SCHEME & SYLLABUS

for

B.TECH. COURSE

in

Electronics and Communication Engineering

(w.e.f. Session 2018-19)

DEPARTMENT OF ELECTRONICS ENGINEERING

YMCA UNIVERSITY OF SCIENCE AND TECHNOLOGY

FARIDABAD
VISION

YMCA University of Science and Technology aspires to be a nationally and internationally acclaimed leader in technical and higher education in all spheres which transforms the life of students through integration of teaching, research and character building.

MISSION

- To contribute to the development of science and technology by synthesizing teaching, research and creative activities.
- To provide an enviable research environment and state-of-the-art technological exposure to its scholars.
- To develop human potential to its fullest extent and make them emerge as world class leaders in their professions and enthuse them towards their social responsibilities.
Department of Electronics Engineering

VISION

To be a Centre of Excellence for producing high quality engineers and scientists capable of providing sustainable solutions to complex problems and promoting cost effective indigenous technology in the area of Electronics, Communication & Control Engineering for Industry, Research Organizations, Academia and all sections of society.

MISSION

• To frame a well-balanced curriculum with an emphasis on basic theoretical knowledge as well the requirements of the industry.

• To motivate students to develop innovative solutions to the existing problems for betterment of the society.

• Collaboration with the industry, research establishments and other academic institutions to bolster the research and development activities.

• To provide infrastructure and financial support for culmination of novel ideas into useful prototypes.

• To promote research in emerging and interdisciplinary areas and act as a facilitator for knowledge generation and dissemination through Research, Institute - Industry and Institute-Institute interaction.
About Electronics Engineering Department

YMCA University of Science & Technology, Faridabad established in 2009, formerly known as YMCA Institute of Engineering, Faridabad, established in year 1969 as a Joint Venture of Govt. of Haryana and National Council of YMCA of India with active assistance from overseas agencies of West Germany to produce highly practical oriented personnel in specialized field of engineering to meet specific technical manpower requirement of industries. Electronics Engineering Department started in 1969 and has been conducting B.Tech. Courses in Electronics Instrumentation and Control and Electronics and Communication Engineering of 4-Years duration since 1997. Students are admitted through centralized counseling nominated by state govt. in 1st Year and 2nd year through lateral entry entrance test. Besides under graduate degree courses, it is also running M.Tech. Courses in VLSI, Instrumentation and Electronics & Communication. Department of Electronics Engineering is also running Ph.D. Programme. All courses are duly approved by AICTE/ UGC. The Electronics Engineering Department has been well known for its track record of employment of the pass out students since its inception. The Department has good infrastructure consisting of 11 laboratories, 10 Lecture Halls and 1 Conference Room beside 6 workshops. It has excellent faculty with 2 Professors, 4 Associate Professors and 23 Assistant Professors. At present, 8 faculty members are PhD in various specializations. The various syllabi of UG/PG courses have been prepared with active participation from Industry. The Department is organizing number of expert lectures from industry experts for students in every semester. Seven month training is mandatory for every B.Tech. Students. Emphasis has been given on project work and workshop for skill enhancement of students. Choice based credit system allows students to study the subjects of his/her choice from a number of elective courses/audit courses.
PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

1. To prepare students to excel in undergraduate programmes and succeed in industry/technical profession through global, rigorous education.

2. To provide students with a solid foundation in mathematical, scientific and engineering fundamentals required to solve engineering problems and also to pursue higher studies.

3. To train students with good scientific and engineering breadth so as to comprehend, analyze, design, and create novel products and solutions for the real life problems.

4. To provide students with foundation in skill development required to design, develop and fabricate engineering products.

5. To inculcate in students professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach, and an ability to relate engineering issues to broader social context, additional courses with regard to physical, psychological and career growth.

6. To provide students with an academic environment aware of excellence, outstanding leadership, written ethical codes and guidelines with moral values, and the life-long learning needed for successful professional career.
PROGRAMME OUTCOMES (POs)

Engineering Graduates will be able to:

1) **Engineering knowledge:** Apply knowledge of mathematics, science, engineering fundamentals, and Electronics Engineering to the solution of engineering problems.

2) **Problem analysis:** Identify, formulate, review literature and analyze Electronics Engineering problems to design, conduct experiments, analyze data and interpret data.

3) **Design /development of solutions:** Design solution for Electronics Engineering problems and design system component of processes that meet the desired needs with appropriate consideration for the public health and safety, and the cultural, societal and the environmental considerations.

4) **Conduct investigations of complex problems:** Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions in Electronics Engineering.

5) **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to Electronics Engineering activities with an understanding of the limitations.

6) **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to mechanical engineering practice.

7) **Environment and sustainability:** Understand the impact of the Electronics Engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.

8) **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the Electronics Engineering practice.

9) **Individual and team work:** Function affectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings in Electronics Engineering.

10) **Communication:** Communicate effectively on complex engineering activities with the engineering committee and with society at large, such as, being able to comprehend and write affective reports and design documentation, make effective presentations in Electronics Engineering.

11) **Project Management and finance:** Demonstrate knowledge & understanding of the mechanical engineering principles and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments in Electronics Engineering.

12) **Life - long learning:** Recognize the need for, and the preparation and ability to engage in independent research and lifelong learning in the broadest contest of technological changes in Electronics Engineering.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

1. To apply the fundamental and design knowledge in the areas of analog & digital circuits, Electronics and Communication Systems.

2. To pursue higher studies or get placed in Industries and Organizations.
GRADING SCHEME

<table>
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<th>Grade</th>
<th>Grade points</th>
<th>Category</th>
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<td>10</td>
<td>Outstanding</td>
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<td>80&lt;marks&lt;90</td>
<td>A+</td>
<td>9</td>
<td>Excellent</td>
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<tr>
<td>70&lt;marks&lt;80</td>
<td>A</td>
<td>8</td>
<td>Very good</td>
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<td>60&lt;marks&lt;70</td>
<td>B+</td>
<td>7</td>
<td>Good</td>
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<tr>
<td>50&lt;marks&lt;60</td>
<td>B</td>
<td>6</td>
<td>Above average</td>
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<tr>
<td>45&lt;marks&lt;50</td>
<td>C</td>
<td>5</td>
<td>Average</td>
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<tr>
<td>40&lt;marks&lt;45</td>
<td>P</td>
<td>4</td>
<td>Pass</td>
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Percentage calculation = CGPA * 9.5

Credits for the B.Tech. (ECE)

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<th>Credits</th>
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<td>5</td>
<td>Fifth semester</td>
<td>20</td>
</tr>
<tr>
<td>6</td>
<td>Sixth semester*</td>
<td>24</td>
</tr>
<tr>
<td>7</td>
<td>Seventh semester*</td>
<td>18</td>
</tr>
<tr>
<td>8</td>
<td>Eighth semester*</td>
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Chapter -1

General, Course structure & Theme

&

Semester-wise credit distribution

A. Definition of Credit:

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<tr>
<th>Course</th>
<th>Hours per week</th>
<th>Credits</th>
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</thead>
<tbody>
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<td>1 Hr.</td>
<td>1 credit</td>
</tr>
<tr>
<td>Tutorial (T)</td>
<td>1 Hr.</td>
<td>1 credit</td>
</tr>
<tr>
<td>Practical (P)</td>
<td>1 Hr.</td>
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<td>Lab</td>
<td>2 Hrs.</td>
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B. Course code and definition:

<table>
<thead>
<tr>
<th>Course code</th>
<th>Definitions</th>
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<td>Lecture</td>
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<tr>
<td>T</td>
<td>Tutorial</td>
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<tr>
<td>P</td>
<td>Practical</td>
</tr>
<tr>
<td>BSC</td>
<td>Basic Science Courses</td>
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<tr>
<td>ESC</td>
<td>Engineering Science Courses</td>
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<tr>
<td>HSMC</td>
<td>Humanities and Social Sciences including Management courses</td>
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<tr>
<td>PCC</td>
<td>Professional core courses</td>
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<tr>
<td>PEC</td>
<td>Professional Elective courses</td>
</tr>
<tr>
<td>OEC</td>
<td>Open Elective courses</td>
</tr>
<tr>
<td>LC</td>
<td>Laboratory course</td>
</tr>
<tr>
<td>MC</td>
<td>Mandatory courses</td>
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<td>PROJ</td>
<td>Project</td>
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C. Category of Courses:

**BASIC SCIENCE COURSES**

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<td></td>
<td>L</td>
<td>T</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>Physics</td>
<td>3</td>
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<td>Chemistry</td>
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<tr>
<td>3</td>
<td></td>
<td>Mathematics –1</td>
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<td>1</td>
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<td>4</td>
<td></td>
<td>Mathematics –2</td>
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ENGINEERING SCIENCE COURSES

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<th>Credits</th>
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<td>L</td>
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</tr>
<tr>
<td>1</td>
<td></td>
<td>Basic Electrical Engineering</td>
<td>3</td>
<td>1</td>
</tr>
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<td>2</td>
<td></td>
<td>Engineering Graphics &amp; Design</td>
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<td>3</td>
<td></td>
<td>Programming for Problem Solving</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
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HUMANITIES & SOCIAL SCIENCES INCLUDING MANAGEMENT

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<td>English</td>
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Chapter -2
Detailed first year curriculum contents

I. **Mandatory Induction program**
[Induction program for students to be offered right at the start of the first year.]

3 weeks duration

- Physical activity
- Creative Arts
- Universal Human Values
- Literary
- Proficiency Modules
- Lectures by Eminent People
- Visits to local Areas
- Familiarization to Dept./Branch & Innovations
### B.TECH 1st YEAR ECE (SEMESTER -I)
#### COURSE STRUCTURE

<table>
<thead>
<tr>
<th>Course Notation</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
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<td>-</td>
<td>4</td>
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<td>75</td>
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<tr>
<td>C</td>
<td>BSC103 D</td>
<td>Mathematics-I (Calculus and Linear Algebra)</td>
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<td>1</td>
<td>-</td>
<td>4</td>
<td>25</td>
<td>75</td>
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<td>B</td>
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<td>-</td>
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<td>30</td>
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<td>3</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>25</td>
<td>75</td>
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<tr>
<td>C</td>
<td>ESC104</td>
<td>Workshop- I</td>
<td>-</td>
<td>-</td>
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<td>15</td>
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<td>18.5</td>
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<td><strong>435</strong></td>
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Note: Workshop I and Workshop II can be decided for specific branch by the respective Dean/Principal of respective UTD/Institutions.
### B.TECH 2nd YEAR ECE (SEMESTER -III) COURSE STRUCTURE

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<th>Sr. No.</th>
<th>Category</th>
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<th>Course Title</th>
<th>Hours per week</th>
<th>Credits</th>
<th>Sessional Marks</th>
<th>Final Marks</th>
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<tr>
<td>1</td>
<td>PCC</td>
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<td>EC302</td>
<td>Digital System Design</td>
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**Total Credits** 23

### B.TECH 2nd YEAR ECE (SEMESTER -IV) COURSE STRUCTURE

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<td>Analog Circuits</td>
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<td>ECC03</td>
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<td>75</td>
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<td>ECC01</td>
<td>Signal and Systems</td>
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**Total Credits** 27

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**Sessional Marks**

For B.TECH 2nd YEAR ECE (SEMESTER -III)

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For B.TECH 2nd YEAR ECE (SEMESTER -IV)

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**Total Credits**

For B.TECH 2nd YEAR ECE (SEMESTER -III)

Total Credits 225

For B.TECH 2nd YEAR ECE (SEMESTER -IV)

Total Credits 275
Course code: BSC101C (Th)/ BSC104 (Lab)

Category: Basic Science Course

Course Title: Physics (Waves and Optics) (Theory & Lab.)

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Prerequisites:

(i) Mathematics course on Differential equations

Unit 1: Simple harmonic motion, damped and forced simple harmonic oscillator (7)
Mechanical and electrical simple harmonic oscillators, complex number notation and phasor representation of simple harmonic motion, damped harmonic oscillator – heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators, electrical and mechanical impedance, steady state motion of forced damped harmonic oscillator, power absorbed by oscillator.

Unit 2: Non-dispersive transverse and longitudinal waves in one dimension and introduction to dispersion (7): Transverse wave on a string, the wave equation on a string, Harmonic waves, reflection and transmission of waves at a boundary, impedance matching, standing waves and their eigenfrequencies, longitudinal waves and the wave equation for them, acoustics waves and speed of sound, standing sound waves. Waves with dispersion, water waves, superposition of waves and Fourier method, wave groups and group velocity.

Unit 3: The propagation of light and geometric optics (10): Fermat’s principle of stationary time and its applications e.g. in explaining mirage effect, laws of reflection and refraction, Light as an electromagnetic wave and Fresnel equations, reflectance and transmittance, Brewster’s angle, total internal reflection, and evanescent wave. Mirrors and lenses and optical instruments based on them, transfer formula and the matrix method.

Unit 4: Wave optics (6): Huygens’ principle, superposition of waves and interference of light by wavefront splitting and amplitude splitting; Young’s double slit experiment, Newton’s rings, Michelson interferometer, Mach-Zehnder interferometer. Farunhofer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power.

Unit 5: Lasers (8): Einstein’s theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers (He-Ne, CO2), solid-state lasers (ruby, Neodymium), dye lasers; Properties of laser beams: monochromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in science, engineering and medicine.

Reference books:

(i) Ian G. Main, Oscillations and waves in physics
(ii) H.J. Pain, The physics of vibrations and waves
(iii) E. Hecht, A. Ghatak, Optics
(iv) O. Svelto, Principles of Lasers
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At least 06 experiments from the following

1. To determine the frequency of an electric tuning fork by Melde’s experiment and verify \( \lambda^2 - T \) law.
2. To study Lissajous Figures.
3. Familiarization with: Schuster’s focusing; determination of angle of prism.
4. To determine refractive index of the Material of a prism using sodium source.
5. To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.
6. To determine the wavelength of sodium source using Michelson’s interferometer.
7. To determine wavelength of sodium light using Fresnel’s Biprism.
8. To determine wavelength of sodium light using Newton’s Rings.
9. To determine wavelength of (1) Na source and (2) spectral lines of Hg source using plane diffraction grating.
10. To determine dispersive power and resolving power of a plane diffraction grating.
11. To determine the wavelength of laser source using diffraction of single slit.
12. To determine the wavelength of laser source using diffraction of double slits.
13. To determine angular spread of He-Ne laser using plane diffraction grating.

Note: Experiments may be added or deleted as per the availability of equipments.

Reference Books

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
2. A Text Book of Practical Physics, I.Prakash & Ramakrishna, 11th Ed., 1511, Kitab Mahal
Course code: BSC103D

Category: Basic Science Course

Course title: MATHEMATICS 1 (Calculus and Linear Algebra)

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Semester –I

Pre-requisites (if any): -

OBJECTIVES:

The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines. More precisely, the objectives are:

- To introduce the idea of applying differential and integral calculus to notions of curvature and to improper integrals. Apart from some applications it gives a basic introduction on Beta and Gamma functions.
- To introduce the fallouts of Rolle’s Theorem that is fundamental to application of analysis to Engineering problems.
- To develop the tool of power series and Fourier series for learning advanced Engineering Mathematics.
- To familiarize the student with functions of several variables that is essential in most branches of engineering.
- To develop the essential tool of matrices and linear algebra in a comprehensive manner.

Module 1: Calculus: (6 hours): Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

Module 2: Calculus: (6 hours): Rolle’s Theorem, Mean value theorems, Taylor’s and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.

Module 3: Sequences and series: (10 hours): Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval’s theorem.

Module 4: Multivariable Calculus (Differentiation): (8 hours): Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.

Module 5: Matrices (10 hours): Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew- symmetric and orthogonal matrices;
Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.

Textbooks/References:

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<tr>
<td>Category</td>
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<tr>
<td>Course title</td>
<td>Engineering Graphics &amp; Design (Theory &amp; Lab.)</td>
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Engineering Graphics & Design
[[L' : 0; T:0; P : 4 (2 credits)]]

Detailed contents

**Traditional Engineering Graphics:**
Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles; Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance.

**Computer Graphics:**
Engineering Graphics Software; -Spatial Transformations; Orthographic Projections; Model Viewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing; Animation; Spatial Manipulation; Surface Modelling; Solid Modelling; Introduction to Building Information Modelling (BIM)

**Module 1: Introduction to Engineering Drawing covering,**
Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;
Module 2: Orthographic Projections covering,
Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes;

Module 3: Projections of Regular Solids covering,
Those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

Module 4: Sections and Sectional Views of Right Angular Solids covering,
Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

Module 5: Isometric Projections covering,
Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;

Module 6: Overview of Computer Graphics covering,
listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids];

Module 7: Customisation& CAD Drawing covering,
consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerance; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles.

Course Outcomes
All phases of manufacturing or construction require the conversion of new ideas and design concepts into the basic line language of graphics. Therefore, there are many areas (civil, mechanical, electrical, architectural and industrial) in which the skills of the CAD technicians play major roles in the design and development of new products or construction. Students prepare for actual work situations through practical training in a new state-of-the-art computer designed CAD laboratory using engineering software. This course is designed to:

- Learn about the visual aspects of engineering design.
- Analyse engineering graphics standards.
• Prepare orthographic and isometric projection.
• Draw section of solids and conic sections.
• Exposure to computer-aided geometric design

Suggested Text/Reference Books:


vi. Corresponding set of) CAD Software Theory and User Manuals
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<td>Programming for Problem Solving (Theory &amp; Lab.)</td>
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(i) Programming for Problem Solving (L: 3; T:0; P: 0 (3 credits)) [contact hrs : 40]

Detailed contents

**Unit 1 Introduction to Programming (4 lectures)** Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) - (1 lecture).

Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. (1 lecture)

From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code- (2 lectures)

**Unit 2: Arithmetic expressions and precedence (2 lectures)** Conditional Branching and Loops (6 lectures) Writing and evaluation of conditionals and consequent branching (3 lectures) Iteration and loops (3 lectures)

**Unit 3 Arrays (6 lectures)** Arrays (1-D, 2-D), Character arrays and Strings

**Unit 4 Basic Algorithms (6 lectures)** Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

**Unit 5 Function (5 lectures)** Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference

**Unit 6 Recursion (4 -5 lectures)** Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

**Unit 7 Structure (4 lectures)** Structures, Defining structures and Array of Structures

**Unit 8 Pointers (2 lectures)** Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

**Unit 9 File handling** (only if time is available, otherwise should be done as part of the lab)

**Suggested Text Books**
(i) Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
(ii) E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

**Suggested Reference Books**
(i) Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
Course Outcomes
The student will learn

- To formulate simple algorithms for arithmetic and logical problems.
- To translate the algorithms to programs (in C language).
- To test and execute the programs and correct syntax and logical errors.
- To implement conditional branching, iteration and recursion.
- To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
- To use arrays, pointers and structures to formulate algorithms and programs.
- To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
- To apply programming to solve simple numerical method problems, namely root finding of function, differentiation of function and simple integration.

(ii) Laboratory - Programming for Problem Solving [L : 0; T:0 ; P : 4 (2 credits)]
[The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.]

Tutorial 1: Problem solving using computers:
Lab 1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:
Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops:
Lab 4: Iterative problems e.g., sum of series

Tutorial 5: 1D Arrays: searching, sorting:
Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings
Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value:
Lab 7: Simple functions

Tutorial 8 & 9: Numerical methods (Root finding, numerical differentiation, numerical integration):
Lab 8 and 9: Programming for solving Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls
Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation
Lab 11: Pointers and structures

Tutorial 12: File handling:
Lab 12: File operations

Laboratory Outcomes
- To formulate the algorithms for simple problems
- To translate given algorithms to a working and correct program
- To be able to correct syntax errors as reported by the compilers
- To be able to identify and correct logical errors encountered at run time
- To be able to write iterative as well as recursive programs
• To be able to represent data in arrays, strings and structures and manipulate them through a program
• To be able to declare pointers of different types and use them in defining self-referential structures.
• To be able to create, read and write to and from simple text files.

*******
OBJECTIVES:
The objective of this course is to familiarize the prospective engineers with techniques in multivariate integration, ordinary and partial differential equations and complex variables. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines. More precisely, the objectives are:

a. To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

b. To introduce effective mathematical tools for the solutions of differential equations that model physical processes.

c. To introduce the tools of differentiation and integration of functions of complex variable that are used in various techniques dealing engineering problems.

Module 1: Multivariable Calculus (Integration): (10 hours) Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.

Module 2: First order ordinary differential equations: (6 hours) Exact, linear and Bernoulli’s equations, Euler’s equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut’s type.

Module 3: Ordinary differential equations of higher orders: (8 hours) Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

Module 4: Complex Variable – Differentiation: (8 hours) Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties.

Module 5: Complex Variable – Integration: (8 hours) Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville’s theorem and Maximum-Modulus theorem (without proof); Taylor’s series, zeros of analytic functions, singularities, Laurent’s series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.
Textbooks/References:
Course code: ESC 101(Th)/ESC107(Lab)  
Category: Engineering Science Course  
Course title: Basic Electrical Engineering (Theory & Lab.)

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Pre-requisites (if any) -

(i) Basic Electrical Engineering [L : 3; T:1; P : 0 (4 credits)]

Detailed contents:


**Module 2: AC Circuits (8 hours)** Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections.

**Module 3: Transformers (6 hours)** Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.


**Module 5: Power Converters (6 hours)** DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation.

**Module 6: Electrical Installations (6 hours)** Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

**Suggested Text / Reference Books**

Course Outcomes

- To understand and analyze basic electric and magnetic circuits
- To study the working principles of electrical machines and power converters.
- To introduce the components of low voltage electrical installations

(ii) Basic Electrical Engineering Laboratory [L : 0; T:0 ; P : 2 (1 credit)]

List of experiments/demonstrations:

- Transformers: Observation of the no-load current waveform on an oscilloscope (non- sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
- Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.
- Torque Speed Characteristic of separately excited dc motor.
- Synchronous Machine operating as a generator: stand-alone operation with a load. Control of voltage through field excitation.
- Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear.

Laboratory Outcomes

- Get an exposure to common electrical components and their ratings.
- Make electrical connections by wires of appropriate ratings.
- Understand the usage of common electrical measuring instruments.
- Understand the basic characteristics of transformers and electrical machines.
- Get an exposure to the working of power electronic converters.
Course code: BSC102(Th)/BSC105(Lab)
Category: Basic Science Course

Course title: Chemistry (Theory & Lab.)

Contents:
(i) Chemistry (Concepts in chemistry for engineering)
(ii) Chemistry Laboratory

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Pre-requisites (if any): -

(i) Chemistry (Concepts in chemistry for engineering) [L : 3; T:1; P : 0 (4 credits)]

Detailed contents

(i) Atomic and molecular structure (12 lectures)

Schroedinger equation. Particle in a box solutions and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multicenter orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

(ii) Spectroscopic techniques and applications (8 lectures)


(iii) Intermolecular forces and potential energy surfaces (4 lectures)

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H3, H2F and HCN and trajectories on these surfaces.

(iv) Use of free energy in chemical equilibria (6 lectures)


Use of free energy considerations in metallurgy through Ellingham diagrams.

(v) Periodic properties (4 Lectures)

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

(vi) Stereochemistry (4 lectures)

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical
activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds

**vii) Organic reactions and synthesis of a drug molecule (4 lectures)**
Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

**Suggested Text Books**
1. University chemistry, by B. H. Mahan
3. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
5. Physical Chemistry, by P. W. Atkins

**Course Outcomes**
The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications.

Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels. The course will enable the student to:

- Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- Rationalise bulk properties and processes using thermodynamic considerations.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
- Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
- List major chemical reactions that are used in the synthesis of molecules.

**(ii) Chemistry Laboratory [ L: 0; T:0 ; P : 3 (1.5 credits)]**
Choice of 10-12 experiments from the following:
- Determination of surface tension and viscosity
- Thin layer chromatography
- Ion exchange column for removal of hardness of water
- Determination of chloride content of water
- Colligative properties using freezing point depression
- Determination of the rate constant of a reaction
- Determination of cell constant and conductance of solutions
- Potentiometry - determination of redox potentials and emfs
- Synthesis of a polymer/drug
- Saponification/acid value of an oil
- Chemical analysis of a salt
- Lattice structures and packing of spheres
- Models of potential energy surfaces
- Chemical oscillations- Iodine clock reaction
- Determination of the partition coefficient of a substance between two immiscible liquids
- Adsorption of acetic acid by charcoal
• Use of the capillary viscosimeters to demonstrate the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg.

**Laboratory Outcomes**

• The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will learn to:
  • Estimate rate constants of reactions from concentration of reactants/products as a function of time
  • Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc
  • Synthesize a small drug molecule and analyse a salt sample
Course code | HSMC 101(Th)/HSMC102(Lab)  
Category | Humanities and Social Sciences including Management  
Course title | English (Theory & Lab.)  

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Pre-requisites (if any) | - |

English  

Detailed contents  

1. Vocabulary Building  
The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives. Synonyms, antonyms, and standard abbreviations.  

2. Basic Writing Skills  
Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence, Organizing principles of paragraphs in documents, Techniques for writing precisely  

3. Identifying Common Errors in Writing  
Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés  

4. Nature and Style of sensible Writing  
Describing, Defining, Classifying, Providing examples or evidence  

5. Writing introduction and conclusion  

6. Writing Practices  
Comprehension, Précis Writing, Essay Writing  

7. Oral Communication  
(This unit involves interactive practice sessions in Language Lab)  
- Listening Comprehension  
- Pronunciation, Intonation, Stress and Rhythm  
- Common Everyday Situations: Conversations and Dialogues  
- Communication at Workplace  
- Interviews  
- Formal Presentations  

Suggested Readings:  
(ii) Remedial English Grammar. F.T. Wood. acmilian.2007  

Course Outcomes  
The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.  

*******
Workshop-I

PART-A

Computer Engineering Workshop

Course Outcomes (COs):
After the completion of the course the student will be able to:

**CO1**- Acquire skills in basic engineering practice.

**CO2**- Have working knowledge of various equipments used in workshop.

**CO3**- Have hands on experience about various machines and their components.

**CO4**- Obtain practical skills of basic operation and working of tools used in the workshop.

1. To study and demonstrate Block diagram of Digital Computer System and brief explanation of each unit.
2. To demonstrate History/ Generation/ classifications and different types of Personnel Computer. To study and demonstrate internal parts of a Computer System (Card level) and other peripheral devices and explanation of POST & BIOS.
3. To study and demonstrate primary memory and secondary memory.
4. To demonstrate CPU Block diagram and other Peripheral chips, Mother Board/ Main Board and its parts, Connectors, Add On Card Slots etc.
5. To study working of various types of monitors: CRT type, LCD type & LED type.
6. To study Keyboard and Mouse: Wired, Wireless, Scroll & Optical with detail working.

PART-B

Electrical Workshop

1. Introduction of Electrical Safety precautions, Electrical Symbols, Electrical Materials, abbreviations commonly used in Electrical Engg. and familiarization with tools used in Electrical Works.
2. To make a Straight Joint & Tee joint on 7/22 PVC wire and Britannia Joint on GI wire.
3. To study fluorescent Tube Light, Sodium Lamp and High Pressure Mercury Vapour Lamp.
4. To study different types of earthing and protection devices e.g. MCBs, ELCBs and fuses.
5. To study different types of domestic and industrial wiring and wire up a circuit used for Stair case and Godown wiring.
6. To make the connection of fan regulator with lamp to study the effect of increasing and decreasing resistance in steps on the lamp.
7. To fabricate half wave and full wave rectifiers with filters on PCB.
8. Maintenance and Repair of Electrical equipment i.e Electric Iron , Electric Toaster, Water heater, Air coolers and Electric Fans etc.
9. To study soldering process with simple soldering exercises.
10. To make the connection of a three core cable to three pin power plug and connect the other cable end by secured eyes connection using 23/0.0076” or 40/0.0076” cable.

PART- C

Electronics Workshop

1. To study and demonstrate basic electronic components, Diode, Transistor, Resistance, Inductor and capacitor.
2. To study and demonstrate resistance color coding, measurement using color code and multimeter and error calculation considering tolerance of resistance.
3. To study and demonstrate Multimeter and CRO- front panel controls, description of block diagram of CRT and block diagram of CRO.
4. To study and demonstrate Vp(peak voltage), Vpp(peak to peak voltage), Time, frequency and phase using CRO.
5. Introduction to function generator. Functions of front panel controls and measurement of different functions on CRO.
6. To study and demonstrate variable DC regulated power supply, function of controls and DC measurement using multimeter and CRO.
7. Soldering practice on wire mesh or a resistance decade board includes fabrication, soldering, lacing, harnessing forming and observation.
8. Testing of components using multimeter and CRO like diode, transistor, resistance capacitor, Zener diode and LED.
9. To study and demonstrate rectification, half wave, Full wave and bridge rectifier. Fabrication, assembly and waveform observation.
10. To design and fabricate a printed circuit board of a Zener regulated/ series regulated power supply and various measurements, testing of power supply.

Note: At least 8 exercises are to be performed from each part by the students.
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| Pre-requisites (if any) | - |

MECHANICAL WORKSHOP

Course Outcomes (COs): After studying this course the students would:
CO 1- Have exposure to mechanical workshop layout and safety aspects.
CO 2- Understand the functions of various machines and cutting tools used in machine shop.
CO 3- Practice real time job preparation using various operations related to machine shop such as filing, drilling, milling & turning.
CO 4 - Practice job preparation in welding shop.
CO 5 - Learn to use different measuring tools like vernier caliper, vernier height gauge and micrometer.
CO 6 - Practice job preparation in sheet metal shop.

List of Exercises:

Fitting, sheet metal and welding workshop:
1. To study layout, safety measures and different engineering materials (mild steel, medium carbon steel, high carbon steel, high speed steel and cast iron etc) used in workshop.
2. To study and use of different types of tools, equipments, devices & machines used in fitting, sheet metal and welding section.
3. To determine the least count of vernier calliper, vernier height gauge, micrometer and take different reading over given metallic pieces using these instruments.
4. To study and demonstrate the parts, specifications & operations performed on lathe machine.
5. To study and demonstrate the parts, specifications & operations performed on milling machine.
6. To study and demonstrate the parts, specifications & operations performed on shaper machine.
7. To prepare a job involving different type of filing practice exercise in specified dimensions.
8. To prepare a job involving multi operational exercise (drilling, counter sinking, tapping, reaming, hack sawing etc.)
9. To prepare a multi operational sheet metal job (self secured single groove joint/ hasp & stay etc.).
10. To practice striking an arc, straight short bead, straight continuous bead and restart of electrode in flat position by arc welding on given M.S. plate as per size.
11. To practice tack weld of two close plate in flat position by arc welding on given M.S. plate as per size.
12. To practice close butt joint in flat position by arc welding on given M.S. plate as per size.

NOTE: - At least nine exercises should be performed from the above list; remaining three may either be performed from above list or designed by the concerned institution as per the scope of the syllabus and facilities available in institute.
Course Objects:
- To give exposure to students about Semiconductor Physics.
- To give the exposure about characteristics of semiconductor devices.
- To introduce the working of different semiconductor electronics devices.
- To introduce about the fabrication technologies of semiconductor electronics devices.

Syllabus


Unit 2: Generation and recombination of carriers, Poisson and continuity equation P-N junction characteristics, I-V characteristics, and small signal switching models: Avalanche breakdown, Zener diode, Schottky diode

Unit 3: Bipolar Junction Transistor, I-V characteristics, Ebers-Moll Model, MOS capacitor, C-V characteristics, MOSFET, I-V characteristics, and small signal models of MOS transistor, LED, photodiode and solar cell

Unit 4: Integrated circuit fabrication process: oxidation, diffusion, ion implantation, photolithography, etching, chemical vapor deposition, sputtering, twin-tub CMOS process.

Course Outcomes: On successful completion of this course, the students should be able to:
- Understand the principles of semiconductor Physics.
- Understand and utilize the mathematical models of semiconductor junctions and MOS transistors for circuits and systems.
- Understand the design & characteristics of semiconductor device.
- Understand various semiconductor, fabrication process.

Text /Reference Books:
Course Objectives:

- To introduce the fundamentals of digital electronics.
- To familiarize the students about the design and analyze various combinational circuits.
- To give exposure to the students about design and analyze various sequential circuits.
- To introduce logic families & semiconductor memories.
- To introduce the basic knowledge of HDL & their ways of implementation.

Syllabus

Unit 1: Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, Binary codes, Code Conversion.

Unit 2: MSI devices like Comparators, Multiplexers, Encoder, Decoder, Driver & Multiplexed Display, Half and Full Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Barrel shifter and ALU

Unit 3: Sequential Logic Design: Building blocks like S-R, JK and Master-Slave JK FF, Edge triggered FF, Ripple and Synchronous counters, Shift registers, Finite state machines, Design of synchronous FSM, Algorithmic State Machines charts. Designing synchronous circuits like Pulse train generator, Pseudo Random Binary Sequence generator, Clock generation

Unit 4: Logic Families and Semiconductor Memories: TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing, Memory elements, Concept of Programmable logic devices like FPGA, Logic implementation using Programmable Devices.

Unit 5: VLSI Design flow: Design entry, Schematic, FSM & HDL, different modeling styles in VHDL, Data types and objects, Dataflow, Behavioral and Structural Modeling, Synthesis and Simulation VHDL constructs and codes for combinational and sequential circuits.

Course outcomes: On successful completion of this course, the students should be able to:

- Design and analyze combinational logic circuits.
- Acquire basic knowledge of digital logic families & semiconductor memories.
- Design & analyze synchronous sequential logic circuits.
- Use HDL & appropriate EDA tools for digital logic design and simulation.

Text/Reference Books:

EC304

Network Theory

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**Theory**: 75  
**Class Work**: 25  
**Total**: 100  
**Duration of Exam**: 3 Hrs.

**Course Objectives:**
- To introduce students about basic electrical circuits with nodal & mesh analysis.
- To give exposure to the students about various network theorem applicable to AC & DC circuits.
- To introduce the application of Laplace & Fourier behavior.
- To introduce students about synthesis and analysis of electrical network.
- To introduce students about transient analysis, two port of network and various types of filters.

**Syllabus**

**Unit 1:** Node and Mesh Analysis, matrix approach of network containing voltage and current sources, and reactances, source transformation and duality. Network theorems: Superposition, reciprocity, Thevenin’s, Norton’s, Maximum power Transfer, compensation and Tallegen’s theorem as applied to AC, circuits. Trigonometric and exponential Fourier series: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values, Fourier transform and continuous spectra, three phase unbalanced circuit and power calculation.

**Unit 2:** Laplace transforms and properties: Partial fractions, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions.

**Unit 3:** Transient behavior, concept of complex frequency, Driving points and transfer functions poles and zeros of admittance function, their properties, sinusoidal response from pole-zero locations, convolution theorem and Two four port network and interconnections, Behaviors of series and parallel resonant circuits, Introduction to band pass, low pass, high pass and band reject filters.

**Course Outcomes:** On successful completion of this course, the students should be able to:
- Understand basics electrical circuits with nodal and mesh analysis.
- Appreciate electrical network theorems.
- Apply Laplace Transform for steady state and transient analysis.
- Determine different network functions.
- Appreciate the frequency domain techniques.

**Text/Reference Books**
Course Objective:-
- To provide an introductory treatment of Engineering
- To give a working knowledge of statics with emphasis on force equilibrium and free body diagrams.
- To provide an understanding of the kinds of stress and deformation and how to determine them in a wide range of simple, practical structural problems.
- To give an understanding of the mechanical behavior of materials under various load conditions

Syllabus

Unit 1: Introduction to Engineering Mechanics covering, Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminancy

Unit 2: Friction covering, Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack.

Unit 3: Basic Structural Analysis covering, Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames & Machines;

Unit 4: Centroid and Centre of Gravity covering, Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook.


Unit 6: Review of particle dynamics- Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton’s 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique).

Unit 7: Introduction to Kinetics of Rigid Bodies covering, Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D’Alembert’s principle and its applications in plane motion and connected bodies Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation.
Unit 8: Mechanical Vibrations covering, Basic terminology, free and forced vibrations, resonance and its effects; Degree of freedom; Derivation for frequency and amplitude of free vibrations without damping and single degree of freedom system, simple problems, types of pendulum, use of simple, compound and torsion pendulums; Tutorials from the above Units covering, To find the various forces and angles including resultants in various parts of wall crane, roof truss, pipes, etc.; To verify the line of polygon on various forces; To find coefficient of friction between various materials on inclined plan; Free body diagrams various systems including block-pulley; To verify the principle of moment in the disc apparatus; Helical block; To draw a load efficiency curve for a screw jack

Course Outcomes: On successful completion of this course, the students should be able to:
- Use scalar and vector analytical techniques for analyzing forces in statically determinate structures
- Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems
- Apply basic knowledge of maths and physics to solve real-world problems, Understand measurement error, and propagation of error in processed data.
- Understand basic kinematics concepts – displacement, velocity and acceleration (and their angular counterparts);
- Understand basic dynamics concepts – force, momentum, work and energy; Understand and be able to apply Newton’s laws of motion;
- Understand and be able to apply other basic dynamics concepts - the Work-Energy principle, Impulse-Momentum principle and the coefficient of restitution;
- Extend all of concepts of linear kinetics to systems in general plane motion (applying Euler's Equation and considering energy of a system in general plane motion, and the work of couples and moments of forces)
- Learn to solve dynamics problems. Appraise given information and determine which concepts apply, and choose an appropriate solution strategy; and Attain an introduction to basic machine parts such as pulleys and mass-spring systems.

Text/Reference Books:
6. Hibler and Gupta (2010), Engineering Mechanics (Statics, Dynamics) by Pearson Education
COURSE OBJECTIVES:
To gain knowledge about: Laplace Transform, Fourier Transform, Z- transform and Numerical Methods.


Unit 3: Vector differentiation, gradient, divergence and curl, line and surface integrals, path independence, statements and illustrations of theorems of Green, Stokes and Gauss, arc length parameterization, applications.

Course Outcome:
- To understand Laplace Transform and its applications
- To understand Fourier Transform, Z Transform and their applications
- To solve the curl, gradient and divergence
- To apply the applications curl, gradient and divergence in various theorems in various applications

Textbooks/References
The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the "basic structure" of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of "Constitutionalism" – a modern and progressive concept historically developed by the thinkers of "liberalism" – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of "constitutionalism" in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America. The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India’s legacy of “diversity”. It has been said that Indian constitution reflects ideals of its freedom movement, however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be “static” and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it “as one of the strongest court in the world”.

Course content

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19

REFERENCES:

2. The Constitution of India by P.M.Bakshi
3. Constitution Law of India by Narender Kumar
4. Bare Act by P. M. Bakshi
Course objective

The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional knowledge Systems connecting society and nature. Holistic life style of yogic science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions. Part-I focuses on introduction to Indian Knowledge Systems, Indian perspective of modern scientific world-view, and basic principles of Yoga and holistic health care system.

Course Contents

- Basic structure of Indian Knowledge System: अष्टदशविद्या - चावद, चावपद (आयुवद, धनुवद, गन्धवद, स्थापत्य आदि) छेवदंग (शिक्षा, कल्य, निरुक्त, व्याकरण, ज्योतिष, छंद) ४ उपार्ग (धर्मशास्त्र, मीमांसा, पुराण, तर्कशास्त्र)
- Modern Science and Indian Knowledge System
- Yoga and Holistic Health care
- Case studies

References

- Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
- Swami Jitatmanand, Holistic Science and Vedant, Bharatiya Vidya Bhavan
- Fritzof Capra, Tao of Physics
- Fritzof Capra, The Wave of life
- VN Jha (Eng. Trans.), Tarkasangraha of Annam Bhatta, International Chinmay Foundation, Velliarmad, Arnakulam
- Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata
- GN Jha (Eng. Trans.), Ed. RN Jha, Yoga-darshanam with Vyasa Bhashya, Vidyanidhi Prakashan, Delhi 2016
- P B Sharma (English translation), Shodashang Hridayan

Pedagogy: Problem based learning, group discussions, collaborative mini projects.

Outcome: Ability to understand, connect up and explain basics of Indian traditional knowledge in modern scientific perspective.
List of Experiments

1. Study of IV Characteristics of PN junction diode.
2. Study of IV Characteristics of zener diode.
3. Study of transistor common base characteristics.
4. Study of transistor common emitter characteristics.
5. Study of Zener diode as a voltage regulator.
7. Study of FET common Drain amplifier.
8. Study of Zener diode as a voltage regulator.
9. Study of CC amplifier as a buffer.
10. Study of 3-terminal IC regulator.
11. Study of LED, photo diode and solar cell.

Course Outcomes: On successful complete of this course, the students should be able to:

- Understand the characteristics of PN junction diode.
- Understand the application of diode & Zener diode experimentally.
- Obtain input and output characteristics of transistors in CE, CB & CC configurations.
- Obtain FET characteristics.
- Write experimental reports and work in a team in professional way.
List of Experiments
1. Study of TTL gates – AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR.
2. Design & realize a given function using K-maps and verify its performance.
3. To verify the operation of multiplexer & Demultiplexer.
4. To verify the operation of comparator.
5. To verify the truth tables of S-R, J-K, T & D type flip flops.
6. To verify the operation of bi-directional shift register.
7. To design & verify the operation of 3-bit synchronous counter.
8. Design all gates using VHDL.
9. Write VHDL programs for the following circuits, check the wave forms and the hardware generated a. half adder b. full adder
10. Write VHDL programs for the following circuits, check the wave forms and the hardware generated a. multiplexer b. demultiplexer
11. Write VHDL programs for the following circuits, check the wave forms and the hardware generated a. decoder b. encoder
12. Write a VHDL program for a comparator and check the wave forms and the hardware generated
13. Write a VHDL program for a code converter and check the wave forms and the hardware generated
14. Write a VHDL program for a FLIP-FLOP and check the wave forms and the hardware generated
15. Write a VHDL program for a up/down counter and check the wave forms and the hardware generated.

Course Outcome: On the successful competition of this course, the students should be able to:
- Verify the operation of basic & universal gates.
- Design & verify the standards of combinational circuits.
- Verify the operations of different type of flip flops.
- Design the counters using flip flops for a given sequence.
- Verify the working of shift registers.
- Write experimental reports and work in a team in professional way
List of Experiments

1. Transient response of RC circuit.
2. Transient response of RL circuit.
3. To find the resonance frequency, Band width of RLC series circuit.
4. To calculate and verify —Z" parameters of a two port network.
5. To calculate and verify "Y" parameters of a two port network.
6. To determine equivalent parameter of parallel connections of two port network.
7. To plot the frequency response of low pass filter and determine half-power frequency.
8. To plot the frequency response of high pass filters and determines the half-power frequency.
9. To plot the frequency response of band-pass filters and determines the band-width.
10. To calculate and verify "ABCD" parameters of a two port network.
11. To synthesize a network of a given network function and verify its response.
12. Introduction of P-Spice

Course Outcomes: On successful complete of this course, the students should be able to:
- Design RC & RL circuits and check their transient response experimentally.
- Design RLC series circuits & find the frequency response.
- Analyse the circuits of two port network and verify ‘ABCD’ ‘Z’ & ‘Y’ parameters of two port network.
- Design & plot the frequency response of low pass filter, high pass filter & band-pass filter experimentally.
- Synthesize a network using Foster & Cauer Forms.
- Write experimental reports and work in a team in professional way.
List of Problems

1. Testing of Electronics Devices
   1) Diode  2) Transoms  3) Capacitors  4) Inductor
2. Design, Fabrication, Testing & Measurement of half & full wave rectifier
3. Design and fabrication of fixed & variable regulators (Zenes, Transistor and IC)
4. Design of transistor as a switch, amplifier and multivibrator.
5. To study of 555 as Astable, Monostable, Bistable multivibrator.
6. To design various applications of OP amp such as
   1) Amplifiers (Inverting & Non Inverting)
   2) Adder, Subtractor & scale changer
   3) Integrator and differentiator
   4) Oscillator and Schmitt trigger
7. Mini project based on analog circuits of above.
Course Objectives:

- To study the concepts of signal & system as well as various modulation techniques.
- To study the concept of probability and random process as well as behavior of noises in communication system.
- To introduce the concept of Sampling Theorem and Pulse Modulation Techniques.
- To introduce the concept of different digital modulations schemes and evaluate their bit error performances.

Syllabus

Unit 1: Review of signals and systems, Frequency domain representation of signals, Principles of Amplitude Modulation Systems, DSB, SSB and VSB modulations, Angle Modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated signals.

Unit 2: Review of probability and random process, Gaussian and white noise characteristics, Noise in amplitude modulation systems, Noise in Frequency modulation systems, Pre-emphasis and Deemphasis, Threshold effect in angle modulation.

Unit 3: Pulse modulation, sampling process, Pulse Amplitude and Pulse code modulation (PCM), Differential pulse code modulation, Delta modulation, Noise considerations in PCM, Time Division multiplexing, Digital Multiplexers.


Unit 5: Digital Modulation tradeoffs, Optimum demodulation of digital signals over band-limited channels, Maximum likelihood sequence detection (Viterbi receiver), Equalization Techniques, Synchronization and Carrier Recovery for Digital modulation.

Course Outcomes: On successful completion of this course, the students should be able to:

- Analyze and compare different analog modulation schemes for their efficiency and bandwidth.
- Analyze the behaviour of a communication system in presence of noise.
- Investigate pulsed modulation system and analyze their system performance.
- Analyze different digital modulation schemes and can compute the bit error performance.

Text/Reference Books:

Course Objectives:
- To study the concept of diode circuits, BJT and FET with their configurations
- To familiar with different types of power amplifiers and different types of feedback configuration.
- To introduce the concept of different types of oscillators.
- To give exposure to the students regarding OP-AMP and their various applications
- To give exposure to the students regarding the concepts of different types of DAC and ADC.

Syllabus

Unit 1: Diode Circuits, Amplifier models: Voltage amplifier, current amplifier, transconductance amplifier and trans-resistance amplifier. Biasing schemes for BJT and FET amplifiers, bias stability, various configurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers.

Unit 1: High frequency transistor models, frequency response of single stage and multistage amplifiers, cascode amplifier. Various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues. Feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability, gain margin and phase margin.

Unit 2: Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators.

Unit 3: Current mirror: Basic topology and its variants, V-I characteristics, output resistance and minimum sustainable voltage (VON), maximum usable load. Differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR. OP-AMP design: design of differential amplifier for a given specification, design of gain stages and output stages, compensation.


Unit 5: Digital-to-analog converters (DAC): Weighted resistor, R-2R ladder, resistorstring etc., Analog to-digital converters (ADC): Single slope, dual slope, successive approximation, flash etc. Switched capacitor circuits: Basic concept, practical configurations, application in amplifier, integrator, ADC etc.

Course Outcomes: On successful completion of this course, the students should be able to:
- Understand the characteristics of diodes and transistors.
- Design and analyze various rectifier and amplifier circuits.
- Design sinusoidal and non-sinusoidal oscillators.
- Understand the functioning of OP-AMP and design OP-AMP based circuits.
- Design ADC and DAC.
Text/Reference Books:
4. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saund3er's College11
Course Objectives:
- To study and familiarise with building blocks of micro computers systems and Assembly programming of 8086.
- To apply the fundamental of programming and Interfacing through 8051.
- To know about virtual, cache and architecture of advance processors.
- To know fundamentals of RISC and ARM microcontrollers and interfaces design.

Syllabus

Unit 1: Overview of microcomputer systems and their building blocks, memory interfacing, concepts of interrupts and Direct Memory Access, 8086 Instruction, addressing modes, instruction set of Microcontroller (with examples of 8085 and 8086)

Unit 2: Peripherals and Interfacing with Microprocessor (8086)-PPI-8255, Timers-8253/8254, Programmable Interrupt Controller 8259, Interfacing of Microprocessor with I/O, A/D, D/A, Switches & LEDs

Unit 3: Microcontroller 8051, Architecture, programming, interfacing with peripherals - timer, serial I/O, parallel I/O, A/D and D/A converters, Arithmetic Coprocessors, System level interfacing design

Unit 4: Concepts of virtual memory, Cache memory, advanced coprocessor Architectures- 286, 486, Pentium

Unit 5: Introduction to RISC processors, PIC, ARM microcontrollers architectures.

Course Outcomes: On successful completion of this course, the students should be able to:
- Do assembly language programming
- Do interfacing design of peripherals like, I/O, A/D, D/A, timer etc.
- Develop systems using different microcontrollers
- Understand RSIC processors and design ARM microcontroller based systems

Text/Reference Books:
Course Objectives:

- To study the basic of computer system.
- To study general system architecture.
- To study memory hierarchy & I/O techniques.
- To study basic non-pipelined CPU architecture & how its performance can be enhanced using pipelining.

Syllabus

Unit 1: Basic Structure of Computers, Functional units, software, performance issues software, machine instructions and programs, Types of instructions, Instruction sets: Instruction formats, Assembly language, Stacks, Ques, Subroutines.

Unit 2: Processor organization, Information representation, number formats.

Unit 3: Multiplication & division, ALU design, Floating Point arithmetic, IEEE 754 floating point Formats, Control Design, Instruction sequencing, Interpretation, Hard wired control-Design methods, and CPU control unit, Microprogrammed Control-Basic concepts, minimizing microinstruction size, multiplier control unit, Microprogrammed computers-CPU control unit

Unit 4: Memory organization, device characteristics, RAM, ROM, Memory management, Concept of Cache & associative memories, Virtual memory. System organization, Input-Output systems, Interrupt, DMA, Standard I/O interfaces

Unit 5: Concept of parallel processing, Pipelining, Forms of parallel processing, interconnect network

Course Outcomes: On successful completion of this course, the students should be able to:

- Learn how computers work.
- Know basic principles of computer’s working.
- Analyze the performance of computers.
- Know how computers are designed and built.
- Understand issues affecting modern processors (caches, pipelines etc.).

Text/Reference Books:

Course Objects:
- To introduce students about various types of signals and their classifications.
- To introduce students about LSI (linear shift invariant) systems and their properties.
- To introduce students about properties of Fourier Series, Fourier Transforms like DTFT and DFT.
- To introduce students about Laplace Transform, Z Transform and State-Space Analysis.

Syllabus

Unit 1: Signals and systems as seen in everyday life, and in various branches of engineering and science, Energy and power signals, continuous and discrete time signals, continuous and discrete amplitude signals. System properties, linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability.


Unit 3: Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response, Fourier series representation, the Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT), Parseval's Theorem, the idea of signal space and orthogonal bases.

Unit 4: The Laplace Transform, notion of eigen functions of LSI systems, a basis of eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and system behavior.

Unit 5: The z-Transform for discrete time signals and systems eigen functions, region of convergence, z-domain analysis.

Unit 6: State-space analysis and multi-input, multi-output representation, the state-transition matrix and its role, The Sampling Theorem and its implications spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first order hold, and so on, Aliasing and its effects, relation between continuous and discrete time systems.

Course outcomes: On successful completion of this course, the students should be able to:
- Analyze different types of signals.
- Represent continuous and discrete systems in time and frequency domain using different transforms.
- Investigate stability of system.
- Perform sampling and reconstruction of a signal.

Text/Reference books:
Effective Technical Communication

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<td>25</td>
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**Unit 1:** Module 1: Information Design and Development- Different kinds of technical documents, Information development life cycle, Organization structures, factors affecting information and document design, Strategies for organization, Information design and writing for print and for online media.

**Unit 2:** Module 2: Technical Writing, Grammar and Editing, Technical writing process, forms of discourse, Writing drafts and revising, Collaborative writing, creating indexes, technical writing style and language. Basics of grammar, study of advanced grammar, editing strategies to achieve appropriate technical style. Introduction to advanced technical communication, Usability, Human factors, Managing technical communication projects, time estimation, Single sourcing, Localization.

**Unit 3:** Module 3: Self Development and Assessment: Self assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, career planning, Self-esteem, Managing Time, Personal memory, Rapid reading, Taking notes, Complex problem solving, Creativity.

**Unit 4:** Module 4: Communication and Technical Writing- Public speaking, Group discussion, Oral presentation, Interviews, Graphic presentation, Presentation aids, Personality Development. Writing reports, project proposals, brochures, newsletters, technical articles, manuals, official notes, business letters, memos, progress reports, minutes of meetings, event report.

**Unit 5:** Module 5: Ethics- Business ethics, Etiquettes in social and office settings, Email etiquettes, Telephone Etiquettes, Engineering ethics, Managing time, Role and responsibility of engineer, Work culture in jobs, Personal memory, Rapid reading, Taking notes, Complex problem solving, Creativity.

**Text/Reference Books:**
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<td>Total: 100</td>
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**Pre-Requisite:** Nil  
**Successive:** Environmental Science

**Course Objectives:**

To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry.

1) “Genetics is to biology what Newton’s laws are to Physical Sciences”, 2) all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine, 3) without catalysis life would not have existed on earth, 4) molecular basis of coding and decoding (genetic information) is universal and that 5) fundamental principles of chemical and physical energy transactions are the same in physical/chemical and biological world.

**Module 1. (2 hours) - Introduction**

**Purpose:** To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry

Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.

**Module 2. (3 hours) - Classification**

**Purpose:** To convey that classification per se is not what biology is all about. The underlying criterion, such as morphological, biochemical or ecological be highlighted. Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilization -Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricotelie, ureotelic (e) Habitatata- aquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S.cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M.musculus.

**Module 3. (4 hours) - Genetics**

**Purpose:** To convey that “Genetics is to biology what Newton’s laws are to Physical Sciences” Mendel’s laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell
division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.

Module 4. (4 hours)- Biomolecules

Purpose: To convey that all forms of life has the same building blocks and yet the manifestations are as diverse as one can imagine. Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.

Module 5. (4 Hours). Enzymes

Purpose: To convey that without catalysis life would not have existed on earth


Module 6. (4 hours)- Information Transfer


Module 7. (5 hours). Macromolecular analysis

Purpose: How to analyses biological processes at the reductionistic level. Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.

Module 8. (4 hours)- Metabolism

Purpose: The fundamental principles of energy transactions are the same in physical and biological world. Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergonic reactions. Concept of Keq and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to CO2 + H2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO2 and H2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge.

Module 9. (3 hours)- Microbiology

Course Outcomes (COs)

1. Classify enzymes and distinguish between different mechanisms of enzyme action.
2. Identify DNA as a genetic material in the molecular basis of information transfer.
3. Analyze biological processes at the reductionist level.
4. Apply thermodynamic principles to biological systems.
5. Identify and classify microorganisms.

Textbooks/ References:

1) Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd

2) Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons


4) Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher

List of Experiments

2. Study of Frequency Modulation and determination of Modulation index.
3. Study of Phase Modulation.
5. Study of Pulse Width Modulation.
7. Study of Pulse Code Modulation.
8. Study of frequency Shift Keying.
9. Study of ASK
10. Study of PSK
11. Study of Delta modulation

Course Outcomes: On successful complete of this course, the students should be able to:

- Demonstrate about various blocks in communication system.
- Analyze the types of modulations.
- Analyze and design the analog modulator and demodulator circuits.
- Generate the waveforms of AM, FM, PM, PWM, PPM, and PAM.
- Calculate Power relations in Amplitude and Frequency modulated waves.
- Write experimental reports and work in a team in professional way
List of Experiments

1. Design & measure the frequency response of an RC coupled amplifier using discrete components.
2. Design a two stage RC coupled amplifier and determine the effect of cascading on gain and bandwidth.
4. Verify the operation of a differentiator circuit using 741 op amp and show that it acts as a high pass filter.
5. Verify the operation of a integrator circuit using 741 op amp and show that it acts as a low pass filter.
6. Design and verify the operations of op amp adder and subtractor circuits.
7. To design & realize Schmitt trigger using op amp 741.
8. Design and realize Wein-bridge oscillator using op amp 741
9. To design & realize square wave generator using op amp 741.
10. To design & realize zero crossing detector using op amp 741

Course Outcomes: On successful complete of this course, the students should be able to:

- Measure & verify the frequency response of RC coupled amplifier.
- Measure the effect of various types of feedback on amplifiers.
- Implement amplifiers, differentiator, Integrator and active filters circuit using op amp.
- Design op-amp as Wein-Bridge Oscillator, Square Wave Generator, Logarithmic Amplifier and Voltage Controlled Circuits.
- Write experimental reports and work in a team in professional way.
List of Experiments

1. Study of architecture of 8085 & familiarization with its hardware, commands & operation of Microprocessor kit.

2. Write a program using 8085 and verify for:
   (i) Addition of two 8-bit numbers.
   (ii) Addition of two 8-bit numbers (with carry).

3. Write a program using 8085 and verify for:
   (i) 8-bit subtraction (display borrow)
   (ii) 16-bit subtraction (display borrow)

4. Write a program using 8085 for multiplication of two 8-bit numbers by repeated addition method. Check for minimum number of additions and test for typical data.

5. Write a program using 8085 for multiplication of two 8-bit numbers by bit rotation method and verify.

6. Write a program using 8085 for division of two 8-bit numbers by repeated subtraction method and test for typical data.

7. Write a program using 8085 for dividing two 8-bit numbers by bit rotation method and test for typical data.

8. Write a program using 8086 and verify for:
   (i) Finding the largest number from an array.
   (ii) Finding the smallest number from an array.

9. Write a program using 8086 for arranging an array of numbers in descending order and verify.

10. Write a program using 8086 for arranging an array of numbers in ascending order and verify.

11. Write a program for finding square of a number using look-up table and verify.

12. Write a program to interface microprocessor with 8253 to generate square wave. Use 8085/8086 microprocessor.

13. Write a program to interface microprocessor with 8253 to generate interrupt on terminal count. Use 8085/8086 microprocessor.

14. Write a program to interface a two digit number using seven-segment LEDs. Use 8085/8086 microprocessor and 8255 PPI.

15. Write a program to control the operation of stepper motor using 8085/8086 microprocessor and 8255 PPI.

Course Outcomes: On successful complete of this course, the students should be able to:

- Identify various modules embedded on the kit.
- Write the assembly code for various operations on 8-bit and 16-bit numbers.
- Interface various peripherals with microprocessor and to write the program for same.
- Interface various devices such as seven segment LEDs & stepper motor with microprocessor through 8255 and to write the program for same.
List of Problems

1. Fabrication of all the gates using Diode & transistors and verification of truth table.
2. To design & realize combinational circuit using K-map & logic simplification.
3. To design 4 bit parallel adder/subtractor for unsigned/signed numbers.
4. To verify the operation of Multiplexer & to implement any given function with a MUX.
5. To verify the operation of DEMUX & decoder.
6. To identify common cathode & common anode of seven segment display with its various segment.
7. Implement binary to BCD conversion.
8. To fabricate BCD to seven segment decoder.
9. To verify the truth table of SR, JK, D & T Flip-Flop & conversion of one Flip-Flop to another FF.
10. To design Mod-8 Synchronous Counter using T Flip-Flop.
11. To design UP-DOWN decade counter using JK/T Flip-Flop & derive o/p into SSD.
12. To design a minute clock.
13. To verify the function of Universal Shift Register.
14. To design Ring & Johnson counter using Universal shift Register.
15. To verify the function of RAM.
16. To verify the function of 4-bit ALU.
17. To study the operation of 8-bit A/D converter.
18. To design 4 bit DAC.
19. Mini project based on concepts of digital electronics.