALYSIS (9 hours)**

Frequency response - Frequency domain specifications - Correlation between time domain and frequency domain specifications - Bode plot - Performance and Stability analysis using Bode plot- Transfer Function from Bode Plot – Analysis using Polar plot – Nyquist stability criterion. Compensator Basics; Cascade and Parallel, Lead, Lag, and Lead Lag Compensators. Principles of two term and three term controllers.

**UNIT IV - MODELING AND ANALYSIS IN STATE SPACE (9 hours)**

Introduction – Concepts of state, state variables and state model– State model of linear systems– system realization - State space representation using physical, phase and canonical variables - diagonal canonical form-Jordan canonical form diagonalization- Time domain solution of state equation-State transition matrix - Laplace transform solution of state equations - Derivation of transfer function from the state model - Controllability and Observability; Basics of state feedback controllers and observers.

**UNIT V - DIGITAL CONTROL SYSTEMS (9 hours)**

Basic digital control system - Spectrum analysis of sampling process - Signal reconstruction - Difference Equation representation and State Space representation of discrete time systems - Z transform and its properties - Pulse transfer function - Inverse Z transform - Response of linear discrete time systems - Z transform analysis of sampled data control systems - Stability analysis; Jury's stability criterion.

**TEXT BOOKS**


1. Norman S Nise, "*Control Systems Engineering"*, 5th edition, Wiley publications, 2009.
2. Madan Gopal andNagrath.I.J, "*Control Systems Engineering"*, 5th edition, New Age International, 2011.
3. Benjamin C Kuo andFarid Golnaraghi, "*Automatic Control Systems"*, 8th edition, Wiley Publications, 2007.


**REFERENCES**


1. Richard C. Dorf and Robert H. Bishop, "*Modern Control systems"*, 11th edition, Pearson, 2008.
2. Katsuhiko Ogata, "*Modern Control Engineering"*, 5th edition, PHI Learning, 2010.


| MH1017 CONTROL ENGINEERING | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mechatronics | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | | x | | | | | x | |
| 2. | Mapping of instructional objectives with student outcome | 2 | 4 | | | 3 | | | | | 1 | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | -- | | -- | | -- | | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | | Computing sciences | |
| | | | | x | | -- | | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1018 | DESIGN OF MACHINE ELEMENTS | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 45 | 3 | 0 | 0 | 3 |
| | Prerequisite | | | | |
| | MH1006 | | | | |

**PURPOSE**

To familiarize and knowledge on component design for performance, strength and durability.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Able to formulate and analyze stresses and strains in machine elements and structures in 3-D subjected to various loads. |
| 2. | Able to analyze and design power transmission shafts carrying various elements with geometrical features. |
| 3. | Students will be acquainted with standards, safety, reliability, importance of dimensional parameters and manufacturing aspects in mechanical design. |

**UNIT I - STRESS ANALYSIS WITH STATIC AND VARIABLE LOADING (9 hours)**

Design process- selection of materials- proffered numbers, fits and tolerances- direct, bending and shear stress – combined stresses - eccentric loading on machine members- stress concentration and notch sensitivity- variable loading on machine members- Soderberg's and Goodman's equation - factors of safety- failure theories.

**UNIT II - DESIGN OF SHAFTS, COUPLING AND SPRINGS (9 hours)**

Design of solid and hollow shafts based on strength, rigidity and critical speed- Design of keys- Design of rigid and flexible couplings- Design of helical springs and leaf springs.

**UNIT III – DESIGN OF JOINTS (9hours)**

Threaded fasteners - Design of bolted joints including eccentric loading, Knuckle joints, Cotter joints – Design of welded joints, riveted joints for structures.

**UNIT IV - DESIGN OF GEARS (9 hours)**

Introduction to transmission elements- types of gear drives – gear nomenclature – design of spur, helical, bevel gears based on contact stress and beam strength- Based on Lewis and Buckingham equations

**UNIT V - DESIGN OF FLEXIBLE DRIVES (9 hours)**

Design of flat belt, V-Belt, rope and chain drives.

**TEXT BOOKS**


1. Bhandari.V.B, *"Design of Machine Elements",* 3rd Edition, Tata McGraw-Hill Education, 2010.
2. Shigley.J.E and Mischke.C.R, "*Mechanical Engineering Design"*, Sixth Edition, Tata McGraw-Hill , 2010.
3. Merhyle Franklin Spotts, Terry E. Shoup and Hornberger.L.E, "*Design of Machine Elements*", 8th Ed., Prentice Hall Publishers.
4. Robert L. Norton, "*Machine Design: An Integrated Approach*", 4th Edition, Prentice Hall Publishers, 2010.


**REFERENCES**


1. Joseph Shigley and Charles Mischke, Standard Handbook of "*Machine Design*", 2nd Edition, Tata Mcgraw Hill Education, 1996.
2. PSG, "*Design Data"* [Data Book Of Engineers], Kalaikathir Achagam.


| MH1018 DESIGN OF MACHINE ELEMENTS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | x | x | | | | | | | | x |
| 2. | Mapping of instructional objectives with student outcome | | 2 | 1 | | | | | | | | 3 |
| 3. | Category | General (G) | | Basic Sciences(B) | | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) |
| | | -- | | -- | | | -- | | | | | x |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | | Mechanical Engineering | | | | | Computing sciences |
| | | -- | | -- | | | x | | | | | -- |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1019 | SENSORS AND ACTUATORS | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 45 | 3 | 0 | 0 | 3 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To make the students aware of different types of sensors and actuators based on their applications also they are given knowledge about miniature sized sensors and actuators.

| INSTRUCTIONAL OBJECTIVES | |
|---|---|
| 1. | To Understand the basic concepts of sensors. |
| 2. | To study about the various sensors types based on their applications. |
| 3. | To study about the micro level sensors and actuators. |

**UNIT I - INTRODUCTION AND DISPLACEMENT MEASUREMENT (8 hours)**

Sensors - Basic requirements of a sensors- Classification of sensors- Static and Dynamic characteristics of sensors- Displacement Sensors- Linear and Rotary displacement sensors- Potentiometer, Capacitive and Inductive type displacement sensor- position sensors- Optical encoder, Photoelectric sensor, Hall Effect Sensor.

**UNIT II - MEASUREMENT OF PROXIMITY, FORCE AND PRESSURE (10 hours)**

Eddy current proximity sensor- Inductive Proximity sensor- Capacitive Proximity sensor -Pneumatic Proximity sensors- Proximity Switches- Contact and Noncontact type – Strain Gauge – Diaphragm Pressure Sensor- Capsule Pressure sensors- Bellows Pressure Sensor- Bourdon tube pressure sensor- Piezoelectric Sensor- Tactile sensor.

**UNIT III - MEASUREMENT OF VELOCITY, FLOW AND LEVEL (8 hours)**

Tachogenerator - Pyroelectric sensors - Ultrasonic sensor – Resistive sensor- Pitot tube – Orificeplate - flow nozzle- Venturi tubes – Rotameter- Electromagnetic flow meter. Float level sensor- Pressure level sensor- Variable capacitance sensor.

**UNIT IV - MEASUREMENT OF TEMPERATURE, MOTION AND LIGHT SENSORS (10 hours)**

Thermocouples- Thermistors -Thermodiodes - Thermotransistors- Bimetallic Strip- Resistance Temperature Detector- Infrared Thermography. Vibrometer and accelerometer- seismic accelerometer. Photoresistors -Photodiodes - Phototranistors- Photocondutors.

**UNIT V - MICRO SENSORS AND ACTUATORS (9 hours)**

Micro Sensors: Principles and examples, Force and pressure micro sensors, position and speed micro sensors, acceleration micro sensors, chemical sensors, biosensors, temperature micro sensors and flow micro sensors.Micro Actuators: Actuation principle, shape memory effects-one way, two way and pseudo elasticity. Types of micro actuators- Electrostatic, Magnetic, Fluidic, Inverse piezo effect, other principles.

**TEXT BOOKS**


1. Sawhney.A.K, *"Course in Mechanical Measurements and Instrumentation"*, Dhanpat Rai and Sons, 1997.
2. Patranabis.D, "*Sensors and Transducers"*, Wheeler publisher, 1994.
3. Sergej Fatikow and Ulrich Rembold, *Microsystem "Technology and Microbotics"* First edition, Springer -Verlag NEwyork, Inc, 1997.
4. Gupta.I.C, "*A Text book of Engineering Metrology"*, Dhanpat Rai and Sons, 1996.
5. *"ASTE Hand Book of Industries Metrology"*, Prentice Hall of India, 1992.


**REFERENCES**


1. Thomas G. Bekwith and Lewis Buck.N, "*Mechanical Measurements*, Oxford and IBH publishing Co. Pvt. Ltd.
2. Massood Tabib and Azar, "*Microactuators Electrical, Magnetic, thermal, optical, mechanical, chemical and smart structures"*, First edition, Kluwer academic publishers, Springer, 1997.
3. Manfred Kohl, "*Shape Memory Actuators"*, first edition, *Springer.*


<table>
<tr><th colspan="14">MH1019 SENSORS AND ACTUATORS</th></tr>
<tr><th colspan="2">Course Designed by</th><th colspan="12">Department of Mechatronics</th></tr>
<tr><td rowspan="2">1.</td><td rowspan="2">Student Outcome</td><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td><td>i</td><td>j</td><td colspan="2">k</td></tr>
<tr><td></td><td>x</td><td>x</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td colspan="2">x</td></tr>
<tr><td>2.</td><td>Mapping of instructional objectives with student outcome</td><td></td><td>2</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td colspan="2">1</td></tr>
<tr><td rowspan="2">3.</td><td rowspan="2">Category</td><td colspan="3">General (G)</td><td colspan="3">Basic Sciences(B)</td><td colspan="4">Engineering Sciences and Technical Arts(E)</td><td colspan="2">Professional Subjects(P)</td></tr>
<tr><td colspan="3">--</td><td colspan="3">--</td><td colspan="4">--</td><td colspan="2">x</td></tr>
<tr><td rowspan="2">4.</td><td rowspan="2">Broad Area</td><td colspan="3">Electrical Engineering</td><td colspan="3">Electronics Engineering</td><td colspan="4">Mechanical Engineering</td><td colspan="2">Computing sciences</td></tr>
<tr><td colspan="3">--</td><td colspan="3">--</td><td colspan="4">x</td><td colspan="2">--</td></tr>
<tr><td>5.</td><td>Approval</td><td colspan="12">23rd Meeting of Academic Council, May 2013</td></tr>
</table>

| | MANUFACTURING AND ASSEMBLY DRAWING | L | T | P | C |
|---|---|---|---|---|---|
| MH1020 | Total Contact Hours - 45 | 1 | 0 | 2 | 2 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To develop in the engineering student the ability to draw a detailed production and assembly drawing for given components

**INSTRUCTIONAL OBJECTIVES**

1. Indian codes and standards for engineering drawing
2. Representation of Fits and Tolerances in technical drawing
3. Assembly drawing of machine elements
4. Production drawing of components

**UNIT I - TECHNICAL DRAWING STANDARDS (2 hours)**

Indian Standard Code of practice for Engineering Drawing: General principles of presentation, conventional representation of dimensioning and sectioning, conventional representation of threaded parts, gears, springs and common features. Abbreviations and symbols used in technical drawings. Symbols and method of indication on the drawing for surface finish, welding and riveted joints.

**UNIT II - FITS AND TOLERANCES (3hours)**

Tolerance types and representation on the drawing – Fits types and selection for different applications – Basic hole systems - Basic shaft systems – Allowances. Geometric tolerances – Form and positional. Datum and datum features symbols used to represent geometric tolerances.

**UNIT III - ASSEMBLY DRAWING OF JOINTS, COUPLING AND BEARINGS (4 hours)**

Preparation of drawing for keys and keyways, cotter joints, pin joints and screwed fasteners. Preparation of drawing for Couplings - Flange coupling and universal coupling, Bearings: Plummer block - Foot step bearing. Representation oftolerances on drawing.

**UNIT IV - PRODUCTION DRAWING (2 hours)**

Preparation of production drawing for simple components, interpretation of production drawings.

**UNIT V - ASSEMBLY DRAWING OF MACHINE ELEMENTS (4 hours)**

Preparation of assembled views given parts details - Lathe tail stock - Lathe chuck - Connecting rod - Screw jack, machine vice, tool head of shaper and stop valve. Representation of tolerances on drawing.

**PRACTICAL (30 hours)**

**TEXT BOOKS**

1. Gopalakrishnan.K.R, "*Machine Drawing",* Subash Publishers, 2000.
2. Narayana.K.L, Kanniah.P and Venkata Reddy.K, "*Production Drawing"*, New Age International, 2002.
3. Sidheswar Kannaiah.N, Sastry.P.V.V.V, "*Machine Drawing",* Tata McGraw Hill, 1997.
4. Bhatt.N.D, "*Machine Drawing",* Charotar publishing house, 1999.

**REFERENCES**

1. Junnarkar.N.D, "*Machine Drawing"*, First Indian print, Pearson Education (Singapore) pvt Ltd, 2005.
2. *"P.S.G. Design"* Data Book 2001.
3. Revised IScodes: 10711, 10712, 10713, 10714, 9609, 1165, 10715, 10716, 10717, 11663, 11668, 10968, 11669, 8043, 8000.

| **MH1020 MANUFACTURING AND ASSEMBLY DRAWING** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | x | | x | | | | x | x | | x |
| 2. | Mapping of instructional objectives with student outcome | | 2 | | 4 | | | | 4 | 1 | | 3 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | -- | | -- | | -- | | | | x | | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | Mechatronics Engineering | | |
| | | -- | | -- | | x | | | | -- | | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| | CONTROL ENGINEERING LAABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| MH1021 | Total Contact Hours – 45 | 3 | 0 | 0 | 3 |
| | Prerequisite | | | | |
| | Nil | | | | |

**Programs (MATLAB or LabVIEW )**

Basics of MATLAB and LabVIEW

1. Simple operations involving polynomials, matrices, generation of transfer functions and state-space representations of systems.
2. Generation of standard test signals (impulse, step, ramp, parabolic, exponential and sinusoidal functions)
3. Determination of time domain specifications for a given system – Transient and steady state.
4. Root locus method – Determination of constant gain K.
5. Stability analysis of a system using Routh – Hurwitz criterion.
6. Frequency response analysis - Determination of frequency domain specifications using
7. Bode plot
8. Polar plot
9. Design of Compensators (lead, lag etc.,)
10. In time domain
11. In frequency domain
12. Modeling in state-space – Determination of state transition matrix, controllability and observability of Linear systems.
13. Design of state feedback controllers and observers using analytical and Ackermann's methods.
14. Discrete-time control systems.
15. Conversion of a given transfer function from analog to digital form
16. Determination of performance and stability in Z - Domain

**Exercises in LabVIEW**

1. Modeling of an armature controlled DC motor and determination of transfer function
2. Speed control of a DC motor using PI controller
3. Position control of a DC motor using PID controller
4. Advanced control practices for tuning of PID controllers
5. Study Exercise – Model based control of a rotary inverted pendulum

| MH1021 CONTROL ENGINEERING LAB | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | | x | | | | | x | |
| 2. | Mapping of instructional objectives with student outcome | 2 | 4 | | | 3 | | | | | 1 | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | -- | | -- | | -- | | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | | Computing sciences | |
| | | -- | | x | | -- | | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1022 | SENSORS AND ACTUATORS LAB | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours – 45 | **3** | **0** | **0** | **3** |
| | Prerequisite | | | | |
| | Nil | | | | |

**EXERCISES IN SENSORS**

Characteristics of

1. Displacement sensors
   a. LVDT
   b. RVDT
2. Position sensors
   a. Potentiometer
   b. Synchro and resolver
   c. Rotary encoders – absolute and incremental
3. Speed sensors
   a. Tachogenerator
   b. Hall effect sensor
4. Force and pressure sensors
   a. Strain gauge
   b. Load cell
5. Torque sensors
   a. Load cell
   b. Hall effect sensors
   c. Stroboscope

6. Proximity and range sensors
   a. Infra red sensors
   b. SONAR
   c. Inductive, Capacitive, Magnetic and Optical Proximity Sensors
7. Temperature Sensors
   a. Thermocouple
   b. Resistance Temperature detectors
   c. Thermistors
   d. IC Temperature sensors
8. Flow measurement
   a. Venturimeter
   b. Hot wire anemometer
9. Vibration measurement using Accelerometer
10. Miscellaneous measurements

**EXERCISES IN ACTUATORS**

1. Stepper motors (Unipolar and Bipolar)– Modes of operation
2. DC motor characteristics (Armature controlled and BLDC)
3. DC Servo motor characteristics
4. Characteristics of Solenoids and relays
5. Electro pneumatic actuators – Linear and rotary (full and limited rotation)
6. Exercises involving mechanical drives (gear trains, lead screw and ball screw, belt drives etc.,)

<table>
<tr><th colspan="14">MH1022 SENSORS AND ACTUATORS LAB</th></tr>
<tr><td colspan="2">Course Designed by</td><td colspan="12">Department of Mechatronics</td></tr>
<tr><td rowspan="2">1.</td><td rowspan="2">Student Outcome</td><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td><td>i</td><td>j</td><td>k</td></tr>
<tr><td>x</td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td></td><td></td><td>x</td><td></td></tr>
<tr><td>2.</td><td>Mapping of instructional objectives with student outcome</td><td>2</td><td>4</td><td></td><td></td><td>3</td><td></td><td></td><td></td><td></td><td>1</td><td></td></tr>
<tr><td rowspan="2">3.</td><td rowspan="2">Category</td><td colspan="2">General (G)</td><td colspan="2">Basic Sciences(B)</td><td colspan="4">Engineering Sciences and Technical Arts(E)</td><td colspan="3">Professional Subjects(P)</td></tr>
<tr><td colspan="2">--</td><td colspan="2">--</td><td colspan="4">--</td><td colspan="3">x</td></tr>
<tr><td rowspan="2">4.</td><td rowspan="2">Broad Area</td><td colspan="2">Electrical Engineering</td><td colspan="2">Electronics Engineering</td><td colspan="4">Mechanical Engineering</td><td colspan="3">Computing sciences</td></tr>
<tr><td colspan="2">--</td><td colspan="2">x</td><td colspan="4">--</td><td colspan="3">--</td></tr>
<tr><td>5.</td><td>Approval</td><td colspan="12">23rd Meeting of Academic Council, May 2013</td></tr>
</table>

| | INDUSTRIAL TRAINING I<br>(Training to be undergone after IV semester) | L | T | P | C |
|---|---|---|---|---|---|
| **MH1047** | 2 week practical training in industry | **0** | **0** | **1** | **1** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To provide practical exposure in Mechanical/Electronics related organizations.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Students have to undergo two – week practical training in Mechanical / Electronics related organizations so that they become aware of the practical applications of theoretical concepts studied in the class rooms. |

Students have to undergo two-week practical training in Mechanical / Electronics related organizations of their choice but with the approval of the department. At the end of the training student will submit a report as per the prescribed format to the department.

**Assessment process**

This course is mandatory and a student has to pass the course to become eligible for the award of degree. The student shall make a presentation before a committee constituted by the department which will assess the student based on the report submitted and the presentation made. Marks will be awarded out of 100 and appropriate grades assigned as per the regulations.

| **MH1047 INDUSTRIAL TRAINING I** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | | | x | x | x | x | x | x | x | |
| 2. | Mapping of instructional objectives with student outcome | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 3. | Category | General (G) | | Basic Sciences(B) | | | Engineering Sciences and Technical Arts(E) | | | Professional Subjects(P) | | |
| | | -- | | -- | | | -- | | | x | | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

**SEMESTER VI**

| | APTITUDE-IV | L | T | P | C |
|---|---|---|---|---|---|
| **PD1006** | Total Contact Hours - 30 | **1** | **0** | **1** | **1** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To enhance holistic development of students and improve their employability skills.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To improve aptitude, problem solving skills and reasoning ability of the student. |
| 2. | To collectively solve problems in teams & group. |

**UNIT I - ARITHMETIC - II** **(6 hours)**

Ratios & Proportions, Averages, Mixtures & Solutions

**UNIT II - ARITHMETIC – III**

**(6 hours)**

Time, Speed & Distance, Time & Work

**UNIT III - ALGEBRA – II** **(6 hours)**

Quadratic Equations, Linear equations & inequalities

**UNITIV - GEOMETRY** **(6 hours)**

2D Geometry, Trigonometry, Mensuration

**UNIT V - MODERN MATHEMATICS – II** **(6 hours)**

Sets & Functions, Sequences & Series, Data Interpretation, Data Sufficiency

**ASSESSMENT**

1. Objective type – Paper based / Online – Time based test

**REFERENCES**


1. Agarwal.R.S,*"Quantitative Aptitude for Competitive Examinations",* S Chand Limited 2011.
2. Abhijit Guha*, "Quantitative Aptitude for Competitive Examinations",*Tata Mcgraw Hill, 3rd Edition.
4. Edgar Thrope*, "Test of Reasoning For Competitive Examinations",* Tata Mcgraw Hill, 4th Edition.
5. *Other material related to quantitative aptitude.*

| PD1006 APTITUDE-IV | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Career Development Centre** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | | | x | | | | | | | |
| 2. | Mapping of instructional objectives with student outcome | 1 | | | 2 | | | | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | x | | -- | | -- | | | | -- | | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1023 | MANUFACTURING TECHNOLOGY | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 45 | 3 | 0 | 0 | 3 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To make the students aware of different manufacturing processes like Casting, Welding, Metal Forming Processes, Metal Cutting Processes, Machine Tools and Gear manufacturing and Finishing Processes.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To Understand the concepts of casting and welding |
| 2. | To study about the various mechanical working of metals |
| 3. | To Understand about the concepts of metal cutting |
| 4. | To study about the construction and working of various Machine tools |
| 5. | To understand about the concepts of Gear manufacturing and Surface finishing Processes |

**UNIT I - CASTING AND WELDING (8 hours)**

Introduction to casting, Patterns, Types, Pattern materials, Allowances - Moulding - types- Moulding sand, Gating and Risering, Cores &Core making. Special Casting Process- Shell, Investment, Die casting, Centrifugal Casting.Special welding techniques- Laser, Electron Beam, Ultrasonic, Electro slag, Friction welding, Electrical resistance welding.

**UNIT II - METAL WORKING (MECHANICAL) PROCESSES (8 hours)**

Hot and Cold Working - Rolling, Forging, Wire Drawing, Extrusion- types- Forward, backward and tube extrusion.Sheet Metal Operations - Blanking- blank size calculation, draw ratio, drawing force, Piercing, Punching, Trimming, Stretch forming, Shearing, Bending- simple problems- Bending force calculation, Tube forming - Embossing and coining, Types of dies: Progressive, compound and combination dies.

**UNIT III - THEORY OF METAL CUTTING (9 hours)**

Cutting Tools - Classification of cutting tools - single, multipoint - Tool signature for single point cutting tool - Tool Nomenclature- Cutting tool materials- Tool wear and tool life - Machinability - Cutting Fluids- Orthogonal and oblique cutting Mechanics of orthogonal cutting - Shear angle and its significance - Chip formation- Simple problems.

**UNIT IV - MACHINE TOOLS (12 hours)**

Shaping, Planning and Slotting Machine- construction, operations, Milling achine – classification, Types of cutters, operations, Indexing methods- Simple problems. Gear cutting machines- Classification, operations. Grinding Machines- classification, operations Boring machine- Classification, operations, Broaching machine- Types, operations, Work and tool holding Devices.

**UNIT V - GEAR MANUFACTURING AND SURFACE FINISHING PROCESS S (8 hours)**

Gear manufacturing processes - Extrusion, Stamping, and Powder Metallurgy. Gear Machining - Forming. Gear generating process- Gear shaping, Gear hobbing.Surface Finishing Processes - Grinding process, Grinding Wheel- types- Selection of Cutting speed and work speed, dressing and truing. Super finishing, Lapping, Buffing, Honing,

**TEXT BOOKS**


1. Sharma.P.C, *"A textbook of Production Technology"* - Vol I and II, S. Chand & Company Ltd., New Delhi, 1996.
2. Rao.P.N, "*Manufacturing Technology"*, Vol I & II, Tata McGraw Hill Publishing Co., New Delhi, 1998.
3. Chapman.W.A.J, "*Workshop Technology"* Vol. I and II, Arnold Publisher, New Delhi, 1998.
4. Hajra Choudhary.S.K and Hajra Choudhary.A.K, "*Elements of Manufacturing Technology"*, Vol II, Media Publishers, Bombay, 1988.

**REFERENCES**


1. Jain.R.K, "*Production Technology"*, Khanna Publishers, New Delhi, 1988.
2. Kalpakjian, "*Manufacturing and Technology"*, Addision Wesley congmen pvt., Singapore, 2000.
3. Kalpakjian, "*Manufacturing Engineering and Technology*", Addision Wesley Congmen Pvt. Ltd., Singapore, 2000.


| **MH1023 MANUFACTURING TECHNOLOGY** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | x | | | | | x | | | x |
| 2. | Mapping of instructional objectives with student outcome | 3 | 5 | 4 | | | | | 2 | | | 1 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | -- | | -- | | -- | | | | x | | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | Computing sciences | | |
| | | -- | | -- | | x | | | | -- | | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| **MH1024** | **MICROPROCESSOR AND MICROCONTROLLER** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| | Total Contact Hours - 45 | **3** | **0** | **0** | **3** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To make the students to gain knowledge on microprocessor and microcontrollers based system design.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Understand the concepts of basic microprocessors. |
| 2. | Analyze the operation of various interfacing devices to microprocessor and microcontroller applications |
| 3. | Apply the concepts of microcontroller and its applications to mechatronics systems. |
| 4. | Able to conduct experiments on microprocessor by developing skill in simple program writing. |

**UNIT I - INTRODUCTION TO 8085 MICROPROCESSOR (9 hours)**

Evolution of Microprocessors and computers-Intel 8085 architecture-Functions of various blocks and signals-Addressing modes-Instruction set- -Simple program-Basic timing diagrams.

**UNIT II - PHERIPHERAL INTERFACING (9 hours)**

Data transfer schemes-Interrupts-Software interrupt-Programmable interrupt controller 8259-Programmable peripheral interface 8255-Programmable interval timer 8253-Programmable communication interface 8251 USART-DMA controller 8257.

**UNIT III - INTRODUCTION TO 8086 MICROPROCESSOR (9 hours)**

Architecture of 8086-Minmum mode-Maximum mode and Timings-Instruction set-Addressing modes-Assembler directives-Interrupts-Simple programs.

**UNIT IV - INTRODUCTION TO 8031/8051 MICROCONTROLLERS (9 hours)**

Role of microcontrollers-8 bit microcontrollers-Architecture of 8031/8051-Signal description of 8051-Register set of 8051-Instruction set-Addressing modes-Simple programs.

**UNIT V - INTERFACING AND APPLICATIONS (9 hours)**

Stepper motor control-Keyboard interfacing-Alpha-Numeric display interfacing-Analog to digital converter interfacing-Digital to analog converter interfacing-Interfacing of Electronic weighing bridge.

**TEXT BOOKS**


1. Ramesh .S. Gaonkar, "*Microprocessor Architecture, Programming and Applications with the 8085"* Penram International.
2. Roy.A.K and Bhurchandi.K.M, "*Advanced Microprocessors and Peripherals"* McGraw-Hill International.
3. Muhammed Ali Mazadi and Janice Gilli Mazdi. "*The 8051 Microcontroller and embedded systems"* Person Education.
4. Douglas V Hall, "*Microprocessors And Interfacing Programming and Hardware"* Tata McGraw-Hill.


**REFERENCES**


1. Mohammed Rafiquzzaman, "*Microprocessors and Microcontrollers based System Design"* Universal Book Stall.
2. Kenneth J Ayala, "*Intel 8051 Architecture and Programming"* , PHI.

| MH1024 MICROPROCESSOR AND MICROCONTROLLER | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mechatronics | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | x | x | | | | | | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | 4 | | 3 | 2 | | | | | | 4 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | -- | | -- | | -- | | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | | Computing sciences | |
| | | -- | | x | | -- | | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1025 | PLC AND ITS APPLICATIONS | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours – 45 | 3 | 0 | 0 | 3 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To provide students the fundamentals of PLC, Data acquisition system and Application.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To understand the fundamental of PLC |
| 2. | To understand the basic of data conversion and data acquisition |
| 3. | To understand the operation of PLC programming |
| 4. | To ability to design application related experiment |

**UNIT I - INTRODUCTION TO COMPUTER CONTROL (10hours)**

Need of computer in a control system-Functional block diagram of a computer control system-Data loggers-Supervisory computer control- Direct digital control-Digital control interfacing-SCADA.(Elementary treatment only).

**UNIT II - DATA CONVERTERS (4 hours)**

DACs-Basic DAC Techniques-Weighted Resistor, R-2R Ladder and Inverted R-2R ladder type DACs- ADCs - Parallel ADC, Dual slope ADC, Successive Approximation ADC-Comparison of A/D conversion techniques- DAC/ADC specifications - Typical IC's for DAC, ADC - Isolation amplifiers.

**UNIT III - DATA ACQUISITION SYSTEMS (12hours)**

Sampling theorem - Sampling and digitising - Aliasing - Sample and hold circuit - Practical implementation of sampling and digitising - Definition, design and need for data acquisition systems - Interfacing ADC and DAC with Microprocessor / Multiplexer - Multiplexed channel operation -Microprocessor/PC based acquisition systems.

**UNIT IV - PLC (10 hours)**

Evolution of PLC's - Sequential and programmable controllers - Architecture-Programming of PLC - Relay logic - Ladder logic - Gates, Flip flops and Timers.

**UNIT V - COMMUNICATION IN PLC's (9 hours)**

Requirement of communication networks of PLC - connecting PLC to computer - Interlocks and alarms - Case study of Tank level control system and Sequential switching of motors.

**TEXT BOOKS**


1. Petrezeulla, *"Programmable Controllers"*, McGraw Hill , 1989.
2. Hughes .T, "*Programmable Logic Controllers*", ISA Press, 1989.
3. Clayton.G.B, "*Data Converters*" , The Mac Millian Press Ltd., 1982.


**REFERENCES**


1. Curtis D. Johnson "*Process Control Instrumentation*" Tech 8TH Edition Prentice Hall June 2005.
2. Roy Choudhury.D and Shail B.Jain, "*Linear Integrated circuits*", New age International Pvt.Ltd, 2003.


| MH1025 PLC AND ITS APPLICATIONS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mechatronics | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | | | | | | | x | x |
| 2. | Mapping of instructional objectives with student outcome | 2 | 4 | | | | | | | | 1 | 3 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | -- | | -- | | -- | | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | | Computing sciences | |
| | | x | | -- | | -- | | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1026 | MANUFACTURING TECHNOLOGY LAB | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 30 | 0 | 0 | 2 | 1 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To expose hands-on training to the students by various experiments using machines like lathe, Shaper, Slotter, Milling, Gear hobbing, grinding machines.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To perform various turning operations on a given component using Lathe |
| 2. | To Produce flat surface and contour shapes, slots on the given component using milling, shaper and slotting machines |
| 3. | To Manufacture a gear from a given blank using Gear Hobbing machine. |
| 4. | To improve surface finish in the given components using grinding machines |
| 5. | Application oriented mini projects |

**LIST OF EXPERIMENTS**

1. Introduction- lathe machine, plain turning, Step turning and grooving.(Including lathe Mechanisms)
2. Taper turning-compound rest/offset method & Drilling using lathe (Including Drilling feed mechanism, Twist drill nomenclature, and Different types of taper turning operations)
3. External threading-Single start. (Including Thread Cutting Mechanism)
4. Eccentric turning-Single axis.
5. Shaping-V-Block (Including Shaper quick return mechanism)
6. Planning/Capstan lathe/Burnishing process (Planner Mechanism, Description of capstan and turret lathe)
7. Slotting-Keyways (Including Broaching tool nomenclature and Slotter mechanism)
8. Milling-Polygon/ Spur gear (Including Milling mechanism)
9. Drilling, reaming, counter boring.
10. Gear hobbing- Spur gear.
11. Grinding-Cylindrical/ Surface/ Tool & cutter
12. Mini Project work- Application oriented products using above experiments

**TEXT BOOKS**


1. Chapman.W.A.J, "*Workshop Technology"* Vol. I and II, Arnold Publisher, 1996.
2. Hajra Choudhary.S.K and Hajra Choudhary.A.K, "*Elements of Manufacturing Technology"* Vol II, Media Publishers, 1986.

**REFERENCES**

1. Laboratory Manual.

| MH1026 MANUFACTURING TECHNOLOGY LAB | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | x | x | | | | | | | | x |
| 2. | Mapping of instructional objectives with student outcome | | 1 | 2,4 | | | | | | | | 3,5 |
| 3. | Category | General (G) | | Basic Sciences(B) | | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | |
| | | -- | | -- | | | -- | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | | Mechanical Engineering | | | | Computing sciences | |
| | | -- | | -- | | | x | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| | MICROPROCESSOR AND MICROCONTROLLER LAB | L | T | P | C |
|---|---|---|---|---|---|
| **MH1027** | Total Contact Hours - 30 | **0** | **0** | **2** | **1** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To enable students to do basic programming in the microprocessor and microcontroller.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Understand the concepts of code conversion. |
| 2. | Analyze and execute the operation of basic arithmetic and logical calculations. |
| 3. | Apply the concepts of applications of pc based system. |

**LIST OF EXPERIMENTS**

1. Addition and subtraction of 8 bit numbers
2. Addition and subtraction of 16 bit numbers
3. Multiplication of two 8 bit numbers
4. Division of two 8 bit numbers
5. Sorting numbers in ascending order and descending order
6. Sum of series of N numbers
7. Code conversion to BCD to Binary and Binary to BCD
8. Stepper motor control
9. Interfacing of Analog to digital converter (ADC)
10. Interfacing of Digital to Analog converter (DAC)
11. Interfacing of traffic light control systems
12. Keyboard/Display Interface
13. Rolling display
14. Flashing display

**REFERENCE**

1. Lab manual

| **MH1027 MICROPROCESSOR AND MICROCONTROLLER LABORATORY** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | | | | | | | | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | 2,3 | | | | | | | | | 1 |
| 3. | Category | General (G) | | Basic Sciences(B) | | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | |
| | | -- | | -- | | | -- | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | | Mechanical Engineering | | | | Computing sciences | |
| | | -- | | x | | | -- | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1028 | PLC AND ITS APPLICATIONS LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 30 | 0 | 0 | 2 | 1 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To provide the students hands on experience on measuring instruments and PLC.

**INSTRUCTIONAL OBJECTIVES**

1. Use different measuring devices.
2. Program PLC

**LIST OF EXPERIMENTS**

1. Strain gauge and load cell characteristics
2. LVDT characteristics
3. Characteristics of thermistors
4. Characteristics of thermocouples
5. Characteristics of RTD and thermostats
6. LDR and opt coupler characteristics
7. Capacitive transducer characteristics
8. Study of PLC
9. Implementation of logic gates using PLC
10. Implementation of timers and flip-flops using PLC
11. Sequential switching of motors using PLC - simulation
12. Tank level control using PLC – simulation

**REFERENCE**

1. Lab manual

| MH1028 PLC AND ITS APPLICATIONS LAB | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mechatronics | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | | | | | | | | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | 2 | | | | | | | | | 1 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | -- | | -- | | -- | | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | | Computing sciences | |
| | | -- | | x | | -- | | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1049 | MINOR PROJECT | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 30 | 0 | 0 | 2 | 1 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To carry out a design project in one of the specializations of the program with substantial multidisciplinary component

**INSTRUCTIONAL OBJECTIVES**

1. To guide the students in such a way so that they carry out a work on a topic as a forerunner to the full fledged project work to be taken subsequently in VIII semester. The project work shall consist of substantial multidisciplinary component

The students will carry out a project in one of the specializations of program under study with substantial multidisciplinary component

Student groups will be formed and a faculty member will be allocated to guide them. Assessment will be based on internal reviews. Based on the reviews marks will be allotted out of 100.

| MH1049 MINOR PROJECT | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mechatroncis | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | x | x | x | x | x | x | x | x | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

## SEMESTER VII

| | INDUSTRIAL ORGANISATION | L | T | P | C |
|---|---|---|---|---|---|
| MH1029 | Total Contact Hours - 45 | 3 | 0 | 0 | 3 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To enable the students to know the various functional entities and their duties in the industrial organization.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Understand the body of the organisation |
| 2. | Know about the competition and various pricing system |
| 3. | Know about the available market structure and working with them |
| 4. | Behavior of human at organisation with modern management concept |

**UNIT I - INDUSTRIAL ORGANISATION (8 hours)**

Introduction to industrial organisation-Definition and Example-classification and comparison-International trade, Basic microeconomics-Demand, Cost, Profit maximization-, Efficiency. Case study.

**UNIT II - COMPETITION AND PRICING (10 hours)**

Perfect competition-From theory to stylized facts-competitive selection – monopolistic competition. Pricing-Types of Costs -Price and output Determination – Price Fixation – Pricing methods - Pricing Policies – Factors governing-Pricing Policies – Break-Even analysis – Estimation of Break-Even Point - Usefulness of BEP – Limitations.

**UNIT III - MARKET STRUCTURES AND ORGANISATION (8 hours)**

Market for homogeneous product- Cournot Market structure – Sequential moves-Bertrand market structure-International trade in homogeneous product, Market for differentiated products-Monopolistic competition in differentiated products-Merger.and Acquisition.

**UNIT IV - MANAGEMENT OF HUMAN AT WORK (9hours)**

Human Resource Development – Motivating individuals and workgroups – Leadership for Managerial Effectiveness – Team working and Creativity – Managerial Communication – Time Management –Performance Appraisal– Career Planning.

**UNIT V - MODERN MANAGEMENT CONCEPTS (10 hours)**

Management By Objectives (MBO) – Principles and Steps – Advantages and Disadvantages - Management ByException (MBE) – Strategic management – SWOT analysis - Enterprise Resource Planning (ERP) – Supply Chain Management (SCM) – Activity Based Management (ABM).

**TEXT BOOKS**


1. Murphy .W.R and Mc Kay.G, "*Energy Management",* Butterworths, London.
2. Chandran.J.S, "*Organizational Beheviours*", Vikas Publishing House Pvt. Ltd., New Delhi,1994.
3. Ernest Dale, "*Management Theory and Practice*", International Student edition, McGraw Hill Publishing.
4. OZSHY, "*Industrial Organisation"*, MIT.


**REFERENCES**


1. Richard Pettinger, Mastering "*Organizational Behaviour*", Macmillan Press, 2000.
2. Chaiger.N.A, Energy "*Consumption and Environment"*, McGraw Hill Publishing Co., 1981.


| **MH 1029 INDUSTRIAL ORGANISATION** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | | | x | | | | x | | x | x |
| 2. | Mapping of instructional objectives with student outcome | | | | 3 | | | | 1 | | 2 | 4 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | -- | | -- | | -- | | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | | Computing sciences | |
| | | | | -- | | x | | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1030 | FUNDAMENTALS OF CAD/CAM | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 45 | 3 | 0 | 0 | 3 |
| | Prerequisite | | | | |
| | MH1018 ,MH1023 | | | | |

**PURPOSE**

To expose the learner to the fundamentals of CAD/CAM and the concepts and techniques used in CAD and CAM.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Understand the fundamentals of CAD/CAM |
| 2. | Understand the graphics display techniques in 2D/3D view of various mechanical component. |
| 3. | Create solid modeling of various component. |

**UNIT I - INTRODUCTION TO CAD/CAM (7 hours)**

Fundamentals of CAD / CAM, product cycle and CAD/CAM, Basic components of CIM, Distributed communication system, Computer networks for manufacturing, Role of computer in CAD/CAM. Benefits of CAD/CAM. Concurrent Engineering, Design for Manufacturability

**UNIT II - INTERACTIVE COMPUTER GRAPHICS (10 hours)**

Introduction of Hardware and Software - Input and Output devices - Creation of Graphics primitives - Graphical Input techniques - Display transformation in 2D and 3D - viewing transformation - clipping - hidden line elimination - Model storage and data structure - Data structure organization, Hierarchical data structure. Network data structure - Relational data structure. Data storage and search methods.

**UNIT III - SOLID MODELING AND GRAPHICS SYSTEM (10 hours)**

Geometric modeling - wire frame, Surface and Solid models - CSG and B-Rep techniques - Wire frame versus Solid modeling - Introduction the software Configuration of Graphics System, Functions of Graphics Packages, Graphic standards - Introduction to Finite Element Analysis.

**UNIT IV - CNC MACHINES (9 hours)**

Basic principles of numerical control; Methods of coding, Computer Numerical Control (CNC) System, Machine Structure, drive system, CNC programming, Machining centre, CNC Tooling. Direct Numerical control (DNC), Adaptive control machining systems: Adaptive control optimization, Adaptive control constraints.

**UNIT V - COMPUTER AIDED PLANNING SYSTEMS (9 hours)**

Principle of computer integrated manufacturing, Approaches to Computer aided Process Planning (CAPP) - Generative and Retrieval CAPP systems, benefits of CAPP, Material Requirement Planning(MRP), mechanism of MRP, Capacity Planning, Computer integrated production planning and control, Shop floor control.

**TEXT BOOKS**


1. Sadhu Singh. "*Computer Aided Design and Manufacturing*", Khanna Publishers, New Delhi, 1998.
2. Ibrahim Zeid, CAD/CAM, "*Theory and Practice"*, Tata McGraw Hill Ed, 1998.
3. David F. Rogers and Alan Adams. J, "*Mathematical Elements for Computer Graphics*", McGraw - Hill Publishing Company International Edition, 1990.
4. William M. Newman, Robert F.Sproull, "*Principles of Interactive Computer Graphics*", McGraw-Hill International Book Company, 1984.
5. Groover and Zimmers, CAD/CAM; "*Computer Aided Design and Manufacturing, Prentice*" Hall of India, New Delhi, 1994.
6. Groover.M.P, "*Automation Production systems and Computer Integrated Manufacturing, Prentice*" - Hall of India Pvt. Ltd., New Delhi, 1996.


**REFERENCES**


1. Paul G. Ranky, "*Computer Integrated Manufacture, Prentice*" - Hall International, UK, 1986.
2. Radha Krishnan.P and Kothandaraman.C.P, "*Comuter Graphics and Design*", Dhanpat Rai and sons, New Delhi, 1991.
3. Radha Krishnan.P and Subramanian.S, "*CAD/CAM/CIM*", Wiley Eastern Ltd, New Age International Ltd., 1994.


| MH1030 FUNDAMENTALS OF CAD/CAM | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mechatronics | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | | | | | | | | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | 2 | | | | | | | | | 3 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | -- | | -- | | -- | | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | | Computing sciences | |
| | | | | -- | | x | | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1031 | DESIGN OF MECHATRONICS SYSTEMS | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 45 | 3 | 0 | 0 | 3 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To design a system with the aid of mechanical and electronic components

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Understand the mechatronic system design and their structure, ergonomic and safety. |
| 2. | Analyze Theoretical and practical aspects of computer interfacing and real time data acquisition and control. |
| 3. | Apply the knowledge to design mechatronics products. |

**UNIT I - SYSTEMS AND DESIGN (9 hours)**

Mechatronic systems - Integrated design issue in mechatronic - mechatronic key element- Distributed system - Design process - Type of design - Integrated product design - man machine interface-Need for mechatronics in industries-industrial design and ergonomics-Sequential Controllers with examples - Water level controller- Shaft speed control-Washing machine control.

**UNIT II - SYSTEM MODELLING (9 hours)**

Introduction-model categories-Fields of application-model development-Model verification-model validation-model simulation-design of mixed systems-electro mechanics design-model transformation-domain-independent description forms-simulator coupling.

**UNIT III - REAL TIME INTERFACING (8 hours)**

Real time interface - Introduction, Elements of a data acquisition and Control system, overview of I/O process, installation of I/O card and software - Installation of the application software - over framing.

**UNIT IV - CASE STUDIES – I (10 hours)**

Case studies on data acquisition - Testing of transportation bridge surface materials - Transducer calibration system for Automotive application - strain gauge weighing system - solenoid force - Displacement calibration system - Rotary optical encoder - sensors for condition monitoring - mechatronic control in automated manufacturing.

**UNIT V - CASE STUDIES – II** **(9 hours)**

Case studies on data acquisition and Control - thermal cycle fatigue of a ceramic plate - pH control system. Deicing temperature control system - skip control of a CD player - Auto focus Camera.Case studies on design of mechatronic product - pick and place robot - car park barriers - Barcode reader.

**TEXT BOOKS**


1. Bolton, "*Mechatronics - Electronic Control Systems in Mechanical and Electrical Engineering"*, 2nd Edition, Addison Wesly Longman Ltd., 1999.
2. Devdas shetty, Richard A. Kolkm, "*Mechatronics System Design*", PWS Publishing company, 1997.
3. Bradley, Dawson.D, Burd.N.C and Loader.A.J, "*Mechatronics : Electronics in products and Processes"*, Chapman and Hall, London, 1991.


**REFERENCES**


1. Brian Morriss, "*Automated Manufacturing Systems - Actuators Controls, Sensors and Robotics"*, McGraw Hill International Edition, 1995.
2. Gopel, "*Sensors A comprehensive Survey"* , Vol I & Vol VIII", BCH Publisher, New York.


<table>
<tr><th colspan="13">MH1031-DESIGN OF MECHATRONICS SYSTEMS</th></tr>
<tr><th colspan="2">Course Designed by</th><th colspan="11">Department of Mechatronics</th></tr>
<tr><td rowspan="2">1.</td><td rowspan="2">Student Outcome</td><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td><td>i</td><td>j</td><td>k</td></tr>
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<tr><td rowspan="2">3.</td><td rowspan="2">Category</td><td colspan="3">General (G)</td><td colspan="3">Basic Sciences(B)</td><td colspan="4">Engineering Sciences and Technical Arts(E)</td><td colspan="2">Professional Subjects(P)</td></tr>
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<tr><td rowspan="2">4.</td><td rowspan="2">Broad Area</td><td colspan="3">Electrical Engineering</td><td colspan="3">Electronics Engineering</td><td colspan="4">Mechanical Engineering</td><td colspan="2">Computing sciences</td></tr>
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<tr><td>5.</td><td>Approval</td><td colspan="11">23rd Meeting of Academic Council, May 2013</td></tr>
</table>

| | POWER ELECTRONICS | L | T | P | C |
|---|---|---|---|---|---|
| MH1032 | Total Contact Hours - 45 | 3 | 0 | 0 | 3 |
| | Prerequisite | | | | |
| | MH1003 | | | | |

**PURPOSE**

To enable the students gain a fair knowledge on characteristics and applications of power electronic devices.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Understand the working principle and characteristics of various types of Semiconductor devices. |
| 2. | Analyze the operation of various controlled rectifiers to mechatronics applications. |
| 3. | Apply the principles of various controlled rectifiers, choppers, inverters to mechatronics systems. |

**UNIT I - INTRODUCTION (9hours)**

Basic structure & Switching characteristics of Power diode, Power transistor, SCR, Basic structure & operation of Triac, GTO, MOSFET & IGBT, series parallel operation of SCR, turn on methods and turn off methods of thyristors,

**UNIT II - PHASE CONTROLLED RECTIFIERS (10 hours)**

Operation of 1-phase half wave rectifiers with R & RL. 1-phase FWR with R & RL load (Fully controlled & half controlled) - analysis of rectifiers -RMS, average & PF. Operation of 3-phase HWR & FWR with R & RL loads for continuous current. 1-phase dual converter operation - simple problems.

**UNIT III - DC –DC CONVERTERS (9 hours)**

Types of forced commutation, classification & operation of choppers (A, B, C, D, E). Control strategies, operation of voltage, current & load commutated choppers. Multiphase chopper operation - applications of choppers

**UNIT IV - INVERTERS (9 hours)**

Types of inverters: operation of 1-phase, 3 phase (120° 180° ) modes with 'R' load. operation of CSI, operation of basic series inverter, modified series & Improved series inverter - 1- phase parallel inverter operation (without feedback diodes) 1-phase basic McMurray inverter.

**UNIT V - AC VOLTAGE REGULATORS** **(8 hours)**

Types of control (phase & Integrated cycle control) operation 1-phase voltage regulator with R, RL loads. Operation of 3-phase AC voltage controls (with Anti parallel SCR configuration) with R load operation 1-phase step up & step down cyclo converters. 1-phase to 3-phase Cyclo converters with R, RL loads.

**TEXT BOOKS**


1. Dr.Bhimbra.P.S, "*Power Electronics"*, Khanna Publishers, 2001.
2. Muhammad H. Rashid, "*Power Electronics - Circuits, Devices & Applications"*, Prentice Hall of India, New Delhi, 1995.
3. Singh.M.D and Khanchandani.K.B, "*Power Electronics"*, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2000.


**REFERENCES**


1. Dubey.G.K, et.al, *Thyristorised "Power Controllers"*, New Age International (P) Publishers Ltd., 2002.
2. Vedam Subramaniam, "*Power Electronic"s*, New Age International (P) Publishers Ltd., 2000.


| **MH1032 POWER ELECTRONICS** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | | x | | | | | | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | 2 | | | 2 | | | | | | 3 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | -- | | -- | | -- | | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | | Computing sciences | |
| | | -- | | x | | -- | | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1033 | FUNDAMENTALS OF CAD/CAM LAB | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact hours - 30 | 0 | 0 | 2 | 1 |
| | Prerequisite | | | | |
| | MH1018 | | | | |

**PURPOSE**

To provide hands on experience on geometric modeling, assembling and drafting using computers and also on part programming.

**INSTRUCTIONAL OBJECTIVES**

1. Draw various views of a component assembly.
2. Model the components.
3. Assemble the components.
4. Manufacture small components using CNC lathe and mill.

**LIST OF EXPERIMENTS**

**CAD LABORATORY**

1. Computer Aided Drafting of Machine Elements Orthographic views - Isometric Views - Sectional views. Dimensioning - Annotations - symbols - welding - surface finish - threads. Text - Bill of Materials - Title Block. Script writing.
2. **Exercise:** Knuckle joint, Gib and Cotter Joint, Screw jack, Footstep bearing, Isometric views with their orthographic views.
3. Geometric modeling of machine components Protrusion - cut - sweep - draft and loft - Modify /edit pattern - Transformation - Boolean operation
4. **Exercise:** Individual parts of universal joint - Flange coupling - Piston and Connecting rod. (Using a popular commercial package)

**CAM LABORATORY**

1. Manual programming for CNC machines using standard G and M codes CNC Lathe - Part programming for Turning, Facing, Chamfering, Step turning, Taper turning circular interpolation. CNC Milling machine - Part programming for PTP motions, Line motions, Contour motions, Pocketing - Circular, Rectangular and Mirror commands.
2. Part programming using fixed / canned cycles. Drilling, Peck Drilling, Boring, Tapping, Thread cutting
3. Simulation of Tool Path for different operations
4. Machining of small components using CNC Lathe and CNC Milling Machine

**REFERENCES**

1. CAD Lab Manual
2. CIM Lab Manual

| MH1033 FUNDAMENTALS OF CAD/CAM LABORATORY | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mechatronics | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | x | x | | | | | | | x | x |
| 2. | Mapping of instructional objectives with student outcome | | 3 | 2 | | | | | | | 1 | 4 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | -- | | -- | | -- | | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | | Computing sciences | |
| | | -- | | -- | | x | | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1034 | DESIGN OF MECHATRONIC SYSTEMS LAB | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours – 30 | 3 | 0 | 2 | 3 |
| | Prerequisite | | | | |
| | Nil | | | | |

1. Insights into analog to digital and digital to analog conversion techniques
2. Characteristics and calibration of Mechatronic and automotive sensors
3. Stepper motor control
4. Servo motor control
5. Design of compensators for DC motor control
6. Direct digital controllers for DC motor
7. Modeling and control of 1 – DOF Helicopter model
8. Modeling and control of rotary inverted pendulum
9. Exercises involving embedded machine vision system(EVS)
10. Exercises in Mobile robotics on following features
11. Kinematics
12. Perception
13. Obstacle avoidance
14. Localization
15. Programming Robot (Pick and place robot)
16. Study exercise – Path planning and navigation of mobile robots

| MH1034 DESIGN OF MECHATRONIC SYSTEMS LAB | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mechatronics | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | | x | | | | | x | |
| 2. | Mapping of instructional objectives with student outcome | 2 | 4 | | | 3 | | | | | 1 | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | -- | | -- | | -- | | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | | Computing sciences | |
| | | -- | | x | | x | | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1035 | POWER ELECTRONICS LAB | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact hours - 30 | 0 | 0 | 2 | 1 |
| | Prerequisite | | | | |
| | MH1003 | | | | |

**PURPOSE**

To expose the students to the operation of various Power Electronic Devices and give them experimental skill.

**INSTRUCTIONAL OBJECTIVES**

1. To enable the students to understand the basic concepts involved in the Operation of Power Electronic Devices, controlled rectifiers and inverters.

**LIST OF EXPERIMENTS**

1. Characteristics of SCR.
2. Characteristics of TRIAC.
3. Characteristics of MOSFET
4. Characteristics of IGBT.
5. Single Phase AC to DC fully controlled converter
6. Single Phase AC to DC half-controlled converter.
7. Three Phase AC to DC fully controlled converter
8. Three Phase AC to DC half controlled converter
9. Series Inverter.
10. Parallel inverter.

**REFERENCE**

1. Lab Manual

| MH1035 POWER ELECTRONICS LAB | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mechatronics | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | | | | | | | | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | 1 | | | | | | | | | 1 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | -- | | -- | | -- | | | | x | | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | Computing sciences | | |
| | | -- | | x | | -- | | | | -- | | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1048 | INDUSTRIAL TRAINING II (Training to be undergone after VI semester) | L | T | P | C |
|---|---|---|---|---|---|
| | 2 week practical training in industry | 0 | 0 | 1 | 1 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To provide practical exposure in Mechanical/Electronics related organizations

**INSTRUCTIONAL OBJECTIVES**

1. Students have to undergo two – week practical training in Aerospace/Mechanical related organizations so that they become aware of the practical applications of theoretical concepts studied in the class rooms.

Students have to undergo two-week practical training in Aerospace/Mechanical related organizations of their choice but with the approval of the department. At the end of the training student will submit a report as per the prescribed format to the department.

**Assessment process**

This course is mandatory and a student has to pass the course to become eligible for the award of degree. The student shall make a presentation before a committee constituted by the department which will assess the student based on the report submitted and the presentation made. Marks will be awarded out of 100 and appropriate grades assigned as per the regulations.

| MH1048 INDUSTRIAL TRAINING II | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | | | x | x | x | x | x | x | x | |
| 2. | Mapping of instructional objectives with student outcome | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 3. | Category | General (G) | | Basic Sciences(B) | | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | |
| | | -- | | -- | | | -- | | | | x | |
| 4. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

**SEMESTER VIII**

| | MAJOR PROJECT / PRACTICE SCHOOL | L | T | P | C |
|---|---|---|---|---|---|
| **ME1050** | Total Contact Hours – 360 | **0** | **0** | **24** | **12** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To simulate real life situations related to the program and impart adequate training so that confidence to face and tackle any problem in the field is developed in the college itself.

**INSTRUCTIONAL OBJECTIVES**

1. To guide the students such a way that the they carry out a comprehensive work on the chosen topic which will stand them in good stead as they face real life situations. The project work so chosen by the student shall culminate in gaining of major design experience in the related area of specialization.

**MAJOR PROJECT**

Each project will cover all the aspects (to the extent possible) of real life application of concepts studied under the program. . Alternately, a few research problems also may be identified for investigation. The project shall be driven by realistic constraints like that related to economic, environmental, social, political, ethical, health & safety, manufacturability and sustainability. The outcomes to be attained by students by doing the project work shall be spelt out clearly. A project report is to be submitted on the topic which will be evaluated during the final review. Assessment procedure will be as spelt out in the regulations.

**PRACTICE SCHOOL**

Alternately, a student is encouraged to take an industrial project with reputed organizations or firms chosen by the institute. In such cases the student will stay with the firm and carry out the project. The project will be guided by the faculty member and the concerned officer in the industry. All the requirements spelt out under 'MAJOR PROJECT' above, shall be incorporated under this work also. However reviews will be conducted in the institute which the student shall attend.

| **ME1050 MAJOR PROJECT** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | x | x | x | x | x | x | x | x | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3. | Approval | 23rd meeting of Academic Council, May 2013 | | | | | | | | | | |

## DEPARTMENT ELECTIVES

| | DRIVES AND CONTROLS FOR AUTOMATION | L | T | P | C |
|---|---|---|---|---|---|
| MH1101 | Total Contact Hours - 45 | 3 | 0 | 0 | 3 |
| | Prerequisite | | | | |
| | MH1002 | | | | |

**PURPOSE**

To introduce to the students the different types of drives, and their control in automation.

**INSTRUCTIONAL OBJECTIVES**

1. Identify different types of drives used in automation.
2. Know the control schemes for difficult applications.

**UNIT I - INTRODUCTION TO DRIVES (8 hours)**

Introduction to drives - Selection of Motor power rating - Drive specifications - Constant speed and constant power operation.

**UNIT II - DC DRIVE (9 hours)**

DC motor and their performance - Armature control and Field control - Ward Leonard drives - converter fed and chopper fed Drive - four quadrant operation - closed loop control,P, PI and PID controllers – response comparison

**UNIT III - INDUCTION MOTOR DRIVE (10 hours)**

Induction motor fundamentals - voltage control and variable frequency control (AC chopper, Inverter fed induction motor drives). - Rotor resistance control - slip power recovery scheme.

**UNIT IV - SYNCHRONOUS MOTOR DRIVE (9hours)**

Synchronous motor fundamentals - open loop, closed loop variable frequency control - voltage and current source fed synchronous motor.

**UNIT V - DRIVE CONTROLS (9 hours)**

Digital technique in speed control - Advantages and limitations - Microprocessor based control of drives - Selection of drives and control schemes for steel rolling mills, paper mills, lifts and cranes.

**TEXT BOOKS**

1. Dubey.G.K, "*Fundamental of Electric Drives"*, Narosa publishing house 1995.
2. Pillai.S.K, "*A first course on Electrical Drives"*, New Age International (p) Ltd.,1984.
3. Dubey.G.K, "*Power Semiconductor Controlled Drives"*, Narosa publishing house, 1995.

**REFERENCES**

1. Vedam Subramanian, "*Thyristor Control of Electrical Drives"*, Tata Mc Graw Hill Publications, 1996.

| **MH1101 DRIVES AND CONTROLS FOR AUTOMATION** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | | | | | | | | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | 2 | | | | | | | | | 1 |
| 3. | Category | General (G) | | Basic Sciences(B) | | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | |
| | | -- | | -- | | | -- | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | | Mechanical Engineering | | | | Computing sciences | |
| | | x | | -- | | | -- | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| **MH1102** | **INTELLIGENT MANUFACTURING TECHNOLOGY** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| | Total Contact Hours - 45 | **3** | **0** | **0** | **3** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To expose the students to different types of sensors used in manufacturing and fundamentals of condition monitoring.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Basics of sensors in manufacturing. |
| 2. | Different types of sensors in manufacturing. |
| 3. | Sensors in CNC machine tools, FMS and Robots. |
| 4. | Concept of condition monitoring and identification techniques. |

**UNIT I - INTRODUCTION** **(10 hours)**

Introduction – Role of sensors in manufacturing automation-operation principles of different sensors –electrical, optical, acoustic, pneumatic, magnetic, electro-optical, photo – electric, vision, proximity, tactile, range sensors.

**UNIT II - SENSORS IN MANUFACTURING** **(10 hours)**

Sensors in manufacturing – Temperature sensors in process control-Pressure sensors – Fiber optic sensors and their principles and applications – Displacement sensor for robotic application-

Sensors for CNC machine tools – Linear and angular position sensors, velocity sensors. Sensors in Robotics – encoder, resolver, potentiometers, range, proximity, touch sensors.

**UNIT III - PROCESS MONITORING** **(7 hours)**

Principle, Sensors for Process Monitoring - online and off line quality control, Quality parameter design Direct monitoring of fault based on process signals.

**UNIT IV - CONDITION MONITORING** **(8 hours)**

Condition monitoring of manufacturing systems-principles –sensors for monitoring force, vibration and noise. Selection of sensors and monitoring techniques. Acoustics emission sensors-principles and applications-online tool wear monitoring.

**UNIT V - AUTOMATIC IDENTIFICATION TECHNIQUES** **(10 hours)**

MRP-MRPII-Shop floor control –Factory data collection systems – Automatic identification methods – Bar code technology, automated data collection system – Agile manufacturing-flexible manufacturing-Enterprise integration and factory information system.

**TEXT BOOKS**


1. Sabrie salomon, "*Sensors and Control Systems in Manufacturing",* McGraw Hill int. edition, 1994.
2. Patranabis .D, "*Sensors and Transducers, Wheeler publishers*", 1994.
3. Deb.S.R, "*Robotics technology and flexible automation"*, Tata McGraw Hill publishing Co. Ltd., 1994.
4. Mikell P. Groover, "*Automation Production System and Computer Integrated Manufacturing"*, Prentice Hall of India Ltd., 2001.
5. Richard D.Klafter, "*Robotic Engineering, Prentice"* Hall of India Pvt., Ltd., 2001.

**REFERENCES**


1. Julian W.Gardner, "*Micro Sensor MEMS and Smart Devices*", John Wiley & Sons, 2001.
2. Randy *Frank, "Understanding Smart Sensors"*, Artech house, USA, 1996.


| MH1102 INTELLIGENT MANUFACTURING TECHNOLOGY | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | x | | | | | x | | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | 2 | | 3 | | | | | 4 | | 4 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | -- | | -- | | -- | | | | x | | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | Computing sciences | | |
| | | -- | | -- | | x | | | | -- | | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1103 | FLEXIBLE MANUFACTURING SYSTEMS | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 45 | 3 | 0 | 0 | 3 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To provide the knowledge about different manufacturing concepts like GT, FMS and material handling systems.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Study of different types of production. |
| 2. | Knowledge of group technology(GT). |
| 3. | Introduction and need of FMS. |
| 4. | Detailed study of flexible manufacturing cells and FMS software. |

**UNIT I - PRODUCTION SYSTEMS** **(9 hours)**

Types of production-Job Shop, Batch and Mass production - Functions in manufacturing - Organization and information processing in manufacturing - Plant layout - Batch production – Work in progress inventory - Scheduling, problems.

**UNIT II - GROUP TECHNOLOGY (9 hours)**

Formation of part families - Part classification - Coding system optiz, Multi Class - Production flow analysis – Machine cells design - Clustering methods - Modern algorithms - Benefits of GT - System planning - Objective, guide line, system definition and sizing - Human resources - Objective, staffing, supervisor role.

**UNIT III - FLEXIBLE MANUFACTURING SYSTEMS (9 hours)**

Introduction – Evolution – Definition - Need for FMS - Need for Flexibility - Economic Justification of FMS-Application Criteria - Machine tool Selection and Layout - Computer control system - Data files – Reports - Planning the FMS - Analysis Methods for FMS - Benefits and limitations.

**UNIT I V - FLEXIBLE MANUFACTURING CELLS AND FMS SOFTWARE (9 hours)**

Introduction - Cell description and classifications - Cellular versus FMS – System - Simulation, Hardware configuration – Controllers - Communication networks - Lean production and agile manufacturing - Computer simulation - FMS installation – Objective - Acceptance testing - Performance goals – Expectations - Continued support.

**UNIT V - MATERIAL HANDLING AND STORAGE SYSTEM (9 hours)**

Material handling systems – Functions, types, Analysis of material handling systems, design. Conveyors, Industrial Robots, Automated Guided Vehicles, Types of flow lines, methods of transport, transfer mechanisms, ASRS system.

**TEXT BOOKS**


1. William W.Luggen., "*Flexible Manufacturing Cells and Systems"*, Prentice Hall, NJ, 1991.
2. Mikell P.Groover., "*Automation Production Systems & Computer Integrated manufacturing"*, PHI, 1989.
3. David J.Parrish., "*Flexible Manufacturing"*, Butterworth-Heinemann, 1990.


**REFERENCES**


1. Buffa.E.S, "*Modern Production and Operation Management"*, 1985.
2. Jha .N.K, Handbook of "*Flexible manufacturing system"* , Academic press Inc,1991.

| MH1103 FLEXIBLE MANUFACTURING SYSTEMS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mechatronics | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | | | x | | | | x | x | | | x |
| 2. | Mapping of instructional objectives with student outcome | | | 3 | | | | 1 | 4 | | | 2 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | -- | | -- | | -- | | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | | Computing sciences | |
| | | -- | | -- | | x | | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1104 | CNC SYSTEMS: DESIGN AND APPLICATIONS | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 45 | 3 | 0 | 0 | 3 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To impart a detailed knowledge about the Computer Numerical Systems and its programming.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Study about the evolution and basic construction of CNC systems and Adaptive control |
| 2. | Understand in detail about various elements and measuring systems in the CNC systems and Machine tools |
| 3. | Understand in detail about the programming techniques in CNC systems. |
| 4. | Study about the methodology of installation and Maintenance of CNC machines. |

**UNIT I - INTRODUCTION OF CNC SYSTEMS AND ADAPTIVE CONTROL (6 hours)**

Classification of machine tools – Types, functions and processes - Fundamentals of NC and CNC technologies - CNC systems -Configuration of the CNC system – nterfacing – Monitoring – Diagnostics - Machine data – Compensations for Machine accuracies - Adaptive control - Types, application and benefits.

**UNIT II - ELEMENTS IN CNC SYSTEMS AND MACHINE TOOLS (8 hours)**

PLC in CNC – PLC programming for CNC - Machine structure -Types of loads on CNC machine -Guide ways and types - Mechanical transmission elements - Elements for rotary motion to linear motion - Ball screw and types - Roller screw and types - Rack and pinion - Various torque transmission elements - Requirements of feed drives and spindle drive.

**UNIT III - ELEMENTS IN CNC MEASURING SYSTEM AND TOOLING (12 hours)**

Measuring systems -Feedback devices -Velocity feedback -Analog and digital - Position feedback Tooling - Requirement and planning - Preset, qualified and semi qualified tools. Fixtures –requirement - Unified and modular fixtures -Tool identification -Touch trigger probe -Tool coding - Tool locking system -ball lock mechanism and contact pressure monitoring - Automatic tool changing system - types and benefits - tool magazine – sensors in CNC.

**UNIT IV - CNC PROGRAMMING FOR MACHINE TOOLS AND ROBOTS (14 hours)**

Machine axes identification - Primary, secondary and tertiary – Programming Types - Manual CNC programming - Milling programming fundamentals - Compensation and offset in milling -Fixed cycles in milling - repetitive programming - Loops, sub programs and macros(Robots) - Turning programming fundamentals - compensation and offset in turning -fixed cycles in turning. Computer assisted programming in APT -basic geometry definition -cutter motion definition -postprocessor statements -generation and execution of APT programs.

**UNIT V - MAINTENANCE OF CNC MACHINES (5 hours)**

Verification of technical specification and functional aspects, Verification during idle running & machine tool and the work piece accuracy - Installation of CNC machines –Maintenance features of CNC Machines – Preventive Maintenance, Other maintenance requirements.

**TEXT BOOKS**


1. Radhakrishnan.P, "*CNC Machine*", New Central Book Agency, 2000.
2. HMT Limited, "Mechatronics", Tata Mcgraw-Hill Publishing Co Ltd, 2002.
3. Groover.M.P, "*Automation, Production System and CIM*", Prentice Hall of India Pvt. Ltd, 2003.
4. Jonathan Lin.S.C, "*Computer Numerical Control (From Programming to Networking*)", Delmar Publishers Inc., 2000
5. Grahamt.Smith, "*Advanced Machining: The Handbook of Cutting Technology"*, IFS Publications Ltd., 1989

**REFERENCES**


1. Sehrawatt.M.S and Narang.J.S, "*CNC Machine*", Dhanpat Rai And Co, 2002.
2. Jayakumar.V and Mahendran.B, "*Computer Aided Manufacturing*", Lakshmi Publications, 2005.
3. Stenerson and Curran, "*Computer Numerical Control-Operation and Programming*", PHI Learning Pvt. Ltd., 2008. Steave Krar and Arthur Gill, CNC Technology and Programming, McGraw–Hill Publishing Company, 1990.
4. Thyer.G.E, "*Computer Numerical Control of Machine Tools*". Second Edition, B/H Newnes, 1993.


| **MH1104 CNC SYSTEMS: DESIGN AND APPLICATIONS** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | | x | | | | | x | |
| 2. | Mapping of instructional objectives with student outcome | 2 | 4 | | | 3 | | | | | 1 | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | -- | | -- | | -- | | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | | Computing sciences | |
| | | -- | | -- | | x | | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| **MH1105** | **ADVANCED ELECTRICAL DRIVES** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| | Total Contact Hours - 45 | **3** | **0** | **0** | **3** |
| | Prerequisite | | | | |
| | MH1002 | | | | |

**PURPOSE**

To introduce to the students the different types of drives, and their control in automation..

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Identify different types of drives used in automation |
| 2. | Know the control schemes for difficult applications |

**UNIT I - INTRODUCTION** **(9hours)**

Components of electrical Drives – electric machines, power converter, controllers - dynamics of
electric drive - torque equation - equivalent values of drive parameters- components of load
torques types of load - four quadrant operation of a motor

**UNIT II - DC MOTOR DRIVES** **(9hours)**

DC motors & their performance (shunt, series, compound, permanent magnet motor, universal motor, dc servomotor) – braking – regenerative, dynamic braking, plugging
converter control of dc motors –analysis of chopper controlled dc drives – sensing and feeds back elements – current and speed loops,– simulation of converter and chopper fed DC drive.

**UNIT III - INDUCTION MOTOR DRIVES** **(9hours)**

Induction Motor Drives-Mutilevel converter-fed induction motor drive-Utility friendly induction motor drive.

**UNIT IV - SYNCHRONOUS MOTOR DRIVES** **(9hours)**

Synchronous motor drives – adjustable frequency operation of synchronous motors – principles of synchronous motor control – voltage source inverter drive with open loop control - Cycloconverter-fed synchronous motor drive.

**UNIT V - SPECIAL ELECTRIC MACHINES** **(9hours)**

Permanent magnet synchronous motor-Brushless dc motor-Switched reluctance motor-Stepper motors and control.

**TEXT BOOKS**


1. Krishnan.R, "*Electric Motor Drives*: *Modeling, Analysis and Control*",Prentice Hall.
2. Bhimbra.P.S, "*Generalized Theory of Electric Machines*", Khanna Publication.
3. Bose.B.K, "*Modern Power Electronics and AC Drives*", Pearson Education.
4. Dubey.GK, *"Fundamentals of Electrical Drives"*, Narosa.
5. Nasar.S.A and Boldea, Electrical Drives, CRC press.


**REFERENCES**


1. Elsharkawi.M.A, "*Fundamentals of Electrical Drives*", Thomson Learning.
2. Murphy and Turnbill, "*Power Electronic Control of AC motors"*, Pergamon Press.
3. Vedam Subarhmanian, "*Electric Drives"*, TMH.

| MH1105 ADVANCED ELECTRICAL DRIVES | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mechatronics | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | | | | | | | | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | 2 | | | | | | | | | 1 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | -- | | -- | | -- | | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | | Computing sciences | |
| | | x | | -- | | -- | | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1106 | INDUSTRIAL ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 45 | 3 | 0 | 0 | 3 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To provide the basic features of Industrial Engineering like work study, material handling, production planning control, wages and incentives.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Analysis the various techniques and procedure for work study |
| 2. | Locate a sight and layout the plant |
| 3. | Design ergonomically jobs / work for higher productivity |
| 4. | Draw production planning and execution |
| 5. | Know the wages to be paid along with various incentives. |

**UNIT I - WORK MEASUREMENT AND WORK STUDY (8 hours)**

Work measurement, Techniques- Production study, Time study, Standard time- Rating factors- Work sampling Work study, Techniques- Human factors- Work study and productivity-method study, Techniques and procedures- charging Techniques- Motion economy principles- SIMO chart.

**UNIT II - PLANT LAYOUT AND MATERIAL HANDLING (11 hours)**

Plant location, site selection- Plant layout types, need, factors influencing the layout - Tools and techniques for developing layout, process chart, flow diagram, string diagram, Template and Scale models- Layout Planning procedure- Assembly line balancing. Material Handling, scope and importance- Types of material handling systems-factors influencing material handling- methods of material handling

**UNIT III - WORK DESIGN ERGONIMICS, PRODUCTION & PRODUCTIVITY (10 hours)**

Introduction to work design-Work design-for increased productivity, Introduction to job design- Effective job design-Environmental factors, organizational factors & behavioral factors. Ergonomics -Objectives' system approach of ergonomic model-Man-machine system.Production and productivity-Definition of production, function and type of production- Definition of productivity- Productivity measurement.

**UNIT IV - PRODUCTION PLANNING AND CONTROL (8 hours)**

Objectives of PPC- Functions of PPC- Aspects of product development and design- Process Planning-Principles of Standardization, specialization, Simplification-Group Technology- Optimum Batch size- ABC analysis- Value Engineering.

**UNIT V - WAGES AND INCENTIVES (8 hours)**

Wages and salary administration- Meaning principles- Techniques of wage fixation- Job evaluation- Merit rating- Methods of wage payment. Incentive scheme, Types, Advantages and disadvantages-Productivity base incentives, Case Example- Evaluation of incentive scheme.

**TEXT BOOKS**


1. Khanna.O.P, "*Industrial Engineering and Management",* Khanna publishers, New Delhi 1999.
2. Samuel Ellen, "*Elements of Production Planning and Control"*, McMillan and Co., 1971.
3. Kumar.B, "*Industrial Engineering"*, Khanna Publishers, New Delhi, 1998.


**REFERENCES**


1. James.M,Apple, "*principles of Layout and Material Handling"*, Ronald press, I 997.
2. Maynard .H.B, "*Industrial Engineering Hand Book"*, McGraw Hill Book Co, New York, 1997.

| MH1106 INDUSTRIAL ENGINEERING | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mechatronics | | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k | |
| | | x | | x | | x | | | | x | | x | |
| 2. | Mapping of instructional objectives with student outcome | 2 | | 3 | | 5 | | | | 1 | | 4 | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | | |
| | | -- | | -- | | -- | | | | x | | | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | Computing sciences | | | |
| | | -- | | -- | | x | | | | -- | | | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | | |

| MH1107 | PROCESS PLANNING AND COST ESTIMATION | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 45 | 3 | 0 | 0 | 3 |
| | Prerequisite | | | | |
| | MH1023 | | | | |

**PURPOSE**

To impart clear knowledge about process planning, costing and estimation of machining time.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Understand the basic concepts of process planning in enterprises. |
| 2. | Understand the different elements of cost of production including depreciation. |
| 3. | Estimate the cost involved for foundry and forging jobs. |
| 4. | Estimate the cost involved in welding and sheet metal shops. |
| 5. | Estimate the cost involved in machining operations. |

**UNIT I - PROCESS PLANNING (7 hours)**

Process Planning, selection and analysis - Manual, Experienced based planning - CAPP, Variant, Generative - Processes analysis - Types of Production.

**UNIT II - COSTING, ESTIMATION, COSTS AND EXPENSES (11 hours)**

Aims of costing and Estimation - Functions and Procedure - Introduction to Costs, Computing Material cost, Direct Labor cost, Analysis of Overhead costs, Factory expenses, Administrative expenses, Selling and Distributing expenses - Cost Ladder - Cost of Product - Depreciation - Analysis of Depreciation.

**UNIT III - ESITMATION OF COSTS IN FOUNDRY AND FORGING SHOPS (7hours)**

Estimation in Foundry shop - Pattern cost Casting cost - Illustrative examples. Estimation in Forging Shop - Losses in forging - Forging cost - Illustrative examples.

**UNIT IV - ESTIMATION OF COSTS IN FABRICATION SHOPS (7hours)**

Estimation in welding shop - Gas cutting - Electric Welding - Illustrative examples. Estimation in sheet metal shop - Shearing and Forming - Illustrative examples.

**UNIT V - ESITMATION OF MACHINING TIMES AND COSTS (13hours)**

Estimation of machining time for lathe operations - Estimation of machining time for drilling, boring, shaping, planning, milling and grinding operations - Illustrative examples.

**TEXT BOOKS**


1. Adithan.M.S and Pabla, "*Estimating and Costing*," Konark Publishers Pvt., Ltd, 1989.
2. Chitale.A.K and Gupta.R.C, "*Product Design and manufacturing"*, Prentice Hall Pvt. Ltd., 1997.
3. Nanua Singh, "*System Approach to Computer Integrated Design and Manufacturing"*, John Wiley & sons, Inc., 1996.
4. Joseph G. Monks., "*Operations Management, Theory and Problems"*, McGraw Hill Book Company, 1982.


**REFERENCES**


1. Narang.G.B.S and Kumar.V, "*Production and Planning"*, Khanna Publishers, 1995.
2. Banga.T.R, and Sharma .S.C, "*Estimating and Costing"*, Khanna publishers, 1986.


| **MH1107 PROCESS PLANNING AND COST ESTIMATION** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | | | | x | | | x | | | |
| 2. | Mapping of instructional objectives with student outcome | 3,4,5 | | | | 2 | | | 1 | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | -- | | -- | | -- | | | | x | | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | Computing sciences | | |
| | | -- | | -- | | x | | | | -- | | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1108 | FACTORY AUTOMATION | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 45 | 3 | 0 | 0 | 3 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To expose the learner to the fundamentals of automating the factory operations and their elements with the computer integrated manufacturing support systems

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Many of the automation fundamentals and control techniques |
| 2. | Material handling technologies |
| 3. | Manufacturing systems |
| 4. | Manufacturing support systems |

**UNIT I - PRODUCTION OPERATIONS AND AUTOMATION STRATEGIES (9 hours)**

Automation – Definition, levels, need, strategies principles. Types of production, functions in manufacturing, plant layout – types, organization and information processing in manufacturing, Types of flow lines, methods of transport, transfer mechanisms, ASRS system.

**UNIT II - GROUP TECHNOLOGY & FLEXIBLE MANUFACTRUING SYSTEMS (9 hours)**

Group Technology – Introduction, part families, parts classification and coding system – OPITZ and MI CLASS system. Production flow analysis, cellular manufacturing – advantages, disadvantages and applications.

FMS – Introduction, workstations, scope, components, types, benefits, typical FMS layout configuration, function of FMS computer Control System, FMS data files.

**UNIT III - COMPUTER CONTROL SYSTEMS & AUTOMATED PROCESS (9 hours)**

Computer control systems – Introduction, Architecture, FactorCommunication, Local areaNetworks – Characteristics, factory networks, open system interconnection model. Network to network interconnections, manufacturing automation protocol, Data Base Management system – Introduction. Computer aided shop floor control. Automated process planning –introduction, structure, information requirement, CAPP, application, programs in CAPP.

**UNIT IV - COMPUTER CONTROLLED MACHINES & MATERIAL HANDLING SYSTEMS (9 hours)**

NC machines – Part Programming, CNC, DNC, Adaptive Control, Pallets & Fixtures, Machine centers, Automated inspection systems. Material handling systems – Introduction, Conveyors, Industrial Robots, Automated Guided Vehicles.

**UNIT V - COMPUTER INTEGRATED MANUFACTURING (9 hours)**

CIM – Introduction, definition, scope, benefits, elements, CIM cycle, organization and information processing in manufacturing. Introduction to Jurt-in-Time (JIT), Kanban System, Business Process Re-engineering (BPR), Materials requirement planning (MRP), Manufacturing Resource Planning (MRP II), Enterprise Resource Planning (ERP), Supply Chain Management (SCM).

**TEXT BOOKS**


1. Mikell Groover .P, Automation, "*Production Systems and Computer Integrated Manufacturing*", Prentice Hall of India Pvt. Ltd., 2001.
2. Viswanathan .N, Navahari .Y, "*Performance Modeling of Automated Manufacturing Systems*", Prentice Hall of India Pvt. Ltd., 1998.
3. Rao .P.N, "*Computer Aided Manufacturing"*, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2001.


**REFERENCES**


1. Kant Vajpayee .S, "*Principles of Computer Integrated Manufacturing"*, Prentice Hall of India Pvt. Ltd., 1995.
2. Radhakrishnan .P, Subramaniyan .S, "*CAD/CAM/CIM"*, New Age International Limited, 1994.


| MH1108 FACTORY AUTOMATION | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mechatronics | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | | | | | | | | x | x | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | | | | | | | | 4 | 3 | 2 |
| 3. | Category | General (G) | | Basic Sciences(B) | | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | |
| | | -- | | -- | | | -- | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | | Mechanical Engineering | | | | Computing sciences | |
| | | -- | | -- | | | x | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| | DIGITAL SIGNAL PROCESSING | L | T | P | C |
|---|---|---|---|---|---|
| **MH1109** | Total Contact Hours - 45 | **3** | **0** | **0** | **3** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To introduce students to the basics of Signal and Systems, Digital Signal Processing, and DSP processor.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To enable students to understand the notion of representing different types of signals and systems mathematically and analyzing them. |
| 2. | To equip students with the knowledge of various mathematical transforms and their applications |
| 3. | To make students familiar with design of digital filters and Implement the same using various structures |

**UNIT I - SIGNALS AND SYSTEMS (9 hours)**

Introduction to analog, Discrete and Digital signals, Classification of continuous and Discrete Time signals, Elementary signals, Basic operations on signals. Classification of systems, Different realizations of discrete-time systems, Convolution and correlation.

**UNIT II - TRANSFORMS (9 hours)**

Discrete Fourier Transform and its properties, Fast Fourier Transform, Z-transform and its properties, Inverse Z-transform using partial fraction and residue methods, Comparison of various transforms and their appropriate use.

**UNIT III - FIR AND IIR FILTERS (10 hours)**

Design of analog filters using Butterworth approximation, Frequency transformation, Design of digital IIR filters-Impulse Invariant and Bilinear transformation methods. Design of digital FIR filters - Frequency sampling and windowing methods, Comparison of FIR and IIR filters.
Realization of filters.

**UNIT IV - ISSUES AND LIMITATIONS IN IMPLEMENTATION OF DSP (7 hours)**

Representation of Numbers in Digital System - Fixed and Floating point Numbers, Finite word length effects, Errors due to quantization, rounding and truncation, Limit cycle oscillation.

**UNIT V - DIGITAL SIGNAL PROCESSOR (10 hours)**

Introduction to TMS320C54 Processor architecture, Features of digital signal processor, Central processing unit, MAC Unit, CSSU, Memory, Addressing modes, Pipelining. Basic programs for DSP using assembly language.

**TEXT BOOKS**


1. Rabiner .L.R and Gold.C.B, "*Theory and Applications of Digital Signal Processing"*, Prentice Hall India, 1987.
2. Venkataramani.B, Bhaskar.M, "*Digital Signal Processors, Architecture, Programming and Application*", Tata McGraw Hill, New Delhi, 2003.


**REFERENCES**


1. John G. Proakis and Dimitris C. Manolakis, "*Digital Signal Processing Principles, Algorithms and Applications"*, Prentice Hall of India, 3rd edition, 1996.
2. Alan V. Oppenheim, Ronald W. Schaffer, "*Discrete Time Signal Processing"*, PHI, 1999.


| MH1109 DIGITAL SIGNAL PROCESSING | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | | | | x | | | | | | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | | | | 2 | | | | | | 3 |
| 3. | Category | General (G) | | Basic Sciences(B) | | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) |
| | | -- | | -- | | | -- | | | | | x |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | | Mechanical Engineering | | | | | Computing sciences |
| | | -- | | x | | | -- | | | | | -- |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1110 | DIGITAL ELECTRONICS | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 45 | **3** | **0** | **0** | **3** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To learn the basic methods for the design of digital circuits and provide the fundamental concepts used in the design of digital systems.

| INSTRUCTIONAL OBJECTIVES | |
|---|---|
| 1. | Understand the concepts of digital logic circuits. |
| 2. | Analyze the operation of various design of combinational circuits. |
| 3. | Analyze the operation of various design of synchronous and asynchronous sequential circuits. |
| 4. | Apply the concepts of memory, programmable logic and digital integrated circuits. |

**UNIT I - NUMBER SYSTEMS - BOOLEAN ALGEBRA AND LOGIC GATES (9hours)**

Number Systems - Boolean algebra - Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) -Karnaugh Map method - four and five variable map methods -Products of Sums Simplification - Don't care conditions. Quine - McClucskey Method.

**Logic Gates:** AND, OR, NOT, NAND, NOR, Exclusive–OR and Exclusive–NORImplementations of Logic Functions using gates, NAND–NOR implementations – Multi level gate implementations- Multi output gate implementations. TTL and CMOS Logic and their characteristics–Tristategates

**UNIT II - COMBINATIONAL LOGIC (9hours)**

Two level implementation - NAND & NOR Implementations - EXOR Functions. Combinational Circuits - Analysis and design procedure - Half adder – Full Adder – Half subtractor – Full subtractor - Decimal Adder - Binary Multiplier - Magnitude Comparator – code converters - Decoders - Encoders - Multiplexers.

**UNIT III - SEQUENTIAL LOGIC (9hours)**

Sequential circuits - Latches - Flip-Flops - SR, JK, D, T, and Master-Slave – Characteristic table and equation–Application table – Edge triggering – Level Triggering – Realization of one flip flop using other flip flops –Analysis of Clocked Sequential Circuits - State Reduction and Assignment - Design Procedure.Registers - Shift Registers – Asynchronous Ripple or serial counter – Asynchronous Up/Down counter - Ripple counters - Synchronous Counters - Synchronous Up/Down counters – Programmable counters – Design of Synchronous counters: state diagram- State table –State minimization –State assignment - Excitation table and maps-Circuit implementation.

**UNIT IV - MEMORY DEVICES (9hours)**

Memory - Introduction - Memory Decoding.Programmable Logic Devices – Programmable Logic Array (PLA) - Programmable Array Logic (PAL) - FieldProgrammable Gate Arrays (FPGA) - Implementation of combinational logic circuits using ROM, PLA, PAL

**UNIT V - DIGITAL INTEGRATED CIRCUITS AND PROGRAMMABLE LOGIC**

**(9hours)**

Introduction - Special Characteristics - Bipolar-Transistor Characteristics - RTL and DTL Circuits - TTL - ECL - MOS - CMOS - CMOS Transmission Gate Circuits - Programmable Logic Array - Programmable Array Logic - Sequential Programmable Devices.

**TEXT BOOKS**


1. Morris.M, "*Mano, Digital Design"*, 3rd Edition, Prentice Hall of India Pvt. Ltd., 2003 / Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.
2. Salivahanan.S and Arivazhagan.S, "*Digital Circuits and Design"*, 3rd Edition, Vikas Publishing House Pvt. Ltd, New Delhi, 2006.
3. John F.Wakerly, "*Digital Design, Fourth Edition*", Pearson/PHI, 2006.
4. John.M Yarbrough, "*Digital Logic Applications and Design"*, Thomson Learning, 2002.
5. Charles H.Roth, "*Fundamentals of Logic Design, Thomson Learning"*, 2003.


**REFERENCES**


1. Donald P.Leach and Albert Paul Malvino, "*Digital Principles and Applications"*, 6th Edition, TMH, 2003.
2. William H. Gothmann, "*Digital Electronics"*, 2nd Edition, PHI, 1982.
3. Thomas L. Floyd, "*Digital Fundamentals"*, 8th Edition, Pearson Education Inc, New Delhi, 2003.
4. Donald D.Givone, "*Digital Principles and Design"*, TMH, 2003.


| MH1110 DIGITAL ELECTRONICS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mechatronics | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | | x | | | | | | |
| 2. | Mapping of instructional objectives with student outcome | 1 | 2,3 | | | 4 | | | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | -- | | -- | | -- | | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | | Computing sciences | |
| | | -- | | x | | -- | | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1111 | ADVANCED CONTROL ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours – 45 | 3 | 0 | 0 | 3 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To familiarize the students with concepts related to the analysis and design of controllers.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To understand the concepts of cascade and feedback compensation. |
| 2. | To understand and perform time domain and frequency domain design of control systems for performance and stability requirements. |
| 3. | To understand modern control theory and design in State – Space. |
| 4. | To understand the non-linear dynamics and control. |

**UNIT I - COMPENSATOR DESIGN (9hours)**

Introduction to controller design - Effect of adding a pole and zero to a system - compensating networks types; Cascade and feedback - Design of cascade lead and cascade lag compensators in time domain and frequency domain - P, PI, PD and PID controllers design.

**UNIT II - DISCRETE TIME CONTROL SYSTEMS (9hours)**

Sampled data control systems - functional elements - sampling process -z-transformers - properties - inverse z-transformers - response between samples - modified z-transformers - ZOH and First order Hold process - mapping between s and z planes - pulse transfer functions - step response - stability analysis - Jury's stability test.

**UNIT III - MODERN CONTROL THEORY (9hours)**

Concepts of State, State variable and State space model - State space representation of linear continuous time systems using physical variables, phase variables and canonical variables, diagonalization - State space representation of discrete time systems - Solution of state equations - computation of state transition matrix.

**UNIT IV - DESIGN IN STATE SPACE (9hours)**

Concepts of Controllability and Observability - linear time invariant systems - pole placement by state feedback-Ackeman's Formula-Observers - Full order and reduced order.

**UNIT V - NON-LINEAR CONTROL THEORY** **(9hours)**

Properties of non-linear systems - common physical non-linearities - dead zone, relay, and saturation nonlinearities - phase plane method-singular points-phase trajectories - Liapunov's stability criterion.

**TEXT BOOKS**


1. Norman S Nise, "*Control Systems Engineering"*, 5th edition, Wiley publications, 2009.
2. Madan Gopal, Nagrath.I.J, "*Control Systems Engineering"*, 5th edition, New Age International, 2011.
3. Benjamin C Kuo, Farid Golnaraghi, "*Automatic Control Systems"*, 8th edition, Wiley Publications, 2007.


**REFERENCES**


1. Richard C. Dorf, Robert H. Bishop, "*Modern Control systems"*, 11th edition, Pearson, 2008.
2. Katsuhiko Ogata, "*Modern Control Engineering"*, 5th edition, PHI Learning, 2010.


| **MH1111 ADVANCED CONTROL ENGINEERING** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | | x | | | | | x | |
| 2. | Mapping of instructional objectives with student outcome | 2 | 4 | | | 3 | | | | | 1 | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | -- | | -- | | -- | | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | | Computing sciences | |
| | | -- | | x | | -- | | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1112 | CONSUMER ELECTRONICS | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 45 | 3 | 0 | 0 | 3 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To gain knowledge in various consumer electronics circuits in home appliances and application.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | To understand the operation of audio, video systems. |
| 2. | To learn the operation of various memory devices. |
| 3. | To understand the performance of various switching systems. |
| 4. | Able to conduct experiments on electrical machines and analyze the experimental data. |

**UNIT I - AUDIO SYSTEM (10 hours)**

Hi-Fi systems, stereophonic sound system, public address systems, Acoustics, Quadraphonic sound systems, Graphics Equalizer, Electronic tuning, Digital sound recording on tape and disc..

**UNIT II - VIDEO SYSTEMS (4 hours)**

B & W TV, colour TV and HD TV systems, Electric cameras, VCR, VCP, Block diagram and principles of working of cable TV and DTH, cable TV using internet.

**UNIT III - MEMORY DEVICES (12 hours)**

CD systems, Memory diskettes, Discs and drums vide monitoring audio, video recording media & Systems.

**UNIT IV - SWITCHING SYSTEMS (10 hours)**

Dolby noise reduction digital and analog recording. Switching Systems: Switching systems for telephone exchange, PAB EPRABX, modular telephones, Telephone message recording concepts, remix controlled systems.

**UNIT V - HOME APPLIANCES (9 hours)**

Electronic toys, microwave oven, Refrigerators, washing machines, calculator, data organizers.

**TEXT BOOKS**

1. Gulati.R.R, Monochrome and color television, New age publisher.
2. Encyclopedia of video & TV / Focal press.

**REFERENCES**


1. Complete Satellite & cable Television R.R Gulati New age International Publisher.
2. Handbook of Electronics & Telecommunication.


| MH1112 CONSUMER ELECTRONICS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mechatronics | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | | x | | | | | x | |
| 2. | Mapping of instructional objectives with student outcome | 2 | 4 | | | 3 | | | | | 1 | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | -- | | -- | | -- | | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | | Computing sciences | |
| | | -- | | x | | -- | | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1113 | INTELLIGENT CONTROLLERS | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 45 | 3 | 0 | 0 | 3 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

This course is designed to make the students familiarized with the existing intelligent controllers and their applications.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Understand the Concepts of knowledge acquisition |
| 2. | Understand the Fundamental of expert system, fuzzy logic and neural controllers |
| 3. | Designing case studies for various applications, using Expert System |

**UNIT I - INTRODUCTION** **(9 hours)**

Approaches to intelligent control. Architecture for intelligent control. Symbolic reasoning system, rule-based systems, the AI approach. Knowledge representation. Expert systems.

**UNIT II - KNOWLEDGE ACQUISITION & EXPERT SYSTEM TOOLS (9 hours)**

Knowledge representation and formal logic-knowledge engineer - knowledge acquisition techniques - concept formalization - knowledge representation development - knowledge acquisition for core problem knowledge acquisition without knowledge engineers.

Problem solving start engines - languages for expert system development - expert system shells - LISP machines - PC - based expert system tools.

**UNIT III - ARTIFICIAL NEURAL NETWORKS (9 hours)**

Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron. Learning and Training the neural network. Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations. Hopfield network, Self-organizing network and Recurrent network. Neural Network based controller

**UNIT IV - GENETIC ALGORITHM (9 hours)**

Basic concept of Genetic algorithm and detail algorithmic steps, adjustment of free parameters.Solution of typical control problems using genetic algorithm. Concept on some other searchtechniques like tabu search and ant-colony search techniques for solving optimization problems.

**UNIT V - FUZZY LOGIC SYSTEM (9 hours)**

Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning.Introduction to fuzzy logic modeling and control. Fuzzification, inferencing and defuzzification. Fuzzy knowledge and rule bases. Fuzzy modeling and control schemes for nonlinear systems. Selforganizing fuzzy logic control. Fuzzy logic control for nonlinear time-delay system.

**TEXT BOOKS**


1. Rolston.D.W, "*Principlesof Artificial and Expert Systems Development"*, McGraw Hill Book Company, International Edition
2. Kosko.B, "*Neural Networks and Fuzzy Systems"*, Prentice Hall of India Pvt. Ltd., 1994
3. Goldberg.D.E, "*Genetic algorithms in Search, Optimization and Machinelearning"*, Addison Wesley, 1989.
4. Klir.G.J and Folger.T.A, "*Fuzzy Sets, and Information*", Prentice Hall.

**REFERENCES**


1. James A.Freeman, David M. Skapura, "*Neural Networks Algirithms*", Applications and programming Techniques, Addition Wesley Publishing Company 1992.
2. Zimmerman.H.J, "Fuzzy set theory-and its Applications"-Kluwer Academic Publishers, 1994.


| MH 1113 INTELLIGENT CONTROLLERS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | | x | | | | | | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | 2 | | | 3 | | | | | | 2 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | -- | | -- | | -- | | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | | Mechatronics Engineering | |
| | | -- | | x | | -- | | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1114 | ROBOTICS ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 45 | **3** | **0** | **0** | **3** |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To impart knowledge in the area of mechanical design, sensors and programming ofindustrial robots.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Understand the components of Robot fundamentals |
| 2. | Analyze various sensors and actuators for robotics application |
| 3. | Able to design and develop robot for various applications |

**UNIT I - INTRODUCTION TO ROBOTICS** **(8 hours)**

RIA definition - History of Robotics - Anatomy - Classifications based on work envelope - Work Volume- Spatial resolution - Accuracy and Repeatability of Robot- co-ordinate system- Degrees of freedom.

**UNIT II - COMPONENTS OF ROBOTICS (9 hours)**

Linkage and Joints of manipulators- drive systems- feedback devices- end effectors – grippers- wrist configurations- motion - roll - Pitch – Yaw- sensor areas for robots - contact and non contact sensors - Machine vision.

**UNIT III - INTRODUCTION TO MATRIX FORMULATIONS (9 hours)**

Descriptions - Positions - Orientations, frames, Mappings - Changing descriptions from frame to frame. Transformation arithmetic - translations - rotations - transformations - transform equations - rotation matrix- transformation of free vectors.-Introduction to manipulations - Forward Kinematics and inverse Kinematics.

**UNIT IV - MOTION PLANNING, CONTROL AND PROGRAMMING (10 hours)**

Joint and Cartesian space trajectory planning and generation-Independent joint PID control, Control of a multi-link manipulator- Non-linear model based control schemes- Control of constrained manipulators- Cartesian control- Force control and hybrid position/force control.

Methods of Robot Programming -1st and 2nd generation languages - structure - Constants, Variables data objects - motion commands - end effectors and Sensor commands- Teach Pendant- motion interpolation - WAIT - SIGNAL - DELAY Commands - Branching - capabilities and Limitations

**UNIT V - ROBOT APPLICATIONS (9 hours)**

Robot cell layout - work cell design and control- robot cycle time analysis- Applications: Machining - Welding - Assembly - Material Handling - Loading and Unloading in hostile and remote environment.Robots in surgery- space and underwater robot.

**TEXT BOOKS**


1. John J. Craig, "*Introduction to Robotics"*, Addison Wesley, ISE 1999.
2. Mikell P. Groover, "*Industrial Robotics"*, McGraw Hill, 2nd Edition, 1989.
3. Deb.S.R, "*Robotics Technology and Flexible Automation"*, Tata McGraw - Hill Publishing Company Limited, 1994.
4. Arthor Critchlow, "*Introduction to Robotics*," Macmillan, 1985.


**REFERENCES**


1. Mohsen Shahinpoor, "*A Robot Engineering Text Book"*, Harper and Row, 1987.
2. Francis N. Nagy, "*Engineering Foundations of Robotics"*, Addison Wesley, 1987.

| MH1114 ROBOTICS ENGINEERING | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mechatronics | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | | | | | | x | | |
| 2. | Mapping of instructional objectives with student outcome | 1 | 2 | | | | | | | 3 | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | -- | | -- | | -- | | | | x | | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | Computing sciences | | |
| | | -- | | -- | | x | | | | -- | | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1115 | AUTOMOTIVE ELECTRONICS | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 45 | 3 | 0 | 0 | 3 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To provide knowledge about application of electronics in Automobile engineering.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Understand the Fundamentals of automotive Systems |
| 2. | Analyze the sensors in to various automobile subsystems |
| 3. | Apply electronics into automobile systems |

**UNIT I - AUTOMOTIVE SYSTEM FUNDAMENTALS (9 hours)**

Evolution of automotive electronics-major automotive system components: Engine-Ignition system-Ignition timing-drivetrain-Suspension-Brakes-Steering system- Components of electronic engine management system-Solenoids-stepper motors-relays.

**UNIT II - SENSORS AND INSTRUMENTATION SYSTEMS (9 hours)**

Introduction- types of sensors: oxygen sensors, Crank angle position sensors - Fuel metering, vehicle speed sensor and detonation sensor- flow sensor- Throttle position sensors--fuel quantity measurement-coolant temperature measurement-oil pressure measurement-vehicle speed measurement.

**UNIT III - ELECTRONIC FUEL INJECTION AND IGNITION SYSTEMS (8 hours)**

Introduction- Feedback carburetor systems (FBC)- Throttle body injection and multi point fuel injection system- Types of solid-state ignition systems and their principle of operation- Electronic spark timing control.

**UNIT IV - DIGITAL ENGINE CONTROL SYSTEM (9 hours)**

Open loop and closed loop control systems -Engine cranking and warm up control -Acceleration enrichment - Deceleration leaning and idle speed control. Distributor less ignition -Integrated engine control system- Exhaust emission control engineering.

**UNIT V - VEHICLE MOTION CONTROL AND STABILIZATION SYSTEMS (10 hours)**

Introduction to Vehicle motion control - Adaptive cruise control-Electronic transmission control- Vehicle stabilization system - Antilock braking system-Traction control system- Electronic stability program-low tire pressure warning system- Onboard diagnosis system.

**TEXT BOOKS**


1. William B.Riddens, "*Understanding Automotive Electronics"*, 5th Edition, Butterworth, Heinemann Woburn, 1998.
2. Tom Weather Jr and ClandC.Hunter, "*Automotive Computers and Control system*", Prentice Hall Inc., New Jersey.
3. *"BOSCH, Automotive"* Handbook, 6th Edition, Bentley publishers
4. Young.A.P and Griffths.L, "*Automobile Electrical Equipment, English Language"*, Book Society and New Press.


**REFERENCE BOOKS**


1. Crouse.W.H, "*Automobile Electrical equipment*", McGraw Hill Book Co Inc., New York, 1955.
2. Robert N Brady, "*Automotive Computers and Digital Instrumentation*", A Reston Book. Prentice Hall, Eagle Wood Cliffs, New Jersey, 1988.
3. Bechtold, "*Understanding Automotive Electronics"*, SAE, 1998.

| MH1115 AUTOMOTIVE ELECTRONICS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mechatronics | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | | x | x | | | | | | | |
| 2. | Mapping of instructional objectives with student outcome | 1 | | 2 | 3 | | | | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | | Professional Subjects(P) | |
| | | -- | | -- | | -- | | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | | Computing sciences | |
| | | -- | | -- | | x | | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1116 | MICRO ELECTRO MECHANICAL SYSTEMS | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 45 | 3 | 0 | 0 | 3 |
| | Prerequisite | | | | |
| | Nil | | | | |

**PURPOSE**

To inspire the students to expect to the trends in manufacturing micro components and measuring systems to nanoscale.

**INSTRUCTIONAL OBJECTIVES**

1. To expose the students to the evolution of micro electromechanical systems, to the various fabrication techniques and to make students to be award of micro actuators.
2. Also to impart knowledge to the students about nano materials and various nano measurements techniques.

**UNIT I - INTRODUCTION TO MICROSYSTEMS (7 hours)**

Overview of microelectronics manufacture and Microsystems technology. Definition- MEMS materials. Laws of scaling. The multi disciplinary nature of MEMS. Survey of materials central to micro engineering. Applications of MEMS in various industries.

**UNIT II - MICRO SENSORS & ACTUATORS (9 hours)**

Working principle of Microsystems - micro actuation techniques - micro sensors-types -Microactuators – types – micropump – micromotors – micro – valves – microgrippers -microaccelerometers.

**UNIT III - FABRICATION PROCESS (9 hours)**

Substrates-single crystal silicon wafer formation-Photolithography-Ion implantation-Diffusion –Oxidation-CVD-Physical vapor deposition-Deposition by epitaxy-etching process.

**UNIT IV - MICRO SYSTEM MANUFACTURING (10 hours)**

Bulk Micro manufacturing- surface micro machining –LIGA-SLIGA-Micro system packaging materials -die level-device level-system level-packaging techniques-die preparation-surfacebonding-wire bonding-sealing.

**UNIT V - MICROSYSTEMS DESIGN AND PACKAGING (9 hours)**

Design considerations, Mechanical Design, Process design, Realization of MEMS components using intellisuite. Micro system packaging, Packing Technologies, Assembly of Microsystems, Reliability in MEMS.

**TEXT BOOKS**


1. Mohamed Gad – el – Hak, "*MEMS Handbook"*, CRC Press, 2002.
2. Rai-Choudhury P. *MEMS and MOEMS Technology and Applications*, PHI Learning Private Limited, 2009.
3. Sabrie Solomon, "*Sensors Handbook*," Mc Graw Hill, 1998.
4. Marc F Madou, "*Fundamentals of Micro Fabricatio"*, CRC Press, 2nd Edition, 2002.


**REFERENCES**


1. Francis E.H. Tay and Choong.W.O, "*Micro fluidics and Bio mems application"*, IEEE Press New York, 1997.
2. Trimmer William S., Ed., "*Micromachanics and MEMS"*, IEEE Press New York, 1997.
3. Maluf, Nadim, "*An introduction to Micro electro mechanical Systems Engineering"*, AR Tech house, Boston 2000.
4. Julian W.Gardner,Vijay K.Varadan,Osama O.Awadel Karim, "*Microsensors MEMS and SmartDevices"*, John Wiby & sons Ltd.,2001.

| MH1116 MICRO ELECTRO MECHANICAL SYSTEMS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Designed by | | Department of Mechatronics | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | | x | x | x | | | | x | | x |
| 2. | Mapping of instructional objectives with student outcome | 1 | | 2 | 1 | 2 | | | | 2 | | 2 |
| 3. | Category | General (G) | | Basic Sciences(B) | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | | |
| | | -- | | -- | | -- | | | | x | | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | Mechanical Engineering | | | | Computing sciences | | |
| | | -- | | -- | | x | | | | -- | | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |

| MH1117 | INDUSTRIAL ELECTRONICS | L | T | P | C |
|---|---|---|---|---|---|
| | Total Contact Hours - 45 | 3 | 0 | 0 | 3 |
| | Prerequisite | | | | |
| | MH1032 | | | | |

**PURPOSE**

To introduce the students the application of electronics in industrial environment.

**INSTRUCTIONAL OBJECTIVES**

| | |
|---|---|
| 1. | Understand the use of Basic electronic devices, their circuits |
| 2. | Analyze and apply the principles of various devices to bring about faster and more accurate responses in industrial plants |
| 3. | Analyze the operation of motors and regulators. |

**UNIT I - INTRODUCTION TO POWER DEVICES (9 hours)**

Concept of thyristor technology, ratings, symbol, characteristics, turn on methods and turn off methods of thyristors, diacs, LASCR, Traics and MOSFETS,IGBT. International power dissipation and need for heat sinks for these devices, di/dt & dv/dt protection for SCR.

**UNIT II - REGULATED POWER SUPPLY (9 hours)**

Concept of regulation. Block diagram of a regulated power supply. Major specifications of a regulated power supply and their significance (line and load regulation, output ripple and transients)-Principles of series and shunt regulators-Concepts of foldback limiting, short circuit and overload protection .Three terminal voltage regulator ICs (positive, negative and variable applications) - Basic working principles of a switched mode power supply - concept of floating and grounded power supplies and their interconnections to obtain multiple output supplies. UPS-Online and Offline UPS.

**UNIT III - ELECTRONIC CONTROL OF HEATING AND WELDING (9 hours)**

Resistance heating. Induction heating. Electronic heaters employed for Induction heating. Thyristorised supplies used in Induction Furnances. Dielectric heating. Electric Welding.

**UNIT IV - APPLICATION OF POWER SWITCHING DEVICES (9 hours)**

Principle of operation and working of following switching circuits - Automatic battery charger - Emergency light - Time delay relay circuit - Temperature control - Electronic Timers-Digital Counters.

**UNIT V - SOLID STATE CONTROL OF DC AND AC MOTORS (9 hours)**

Speed control of Dc and small DC motors -Speed control of DC shunt motor using thyristor technology - Over-voltage protection and over load protection of DC motors. Speed control of single phase induction motor, three phase induction motor, and universal series motor. Traic as a starter for single phase induction motors.

**TEXT BOOKS**


1. Dr.Bhimbra.P.S, "*Power Electronics"* Khanna Publishers, 2001.
2. Mithal.G.K,"Industrial Electronics", Khanna Publishers, Delhi, 2000.
3. Dr.Bhattacharya.SK andChattertji.S, "*Industrial electronics and control"*, Tata McGraw Hill New Delhi.
4. PC Sen, "*Power Electronics".*


**REFERENCES**


1. Muhammad H. Rashid, "*Power Electronics - Circuits, Devices & Applications"*, Prentice Hall of India, 3rd Edition, 2004.
2. Chute.G.M,"*Electronics in Industry*", McGraw Hill Ltd, Tokyo,1995.
3. Petruzulla.F.D,"*Industrial Electronics", McGraw* Hill, Singapore, 1996.

| MH1117 INDUSTRIAL ELECTRONICS | | | | | | | | | | | | |
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| **Course Designed by** | | **Department of Mechatronics** | | | | | | | | | | |
| 1. | Student Outcome | a | b | c | d | e | f | g | h | i | j | k |
| | | x | x | | x | x | | | | | | |
| 2. | Mapping of instructional objectives with student outcome | 2 | 2 | | 1 | 2,3 | | | | | | |
| 3. | Category | General (G) | | Basic Sciences(B) | | | Engineering Sciences and Technical Arts(E) | | | | Professional Subjects(P) | |
| | | -- | | -- | | | -- | | | | x | |
| 4. | Broad Area | Electrical Engineering | | Electronics Engineering | | | Mechanical Engineering | | | | Computing sciences | |
| | | -- | | x | | | -- | | | | -- | |
| 5. | Approval | 23rd Meeting of Academic Council, May 2013 | | | | | | | | | | |