# B.TECH. (FULL TIME)

# ELECTRONICS AND COMMUNICATION

# ENGINEERING

# CURRICULUM & SYLLABUS

**Faculty of Engineering and Technology**

**PDM University** Bahadurgarh

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

**SEMESTER - I**

| MODULE CODE | CATEGORY | SUB-CATEGORY | MODULE | L | T | P | C | INTERNAL MARKS | EXTERNAL MARKS | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|
| ENGL0101 | G | | ENGLISH | 3 | 0 | 0 | 3 | 25 | 75 | 100 |
| MATH0101 | G | | APPLIED MATHEMATICS - I | 3 | 1 | 0 | 3.5 | 50 | 100 | 150 |
| CHEM0101 | G | | INDUSTRIAL CHEMISTRY | 3 | 0 | 0 | 3 | 25 | 75 | 100 |
| CHEM0102 | G | | INDUSTRIAL CHEMISTRY LAB | 0 | 0 | 2 | 1 | 25 | 25 | 50 |
| PHYS0101 | G | | APPLIED PHYSICS – I | 3 | 1 | 0 | 3.5 | 50 | 100 | 150 |
| PHYS0102 | G | | APPLIED PHYSICS – I LAB | 0 | 0 | 2 | 1 | 25 | 25 | 50 |
| ECEN1101 | G | | ELECTRICAL TECHNOLOGY | 2 | 0 | 0 | 2 | 25 | 50 | 75 |
| ECEN1102 | G | | ELECTRICAL TECHNOLOGY LAB | 0 | | 2 | 1 | 25 | 25 | 50 |
| CSEN1101 | G | | FUNDAMENTALS OF COMPUTERS AND PROGRAMMING (WITH C) | 4 | 0 | 0 | 4 | 50 | 100 | 150 |
| CSEN1102 | G | | FUNDAMENTALS OF COMPUTERS AND PROGRAMMING (WITH C) LAB | 0 | 0 | 2 | 1 | 25 | 25 | 50 |
| | G | | FOREIGN LANGUAGE–PART-I# | 2 | 0 | 0 | 2 | 25 | 50 | 75 |
| **TOTAL** | | | | **20** | **2** | **8** | **25** | **350** | **650** | **1000** |

**L = Lecture**
**T = Tutorial**
**P=Practical**
**C = Credit Point**

**# FOREIGN LANGUAGE**

**One foreign language out of the following**

| MODULE CODE | MODULE NAME |
|---|---|
| LANF0101 | French |
| LANG0102 | German |
| LANS0103 | Spanish |

# SEMESTER-1

## English

**L  T  P**
3  0  0

| MODULE CODE | ENGL0101 |
|---|---|
| CREDIT POINTS | 3 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 75 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

**OBJECTIVES:**

The aim of this subject is to develop understanding on different aspects related to vocabulary, synonyms, anatomize and to enhance English language skills as mentioned below:

1. To achieve knowledge and understanding on fundamentals of English Language and various aspects of it.
2. To get familiar with the rules of Grammar and their correct usage.
3. To enhance the creativity of the students related to verbal ability and reasoning or fluency of language.
4. To acquire knowledge and understanding the basic concepts of English language and its application in Science and & Engineering.
5. To acquire knowledge for the correct usage of technical English.

## LEARNING OUTCOMES:

1. Able to achieve knowledge and understanding on fundamentals of English Language.
2. Able to get familiar with the rules of Grammar and their correct usage.
3. Enhance the creativity of the students related to verbal ability and reasoning or fluency of English.
4. Ability to acquire knowledge for the correct usage of technical English.

## MODULE CONTENTS:

| |
|---|
| *Unit I: Communicative Grammar* <br> Communicative Grammar: Spotting the errors pertaining to parts of speech, nouns, pronouns, adjective, adverbs, preposition, conjunction, genders, infinitives, participles, form of Tenses, use of articles ;Concord - grammatical concord, notional Concord and the principle of proximity between subject and verb and other exceptional usages. |
| *Unit II: Lexis* <br> Lexis: Words often confused; One-Word Substitutes; Foreign Words (A selected list may be included for all the above components); Formation of Words (suffixes, prefixes and derivatives).. |
| *Unit III: Introduction to principal components of spoken English* <br> Introduction to principal components of spoken English – Phonetics, Word-stress patterns, Intonation, Weak forms in English. |
| *Unit IV: Developing listening and speaking skills through various activities* <br> Developing listening and speaking skills through various activities, such As: Role play activities Practicing short dialogues Group discussion Debates Speeches Listening to news bulletins Viewing and reviewing T.V. programs etc. |
| *Unit V: Written Communication* <br> Written Communication: Developing reading and writing skills through such tasks/activities as developing outlines, key expressions, situations, slogan writing and theme building exercises. Reading verbal and non-verbal texts like cartoons, Graphs and tabulated data etc. |
| *Unit VI: Technical Writing* <br> Business Letters, Format of Business letters and Business letter writing-Fully- blocked layout may be used-mail writing; Reports, Types of Reports and Format of Formal Reports; Press Report Writing. |

## RECOMMENDED BOOKS:

| | |
|---|---|
| **TEXT BOOKS** | 1. Basic Business Communication: Raymond V Lesikar Mc A Graw Hill publications. <br> 2. Communication Skills: D G Saxena, Kuntal Tamang Top Quark,New Delhi. <br> 3. A textbook of English Phonetics for Indian Students: T Balasubramanian Macmillan India Limited, New Delhi. |
| **REFERENCE BOOKS** | 1. Living English Structures:W S Allen Pearson Publications, New Delhi. <br> 2. High School English Grammar and Composition: P C Wren and H Martin S.Chand Publications, New Delhi. <br> 3. Essentials of Communication: B R Sharma and Sanjeev Gandhi Bharat publications, Yamuna Nagar |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | f | G | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 1,2,3,4 | 1,2,3,4 | 1,2,3 | 1,2,3 | 2,4 | 3,4 | 1,4 | 3,4 | 2,5 | 1,2,3,5 | 1,5 |

### METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for theory.

### Theory:

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 4 | 5 |
| 2. | Sessional Test | 2 | 15 |
| 3. | Group Discussion | 4 | 5 |
| 4. | End Semester Exam | 1 | 75 |

### MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

### Theory:

| Assessments | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Class Test | x | | X | | x | |
| Quiz | | | X | | x | X |
| Assignment | x | x | | x | | |

### EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;

- Approved refinement decisions due for implementation;

- Actions taken based on previous course review; and

- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

**SEMESTER-I**

## Applied Mathematics-I

**L T P**
**3  1  0**

| MODULE CODE | MATH0101 |
|---|---|
| CREDIT POINTS | 3.5 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

## OBJECTIVES:

1. To achieve knowledge and understanding on fundamentals of matrices, their various properties and capabilities to model and solve wide range of problems in science and engineering.
2. To get familiar with concepts of differential calculus and develop ability to solve simple problems.
3. To understand multiple integrals and their applications in engineering problems.
4. To learn basic concepts of probability and its application in realistic decision making.
5. To acquire knowledge of statistical hypothesis testing and assess their effectiveness in problem solving.

## LEARNING OUTCOMES:

1. Able to understand the evolution of matrices and their applications.
2. Exposure to differential calculus and their capabilities to solve problems.
3. Enhance the knowledge of multiple integrals.
4. Able to understand concepts of probability and its application.
5. Ability to acquire knowledge of statistical hypothesis testing and assess their effectiveness.

## MODULE CONTENTS:

| |
|---|
| *UNIT-I: Matrices &their Applications*<br>Rank of a matrix, elementary transformations, elementary matrices, inverse using elementary transformations, normal form of a matrix, linear dependence and in dependence of vectors, consistency of linear system of equations, linear and orthogonal transformations, Eigen values and Eigen vectors, properties of Eigen values, Cayley - Hamilton theorem and its applications. Determinants and their evaluations. |
| *UNIT-II: Applications of Differentiation*<br>Taylor's and McLaurin's series, Asymptotes and Curvature.<br>Partial Differentiation & its Applications : Functions of two or more variables; partial derivatives, Total differential and differentiability, Derivatives of composite and implicit functions, Jacobians, Higher order partial derivatives. |
| *UNIT-III: Applications of Differentiation contd.*<br>Homogeneous functions, Euler's theorem, Taylor's series for functions of two variables (without proof), maxima-minima of function of two variables, Lagrange's method of undetermined multipliers, Differentiation under integral sign.. |
| *UNIT-IV: Multiple Integration*<br>Double integral, change of order of integration, Double integral in polar coordinates, Applications of double integral to find area enclosed by plane curves and volume of solids of revolution. |
| *UNIT-V: Multiple Integration contd.*<br>Triple integral, volume of solids, change of variables, Beta and gamma functions and relationship between them. |
| *UNIT-VI:Probability Distributions & Hypothesis Testing*<br>Conditional probability, Bayes theorem and its applications, expected value of a random variable. Properties and application of Binomial, Poisson and Normal distributions.<br>Testing of a hypothesis, tests of significance for large samples, Student's t-distribution (applications only) and Chi-square test of goodness of fit. Chi-square test of independent events, F- Test. |

## RECOMMENDED BOOKS:

| | |
|---|---|
| **TEXT BOOKS** | 4. Higher Engineering Mathematics: B.S. Grewal,KhannaPublishers, New Delhi.<br>5. Advanced Engineering Mathematics,Erwin Kreyszig, JohnWiley & Sons, Inc., New York.<br>6. *Advanced Engineering Mathematics*, Peter V. O'Neil,Thomson Learning, Inc., Singapore. |

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

| REFERENCEBOOKS | 4. Advanced Engineering Mathematics, R.K. Jain andS.R.K.Iyengar, Alpha science International Ltd. Pang Bourne, England.<br>5. Advanced Engineering Mathematics, Michael DGreenberg, Prentice-Hall, Englewood Cliffs, NJ. |
| --- | --- |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | A | b | C | d | e | f | g | h | I | j | k |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Course Learning Outcomes | 1,2,3,4,5 | 1,2,3,4,5 | 1,3,5 | 1,2,5 | 1,2,4 | 2,3 | 1,4,5 | 1,3 | 1,2,5 | 1,2,3 | 2,4 |

## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

### Theory:

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
| --- | --- | --- | --- |
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

## MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

### Theory:

| Assessments | 1 | 2 | 3 | 4 | 5 | 6 |
| --- | --- | --- | --- | --- | --- | --- |
| Class Test | x | | x | | X | |
| Quiz | | | x | | X | X |
| Assignment | x | x | | x | | |

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

# SEMESTER-I

## Industrial Chemistry

L T P
3 0 0

| MODULE CODE | CHEM0101 |
|---|---|
| CREDIT POINTS | 3 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 75 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

## OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to fuel, lubricants and to enhance skills of industrial chemistry as mentioned below:

1. To achieve knowledge and understanding the phase rule for different systems and further for various engineering applications.
2. To get familiar with the importance of water, impurities in water & their effects like hardness, alkalinity & biological effects.
3. To understand & solve the problems like scale and sludge formation, boiler corrosion due to impurities present in water used for industrial purpose.
4. To learn basic concepts about the process of corrosion of different metals & its types with mechanism and cause.
5. To know various factors that can effect corrosion and to be able to produce different methods for prevention of corrosion of different metals used in machines.
6. To have knowledge of different lubricants and to use different lubricants for different machines.
7. To gain knowledge of different fuels and their efficiency.
8. To acquire knowledge about the preparation & properties of different polymers and to be able to recognize the use of different polymers & their composites for engineering applications.

## LEARNING OUTCOMES:

1. Students will be able to develop an insight about the way the chemistry is connected to other occupations and appreciation of the role of chemistry in day to day life in society and the skills of solving related industrial problems.

2. Students will be able to demonstrate their knowledge of removal of hardness of water and different water treatments methods in energy and environment related industries.

3. Graduates will be able to apply their knowledge of preventions of corrosions in different machinery systems.

4. Students will be able to demonstrate the application of different lubricants for various machinery problems and energy usage as well as the influence of human and industrial activities on the environment.

5. Students will show their interest in manufacturing different polymers and polymer composites by using different polymerization techniques and their application in industries.

6. Graduates will be able to develop their challenging careers in the field of chemicals, petroleum, petrochemical, polymer, pharmaceutical, food, biotechnology, microelectronics, energy and nano-materials processing.

7. Graduates will be able to perform laboratory experiments and proper use of standard chemistry glassware and equipment compare and collect quantitative data obtained from experimentation and using various analytical techniques.

8. Graduates will be able to communicate effectively through assignments, presentations and discussions in technical as well as in non technical domain.

## MODULE CONTENTS:

*UNIT-I: Phase Rule*

Terminology, Gibb's phase rule equation, One component system ($H_2O$ system and $CO_2$–system), Two components system: simple eutectic system (Pb–Ag), system with congruent melting point (Zn–Mg), system with incongruent melting point (Na–K), Applications of these systems and phase rule, Cooling curves.

*UNIT-II: V Water & its treatment*

Impurities in water & their effects, hardness of water and its determination (EDTA method), alkalinity of water and its determination, treatment of water for domestic use: coagulation, sedimentation, filtration and disinfection, water softening methods: Lime-Soda process, Zeolite process, Ion–exchange process, Related numerical problems.

*UNIT-III: Corrosion and its prevention*

Introduction, Chemical and Electrochemical corrosion, Types of corrosion: oxidation corrosion, galvanic corrosion, differential aeration corrosion, pitting corrosion, waterline corrosion, stress corrosion (caustic embrittlement), Factors affecting corrosion, preventive measures (Cathodic& anodic protection, electroplating, tinning, galvanization).

*UNIT-IV: Lubricants and Fuels*

Need for lubricants, Classification, general properties & applications of lubricants, Properties of lubricating oils (Flash & Fire point, Viscosity and Viscosity index, Saponification value, Iodine value, Acid value, Aniline point), Definition and classification of fuel, Calorific value of fuels, Dulong' formula, Determination of calorific value of fuels (Bomb's calorimeter & Boy's Gas calorimeter), Related numerical problems.

*UNIT-V: Polymers and Composites*

Classification of polymers, types & mechanism of polymerization (Addition and condensation), preparation properties and technical application of thermoplastics (PE, PVC, Teflon), thermosets (UF, PF) and elastomers (synthetic rubbers: SBR, Nitrile rubber), Inorganic polymers (silicones), Polymeric composites (composition, advantages and application areas), Introduction to conducting polymers and conducting polymer composites.

*UNIT-VI: Instrumental Methods of Analysis*

Principle, instrumentation & general applications of thermal methods of analysis (TGA, DTA, DSC), Basic concepts of spectroscopy, Principal, instrumentation and general applications of spectroscopic techniques (UV-Vis spectroscopy, IR-spectroscopy & Flame photometery), Conductometric titrations, pH metry.

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOKS** | 1. *Engineering Chemistry*, P.C. Jain Monica Jain (DhanpatRai& Co)<br>2. *Fundamentals of Engineering Chemistry*, Shashi Chawla (DhanpatRai& Co)<br>3. *Chemistry for Engineers*, B.K. Ambasta (Luxmi Publication)<br>4. *Chemistry in Engineering & Tech*, Vol. I & II, Kuriacose (TMH) |
| **REFERENCES** | 1. *Instrumental methods of Chemical analysis*, MERITT & WILLARD (EAST – WEST press)<br>2. *Physical Chemistry*, P.W Atkin (ELBS, OXFORD Press)<br>3. *Physical Chemistry*, W.J.Moore (Orient Longman) |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 1,2,3,4,5,6,7 | 1,2,5,6,7 | 1,3,5,7 | 1,2,7 | 2,4,6 | 1,2,3,7 | 1,4,6.7 | 1,3,4,5, | 2,5,6,8 | 1,2,4,7,8 | 2,3,4 |

### METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for theory.

### Theory:

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 4 | 5 |
| 2. | Sessional Test | 2 | 15 |
| 3. | Group Discussion | 4 | 5 |
| 4. | End Semester Exam | 1 | 75 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

**Theory:**

| Assessments | a | b | c | d | e | f | G | H |
|---|---|---|---|---|---|---|---|---|
| Class Test | | x | x | x | | x | X | |
| Quiz | x | x | x | x | | x | | |
| Assignment | x | | x | | | | | X |

**EVALUATION**

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

# SEMESTER-I

## Applied Physics I

**L T P**
3 1 0

| MODULE CODE | PHYS0101 |
|---|---|
| CREDIT POINTS | 3.5 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

## OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to modern physics, interference, difference, polarization and to enhance skills of different type of laser and its applications as mentioned below:

1. To make students aware about Modern Physics, their various properties and capabilities to model and solve wide range of problems in science and engineering.
2. To acquire knowledge polarization and their applications in engineering problems.
3. To get familiar with concepts of interference and diffraction and develop ability to solve simple problems.
4. To learn basic concepts of different types of laser and its application in scientific problems.
5. To acquire knowledge of superconductivity implementation and assess their effectiveness in science and Technology.

## LEARNING OUTCOMES:

1. Able to apply knowledge in developing advanced materials and devices.
2. Able to apply fundamental laws of superconductivity in engineering.
3. Able to identify and solve applied physics problems.
4. Able to apply knowledge to understand the concepts of fiber optics.
5. Ability to create new problems and solve with the help of applications used.

## MODULE CONTENTS:

| |
|---|
| *Unit I: Interference* |
| Coherent sources, conditions for sustained interference. Division of Wave-Front, Fresnel's Biprism, Division of Amplitude- Wedge-shaped film, Newton's Rings, Michelson Interferometer, applications, Resolution of closely spaced spectral lines, determination of wavelengths. |
| *Unit II: Diffraction* |
| Difference between interference and diffraction, Fraunhofer and Fresnel diffraction, Zone Plate, Fraunhofer diffraction through a single slit, Plane transmission diffraction grating, absent spectra, dispersive power, resolving power and Rayleigh criterion of resolution. |
| *Unit III: Polarization* |
| Polarized and unpolarised light, Uni-axial crystals double refraction, Nicol prism, quarter and half wave plates, Detection and Production of different types of polarized light, Polarimetry, Optical and specific rotation, Biquartz and Laurent's haled shade polar meter |
| *Unit IV: Laser & Fibre Optics* |
| Absorption of radiation, spontaneous and stimulated emission, Laser action, Einstein Coefficient, characteristics of laser beam-concept of coherence, spatial and temporal coherence. He-Ne and semiconductor lasers (simple ideas), applications of Laser. Propagation of light in optical fibres, numerical aperture, V-number, single and multimode fibres, attenuation dispersion, applications. |
| *Unit V: Nuclear Physics* |
| Introduction, Radioactivity, Alpha decay, Gama decay, Q value, Threshold energy, Nuclear reactions, Nuclear fission: Liquid drop model, Nuclear fusion, Particle accelerators: Linear accelerator, Cyclotron. |
| *Unit VI: Theory of Relativity* |
| Introduction, Frame of reference, Galilean transformation, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Mass energy relation. |

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOKS** | 1. Perspectives of Modern Physics, Arthur Beiser (TMH) <br> 2. Modern Physics for Engineers, S.P. Taneja (R. Chand). <br> 3. Modern Engineering Physics, A.S. Vasudeva (S. Chand). <br> 4. Engineering Physics, SatyaPrakash (PragatiPrakashan). <br> 5. Optics, Ajoy Ghatak (TMH). |
| **REFERENCEBOOKS** | 1. Fundamentals of Physics, Resnick& Halliday (Asian Book). <br> 2. Introduction to Electrodynamics, D.J. Griffith (Prentice Hall). |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | C | D | e | f | g | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 1,2 ,3, 4 | 1,3 ,5 | 1,2 ,4, 5 | 1,2,3,4, 5 | 1,3,4 | 1,4 | 1,2,5 | 1, 3, 5 | 1,4 ,5 | 1,2 ,5 | 1,3 ,5 |

## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

### Theory:

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

## MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

### Theory:

| Assessments | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Class Test | x | | x | | x | |
| Quiz | | | x | | x | X |
| Assignment | x | x | | x | | |

## EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

## SEMESTER-I

# Electrical Technology

**L  T  P**
**2  0  0**

| MODULE CODE | ECEN1101 |
|---|---|
| CREDIT POINTS | 2 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 50 |
| END SEMESTER EXAM DURATION | 2 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

## OBJECTIVES:

The aim of teaching this subject is to impart knowledge primarily related to application of electricity so that learner will be able to make basic electrical circuits in real life. Some of the objectives of the course are:

1. To acquire basic knowledge of Electric Networks.
2. To inculcate the knowledge of AC and DC fundamentals.
3. To enable to solve electric circuit using various theorems and methods.
4. To get familiar with the concept of three phase circuit and its various connections.
5. To understand the concept of resonance in electrical network.
6. To gain knowledge of construction and working of Transformer.
7. To get exposure about working of AC and DC machines.

## LEARNING OUTCOMES:

1. Able to understand basic aspects of electrical technology used in any kind of industry.
2. Able to understand various electrical applications in day to day life.
3. Get familiar with working of various components of a circuit.
4. Ability to analyze the behavior of electrical parameters in different forms.
5. Able to measure various electrical parameters.
6. Able to know the difference between single phase and three phase electrical supply.
7. Acquiring problem solving skills.

## MODULE CONTENTS:

| |
|---|
| *Unit I: D.C. Network Laws*<br>Ohm's Law, Kirchhoff's Laws, Nodal and Loop methods of analysis Star to Delta & Delta to Star transformation. |
| *Unit II: Network Theorems*<br>Thevenin's theorem, Norton's theorem, superposition theorem, maximum power transfer theorem, Millman's theorem. |
| *Unit III: Single Phase A.C. Circuits*<br>Sinusoidal signal, instantaneous and peak values, RMS and average values, crest and peak factor, Concept of phase, representation-polar & rectangular. |
| *Unit IV: Series and Parallel A.C. circuits*<br>Series and Parallel A.C. circuits. Concept of active and reactive power, power factor, series and parallel resonance, Q factor, cut-off frequencies and bandwidth. |
| *Unit V: Three Phase A.C. Circuits*<br>Three phase A.C. circuit, star and delta connection, phase and line voltage and currents, balanced star and circuits, power equation, measurement of power by two wattmeter method, introduction to unbalanced circuits. |
| *Unit VI: Transformers & Machines*<br>Construction, EMF equation, ideal transformer, Phasor diagram on no load and full load, equivalent circuit, losses, regulation and efficiency, open and short circuit test.<br>Introduction of AC and DC machines. |

## RECOMMENDED BOOKS:

| | |
|---|---|
| **TEXT BOOKS** | 1. Electrical Technology (Vol-I), by B.L. Thareja & A. K. Thareja, S. Chand publications.<br>2. Electrical Technology (Vol-II), by B.L. Thareja& A. K. Thareja, S. Chand publications.<br>3. Basic Electrical Engineering, II edition, by V. N. Mittal & Arvind Mittal, TMH Publications. |
| **REFERENCEBOOKS** | 1. Electrical Engineering Fundamentals : Deltoro, PHI<br>2. Network Analysis ; Valkenburg, PHI.<br>3. Electrical and Electronic Technology (8th Edition): Hughes, Pearson.<br>4. A textbook of Electrical Technology, J. B. Gupta, Katson publication.<br>5. Electrical Technology by Mukesh Saini. |

## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 75 marks for theory.

### Theory:

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 4 | 5 |
| 2. | Sessional Test | 2 | 15 |
| 3. | Group Discussion | 4 | 5 |
| 4. | End Semester Exam | 1 | 50 |

## MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Class Test | | | | x | X | X | x |
| Quiz | x | x | x | | | | |
| Assignment | | x | x | | | X | x |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | f | g | h | I | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 1,7 | 2 | 5 | 3 | | 1,6 | | 7,4 | | | |

## EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

# SEMESTER-I

## Fundamentals of Computers (with 'C')

L  T  P
4  0  0

| MODULE CODE | CSEN0101 |
|---|---|
| CREDIT POINTS | 4 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

## OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to components of computers, computer languages and to enhance skills of programming in „C"language as mentioned below:

1. To make students aware of the evolution of computers in different generations including its classification in different categories based on its capabilities.
2. To acquire knowledge on major components of computers hardware, software, data and processes.
3. To get familiar with concepts of microprocessor interfacing and its applications.
4. To achieve an understanding on basic concepts of operating system and networking.
5. To demonstrate the working of system software.
6. To understand syntax and semantics of „C"programming language.
7. To enable learner to build logic for a given problem and finally develop programs.

## LEARNING OUTCOMES:

1. Able to understand the evolution of computer and basic terminology.
2. Exposure to various hardware and software and their compatibilities.
3. Enhance the knowledge regarding components and connectors such as ports etc to enable communication between computers.
4. Able to understand the basic functionality of OS and the process of secured data management.
5. Ability to differentiate the class of system software, its functionality versus application software.
6. Ability to create programs involving file handling and to understand the scenario of sequential as well as random data retrieval approach.

## MODULE CONTENTS:

*Unit I: Computers system and its fundamentals*
Evolution of computers, hardware organization of a computer; Introduction to microprocessors, generations of microprocessors, Input/Output devices, Input/Output ports and connectors; Programming languages- machine language, assembly language, low level languages, high level languages, types of high level languages.

*Unit II: System software*
Translators- complier, interpreter, assembler; Macros, Loader, Linker, Relationship between Compiler, Interpreter, Loader and Linker; Operating System-fundamentals of operating system, functions of operating system, classification of operating systems, basic introduction to DOS, UNIX/LINUX OS, Windows XP.

*Unit III: An overview of 'C'*
History of C, importance of C, basic structure of C programs, executing a „C" program, character set, „C" tokens, keywords and identifiers, constants, variables and data types, declaration of variables, declaration of storage class, operators and expressions, managing I/O operations, decision making with IF statement, the if..else statement, nesting of if…else statement, switch statement, conditional statement, GOTO statement, the while statement, the do statement, the for statement and jumps in loops.

*Unit IV: Array, structure and union in 'C'*
Arrays: one-dimensional arrays, two-dimensional arrays, multi-dimensional arrays, dynamic arrays, character arrays and strings, user defined functions, structure-definition and initialization, declaring variables, accessing structure members; copying and comparing structure variables; operations on individual members; array of structure; structure within structure; unions, size of structure.

*Unit V: Functions in 'C'*
Basics of functions, built-in and user defined functions, using string, Math and other built-in functions, advantages of using functions, working of a function, declaring, defining and calling user defined functions-The return statement, call by value and call by reference, function as an argument, recursion, advantages and disadvantages of recursion.

*Unit VI: Pointers in 'C'*
Pointers- accessing the address of a variable, declaration and initialization of pointer variables, accessing a variable through its pointer; pointer Expressions; pointer and arrays, pointer and character strings; arrays of pointer; pointers as function arguments; functions returning pointers; pointers to functions.

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOKS** | 1. Fundamental of Computers and Programming with C, by A.K.Sharma, Dhanpat Rai Publications, Delhi.<br>2. Computer Networks (4th Edition), by Andrew S. Tanenbaum.<br>3. Balagurusamy-Programming in ANSI C. |
| **REFERENCE BOOKS** | 1. ANSI C, by Dennis Ritchi.<br>2. Balagurusamy-Programming in ANSI „C". |

## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

### Theory:

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

### MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Class Test | x | | x | | X | |
| Quiz | | | x | | X | X |
| Assignment | x | x | | x | | |

### MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | C | d | e | f | g | h | i | J | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 2 | 3 | 5 | 2 | 5 | 3 | | | | | |

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

# SEMESTER-I

## INDUSTRIAL CHEMISTRY LAB

**L T P**
0 0 2

| MODULE CODE | CHEM0102 |
|---|---|
| CREDIT POINTS | 1 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 25 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

## OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to chemistry as mentioned below:

1. To achieve the practical knowledge of the importance of water and it"s, impurities in water & their effects like hardness, alkalinity & biological effects.
2. To be able to understand & solve the problems like scale and sludge formation, boiler corrosion due to impurities present in water used for industrial purpose.
3. To get familiar with experimental methods for treatment of domestic water, water for industrial purpose.
4. To have knowledge of different properties of lubricants and further to use different lubricants for different machines.
5. To obtain data by cooling method for constructing a phase diagram which indicates the solid and liquid phase that is present at each temperature and composition.
6. To be effective in applying the basic concept of different polymerization synthesis techniques for preparation of different polymers and their applications.

## LEARNING OUTCOMES:

1. Able to develop an insight about the way the chemistry is connected to other occupations and appreciation of the role of chemistry in day to day life in society and the skills of solving related industrial problems.

2. Able to perform laboratory experiments and proper use of chemicals in removal of hardness of water and different water treatments methods in energy and environment related industries.

3. Able to check the water samples for various purposes in industries, like chemical industry, Construction Company, pharmaceutical company and demonstrate the role of pure water in day to day life.

4. Able to demonstrate the application of different lubricants for various machinery problems.

5. Enhance the knowledge of different polymers by using some polymerization techniques in industries.

**6.** Ability to develop their challenging careers in the chemical, petroleum, petrochemical, polymer, pharmaceutical, food and other related industries compare quantitative data collected in the lab and interpret the data obtained from experimentation and using various analytical techniques.

## MODULE CONTENTS:

| | |
|---|---|
| 1. | Determination of $Ca^{+2}$ and $Mg^{+2}$ hardness of water using EDTA solution |
| 2. | Determination of alkalinity of water sample. |
| 3. | Determination of dissolved oxygen (DO) in the given water sample. |
| 4. | To determine TDS of Water samples of different sources. |
| 5. | To find the eutectic point Fo a two component system by using method of cooling curve. |
| 6. | To Prepare Urea formaldehyde and Phenol–formaldehyde resin. |
| 7. | Determination of viscosity of lubricant by Red Wood Viscosity (No. 1 & N0. 2). |
| 8. | To find out saponification no. of lubricating oil. |
| 9. | Determination of concentration of KMnO4 solution spectrophotomererically. |
| 10. | Determination of strength of HCl solution by titrating against NaOH solution conductometerically. |
| 11. | To determine amount of sodium & potassium in given water sample by flame photometer. |
| 12. | Determination of dissociation constant of a weak acid by pH-meter. |
| 13. | Estimation of total iron in an iron alloy |
| Any other experiment carried out in the laboratory. | |

## RECOMMENDED BOOKS:

| | |
|---|---|
| **TEXT BOOKS** | 1. *Essential of Experimental Engineering Chemistry*, Shashi Chawla (DhanpatRai& Co.) <br> 2. *Expeiments in Applied Chemistry*, SunitaRatan (S.K. Kataria& Sons) |
| **REFRENCE BOOKS** | 1. *Vogel's Text Book of Quantitative Chemical Analysis*, A. I. Vogel, G. H. Jeffery Published by Longman Scientific & Technical, 5th Edition, 1989. <br> 2. *Theory & Practice Applied Chemistry* – O.P.Virmani, A.K. Narula (New Age). <br> 3. *A Text book on Experiments and Calculation– Engineering Chemistry*, S.S.Dara, (S.Chand & Company Ltd). |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | C | d | e | f | g | h | I | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 1,2,3 ,4,6 | 1,2, 4 | 1,3,6 | 1,2,4 | 2,4, 6 | 1,4 | 1,2, 4,6 | 1,2,5 | 1,3 | 1,2 ,3, 6 | 1,2 ,3 |

## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks.

### Practical

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1 | Internal Assessment | 2 | 25 |
| 2 | External Assessment | 1 | 25 |

## EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

# SEMESTER-I

**Applied Physics Lab I**                                                              **L  T  P**
                                                                                        0  0  2

| MODULE CODE | PHYS0102 |
|---|---|
| CREDIT POINTS | 1 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 25 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

## OBJECTIVES:

1. To achieve knowledge and understanding on Modern Physics, their various properties and capabilities to model and solve wide range of problems in science and engineering.
2. To get familiar with concepts of interference and diffraction and develop ability to solve simple problems.
3. To understand polarization and their applications in engineering problems.
4. To learn basic concepts of different types of laser and its application in scientific problems.
5. To acquire knowledge of superconductivity implementation and assess their effectiveness in science and Technology.

## LEARNING OUTCOMES:

1. Able to apply knowledge for finding wavelength of sodium, colours of white light using advanced technology.
2. Able to apply fundamental laws of superconductivity in engineering and technology.
3. Able to identify new problems and solve through different techniques.
4. Able to apply knowledge to understand the concepts of fiber optics.
5. Able to develop new experiment using advances technology.

## MODULE CONTENTS:

| | |
|---|---|
| 1. | To find he wavelength of sodium light by Newton's rings experiment. |
| 2. | To find the wavelength of sodium light by Fresnel's biprism experiment. |
| 3. | To find the wavelength of various colours of white light with the help of a plane transmission diffraction grating. |
| 4. | To find the refractive index and cauchey"s constants of a prism by using spectrometer. |
| 5. | To find the wavelength of sodium light by Michelson Interferometer. |
| 6. | To find the resolving power of a telescope. |
| 7. | To find the pitch of a screw using He-Ne laser. |
| 8. | To find the specific rotation of sugar solution by using a polar meter. |
| 9. | To compare the capacitances of two capacitors by De'sauty bridge and hence to find the dielectric constant of a medium. |
| 10. | To find the flashing and quenching potentials of Argon and also to find the capacitance of unknown capacitor. |
| 11. | To study the photo-conducting cell and hence to verity the inverse square law. |
| 12. | To find the temperature co-efficient of resistance by using platinum resistance thermometer and calendar and Griffin bridge. |

**RECOMMENDED BOOKS**

| | |
|---|---|
| **TEXT BOOKS** | 1. Advanced Practical Physics - B.L. Workshop and H.T. Flint (KPH) |
| **REFERENCES** | 1. Practical Physics - S.L. Gupta & V. Kumar (Pragati Prakashan). 2.Advanced Practical Physics Vol. I & II- Chauhan & Singh (Pragati Prakashan). |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | C | D | e | f | g | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 1,2,5 | 1,2,4 | 1,2,35 | 1,2,4 | 2,5 | 1,3,5 | 3,5 | 1,3,5 | 3 | 2 | 3,5 |

**METHODS OF TEACHING AND STUDENT LEARNING**
The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks.

### Practical

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|:---:|---|:---:|:---:|
| 1 | Internal Assessment | 2 | 25 |
| 2 | External Assessment | 1 | 25 |

## EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

# SEMESTER-I

## Fundamentals of Computers (with 'C') Lab

**L  T  P**
**0  0  2**

| MODULE CODE | CSEN0102 |
|---|---|
| CREDIT POINTS | 1 |
| FORMATIVE ASSESSMENT MARKS | 25 |
| SUMMATIVE ASSESSMENT MARKS | 25 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

## OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to components of computers, computer languages and to enhance skills of programming in „C‟language as mentioned below:

1. To acquire knowledge on a programming language.
2. To learn problem solving techniques.
3. To understand syntax and semantics of „C‟programming language.
4. To get familiar with program writing in C.
5. To enable learner to build logic for a given problem and finally develop programs.

## LEARNING OUTCOMES:

1. Read, understand and trace the execution of programs in C language.
2. Ability to write code in C for a given algorithm.
3. Implement programs with pointers and arrays.
4. Perform pointer arithmetic, and use of pre-processor.
5. Write programs that perform operations using derived data types.

### LIST OF EXPERIMENTS

| | |
|---|---|
| 1. | Write a program to calculate Simple Interest. |
| 2. | Write a program to print largest of three numbers (if-then-else). |
| 3. | Write a program to print whether given number is prime or not. |
| 4. | Write basic programs illustrating Switch Case statement. |
| 5. | Write a program to print largest of ten numbers (for statement). |
| 6. | Write a program to implement matrix multiplication. |
| 7. | Write a program to print Fibonacci Series. |
| 8. | Write a program to print factorial of a number. |
| 9. | Write a program to implement different string functions. |
| 10. | Write a program to check whether a string is palindrome or not. |
| 11. | Write a program to swap two numbers using call by reference and call by value. |
| 12. | Write a program to create records of student (Name, Roll No., DOB and Marks) using struct and union. |
| **Experiments based on advanced topics:** | |
| 13. | Write a program to determine the length of a character string using pointers. |
| 14. | Write a C program to count the lines, words and characters in a given text. |

### METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

### ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

### Practical:

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1 | Internal Assessment | 2 | 25 |
| 2 | External Assessment | 1 | 25 |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | C | d | e | f | g | h | I | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 3 | 2 | 4 | 1 | 1,2 | | | | | | |

**EVALUATION**

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

## SEMESTER-I

## French Language – Part 1
**L   T   P**
**2   0   0**

| MODULE CODE | LANF0101 |
|---|---|
| CREDIT POINTS | 2 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 50 |
| END SEMESTER EXAM DURATION | 2 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** All questions are compulsory. Each question may have multiple options and will cover all units.

## OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to oral and written skills of expressing and exchanging information / interacting in French language and to enhance skills as mentioned below:

1. To prepare students to develop basic understanding on French language.
2. To acquire knowledge on French grammar.
3. To understand syntax and semantics of language.
4. To achieve an understanding on basic communication in French language.
5. To understand a dialogue between two native speakers and also take part in short, simple conversations using the skills acquired.

## LEARNING OUTCOMES:

1. Able to understand the basic grammar of French language and differentiation of genders and objects.
2. Exposure to various syntax & communication methods with others.
3. Ability to read, write, speak & listen the basics of French language.
4. Able to understand the French history.

## MODULE CONTENTS

> _UNIT I:- BASIC COMMUNICATION_ – This module will develops oral and written skills of understanding, expressing and exchanging information / interacting on the topics given below: -
> • Establish contact with someone
> • Introduce self and others
> • Greet, congratulate, and express condolences
> • Spell
> • Count

• Exchange simple information on self, preferences, feelings, plans, dreams
• Ask for information
• Tell the time
• Advice, order, suggest
• Buy, sell
• Make a reservation
• Order food or any article
• Invite, accept or refuse invitation
• Fix an appointment
• Locate a place
• Give directions
• Give chronological order of events
• Prepare an itinerary
• Ask for / Give explanations
• Describe a person, an object, an event, a place
• Describe the weather
• Compare

_UNIT II: BASIC PHONETICS_ – This module will develop the ability in the students: -
• To pronounce words, say sentences, questions and give orders using the right accent and intonation.
• To express surprise, doubt, fear, displeasure and all positive or negative feelings using the right intonation
• To use „liaison" and „enchainment"
• To distinguish voiced and unvoiced consonants
• To distinguish between vowel sounds

_UNIT III: BASIC GRAMMAR & FORMATION OF SENTENCES_ – This module will develops the ability in the students to construct sentences and frame questions using: -
• Nouns – gender and number
• Articles – definite and indefinite, partitif, articles contractés
• Pronouns – personal, relative (qui, que,où), y, en
• Verbs – conjugation of regular and irregular verbs (affirmative and negative) in the following tenses (indicative mood) – present, present continuous, simple future, immediate future, recent past, simple past, past continuous
• Verbs – the imperative mood
• Adjectives – numeric, qualitative, possessive, demonstrative, interrogative – gender and number
• Adverbs – simple adverbs of time, place, quantity
• Prepositions – simple prepositions (place, time)
• Interrogation – interrogative words, interrogative phrases, inversion

## RECOMMENDED BOOKS:

| | |
|---|---|
| **TEXT BOOKS** | 7. Nouveau Sans Frontières 1 by Philippe Dominique & Jacky Girardet<br>8. "CONNEXIONS-1" by Regine Merieux & Yves Loiseau Published by Didier. |
| **REFERENCE BOOKS** | 6. Five in one Multilingual Glossary, published by Saraswati House Pvt. Ltd. New Delhi 2011. |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | C | d | e | f | g | H | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | | | | | | | | | | 1,2 | 3,4 |

### METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 75 marks for theory.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 1 | 10 |
| 2. | Sessional Test | 2 | 15 |
| 3. | End Semester Written Exam | 1 | 50 |

### MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

**Theory:**

| Assessments | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Class Test | x | x | x | |
| Quiz | x | x | x | |
| Assignment | | | x | x |

# PDM UNIVERSITY
## DEPARTMENT OF CIVIL ENGINEERING

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

## SEMESTER-I

**German Language – Part 1**                                    L   T   P
                                                                2   0   0

| MODULE CODE | LANG0102 |
|---|---|
| CREDIT POINTS | 2 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 50 |
| END SEMESTER EXAM DURATION | 2 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** All questions are compulsory. Each question may have multiple options and will cover all units.

## OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to oral and written skills of expressing and exchanging information / interacting in German language and to enhance skills as mentioned below:

1. To prepare students to develop basic understanding on German language.
2. To acquire knowledge on German grammar.
3. To understand syntax and semantics of language.
4. To achieve an understanding on basic communication in German language.
5. To understand a dialogue between two native speakers and also take part in short, simple conversations using the skills acquired.

## LEARNING OUTCOMES:

1. Able to understand the basic grammar of German language and differentiation of genders and objects.
2. Exposure to various syntax & communication methods with others.
3. Ability to read, write, speak & listen the basics of German language.
4. Able to understand the German history.

## MODULE CONTENTS

*UNIT I:- BASIC COMMUNICATION* – This module will develops oral and written skills of understanding, expressing and exchanging information / interacting on the topics given below: -
• Establish contact with someone
• Introduce self and others
• Greet, congratulate, and express condolences
• Spell
• Count

• Exchange simple information on self, preferences, feelings, plans, dreams
• Ask for information
• Tell the time
• Advice, order, suggest
• Buy, sell
• Make a reservation
• Order food or any article
• Invite, accept or refuse invitation
• Fix an appointment
• Locate a place
• Give directions
• Give chronological order of events
• Prepare an itinerary
• Ask for / Give explanations
• Describe a person, an object, an event, a place
• Describe the weather
• Compare

*UNIT II: BASIC PHONETICS* – This module will develop the ability in the students: -
• To pronounce words, say sentences, questions and give orders using the right accent and intonation.
• To express surprise, doubt, fear, displeasure and all positive or negative feelings using the right intonation
• To use „liaison" and „enchainment"
• To distinguish voiced and unvoiced consonants
• To distinguish between vowel sounds

_UNIT III: BASIC GRAMMAR & FORMATION OF SENTENCES_ – This module will develops the ability in the students to construct sentences and frame questions using: -

• Nouns – gender and number
• Articles – definite and indefinite, articles
• Pronouns – personal, relative
• Verbs – conjugation of regular and irregular verbs (affirmative and negative) in the following tenses (indicative mood) – present, present continuous, simple future, immediate future, recent past, simple past, past continuous
• Verbs – the imperative mood
• Adjectives – numeric, qualitative, possessive, demonstrative, interrogative – gender and number
• Adverbs – simple adverbs of time, place, quantity
• Prepositions – simple prepositions (place, time)
• Interrogation – interrogative words, interrogative phrases, inversion

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOKS** | 9.  Tangram, Kursbuch und Arbeitsbuch, 1A, 1B & 2A, Max Hueber Verlag<br>10. Tangram, Kursbuch und Arbeitsbuch, 2B, 3A & 3B, Max Hueber Verlag |
| **REFERENCE BOOKS** | 5.  em Abschlusskurs, Kursbuch und Arbeitsbuch, Max Hueber Verlag |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | C | d | e | f | g | H | i | J | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | | | | | | | | | | 1,2 | 3,4 |

### METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 75 marks for theory.

### Theory:

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 1 | 10 |
| 2. | Sessional Test | 2 | 15 |
| 3. | End Semester Written Exam | 1 | 50 |

### MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

**Theory:**

| Assessments | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Class Test | X | x | x | |
| Quiz | X | x | x | |

| Assessments | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Assignment | | | x | x |

### EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

## SEMESTER-I

## Spanish Language – Part 1

L  T  P
2  0  0

| MODULE CODE | LANS0103 |
|---|---|
| CREDIT POINTS | 2 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 50 |
| END SEMESTER EXAM DURATION | 2 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** All questions are compulsory. Each question may have multiple options and will cover all units.

## OBJECTIVES:

The aim of this subject is to develop understanding on different aspects related to oral and written skills of expressing and exchanging information / interacting in Spanish language and to enhance skills as mentioned below:

1. To prepare students to develop basic understanding on Spanish language.
2. To acquire knowledge on Spanish grammar.
3. To understand syntax and semantics of language.
4. To achieve an understanding on basic communication in Spanish language.
5. To understand a dialogue between two native speakers and also take part in short, simple conversations using the skills acquired.

## LEARNING OUTCOMES:

1. Able to understand the basic grammar of Spanish language and differentiation of genders and objects.
2. Exposure to various syntax & communication methods with others.
3. Ability to read, write, speak & listen the basics of Spanish language.
4. Able to understand the Spanish history.

## PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

## MODULE CONTENTS

*UNIT I:- BASIC COMMUNICATION* – This module will develops oral and written skills of understanding, expressing and exchanging information / interacting on the topics given below: -
• Establish contact with someone
• Introduce self and others
• Greet, congratulate, and express condolences
• Spell

• Count
• Exchange simple information on self, preferences, feelings, plans, dreams
• Ask for information
• Tell the time
• Advice, order, suggest
• Buy, sell
• Make a reservation
• Order food or any article
• Invite, accept or refuse invitation
• Fix an appointment
• Locate a place
• Give directions
• Give chronological order of events
• Prepare an itinerary
• Ask for / Give explanations
• Describe a person, an object, an event, a place
• Describe the weather
• Compare

*UNIT II: BASIC PHONETICS* – This module will develop the ability in the students: -
• To pronounce words, say sentences, questions and give orders using the right accent and intonation.
• To express surprise, doubt, fear, displeasure and all positive or negative feelings using the right intonation
• To use „liaison" and „enchainment"
• To distinguish voiced and unvoiced consonants
• To distinguish between vowel sounds

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## DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

*UNIT III: BASIC GRAMMAR & FORMATION OF SENTENCES* – This module will develops the ability in the students to construct sentences and frame questions using: -

• Nouns – gender and number
• Articles – definite and indefinite, articles
• Pronouns – personal, relative
• Verbs – conjugation of regular and irregular verbs (affirmative and negative) in the following tenses (indicative mood) – present, present continuous, simple future, immediate future, recent past, simple past, past continuous
• Verbs – the imperative mood
• Adjectives – numeric, qualitative, possessive, demonstrative, interrogative – gender and number
• Adverbs – simple adverbs of time, place, quantity
• Prepositions – simple prepositions (place, time)
• Interrogation – interrogative words, interrogative phrases, inversion

## RECOMMENDED BOOKS:

| | |
|---|---|
| **TEXT BOOKS** | 11. Aula Internacional 1 and 2, Novellas and short stories<br>12. Aula Internacional 3, España and Latinoamérica: Historia y Cultura, Novellas |
| **REFERENCE BOOKS** | 5. Español sin fronteras, I, SGEL, 1997<br>6. Nuevo Ven I, Edelsa 2004 |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | F | g | H | i | J | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | | | | | | | | | | 1,2 | 3,4 |

### METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 75 marks for theory.

## Theory:

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 1 | 10 |
| 2. | Sessional Test | 2 | 15 |
| 3. | End Semester Written Exam | 1 | 50 |

### MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

**Theory:**

| Assessments | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Class Test | X | x | x | |
| Quiz | X | x | x | |
| Assignment | | | x | x |

### EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty''s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

## SEMESTER-I

**Electrical Technology Lab**

**L  T  P**
**0  0  2**

| MODULE CODE | |
|---|---|
| CREDIT POINTS | 1 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 25 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**OBJECTIVES:**
1. To get familiar with various measuring instruments.
2. To understand practical aspects of Network theorems.
3. To get familiar with major parts of electrical machines.
4. To aware students about precautionary measures of using Electrical supply.
5. To analyze different components of any electrical network.
6. To get familiar with the constructional part of transformer.

**LEARNING OUTCOMES:**
1. Creates implementation skills.
2. Able to measure various electrical parameters.
3. Able to understand various electrical applications in day to day life.
4. Get familiar with working environment of three phase electrical supply.
5. Ability to analyze the electrical connections.

**LIST OF EXPERIMENTS**:

| 1. | To verify ohm"s law. |
|---|---|
| 2. | To verify KCL and KVL. |
| 3. | To verify Thevenin's theorem. |
| 4. | To verify Norton theorem. |
| 5. | To verify superposition theorem. |
| 6. | To verify Maximum power transfer theorem. |
| 7. | To measure power and power factor by 3 voltmeter method. |
| 8. | To measure power and power factor by 3 ammeter method. |
| 9. | To study the construction of Transformer. |
| 10. | To study about function of multimeter. |
| **Experiments based on advanced topics:** | |
| 11. | To perform O.C. and S.C. tests of a transformer. |
| 12. | To study frequency response of a series R-L-C circuit and determine resonant frequency and Q-factor for various values of R, L, and C. |

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

## Practical:

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1 | Internal Assessment | 2 | 25 |
| 2 | External Assessment | 1 | 25 |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 3 | 2,4 | | 1 | 5 | 1,4 | | 1,2 | | 3 | |

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

### SEMESTER II

| MODULE CODE | CATEGORY | SUB-CATEGORY | MODULE | L | T | P | C | INTERNL MARKS | EXTERNAL MARKS | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|
| PHYS0103 | G | | APPLIED PHYSICS-II | 3 | 1 | 0 | 3.5 | 50 | 100 | 150 |
| PHYS0104 | G | | APPLIED PHYSICS-II LAB | 0 | 0 | 2 | 1 | 25 | 25 | 50 |
| ECEN1103 | G | | ANALOG ELECTRONICS | 2 | 0 | 0 | 2 | 25 | 50 | 75 |
| ECEN1104 | G | | ANALOG ELECTRONICS LAB | 0 | 0 | 2 | 1 | 25 | 25 | 50 |
| MECH0102 | G | | BASICS OF MECHANICAL ENGINEERING | 2 | 0 | 0 | 2 | 25 | 50 | 75 |
| MECH1103 | G | | BASICS OF MECHANICAL ENGINEERING LAB | 0 | 0 | 2 | 1 | 25 | 25 | 50 |
| MECH1102 | G | | WORKSHOP TECHNOLOGY LAB | 0 | 0 | 2 | 1 | 25 | 25 | 50 |
| CIVL0101 | G | | BASICS OF CIVIL ENGINEERING | 2 | 0 | 0 | 2 | 25 | 50 | 75 |
| CIVL0102 | G | | BASICS OF CIVIL ENGINEERING LAB | 0 | 0 | 2 | 1 | 25 | 25 | 50 |
| MATH0116 | G | | APPLIED MATHEMATICS-II | 4 | 1 | 0 | 4.5 | 50 | 100 | 150 |
| MATH0117 | G | | NUMERICAL METHODS | 3 | 0 | 0 | 3 | 25 | 75 | 100 |
| VALU0109 | G | | VALUE EDUCATION | 2 | 0 | 0 | 2 | 25 | 50 | 75 |
| CSEN1103 | G | | PC LAB | 0 | 0 | 2 | 1 | 25 | 25 | 50 |
| | G | | FOREIGN LANGUAGE PART- II # | 2 | 0 | 0 | 2 | 25 | 50 | 75 |
| TOTAL CREDITS | | | | 20 | 2 | 12 | 27 | 400 | 675 | 1075 |

**L = Lecture**

**T = Tutorial**

**P = Practical**

**C = Credit Point**

**# FOREIGN LANGUAGE**

**One foreign language out of the following**

| MODULE CODE | MODULE NAME |
|---|---|
| LANF0104 | French |
| LANG0105 | German |
| LANS0106 | Spanish |

## SEMESTER II

**Applied Physics II**

| | L | T | P |
|---|---|---|---|
| | 3 | 1 | 0 |

| | |
|---|---|
| MODULE CODE | PHYS0103 |
| CREDIT POINTS | 3.5 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** In total EIGHT questions will be set. Question ONE will be compulsory and will cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

**OBJECTIVES:**
The aim of this subject is to develop understanding on different aspects related to solid state physics, crystal geometries, quantum physics, nano-science, energy bands and electromagnetic theory to enhance skills in the field of electricity and magnetism and its applications as mentioned below:

1. To achieve knowledge and understanding on soli-state physics, various properties of crystals to model and solve wide range problems in science and engineering.
2. To get familiar with concepts of micro and nano scales of materials and develop ability to solve simple problems.
3. To understand the concepts of electricity and magnetism, distribution of solids according to band theory, free electrons, and applications of maxwell"s equation in engineering problems.
4. To learn basic concepts of different types of magnetic properties of solids in scientific problems.
5. To acquire knowledge of crystal structure and assess their effectiveness in science and Technology.

**LEARNING OUTCOMES:**
1. Able to apply knowledge in developing advanced materials and devices.
2. Able to apply fundamental laws of electricity and magnetism in engineering.
3. Able to identify and solve crystal structure and semiconductor physics problems.
4. Able to solve applications based on Maxwell"s equation

5. Able to apply knowledge to understand the concepts of quantum physics.
6. Able to identify and solve concepts related to nano particles.
7. Ability to create new problems and solve with the help of applications used.

**COURSE CONTENT:**

| |
|---|
| *UNIT I: Crystal Structure* <br><br> Space lattice, unit cell and translation vector, Miller indices, simple crystal structure. Laue's treatment to Bragg's law, powder method, point defects in solids- Schottky and Frenkel defects, Bonding in solidsionic and covalent bonds. |
| *UNIT II: Quantum Physics* <br><br> Difficulties with classical physics, introduction to quantum mechanics simple concepts, Black body radiations Discovery of Planck's constant, phase velocity and group velocity. Schrodinger wave equations-time dependent and time independent, Expectation value, Ehrnfest Theorem, particle in a one-dimensional box. Quantum Statistics, Bose-Einstein and Fermi-Dirac Statisticsz, Elementary ideas of quark, gluons and hadrons. |
| *UNIT III: Nano-Science* <br><br> Features of nano-systems, concept of quantum size effect, quantum dots and their applications. Free Electron Theory: Elements of classical free electron theory and its limitations. Drude's theory of conduction, quantum theory of free electrons, Fermi level, density of states, Fermi-Dirac distribution function, Thermionic emission, Richardson's equation. |
| *UNIT IV: Band Theory of Solids* <br><br> Origin of energy bonds, Kronig-Penny model (qualitative) E-K diagrams, Brillouin Zones, Concept of effective mass and holes. Classification of solids into metals, semiconductors and insulators. Fermi energy and its variation with temperature. Hall Effect and its applications. |
| *UNIT V: Green Energy* <br><br> Introduction to Green energy, types of green energy, energy conversion mechanisms for solar energy, wind energy, ocean energy and geothermal energy. |
| *UNIT VI: Electro Magnetic Theory* <br><br> Gradient, Divergence, Curl, Gauss" law, Ampere"s Law, Continuity equation, Maxwell,s equation (differential and integral forms), Significance of Maxwell"s equations, Poynting Theorem, Electromagnetic wave propagation inn dielectrics and conductors. |

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOKS** | 1. Concepts of Modern Physics, Arthur Beiser (TMGH)<br>2. Solid State Physics, S.O. Pillai (New Age Int. Ltd. Pub.)<br>3. Modern Physics for Engineers, S.P. Taneja (R. Chand)<br>4. Modern Engineering Physics, A.S. Vasudeva (S. Chand) |
| **REFERENCEBOOKS** | 1. Introduction to Solid State Physics,Kittel (John Wiley)<br>2. Quantum Mechanics, A. Ghatak<br>3. A Textbook of Engineering Physics,Avadhanulu and Kshisagar (S. Chand) |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | C | d | e | f | G | h | i | j | K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 1,3 | 1,7 | 1 | 1,7 | 1,2,6 | 1,4 | 1,2 | 1,5 | 2,3 | 1,2 | 1,3 |

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 150 marks for theory.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Class Test | x | | x | | x | |
| Quiz | | | x | | x | x |
| Assignment | x | x | | X | | |

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

## SEMESTER - II

**Applied Physics II Lab**

| L | T | P |
|---|---|---|
| 0 | 0 | 2 |

| MODULE CODE | PHYS0104 |
|---|---|
| CREDIT POINTS | 1 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 25 |
| END SEMESTER EXAM DURATION | 3 hrs. |
| LAST REVISION DATE | |

**OBJECTIVES**

1. To achieve the practical knowledge of low and high resistance and resistance of galvanometer by different methods.

2. To be able to find characteristic of a solar cell, V-I of a p-n diode and to find the fill factor and e/m for electrons by helical method.

3. To get familiar with ionization potential of Argon/Mercury using a thyratron tube and find the radius of coil by Stewart and Gee's apparatus.

4. To have knowledge of hysteresis loss by tracing a B-H curve.

5. To obtain the Planck's constant, co-efficient of self-inductance by using a Rayleigh bridge, Hall Co-efficient of semi-conductor.

6. To obtain band gap of intrinsic semi-conductor using four probe method.

**LEARNING OUTCOMES:**

1. Able to apply knowledge for finding the characteristics of solar cells and their applications.

2. Able to apply fundamental laws of superconductivity in engineering and technology.

3. Able to identify new problems and solve through different techniques.

4. Able to apply knowledge to understand the concepts of p-n junction diode.

5. Able to develop new experiment using advances technology.

## COURSE CONTENT

| |
|---|
| 1. To find the low resistance by Carey- Foster's bridge. |
| 2. To find the resistance of a galvanometer by Thomson's constant deflection method using a post office box. |
| 3. To find the value of high resistance by Substitution method. |
| 4. To find the value of high resistance by Leakage method. |
| 5. To study the characteristics of a solar cell and to find the fill factor. |
| 6. To find the value of e/m for electrons by Helical method. |
| 7. To find the ionisation potential of Argon/Mercury using a thyratron tube. |
| 8. To study the variation of magnetic field with distance and to find the radius of coil by Stewart and Gee's apparatus. |
| 9. To study the characteristics of (Cu-Fe, Cu-Constantan) thermo couple. |
| 10. To find the value of Planck's constant by using a photo electric cell. |
| 11. To find the value of co-efficient of self-inductance by using a Rayleigh beidge. |
| 12. To find the value of Hall Co-efficient of semi-conductor. |
| 13. To study the V-I characteristics of a p-n diode. |
| 14. To find the band gap of intrinsic semi-conductor using four probe method. |
| 15. To calculate the hysteresis loss by tracing a B-H curve. |
| Note: At least 12 experiments out of the list must be done in the semester. |

## RECOMMENDED BOOKS

| TEXT BOOKS | 3. Advanced Practical Physics, B.L. Workshop and H.T. Flint (KPH) |
|---|---|
| **REFRENCE BOOKS** | 4. Practical Physics, S.L. Gupta & V. Kumar (Pragati Prakshan). <br> 5. Advanced Practical Physics Vol. I & II – Chauhan & Singh (Pragati Prakshan). |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | f | G | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 1,5 | 2,4 | 2,3,5 | 1,2,4 | 1,5 | 3,4 | 2,3,5 | 1,2,4 | 4,5 | 1 | 3,5 |

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 50 marks.

**Practical**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1 | Internal Assessment | 2 | 25 |
| 2 | External Assessment | 1 | 25 |

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

## SEMESTER - II

**Analog Electronics**                                                    **L      T      P**
                                                                          **2      0      0**

| MODULE CODE | ECEN1103 |
|---|---|
| CREDIT POINTS | 2 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 50 |
| END SEMESTER EXAM DURATION | 2 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

**OBJECTIVES:**

The aim of teaching this subject is to impart knowledge primarily related to electronic circuitry so that learner may found it's applications in real life. Some of the objectives of the course are:

6.  To acquire knowledge about semiconductor physics for intrinsic and extrinsic materials.
7.  To understand the concept of PN Junction Diode, Transistor and their applications.
8.  To analyze the performance of negative as well as positive feedback circuits.
9.  To have complete knowledge of Amplifiers, oscillators and its various applications.
10. To describe the scientific principles applied to the basic flow of electricity.
11. To understand the concept of Operational amplifier its various applications.

**LEARNING OUTCOMES:**

1.  Able to implement the different of electronic devices in different applications.
2.  Able to apply method and appropriate technology to the study of physical science.
3.  Get familiar with working of various components of a circuit.
4.  Get familiar with the many important electronics phenomena such as Rectification, Amplification etc.
5.  Get familiar with various power supplies.
6.  Able to understand the concept of Barkhausen criteria of oscillation.

**MODULE CONTENTS:**

*Unit I: Semiconductor Physics*
Conductors, Insulators, Semiconductors, Intrinsic and extrinsic semiconductors, diffusion and drift currents.

*Unit II: Diode and its applications*
PN Junction Diode, forward and reverse-biased junctions, Characteristics, Ideal Diode, Diode as Limiters, half wave & full wave rectification, Zener diode.

*Unit III: Transistor*
Bipolar Junction Transistors (BJT), Transistor fundamentals, transistor configurations, BJT.

*Unit IV: Amplifier Circuits*
Introduction of different types of amplifiers and their characteristics, Principle of amplification, RC coupled Amplifier, concept of feedback in amplifiers.

*Unit V: Oscillator Circuits*
Effect of positive and negative feedbacks, Sinusoidal Oscillators (RC, LC and Crystal), Working of an oscillator, Barkhausen criterion of oscillation.

*Unit VI: Operational Amplifiers:*
Op-Amp Basics, practical Op-Amp circuits, Inverting & Non Inverting Amplifier and other Op-Amp applications.

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOKS** | 13. Electronic Devices & Circuits - Boylstad & Nashelsky. <br> 14. J.S Katre "Basic Electronics" Tech Max Publications <br> 15. J.B Gupta, "Basic Electronics" S K kataria and sons <br> 16. Electronic devices and circuits-Millman and Halkias, McGraw Hills. |
| **REFERENCEBOOKS** | 7. Electrical and Electronic Technology (8th Edition): Hughes, Pearson. <br> 8. Cooper and Helfrick, "Modern Electronic Instrumentation and Measuring Techniques", 4th print Prentice Hall of India, New Delhi (1996). <br> 9. Cooper and Helfrick, "Modern Electronic Instrumentation and Measuring Techniques", 4th print Prentice Hall of India, New Delhi (1996). |

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 75 marks.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 4 | 05 |
| 2. | Sessional Test | 2 | 15 |
| 3. | Group Discussion | 4 | 05 |
| 4. | End Semester Exam | 1 | 50 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Class Test | x | | | X | | |
| Quiz | x | | x | | | x |
| Assignment | | x | | | x | x |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | c | d | e | f | g | H | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 1,2 | 3 | | 6 | 4 | 3,5 | | 2 | 4 | | 1,3 |

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

## SEMESTER - II

**Analog Electronics Lab**

| | L | T | P |
|---|---|---|---|
| | 0 | 0 | 2 |

| | |
|---|---|
| MODULE CODE | ECEN1104 |
| CREDIT POINTS | 1 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 25 |
| END SEMESTER EXAM DURATION | 3  hrs |
| LAST REVISION DATE | |

**OBJECTIVES:**

1. To understand the practical aspects of basic electronics theory.
2. To Design and construct simple electronic circuits to accomplish a specific function
3. To understand the working of CRO and other measuring instruments.
4. To understand input and output characteristics of Bi-polar junction transistor.
5. To get familiar with ideal and practical characteristics of IC 741.
6. To provide experimental validation of the elementary analogue circuitry using analogue and digital testers.
7. To learn operation of electronic displays.
8. To understand their capabilities and limitations and make decisions regarding their best utilization in a specific situation.

**LEARNING OUTCOMES:**

1. Identify the basic tools and test equipment used to construct, troubleshoot, and maintain standard electronic circuits and systems.
2. Able to verify the working of diodes, transistors and their applications.
3. Able to design various basic circuits of digital electronics using simple gates and capable to work on IC 741.
4. Get familiar with the operation and applications of cathode ray oscilloscope.
5.  To generate signals using function generator.
6. Build a common emitter/base/collector amplifier and measure its voltage gain.
7. Explore the operation and advantages of operational amplifiers.
8. Exploring the circuitry which converts an analog signal to digital signal.

**LIST OF EXPERIMENTS**:

| | |
|---|---|
| 1. | To get familiar with the working knowledge of the following instruments : <br> a) Cathode Ray Oscilloscope (CRO) b) Multi meter (Analog and Digital) <br> c) Function generator. d) Power supply |
| 2. | To Plot the V-I characteristics of P-N junction diode in forward and Reverse bias mode. |
| 3. | To verify the operation of PN junction diode as half wave rectifier circuit. |
| 4. | To verify the operation of PN junction diode as full wave rectifier circuit. |
| 5. | To Study the operation and plot the characteristics of Zener Diode. |
| 6. | To plot the input and output characteristics of BJT in common-emitter configuration |
| 7. | To find frequency response of a given amplifier and calculate its bandwidth. |
| 8. | To verify the operation of an op-amp (IC 741) as : <br> a) Inverting amplifier b) Non-inverting amplifier |
| 9. | To study and verify the operation of an Op-Amp as a Differentiator. |
| 10. | To study and verify the operation of an Op-Amp as a Integrator. |
| **Experiments based on advanced topics:** | |
| 11. | Design and set up the BJT common emitter amplifier using voltage divider bias with and without feedback and determine the gain- bandwidth product from its frequency response. |
| 12. | To assemble Wein Bridge oscillator circuit and calculation of oscillation frequency and its verification from the observed output. |

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 50 marks for practical.

**Practical:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1 | Internal Assessment | 2 | 25 |
| 2 | External Assessment | 1 | 25 |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 4 | 1 | 2,3 | 1 | 3 | 3,5 | 6,8,7 | 4,5 | | | |

## EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

## SEMESTER - II

**Basics of Mechanical Engineering**

| | L | T | P |
| --- | --- | --- | --- |
| | 2 | 0 | 0 |

| | |
| --- | --- |
| MODULE CODE | MECH0102 |
| CREDIT POINTS | 2 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 50 |
| END SEMESTER EXAM DURATION | 2 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C comprise of short answer type and Long answer type questions and will have internal choices.

**OBJECTIVES:**

1. To have an understanding of fundamental concepts of thermodynamics system and its properties.
2. To develop an ability to identify, formulate, and solve engineering problems.
3. To achieve an ability to use the techniques, skill, and modern engineering tools necessary for engineering practice.
4. An ability to work professionally in both thermal and mechanical systems areas.
5. Apply their mechanical engineering education to address the full range of technical and societal problems with creativity, imagination, confidence and responsibility.
6. To understand multiple integrals and their applications in engineering problems.

**LEARNING OUTCOMES:**

1. Able to apply knowledge of mathematics, science, and engineering.
2. An ability to design and conduct experiments, as well as to analyze and interpret data.
3. Enhance the knowledge about how to identify, formulate, and solve engineering problems.
4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
5. Able to design and conduct experiments; analyze results.
6. Recognize and understand contemporary issues and the role of professionals in global society

**COURSE CONTENT:**

*Unit I: Introduction to Machine tools*
Introduction to Machine Tool to Commonly used Machine Tools in a Workshop: - Lathe, Shaper, Planer, Milling, Drilling, Slotter. Introduction to Metal Cutting.

*Unit II: Basic concept of thermodynamics*
Basic concept of thermodynamics, Introduction, States, Work, Heat, Temperature, Zeroth, 1st, 2nd and 3rd law of thermodynamics, Concept of internal energy, enthalpy and entropy. Problems Properties of Steam & Steam Generator Formation of steam at constant pressure, Thermodynamic properties of Steam, Use of steam tables, Measurement of dryness fraction by throttling calorimeter.

*Unit III : Refrigeration & Air-conditioning*
Introduction to refrigeration and air -conditioning, Rating of refrigeration machines, Coefficient of performance, Simple refrigeration vapour compression cycle, Psychrometric charts and its use, Human comforts.

*Unit IV: Hydraulic Turbines & Pumps*
Introduction, Classification, Construction details and working of Pelton, Francis and Kaplan turbines, Specific speed and selection of turbines, Classification of water pumps and their working

*Unit V: Power Transmission Methods and Devices*
Introduction to Power transmission, Belt, Rope, Chain and Gear drive. Types and functioning of clutches. Introduction to Manufacturing Systems, Fundamentals of Numerical Control (NC), Advantage of NC systems, Classifications of NC, Comparison of NC and CNC.

*Unit VI : Stresses and Strains*
Introduction, Concept & types of Stresses and strains, Poison"s ratio, stresses and strains in simple and compound bars under axial, flexure & torsional loading, Stress- strain diagrams, Hooks law, Elastic constants & their relationships.

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOK** | 1. Elements of Mechanical Engineering – R.K.Rajput Lakmi Pub., Delhi<br>2. Elements of Mechanical Engineering – D.S. Kumar, S.K. Kataria and Sons<br>3. Engineering Thermodynamics- P.K.Nag TMH, New Delhi<br>4. Refrigeration &Airconditioning – Arora & Domkundwar, Dhanpatrai & co.pvt ltd |

| | |
|---|---|
| **REFERENCE** | 1. Hydraulic Machines – Jagdish Lal, Pub.- Metropolitan, Allahbad.<br>2. Strength of Materials - G.H. Ryder, Pub.- ELBS.<br>3. Hydraulic and Fluid Mechanics – Modi and Seth, Pub. – Standard Book House, New Delhi<br>4. Engineering Thermodynamics – C.P. Arora, Pub. - TMH, New Delhi. |

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 75 marks for theory.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|:---:|:---|:---:|:---:|
| 1. | Class Test | 4 | 05 |
| 2. | Sessional Test | 2 | 15 |
| 3. | Group Discussion | 4 | 05 |
| 4. | End Semester Exam | 1 | 50 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 | 6 |
|:---|:---:|:---:|:---:|:---:|:---:|:---:|
| Class Test | x | | x | | x | |
| Quiz | | | x | | x | x |
| Assignment | x | x | | x | | |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | C | d | E | f | g | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 2 | 5 | | 2,4 | 4 | 3 | 6 | 2 | | 3 | 4 |

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

## SEMESTER - II

### Basics of Mechanical Engineering Lab

| | L | T | P |
|---|---|---|---|
| | 0 | 0 | 2 |

| | |
|---|---|
| MODULE CODE | MECH0103 |
| CREDIT POINTS | 1 |
| FORMATIVE ASSESSMENT MARKS | 25 |
| SUMMATIVE ASSESSMENT MARKS | 25 |
| END SEMESTER EXAM DURATION | 3 hrs. |
| LAST REVISION DATE | |

**OBJECTIVES:**

1. To learn effective engineering communication.
2. Ability to work in teams on multidisciplinary projects in industry and research organizations.
3. Develop awareness of the ethical, professional and environmental implications of work in a global and societal context.
4. To learn modern engineering tools, techniques, skills and contemporary engineering practice, necessary for engineering work.
5. Have an understanding to solve mechanical engineering problems based on data interpretation, design, experiment and analysis of results.

**LEARNING OUTCOMES:**
1. Able to apply knowledge of mathematics (including differential equations and statistics), physical and life sciences, and engineering to carry out analysis and design to solve problems at the interface of engineering and biology.
2. Exposure to design and conduct experiments, as well as to measure, analyze and interpret data from living systems.
3. Ability to design a system, component, or process to meet desired needs, including systems that involve the interaction between living and non-living materials.
4. Ability to identify, formulate, and adapt engineering solutions to unmet biological needs.
5. Ability to create the techniques, skills, and modern engineering tools necessary for engineering practice, including the ability to model and analyze biological systems as engineering systems.

**LIST OF EXPERIMENTS**

| | |
|---|---|
| 1. | To study the Cochran and Babcock & Wilcox boilers. |
| 2. | To study the working and function of mountings and accessories in boilers. |
| 3. | To study Two-Stroke & Four-Stroke Diesel Engines. |
| 4. | To Study Two-Stroke & Four-Stroke Petrol Engines. |
| 5. | To study the vapour compression Refrigeration System and determination of its C.O.P. |
| 6. | To study the functioning of Window Room Air Conditioner. |
| 7. | To study the constructional features and working of Pelton Wheel Turbine, Francis Turbine and Kaplan Turbine. |
| 9. | To calculate the Mechanical Advantage, Velocity Ratio and Efficiency of Single Start, Double |
| 10. | Start and Triple Start Worm Wheel. |
| 11. | To calculate Mechanical Advantage, Velocity Ratio and Efficiency of Single Purchase and Double purchase winch crab and plot graphs. |

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOK** | 1. Elements of Mechanical Engineering – R.K.Rajput Lakmi Pub., Delhi. <br> 2. Elements of Mechanical Engineering – D.S.Kumar, S.K. Kataria and Sons. |
| **REFERENCE** | 1. Strength of Materials - G.H. Ryder, Pub.- ELBS. <br> 2. Hydraulic and Fluid Mechanics – Modi and Seth, Pub. – Standard Book House, New Delhi. |

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 50 marks for practical.

**Practical:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|:---:|:---|:---:|:---:|
| 1 | Internal Assessment | 2 | 25 |
| 2 | External Assessment | 1 | 25 |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|:---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Course Learning Outcomes | 3,4 | 2 | 3,5 | 1 | 1,2 | | 4 | | 3 | | 1 |

**EVALUATION**

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
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## SEMESTER - II

**Workshop Technology Lab**
                                                                          L     T     P
                                                                          0     0     2

| MODULE CODE | MECH1102 |
|---|---|
| CREDIT POINTS | 1 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 25 |
| END SEMESTER EXAM DURATION | 3 hrs. |
| LAST REVISION DATE | |

**OBJECTIVES:**

1. To practice workshop safety rules effectively.
2. To acquire knowledge and use simple hand tools.
3. To acquire knowledge and use simple measuring and gauging instruments.
4. To operate simple drilling machines for producing small holes.
5. To understand about various machine tools for producing simple metal components and articles.

**LEARNING OUTCOMES:**

1. Able to understand applications of hand tools and power tools.
2. Able to get familiar with operations of machine tools.
3. Ability to select the appropriate tools required for specific operation.
4. Exposure to safety measures required to be taken while using the tools.
5. Ability to acquire knowledge and practice on foundry, forging and welding.

## COURSE CONTENT:

| | |
|---|---|
| 1 | To study different types of measuring tools used in metrology and determine least counts of verniercalipers, micrometers and vernier height gauges. |
| 2 | To study different types of machine tools (lathe, shape or planer of slotter, milling, drilling machines). |
| 3 | To prepare a job on a lathe involving facing, outside turning, taper turning, step turning, radius making and parting-off. |
| 4 | To study different types of fitting tools and marking tools used in fitting practice. |
| 5 | To prepare lay out on a metal sheet by making and prepare rectangular tray pipe shaped components e.g. funnel. |
| 6 | To prepare joints for welding suitable for bull welding and lap welding. |
| 7 | To perform pipe welding. |
| 8 | To study various types of carpentry tools and prepare simple types of at least two wooden joints. |
| 9 | To prepare simple engineering components/shapes by forging. |
| 10 | To prepare mold and core assembly to put metal in the mold and fettle the casting. |

## RECOMMENDED BOOKS:

| | |
|---|---|
| **TEXT BOOK** | 1. Workshop Technology Vol. 1 and 2 BY RAGHUVANSHI, Title: B.S. DhanpatRai& Sons.<br>2. Workshop practices, Author HS BAWA, TITLE: Tata McGraw-Hill. |
| **REFERENCE** | 1. Workshop practices and materials, author BJ BLACK, Title: CRC press.<br>2. Mechanical practice workshop, author KC john, Title: PHI learning. |

## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

**Practical:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1 | Internal Assessment | 2 | 25 |
| 2 | External Assessment | 1 | 25 |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 2 | 3 | | 2,5 | 4 | 3 | | 2 | | 1,3 | 4 |

## EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty''s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
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## SEMESTER - II

**Basics of Civil Engineering**

| | L | T | P |
| | 2 | 0 | 0 |

| MODULE CODE | CIVL0101 |
|---|---|
| CREDIT POINTS | 2 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 50 |
| END SEMESTER EXAM DURATION | 2 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will consist of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B & C comprise of short answers type and long answer type questions. These sections will have internal choice.

**OBJECTIVES:**

The aim of this subject is to develop understanding on different aspects related to basic knowledge of different sections of civil engineering as mentioned below:

1. To achieve knowledge and understanding about engineering aspects related to buildings.
2. To get familiar with different building materials and their properties.
3. To understand importance of surveying and the transportation systems.
4. To learn basic concepts related to water supply and sewage disposal.
5. To understand the fundamental concepts of geotechnical engineering and properties of soil.

**LEARNING OUTCOMES:**

1. Able to know about basic civil engineering terms and their applications.
2. Able to learn about the basic building material used in construction.
3. Able to understand about importance of surveying in civil engineering.
4. Able to know about soil behaviour and soil properties in different conditions.
5. Able to learn about water supply system and different layout of water distribution systems.

**MODULE CONTENT:**

| |
|---|
| *UNIT -I : Building Materials*<br>Introduction of Civil Engineering materials: Bricks– composition, classifications, properties and uses. Stone – classification of rocks, quarrying, dressing properties and uses. Timber – properties, uses. Cement – grades, types, properties, uses. Steel – mild steel, medium steel, hard steel, their properties, uses. Concrete – grade designation, properties and uses. |
| *UNIT-II: Building Components*<br>Building – selection of site, classification, components. Foundations –functions, classification bearing capacity. Flooring – requirements, selection, types. Roof – types and requirements. |
| *UNIT-III: Surveying*<br>Introduction, Principles of surveying, use and adjustment of various instruments employed in chain survey, compass surveying and plane table surveying. Definition and working principles of a levelling instruments, Use and adjustment of dumpy and tilting levels, Establishment of Bench Marks by levelling. |
| *UNIT-IV: Transportation*<br>Highway –classification, cross section and components of roads. Railway – cross section and components of permanent way and their functions. Waterway – docks and harbour, classifications, components. Bridge – introduction and components of bridge. |
| *UNIT-V: Water Supply And Sewage Disposal*<br>Water supply – objective, quantity of water, sources, standards of drinking water, distribution system. Sewage – classification, technical terms, septic tank, components and functions. |
| *UNIT-VI:* Geotechnical Engineering<br> Soil mechanics– Introduction, formation, composition, classification and   properties of soil. |

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOKS** | 1. Basics of Civil Engineering, Raju .K.V.B, Ravichandran .P.T, Ayyappa Publications.<br>2.Engineering Material"s, Rangwala .S.C Charotar Publishing House. |
| **REFERENCE BOOKS** | 1. Basics of Civil Engineering, Shrikrishna, Kiran M . Tajne, Shrikrishna A Dhale. S.Chand  Publication<br>2. Basic Civil Engineering, Satheesh Gopi. Publisher: Pearson India |

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 75 marks for theory.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|:---:|:---|:---:|:---:|
| 1. | Class Test | 4 | 5 |
| 2. | Sessional Test | 2 | 15 |
| 3. | Group Discussion | 4 | 5 |
| 4. | End Semester Exam | 1 | 50 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 | 6 |
|:---|:---:|:---:|:---:|:---:|:---:|:---:|
| Class Test | x | | x | x | X | |
| Quiz | x | x | | x | | x |
| Assignment | x | | x | | X | |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | C | d | e | f | g | H | i | j | k |
|:---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Course Learning Outcomes | 3,4,5,6 | 1,2,3,4,5,6 | 1,2,4,5 | 1,3 | 1,5 | 5 | 1,2 | 1,3,5 | 3,5 | 2 | |

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty‟s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;

- Suggested remedies / corrective measures;

- Approved refinement decisions due for implementation;

- Actions taken based on previous course review; and

- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

## SEMESTER - II

**Basics of Civil Engineering Lab**

| L | T | P |
|---|---|---|
| 0 | 0 | 2 |

| MODULE CODE | CIVL0102 |
|---|---|
| CREDIT POINTS | 1 |
| FORMATIVE ASSESSMENT MARKS | 25 |
| SUMMATIVE ASSESSMENT MARKS | 25 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**OBJECTIVES:**

The aim of this subject is to develop understanding on different aspects of Civil Engineering field to the students of all branches of Engineering.

1. To study the practical experiments in chaining, compass.
2. To study the basics properties of cement.
3. To study the practical application of theodolite.
4. To study the properties of soil.
5. To give experience in handling surveying equipment.

**LEARNING OUTCOMES:**

1. Able to determine linear measurement like horizontal distance.
2. Ability to determine properties of cement experimentally.
3. Ability to determine different properties of soil experimentally.
4. Ability to determine C B R value of soil.
5. Ability to handle different surveying instruments.

**LIST OF EXPERIMENTS**

| | |
|---|---|
| 1. | Linear measurement using tape, chain. |
| 2. | Chain survey – Determination of area by perpendicular offset. |
| 3. | Theodolite- Measurement of horizontal and vertical angles by Vernier Theodolite. |
| 4. | To determine the normal consistency of cement paste. |
| 5. | To determine soundness of given cement by Le-Chatelier method |
| 6. | To determine initial and final setting time of cement |
| 7. | To determine the fineness of cement. |
| 8. | To determine water content of soil mass. |
| 9. | To determine Atterberg Limit of soil. |
| 10. | C B R Value test. |

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 100 marks for practical.

**Practical:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1 | Internal Assessment | 2 | 25 |
| 2 | External Assessment | 1 | 25 |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | c | d | e | f | g | h | I | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | | 1,2,3 | 1,2,3,4 | | 1,2,3,4 | | | | | | |

**EVALUATION**

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

## SEMESTER - II

**Applied Mathematics-II**                                                  **L        T        P**
                                                                            **4        1        0**

| MODULE CODE | MATH0116 |
|---|---|
| CREDIT POINTS | 4.5 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** In total EIGHT questions will be set. Question ONE will be compulsory and will cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

**OBJECTIVES:**

1. To achieve knowledge and understanding of differential equations, their various properties and capabilities to model and solve wide range of problems in science and engineering.
2. To get familiar with concepts of Laplace transforms and develop ability to solve simple and complex problems.
3. To understand Fourier series and their applications in engineering problems.
4. To learn basic concepts of Fourier Transforms and its application in scientific problems.
5. To acquire knowledge of complex functions and assess their effectiveness in science and Technology.

**LEARNING OUTCOMES:**

1. Able to understand differential equations and their capability to solve problems.
2. Exposure to Laplace transforms and their compatibilities.
3. Enhance the knowledge regarding Fourier series and their applications
4. Able to understand Fourier Transforms and its application.
5. Ability to acquire knowledge of complex functions and assess their effectiveness in science and Technology.

**MODULE CONTENT:**

| |
|---|
| *UNIT-I: Ordinary Differential Equations & its Applications*<br><br>Exact differential equations. Equations reducible to exact differential equations. Applications of Differential equations of first order & first degree to simple electric circuits, Newton's law of cooling, heat flow and orthogonal trajectories. |
| *UNIT-II: Linear Differential Equations.*<br><br>Linear differential equations of second and higher order. Complete solution, complementary function and particular integral, method of variation of parameters to find particular Integral, Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficient. Applications of linear differential equations to simple pendulum, oscillatory electric circuits. |
| *UNIT-III: Partial Differential Equations and Its Applications*<br><br>Formation of partial differential equations, Lagrange's linear partial differential equation, First orders non-linear partial differential equation, Char pit's method. Method of separation of variables and its applications to wave equation and one dimensional heat equation, two dimensional heat flow, steady state solutions only. |
| *UNIT-IV: Laplace Transforms and its Applications*<br><br>Laplace transforms of elementary functions, properties of Laplace transforms, existence conditions, transforms of derivatives, transforms of integrals, multiplication by $t^n$, division by t. Evaluation of integrals by Laplace transforms. Laplace transform of Unit step function, unit impulse function and periodic function. Inverse transforms, convolution theorem, application to linear differential equations and simultaneous linear differential equations with constant coefficients. |
| *Unit –V: Fourier Series and Fourier Transforms*<br><br>Euler's formulae, conditions for a Fourier expansion, change of interval, Fourier expansion of odd and even functions, Fourier expansion of square wave, rectangular wave, saw-toothed wave, half and full rectified wave, half range sine and cosine series.<br><br>Fourier integrals, Fourier transforms, Shifting theorem (both on time and frequency axes), Fourier transforms of derivatives, Fourier transforms of integrals, Convolution theorem. |

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*UNIT-VI: Functions of Complex Variable*

Definition, Exponential function, Trigonometric and Hyperbolic functions, Logarithmic functions. Limit and Continuity of a function, Differentiability and Analyticity, Cauchy-Riemann equations, necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations. Harmonic functions, application to flow problems. Integration of complex functions. Cauchy-Integral theorem and formula.

## RECOMMENDED BOOKS

| | |
|---|---|
| **TEXT BOOKS** | 1. Higher Engineering Mathematics: B.S. Grewal, Khanna Publishers, New Delhi. <br> 2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, Inc., New York. <br> 3. Advanced Engineering Mathematics, Peter V. O'Neil, Thomson Learning, Inc., Singapore. |
| **REFERENCES** | 1. Advanced Engineering Mathematics, R.K. Jain and S. R .K. Iyengar, Alpha science International Ltd. Pang Bourne, England. <br> 2. Advanced Engg. Mathematics, Michael D. Greenberg, Prentice-Hall, Englewood Cliffs, NJ. |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | f | g | H | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 1,2,5 | 2, 5 | 3,4 | 1,2,3,4 | 2,3 | 3,4 | 2,3,5 | 1,3 | 4,5 | 1,2 | 1,3 |

## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 150 marks for theory.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|:---:|:---|:---:|:---:|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 | 6 |
|:---|:---:|:---:|:---:|:---:|:---:|:---:|
| Class Test | x | | x | | X | |
| Quiz | | | x | | X | x |
| Assignment | x | x | | x | | |

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;

- Suggested remedies / corrective measures;

- Approved refinement decisions due for implementation;

- Actions taken based on previous course review; and

- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

## SEMESTER - II

**Numerical Methods**

| | **L** | **T** | **P** |
|---|---|---|---|
| | 3 | 0 | 0 |

| | |
|---|---|
| MODULE CODE | MATH0117 |
| CREDIT POINTS | 3 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 75 |
| END SEMESTER EXAM DURATION | 3 hrs. |
| LAST REVISION DATE | |

**INSTRUCTIONS:** In total EIGHT questions will be set. Question ONE will be compulsory and will cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

**OBJECTIVES:**

The aim of this subject is to develop understanding of different methods related to error, area numerically, using different techniques to enhance skills of numerical methods as mentioned below:

1. To achieve knowledge and understanding of different types of error, interpolation, extrapolation and capabilities to solve by different methods with wide range of problems in science and engineering.
2. To get familiar with concepts of nonlinear equations and develop ability to solve simple Complex problems.
3. To understand direct and indirect methods solve simultaneous linear equations and their applications in engineering problems.
4. To learn basic concepts of area solve by integration and its application in realistic decision making.
5. To acquire knowledge of ordinary and partial differential equations solve by different methods and assess their effectiveness in problem solving.

**LEARNING OUTCOMES:**

1. Able to understand the evolution of techniques and basic terminology.
2. Exposure to various methods and techniques and their compatibilities.
3. Enhance the knowledge regarding different types of error, linear, non-linear and ordinary and partial differential equations.
4. Able to understand the basic techniques and start to implement in real life.
5. Ability to find the largest Eigen values and corresponding Eigen vector.

**MODULE CONTENT:**

| |
|---|
| *Unit I: Errors in Numerical Calculation* |
| Introduction, Numbers and their accuracy, Absolute, relative and Percentage errors and their analysis, General error formula. |
| Interpolation and Curve Fitting: Newton"s forward and backward; Gauss forward and backward; central difference interpolation formulae; Lagrange"s and Newton divided difference interpolation formula, Interpolating with a cubic spline, Bezier curves and B-spline curves, Curve fitting by Least squares approximations. |
| *Unit II: Nonlinear equations* |
| Bisection method, Regula False method, Secant method, Iteration Method, Newton"s Raphson method, Giraffe"s methods, Muller"s method. |
| *Unit III: Simultaneous linear equations* |
| Gauss Elimination method, Gauss-Jordan method, LU- decomposition Method, Jacobi"s method, Gauss- Seidal method, Relaxation method. |
| *Unit IV: Numerical differentiation and Integration* |
| Derivatives from differences tables, higher order derivatives, Newton-cotes integration formula, Trapezoidal rule, Simpson"s rules, Boole"s rule and Weddle"s rule, Romberg"s Integration. |
| *Unit V: Numerical solution of ordinary differential equations* |
| Taylor series methods, Euler and modified Euler method, Runge-Kutta methods, Milne"s method, Adams-Moulton method. |
| *Unit VI: Numerical solution of partial differential equations* |
| Finite difference approximation of partial derivatives, solution of Laplace equation (standard 5-point formula only), one dimensional heat equation (Schmidt method, Crank-Nicolson method, Dufort and Frankel method). |
| Eigen Value Problems: Power method, Jacobi, Given"s and Householder"s methods for symmetric matrices. |

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOKS** | 1. Applied Numerical analysis: Curtis F Gerald and Patrick, G Wheatley-Pearson Education.<br>2. Numerical Methods: Fairs & Burden, Brooks Cole, 2001.<br>3. Numerical Methods in Engineering and Science, B S Grewal, Khanna Publishers. |
| **REFERENCE BOOKS** | 1. Numerical Methods for Scientific and Engineering computations, M.K. Jain, S.R.K. Iyenger and R.K. Jain-Wiley Eastern Ltd.<br>2. Numerical Methods for engineers, Steven C. Chapra, Raymond P. Can ale, McGraw Hill. |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 1,2 | 1,3 | 1,5 | 1,3,5 | 2,3 | 2,3,4 | 1,2,4 | 1,4 | 1,3 | 2,5 | 1,4 |

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 100 marks for theory.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 10 |
| 3. | Group Discussion | 4 | 05 |
| 4. | End Semester Exam | 1 | 75 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Class Test | x | | x | | X | |
| Quiz | | | x | | X | x |
| Assignment | x | x | | x | | |

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

## SEMESTER - II

**Value Education**
<div align="right">

| L | T | P |
|---|---|---|
| 2 | 0 | 0 |

</div>

| | |
|---|---|
| MODULE CODE | VALU1019 |
| CREDIT POINTS | 2 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 50 |
| END SEMESTER EXAM DURATION | 2 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** All questions are compulsory. Each question may have multiple options and will cover all units.

**OBJECTIVES:**

The Purpose of Value Education is specifying the present deterioration in the value system in the fast changing world trends and to develop understanding of moral values in different aspects of life for inculcating the skills as mentioned below:

1. To prepare students to develop basic understanding of Value Education.
2. To acquire knowledge on Value Education.
3. To understand the ethics, character building, leadership & goal setting.
4. To understand the success & personal growth.
5. To support the women empowerment & environmental awareness.

**LEARNING OUTCOMES:**

1. Able to understand the Importance of Values in Life – what is a Value system?
2. Exposure to various principles, concepts, types, advantages and disadvantages of value education.
3. Ability to understand the life style management & self-esteem.
4. To behave morally in society.

## MODULE CONTENTS:

| |
|---|
| *UNIT 1: VALUE EDUCATION* |
| <ul><li>Definition, Concept and Classification of values</li><li>The need for value education</li><li>Pedagogy of Values</li><li>Challenges of Value Adoption</li><li>Life Style Management</li></ul> |
| *UNIT 2: VALUE & PERSONAL DEVELOPMENT* |
| <ul><li>The principles of integrity</li><li>Character Development</li><li>Values in everyday life</li><li>Values, Virtues, Powers & Qualities</li><li>Successful Personality</li></ul> |
| *UNIT 3:VALUES IN SOCIETY* |
| <ul><li>Character Building</li><li>Positive thinking & Emotional Maturity</li><li>Women Empowerment</li><li>Overcoming Addiction</li><li>Environmental Awareness</li></ul> |
| *UNIT 4: PERSONAL PROGRESS & FIELD STUDY* |
| <ul><li>Personal progress manual</li><li>Field Project</li></ul> |

## RECOMMENDED BOOKS:

| | |
|---|---|
| **TEXT BOOKS** | 1. Seven Habits of Highly Effective People, Covey Stephen, Free Press, United States, 1989<br>2. You Can Win, Khera Shiv, Macmillan India Limited, New Delhi, 1998 |
| **REFERENCE BOOKS** | Mani Jacob, ed., (2002). Resource for Value Education, New Delhi: Institute of Value Education. |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | f | g | H | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | | | | | | | | | | 1,2 | 3,4 |

## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for theory.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 1 | 10 |
| 2. | Sessional Test | 2 | 15 |
| 3. | End Semester  Exam | 1 | 50 |

## MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

**Theory:**

| Assessments | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Class Test | x | x | x | |
| Quiz | x | x | x | |
| Assignment | | | x | x |

## EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty‟s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

**SEMESTER - II**

**PC Lab**                                                    **L    T    P**
                                                              0    0    2

| MODULE CODE | CSEN1107 |
|---|---|
| CREDIT POINTS | 1 |
| FORMATIVE ASSESSMENT MARKS | 25 |
| SUMMATIVE ASSESSMENT MARKS | 25 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**OBJECTIVES:**

The main objective of the lab is to provide the students the knowledge of computer hardware, the processors, memories, motherboards, different add-on cards, and other peripherals like printers, plotters and the scanners. The students are trained for the assembly and disassembly of PCs. Another important objective is to impart knowledge about the troubleshooting and fault finding the computers and the peripherals.

**LEARNING OUTCOMES:**
Following this course, students will be able to:

1. Learn about different hardware components of a computer and their troubleshooting.
2. Understand different peripherals, their performance and cost characteristics
3. Understand installation of various operating systems, their capabilities
4. Learn commonly used PC software like MS Word, Excel and PowerPoint.

**LIST OF EXPERIMENTS**

**PC Software:** Application of basics of MS Word 2013, MS Excel 2013, MS Power Point 2013, MS Access 2013.

| | |
|---|---|
| 1. | To prepare the Your Bio Data using MS Word. |
| 2. | To prepare the list of marks obtained by students in different subjects and show with the help of chart/graph the average, min and max marks in each subject. |
| 3. | Prepare a presentation explaining the facilities/infrastructure available in your department. |
| 4. | Create a database of books in the library on a mini scale w.r.t. Computers and manipulate the database using different forms and reports. |

**PC Hardware:**

| | |
|---|---|
| 1. | To check and measure various supply voltages of PC. |
| 2. | To make the comparative study of various motherboards. |
| 3. | To make the comparative study of various processors. |
| 4. | To study various cables used in computer communication. |
| 5. | To study various connections and ports used in computer communication. |
| 6. | To study various cards used in a Computer System. |
| 7. | To remove, study and replace CD-Rom, Harddisk. |
| 8. | To observe various cables and connectors used in networking. |
| 9. | To assemble a PC. |
| 10. | Troubleshooting exercises related to various components of computer like monitor, drives, memory and printers etc. |

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 50 marks for practical.

**Practical:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|:---:|:---|:---:|:---:|
| 1 | Internal Assessment | 2 | 25 |
| 2 | External Assessment | 1 | 25 |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | c | d | e | f | G | h | I | j | k |
|:---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Course Learning Outcomes | 3 | 2 | 4 | 1 | 1,2 | | | | | | |

**EVALUATION**

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

**SEMESTER - II**

| L | T | P |
|---|---|---|
| **2** | **0** | **0** |

**French Language – Part 2**
**Pre-requisite -** French Language – Part 1

| MODULE CODE | LANF0104 |
|---|---|
| CREDIT POINTS | 2 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 50 |
| END SEMESTER EXAM DURATION | 2 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** All questions are compulsory. Each question may have multiple options and will cover all units.

**OBJECTIVES:**

The aim of this subject is to develop understanding on different aspects related to oral and written skills of expressing and exchanging information / interacting in French language and to enhance skills as mentioned below:

1. To prepare students to develop advance understanding on French language.
2. To acquire the command over the French grammar.
3. To read and write short, simple texts.
4. To enable learner to build logic in French language.
5. To make students aware of the French culture, customs & traditions.

**LEARNING OUTCOMES:**

1. Able to understand the advance grammar of French language and differentiation of genders and objects.
2. Exposure to various syntax & communication methods with others.
3. Ability to read, write, speak & listen the advance of French language.
4. Able to understand the French history.

**MODULE CONTENTS**

*UNIT I: MODERATE COMMUNICATION* – This module will sharpen the communicative skills already acquired in the **PART 1 - BASIC COMMUNICATION** and further builds on them. It develops oral and written skills of understanding, expressing and exchanging information / interacting on the topics given below: -

• Describe in detail people, relationships, events, places, cultures of countries

• Compare people, relationships, events, places, cultures and the changes that they have undergone

• Apply for a job

• Exchange personal and professional information

• Express opinion on people, places, events encountered in one‟s personal life and on press articles, television programmes, multimedia, films, and books

• Argue, justify and substantiate a point of view

• Describe hypothetical or imaginary situations

• Express plans, dreams, aspirations of the future

• Paragraph writing

• Professional communication

*UNIT II: MODERATE PHONETICS* – This module will re-enforces all the notions introduced in the **PART 1- BASIC PHONETICS**.

*UNIT III: MODERATE GRAMMAR* – This module will sharpen the concepts introduced in the **PART 1 - BASIC GRAMMAR & FORMATION OF SENTENCES** and further develops the following linguistic skills: -

• Pronouns – relative (don‟t), possessive, indefinite, demonstrative and the use of double pronouns

• Verbs – conjugation of regular and irregular verbs (affirmative and negative) in the following tenses (indicative mood) – past perfect, future perfect

• Verbs – the subjunctive mood (past and present)

• Verbs – conditional (past and present) and gerund forms,

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• Adverbs of time, place, quantity and indefinite adverbs

• Direct/indirect speech

• Comparative and superlative structures

• Active/passive structures

• Multiple clause sentences – independent clauses joined by co-ordinating conjunctions, dependant clause (subordinate clause)

• Phrases to express cause, consequence, and objective

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**RECOMMENDED BOOKS:**

| TEXT BOOKS | 1. Nouveau Sans Frontières 1 by Philippe Dominique & Jacky Girardet<br>2. "CONNEXIONS-1" by Regine Merieux & Yves Loiseau Published by Didier. |
|---|---|
| **REFERENCE BOOKS** | Five in one Multilingual Glossary, published by Saraswati House Pvt. Ltd. New Delhi 2011. |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | c | d | E | f | G | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | | | | | | | | | | 1,2 | 3,4 |

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 75 marks for theory.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 1 | 10 |

| 2. | Sessional Test | 2 | 15 |
|----|----------------|---|-----|
| 3. | End Semester Written Exam | 1 | 50 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

**Theory:**

| Assessments | 1 | 2 | 3 | 4 |
|-------------|---|---|---|---|
| Class Test | x | x | x | |
| Quiz | x | x | x | |
| Assignment | | | x | x |

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;

- Suggested remedies / corrective measures;

- Approved refinement decisions due for implementation;

- Actions taken based on previous course review; and

- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## SEMESTER - II

| | **L** | **T** | **P** |
|---|---|---|---|
| | **2** | **0** | **0** |

**German Language – Part 2**
<u>**Pre-requisite**</u> - German Language – Part 1

| MODULE CODE | LANG0105 |
|---|---|
| CREDIT POINTS | 2 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 50 |
| END SEMESTER EXAM DURATION | 2 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** All questions are compulsory. Each question may have multiple options and will cover all units.

**OBJECTIVES:**

The aim of this subject is to develop understanding on different aspects related to oral and written skills of expressing and exchanging information / interacting in German language and to enhance skills as mentioned below:

1. To prepare students to develop advance understanding on German language.
2. To acquire the command over the German grammar.
3. To read and write short, simple texts.
4. To enable learner to build logic in German language.
5. To make students aware of the German culture, customs & traditions.

**LEARNING OUTCOMES:**

1. Able to understand the advance grammar of German language and differentiation of genders and objects.
2. Exposure to various syntax & communication methods with others.
3. Ability to read, write, speak & listen the advance of German language.
4. Able to understand the German history.

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**MODULE CONTENTS**

*UNIT I: MODERATE COMMUNICATION* – This module will sharpen the communicative skills already acquired in the **PART 1 - BASIC COMMUNICATION** and further builds on them. It develops oral and written skills of understanding, expressing and exchanging information / interacting on the topics given below: -

• Describe in detail people, relationships, events, places, cultures of countries

• Compare people, relationships, events, places, cultures and the changes that they have undergone

• Apply for a job

• Exchange personal and professional information

• Express opinion on people, places, events encountered in one‟s personal life and on press articles, television programmes, multimedia, films, and books

• Argue, justify and substantiate a point of view

• Describe hypothetical or imaginary situations

• Express plans, dreams, aspirations of the future

• Paragraph writing

• Professional communication

*UNIT II: MODERATE PHONETICS* – This module will re-enforces all the notions introduced in the **PART 1- BASIC PHONETICS**.

*UNIT III: MODERATE GRAMMAR* – This module will sharpen the concepts introduced in the **PART 1 - BASIC GRAMMAR & FORMATION OF SENTENCES** and further develops the following linguistic skills: -

• Pronouns – relative (don‟t), possessive, indefinite, demonstrative and the use of double pronouns

• Verbs – conjugation of regular and irregular verbs (affirmative and negative) in the following tenses (indicative mood) – past perfect, future perfect

• Verbs – the subjunctive mood (past and present)

• Verbs – conditional (past and present) and gerund forms,

• Adverbs of time, place, quantity and indefinite adverbs

---

• Direct/indirect speech

• Comparative and superlative structures

• Active/passive structures
• Multiple clause sentences – independent clauses joined by co-ordinating conjunctions, dependant clause (subordinate clause)

• Phrases to express cause, consequence, and objective

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## RECOMMENDED BOOKS:

| TEXT BOOKS | 1. Tangram, Kursbuch und Arbeitsbuch, 1A, 1B & 2A, Max Hueber Verlag<br>2. Tangram, Kursbuch und Arbeitsbuch, 2B, 3A & 3B, Max Hueber Verlag |
|---|---|
| REFERENCE BOOKS | em Abschlusskurs, Kursbuch und Arbeitsbuch, Max Hueber Verlag |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | C | d | E | f | G | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | | | | | | | | | | 1,2 | 3,4 |

## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 75 marks for theory.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 1 | 10 |
| 2. | Sessional Test | 2 | 15 |

| 3. | End Semester Written Exam | 1 | 25 |
|---|---|---|---|

## MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

**Theory:**

| Assessments | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Class Test | x | x | x | |
| Quiz | x | x | x | |
| Assignment | | | x | X |

## EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
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# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## SEMESTER - II

| | L | T | P |
|---|---|---|---|
| | **2** | **0** | **0** |

**Spanish Language – Part 2**
**Pre-requisite -** Spanish Language – Part 1

| MODULE CODE | LANS0106 |
|---|---|
| CREDIT POINTS | 2 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 50 |
| END SEMESTER EXAM DURATION | 2 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** All questions are compulsory. Each question may have multiple options and will cover all units.

**OBJECTIVES:**

The aim of this subject is to develop understanding on different aspects related to oral and written skills of expressing and exchanging information / interacting in Spanish language and to enhance skills as mentioned below:
1. To prepare students to develop advance understanding on Spanish language.
2. To acquire the command over the Spanish grammar.
3. To read and write short, simple texts.
4. To enable learner to build logic in Spanish language.
5. To make students aware of the Spanish culture, customs & traditions.

**LEARNING OUTCOMES:**

1. Able to understand the advance grammar of Spanish language and differentiation of genders and objects.
2. Exposure to various syntax & communication methods with others.
3. Ability to read, write, speak & listen the advance of Spanish language.
4. Able to understand the Spanish history.

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**MODULE CONTENTS**

*UNIT I: MODERATE COMMUNICATION* – This module will sharpen the communicative skills already acquired in the **PART 1 - BASIC COMMUNICATION** and further builds on them. It develops oral and written skills of understanding, expressing and exchanging information / interacting on the topics given below: -

• Describe in detail people, relationships, events, places, cultures of countries

• Compare people, relationships, events, places, cultures and the changes that they have undergone

• Apply for a job

• Exchange personal and professional information

• Express opinion on people, places, events encountered in one˙s personal life and on press articles, television programmes, multimedia, films, and books

• Argue, justify and substantiate a point of view

• Describe hypothetical or imaginary situations

• Express plans, dreams, aspirations of the future

• Paragraph writing

• Professional communication

*UNIT II: MODERATE PHONETICS* – This module will re-enforces all the notions introduced in the **PART 1- BASIC PHONETICS**.

*UNIT III: MODERATE GRAMMAR* – This module will sharpen the concepts introduced in the **PART 1 - BASIC GRAMMAR & FORMATION OF SENTENCES** and further develops the following linguistic skills: -

• Pronouns – relative (don˙t), possessive, indefinite, demonstrative and the use of double pronouns

• Verbs – conjugation of regular and irregular verbs (affirmative and negative) in the following tenses (indicative mood) – past perfect, future perfect

• Verbs – the subjunctive mood (past and present)

• Verbs – conditional (past and present) and gerund forms,

• Adverbs of time, place, quantity and indefinite adverbs

• Direct/indirect speech

• Comparative and superlative structures

• Active/passive structures

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• Multiple clause sentences – independent clauses joined by co-ordinating conjunctions, dependant clause (subordinate clause)

• Phrases to express cause, consequence, and objective

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOKS** | 1. Aula Internacional 1 and 2, Novellas and short stories<br>2. Aula Internacional 3, España and Latinoamérica: Historia y Cultura, Novellas |
| **REFERENCE BOOKS** | 1. Español sin fronteras, I, SGEL, 1997<br>2. Nuevo Ven I, Edelsa 2004 |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | B | c | d | e | F | G | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | | | | | | | | | | 1,2 | 3,4 |

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 75 marks for theory.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 1 | 10 |
| 2. | Sessional Test | 2 | 15 |
| 3. | End Semester Written Exam | 1 | 50 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

**Theory:**

| Assessments | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Class Test | x | x | x | |
| Quiz | x | x | x | |
| Assignment | | | x | x |

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;

- Suggested remedies / corrective measures;

- Approved refinement decisions due for implementation;

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# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## SEMESTER III

| MODULE CODE | CATEGORY | SUB-CATEGORY | MODULE | L | T | P | C | INTERNAL MARKS | EXTERNAL MARKS | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|
| ECEN2101 | E | PC | ELETROMAGNETIC FIELD THEORY | 3 | 0 | 0 | 3 | 25 | 75 | 100 |
| ECEN2102 | E | PC | NETWORK ANALYSIS AND SYNTHESIS | 4 | 0 | 2 | 4 | 50 | 100 | 150 |
| ECEN2103 | E | PC | NETWORK ANALYSIS AND SYNTHESIS LAB | 0 | 0 | 2 | 1 | 25 | 25 | 50 |
| ECEN2104 | E | PC | ELECTRONIC DEVICES AND CIRCUITS | 3 | 0 | 0 | 3 | 25 | 75 | 100 |
| ECEN2105 | E | PC | ELECTRONIC DEVICES AND CIRCUITS LAB | 0 | 0 | 2 | 1 | 25 | 25 | 50 |
| VALU0119 | P | AE | APTITUDE I | 2 | 0 | 0 | 2 | 25 | 50 | 75 |
| MGMT0101 | M | | MANAGEMENT & PROFESSIONAL LEADERSHIP | 3 | 0 | 0 | 3 | 25 | 75 | 100 |
| VALU0123 | P | SE | PROFESSIONAL COMMUNICATION-I | 2 | 0 | 0 | 2 | 25 | 50 | 75 |
| ENGL0009 | P | AE | ACADEMIC WRITING | 0 | 0 | 2 | 1 | 25 | 25 | 50 |
| | P | AE | YOGA/NCC/NSS* | 0 | 0 | 2 | 1 | 25 | 25 | 50 |
| | E | PE | ELECTIVE-I | 4 | 0 | 0 | 4 | 50 | 100 | 150 |
| | E | PE | ELECTIVE-II | 4 | 0 | 0 | 4 | 50 | 100 | 150 |
| TOTAL | | | | 25 | 0 | 10 | 29 | **375** | **750** | **1100** |

L = Lecture

T = Tutorial

P = Practical

C = Credit Point

| MODULE CODE | MODULE NAME* |
|---|---|
| VALU0118 | YOGA |
| VALU0121 | NCC |
| VALU0122 | NSS |

**ELECTIVES**

| MODULE CODE | ELECTIVE-I | MODULE CODE | ELECTIVE-II |
|---|---|---|---|
| ECEN2206 | SENSOR & TRANSDUCERS | ECEN2208 | ELECTROMECHANICAL ENERGY CONVERSION |
| ECEN2207 | PLC & SCADA | ECEN2209 | POWER ELECTRONICS |

# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## SEMESTER-III

**Electromagnetic Field Theory**

| | L | T | P |
|---|---|---|---|
| | 3 | 0 | 0 |

| MODULE CODE | ECEN2101 |
|---|---|
| CREDIT POINTS | 3 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 75 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

**OBJECTIVES:**

Students will learn scientific, mathematical and engineering principles that enable them to understand forces, fields, and waves; know how devices work that use those principles and phenomena; and be familiar with the historical context in which development of knowledge and devices occurred.

1.  To Acquire the prerequisites of the electro-magnetic fields and their interaction with materials
2.  To study the different coordinate systems and physical significance of Divergence, Curl and Gradient
3.  To Understand the applications of Coulomb"s law and Gauss"s law, Biot-Savart"s and Ampere"s Law, pointing theorem
4.  To Know the physical interpretation of Maxwell" equations and applications for various fields like Antennas, Waveguides
5.  To understand the behavior of E.M. waves incident on the interface between two different media.
6.  Interpret the effect of various types of dielectrics upon electromagnetic wave.

**LEARNING OUTCOMES:**

Following this course,

1.  Students will be able to evaluate different coordinate systems in all respects like vector calculus and integration
2.  They will have the knowledge about the applications of Coulomb"s law and Gauss law on different charge distributions
3.  Graduates will be able to understand the concept of Laplace"s and Poisson"s equations to solve different capacitance problems
4.  Graduates will be to understand different boundary conditions for electric and magnetic fields.
5.  They will be having brief knowledge about different antennas and wave propagation concepts.

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**MODULE CONTENTS:**

| |
|---|
| *Unit I: Coordinate systems and transformation* <br> Cartesian coordinates, circular cylindrical coordinates, spherical coordinates Vector calculus: Differential length, area and volume, line surface and volume integrals, del operator, gradient of a scalar, divergence of a vector and divergence theorem, curl of a vector and Stokes theorem, Laplacian of a scalar. |
| *Unit II: Electrostatics* <br> Electrostatic fields, Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gausses" Law – Maxwell"s equation, Electric dipole and flux lines, energy density in electrostatic field. |
| *Unit III: Electric field in material space* <br> Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, dielectric constants, continuity equation and relaxation time, boundary condition. Electrostatic boundary value problems: Poisson"s and Laplace"s equations, general procedures for solving Poisson"s or Laplace"s equations. |
| *Unit IV: Magneto statics* <br> Magneto-static fields, Biot-Savart"s Law, Ampere"s circuit law, Maxwell"s equation, application of ampere"s law, magnetic flux density- Maxwell"s equation, Maxwell"s equation for static fields, magnetic scalar and vector potential |
| *Unit V: Magnetic forces, materials and devices* <br> Forces due to magnetic field, magnetic torque and moment, a magnetic dipole, magnetization in materials, magnetic boundary conditions, inductors and inductances, magnetic energy |
| *Unit VI: Waves and applications* <br> Maxwell"s equation, Faraday"s Law, transformer and motional electromotive forces, displacement current, Maxwell"s equation in final form. Electromagnetic wave propagation: Wave propagation in lossy dielectrics, plane waves in lossless dielectrics, plane wave in free space, plain waves in good conductors, power and the pointing vector, Transmission lines: Transmission line parameters, Transmission line equations, standing wave ratio and power |

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOKS** | 1. M. N. O. Sadiku, "Elements of Electromagnetic", 4th Ed, Oxford University Press. <br> 1. K.D.Prasad, " Antenna and Wave Propagation", Tech India Publication. |
| **REFERENCE BOOKS** | 1. W. H. Hayt and J. A. Buck, "Electromagnetic field theory",7th edition TMH. <br> 2. Electromagnetic Field theory by Balmein and Jordan |

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

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## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 100 marks for theory.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|:---:|---|:---:|:---:|
| 1. | Class Test | 4 | 5 |
| 2. | Sessional Test | 2 | 15 |
| 3. | Group Discussion | 4 | 5 |
| 4. | End Semester Exam | 1 | 75 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 |
|---|:---:|:---:|:---:|:---:|:---:|
| Class Test | x | x | | | |
| Quiz | x | | | | x |
| Assignment | | | x | x | |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Course Learning Outcomes | 1 | 1,2 | 5 | | 3,2 | 5 | 4 | | | 5 | |

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;

- Suggested remedies / corrective measures;

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# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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## SEMESTER-III

**Network Analysis & Synthesis**

| | L | T | P |
|---|---|---|---|
| | **4** | **0** | **0** |

| | |
|---|---|
| MODULE CODE | ECEN2102 |
| CREDIT POINTS | 4 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

**OBJECTIVES:**

This subject develops a fundamental understanding of linear time-invariant network models for the analysis and design of electrical and electronic systems.

1. To develop basic concepts of network analysis which is the pre-requisite for all the electronics and communication engineering subjects.
2. To understand transient analysis in electrical circuits and to analyze the system stability.
3. To evaluate various parameters using 2 port network.
4. To understand basic filters used in communication systems.
5. To solve complex networks using various analytical techniques.

**LEARNING OUTCOMES:**

After successful completion of the course, student will be able to

1. Apply the fundamental concepts in solving and analyzing different Electrical networks
2. Select appropriate and relevant technique for solving the Electrical network in different conditions
3. Apply mathematics in analyzing and synthesizing the networks in time and frequency domain
4. Estimate the performance of a particular network from its analysis.
5. Express given Electrical Circuit in terms of A,B,C,D and Z,Y Parameter Model and Solve the circuits

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## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**MODULE CONTENTS:**

| |
|---|
| *Unit I: Network topology:* <br> Principles of network topology, introduction to graph theory, tree, branches, chords, cut-sets, loops, fundamental cut-sets and loops, graph matrices, relationship between the matrices, network analysis using graph theory, review of network theorems. |
| *Unit II: Transient response:* <br> General characteristics and description of step, ramp and impulse signals. Transient Response of RC, RL, RLC Circuits to various excitation signals using Laplace transform. |
| *Unit III: Network functions:* <br> Terminal pairs or Ports, Network functions for one-port and two-port networks, poles and zeros of Network functions, Restrictions on pole and zero Locations for driving point functions and transfer functions, Time domain behavior from the pole-zero plot |
| *Unit IV: Network functions:* <br> Relationship of two-port variables, short-circuit Admittance parameters, open circuit impedance, parameters, Transmission parameters, hybrid parameters, relationships between parameter sets, Inter-connection of two port networks. Symmetrical two port network: T and $\pi$ equivalents, image impedance, characteristic impedance and propagation constant. |
| *Unit V: Types of filters and their characteristics:* <br> Filter fundamentals, high-pass, low-pass, band-pass, and band-reject Filters and frequency transformations: low pass to low pass, low pass to high pass, low pass to band pass and low pass to band stop. |
| *Unit VI: Network synthesis:* <br> Introduction to synthesis, Positive real functions, Hurwitz polynomials, extraction of poles and zeros at infinity and on the jw axis, synthesis of one port and two port networks, elementary ideas of Active networks. Synthesis of LC driving point admittances, Synthesis of RC driving point impedances, Synthesis of RC impedances or RL admittances, properties of RL impedances and RC admittances |

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOKS** | 1. Valkenburg, "Network analysis" PHI, <br> 2. R. Choudhary, "Networks and Systems" New Age International, 1999 <br> 3. Network Analysis & Synthesis : F.F.Kuo; John Wiley & Sons Inc. |
| **REFERENCE BOOKS** | 1. Basic circuit theory: Dasoer Kuh, McGraw Hill. <br> 2. A Course in Electrical Circuit Analysis by Soni & Gupta, Dhanpat Rai Publication. <br> 3. Circuit Analysis : G.K. Mithal, Khanna Publication |

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## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**METHODS OF TEACHING AND STUDENT LEARNING**

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**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 150 marks for theory.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|:---:|:---|:---:|:---:|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 |
|:---|:---:|:---:|:---:|:---:|:---:|
| Class Test | | | | x | x |
| Quiz | x | x | | | |
| Assignment | | | x | | x |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | c | d | e | f | g | h | i | J | k |
|:---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Course Learning Outcomes | 1,3 | 4 | 1 | 1 | 5 | 2 | 4 | | | | |

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## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

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**SEMESTER-III**

**Network Analysis & Synthesis Lab**

| | L | T | P |
|---|---|---|---|
| | 0 | 0 | 2 |

| | |
|---|---|
| MODULE CODE | ECEN2103 |
| CREDIT POINTS | 1 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 25 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**OBJECTIVES:**

1. Implement and verify circuit theorems.
2. Gain knowledge about resonance and circuit transients.
3. To make the students capable of analyzing any given electrical network.
4. To make the students learn how to synthesize an electrical network from a given impedance/admittance function.
5. Gain knowledge about different types of software''s used for analysis & synthesis of different networks

**LEARNING OUTCOMES:**

Following this course,

1. Students will be able to analyze the various electrical and electronic networks using the techniques they learn.
2. Students will be able to construct a circuit to suit the need
3. Graduates will be able Implement and verify circuit theorems
4. Students will be able to understand the concepts of power measurements
5. They will gain knowledge about resonance and circuit transient

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**LIST OF EXPERIMENTS**:

| | |
|---|---|
| 1. | **A: Simulation based** <br> Introduction of circuit creation & simulation software like TINAPRO, P-Spice, Dr.-Spice, MATLAB and other relevant Software |
| 2. | Transient response of RC, RL circuit on any of above software. |
| 3. | To find the resonance frequency, Band width of RLC series circuit using any of above software. |
| 4. | To plot the frequency response of low pass filter and determine half-power frequency. |
| 5. | To plot the frequency response of high pass filters and determines the half-power frequency. |
| 6. | To plot the frequency response of band-pass filters and determines the band-width |
| 7. | **B: Hardware Based** <br> To calculate and verify "Z" & "Y" parameters of a two port network. |
| 8. | To determine equivalent parameter of parallel connections of two port network and study loading effect. |
| 9. | To calculate and verify "ABCD" parameters of a two port network. |
| 10. | To synthesize a network of a given network function and verify its response |
| **Experiments based on advanced topics:** | |
| 11. | Generation of Periodic, Exponential, Sinusoidal, Damped Sinusoidal, Step, Impulse, Ramp signal using MATLAB in both discrete and analog form |
| 12. | To calculate and verify h- parameters of a two port network |

## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

**Practical:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1 | Internal Assessment | 2 | 25 |
| 2 | External Assessment | 1 | 25 |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 1,2 | 1 | | 1,3 | 5 | | 4 | 1,3 | | | |

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

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# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## SEMESTER-III

**Electronic Devices & Circuits**

| | **L** | **T** | **P** |
|---|---|---|---|
| | **3** | **0** | **0** |

| MODULE CODE | ECEN2104 |
|---|---|
| CREDIT POINTS | 3 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 75 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

**OBJECTIVES:**

This course introduces some of the basic electronic devices like diodes and different types of transistors. It also aims to introduce students the analysis and design techniques of circuits involving these discrete devices as well as the integrated circuits.

1. To provide a basic understanding of semiconductor devices.
2. To make the graduates familiar with the construction, operation and characteristics of different semiconductor devices.
3. To understand the different biasing and stabilization concepts of bipolar junction transistors.
4. To learn the working and design of oscillators for the various communication systems.
5. To design different types of amplifier and to understand their frequency response by the use of BJT or FET.

**LEARNING OUTCOMES:**

Following this course,

1. Graduates will be able to design small circuits using different semiconductor devices.
2. At the end of this course, the students will be able to analyze amplifier circuits, oscillators and filter circuits employing BJT, FET devices.
3. The students will be able to understand the concept of bias stabilization
4. Graduates will be having knowledge about the affect of frequency on the characteristics of amplifier.
5. The students will be able to understand the concept of negative feedback in amplifiers.

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## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**MODULE CONTENTS**

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*Unit I: PN Junction devices*
Basics of Semiconductor, PN diode, Continuity Equation, Diffusion & Transition capacitances of P-N junction, Switching characteristics of diode, diode as circuit element.

*Unit II: Semiconductor Devices*
Zener Diode, Tunnel Diode, Schottky diode, Varactor diode, IMPATT diode; GUNN diode, P-N-P-N diode, semiconductor controlled rectifier (SCR).

*Unit III: Bipolar Junction Transistors*
BJT: BJT review, Bias stabilization: Need for stabilization, fixed Bias, emitter bias, self-bias, bias stability, Stabilization factors, thermal stability.

*Unit IV: Oscillators*
Oscillators: Barkhausen Criteria, Classification of Oscillators, Qualitative analysis of LC, Crystal Oscillators, Study of Wein Bridge Oscillators.

*Unit V: Field Effect Transistors*
Introduction to FETs, Classification, Characteristics of FET, Metal-insulator-semiconductor-field-effect-transistors (MISFET), Metal oxide semiconductor field effect transistor (MOSFET): Construction, operation and characteristics of above devices. MOSFET internal capacitances.

*Unit VI: Amplifiers:*
Classification of amplifiers, distortion in amplifiers, Multistage& Cascade amplifiers: Calculations of gain, bandwidth. Feedback concept, Properties of negative feedback amplifier.

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**RECOMMENDED BOOKS:**

| | |
|---|---|
| **Text Books:** | 1. Boylestad & Nashelsky, "Electronic devices & circuit Theory" Pearson Education. <br> 2.Salivahanan, Suresh Kumar, Vallavraj, "Electronic Devices and circuits" TMH <br> 3.J.Milliman and Halkias, "Integrated Electronics, Analog & Digital circuits & Systems TMH" |
| **Reference Books:** | 1.Sedra& Smith, "Micro electronic Circuits" Oxford University Press <br> 2. Albert Malvino, David J.Bates, "Problems and Solutions in Basic Electronics", TMH |

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks for theory and 50 marks for practical.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|:---:|:---|:---:|:---:|
| 1. | Class Test | 4 | 5 |
| 2. | Sessional Test | 2 | 15 |
| 3. | Group Discussion | 4 | 5 |
| 4. | End Semester Exam | 1 | 75 |

## MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 |
|:---|:---:|:---:|:---:|:---:|:---:|
| Class Test | X | | X | | |
| Quiz | | X | | | |
| Assignment | | | X | X | X |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | E | f | g | h | I | j | k |
|:---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Course Learning Outcomes | 2 | 4 | 2,5 | | 1 | | 3 | | | 2 | |

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## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;

- Suggested remedies / corrective measures;

- Approved refinement decisions due for implementation;

- Actions taken based on previous course review; and

- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**SEMESTER-III**

**Electronic Devices & Circuits Lab**

| | L | T | P |
|---|---|---|---|
| | 0 | 0 | 2 |

| | |
|---|---|
| MODULE CODE | ECEN2105 |
| CREDIT POINTS | 1 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 25 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**OBJECTIVES:**

1. To get familiar with various semiconductor devices
2. To understand practical aspects of transistors
3. To get familiar with major components of CRO
4. Understand the nature and scope of modern electronics.
5. Describe physical models of basic components.
6. Design and construct simple electronic circuits to accomplish a specific function, e.g., designing amplifiers, ADC converters etc.
7. Understand their capabilities and limitations and make decisions regarding their best utilization in a specific situation

**LEARNING OUTCOMES:**

1. Creates implementation skills.
2. Set up a bias point in a transistor
3. Verify the working of diodes, transistors and their applications.
4. Build a common emitter/base/collector amplifier and measure its voltage gain.
5. Understand the use of RPS and CRT.
6. Explore the operation and advantages of operational amplifiers.
7. Learn to design different types of filters and apply the same to oscillators and amplifiers.
8. Exploring the circuitry which converts an analog signal to digital signal

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**LIST OF EXPERIMENTS**:

| 1. | To study and plot the VI characteristics of PN Diode. |
|---|---|
| 2. | Plotting input and output characteristics of a transistor in common emitter configuration |
| 3. | Plot the FET characteristics. |
| 4. | Plot the MOSFET characteristics. |
| 5. | To plot the frequency response curve of two stage RC amplifier. |
| 6. | To study Emitter follower circuit & measurement of voltage gain and plotting of frequency response Curve. |
| 7. | To study and measure the voltage gain of an Amplifier. |
| 8. | To determine and plot firing characteristics of SCR by varying anode to cathode voltage, and varying gate current. |
| 9. | Study of frequency response of Low Pass Filter |
| 10. | To study the characteristics of single tuned & double tuned amplifier. Note: It is advised to use PSPICE software and the hardware design for performing and evaluation of the above circuits. |
| **Experiments based on advanced topics:** | |
| 11. | To develop a working model of any electronic circuit. |
| 12. | To get familiar with the working and use Transistors ICs. NOTE: - At least 10 Experiments out of the list must be done in the semester. |

## METHODS OF TEACHING AND STUDENT LEARNING

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## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

**Practical:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|:---:|---|:---:|:---:|
| 1 | Internal Assessment | 2 | 25 |
| 2 | External Assessment | 1 | 25 |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Course Learning Outcomes | 1,2 | 2 | | 5,6 | | 7 | 3,4 | | 5 | | |

## EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;

- Suggested remedies / corrective measures;

- Approved refinement decisions due for implementation;

- Actions taken based on previous course review; and

- Report discussed and analyzed; actions taken as a result of this process and are communicated to the main stakeholders.

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<div align="center">

### SEMESTER-III

</div>

|   |   |   |
|---|---|---|
| **L** | **T** | **P** |
| **2** | **0** | **0** |

**Aptitude – Part 1**

| MODULE CODE | VALU0119 |
|---|---|
| CREDIT POINTS | 2 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 50 |
| END SEMESTER EXAM DURATION | 2 hrs |
| LAST REVISION DATE |  |

**INSTRUCTIONS:** All questions are compulsory. Each question may have multiple options and will cover all units.

**OBJECTIVES:**

The aim of this subject is to develop understanding on different aspects related to analytical and business skills in Aptitude and to enhance skills as mentioned below:
8. To prepare students to develop basic understanding in Aptitude.
9. To acquire knowledge on various analytical tools.
10. To understand syntax and semantics of Aptitude in business.

**LEARNING OUTCOMES:**

1. Able to understand the basic fundamentals & concepts of Aptitude.
2. Exposure to various analytical tools used in business.
3. Ability to use different mathematical techniques.
4. Able to understand the importance of Aptitude.

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**MODULE CONTENTS**

*UNIT 1:- FUNDAMENTALS & USES OF ARITHMETIC-*
**Percentage, Ratio & Proportion:** Percentage Meaning and Computations of Percentages, Definition of Ratio, Continued Ratio, Inverse Ratio, Definition of Proportion, Continued Proportion, Direct Proportion.

**Profit And Loss :**Terms and Formulae, Trade discount, Cash discount, Problems involving cost price, Selling Price, Trade discount and Cash Discount, Problems involving cost price, selling price, trade discount and cash discount.
**Interest: Simple** Interest, Compound Interest, Equated Monthly Instalments (EMI), Word Problems.

**Sequence and Series:** AP, GP (simple word problems only).
**Average:** Definition, meaning and simple problems on average.

*UNIT 2: DATA ANALYSIS-*
To understand different types of data format.

To acquire skills for analyzing different data format.

To understand scope and limitations of data uses in business.

**Bar graph:** Reading and interpretation of bar graph in vertical forms, reading scales, creating bar graph from given data, solving problems using information presented in bar graph.

**Table:** Creating table from given data, Reading and interpreting table, solving problems using information presented in table.

**Line graph:** Reading and interpreting line graph, solving problems using information presented in line graph.

**Shares and Dividends:** Concept of shares, stock exchange, Face value, Market value, Dividend, Equity shares, Preferential shares, Bonus share with examples.

**Matrices and Determinants :**Definition of Matrix ,Types of Matrix, Algebra of Matrix (Addition and Multiplication), Determinant, Adjoint of Matrix, Inverse of Matrix via Adjoint matrix, Solving simultaneous equations(Order3).

*UNIT 3: ESSENTIALS OF LANGUAGE AND COMMUNICATION-*

**Speaking Skills:** Formal and Informal Conversation, Conversation in the work place, Interviews, Public

Speech, Lectures.

**Listening Skills:** Comprehending, Retaining, Responding, Tactics, Barriers to Listening, Overcoming listening

barriers, Misconception about listening.

**Reading Skills:** Acquiring Reading, Reading Development, Methods of Teaching, Reading difficulties.

**Writing skills:** Note-making, CV"s, Report writing, Copy Writing, Agenda, Minutes, Circular, Essay writing

on any current issues, Paragraph, Essay Writing, Writing Research Papers, Dissertation.

*UNIT4:*
Assignment 1,
Assignment2,

| Project |
|---|

**RECOMMENDED BOOKS:**

| TEXT BOOKS | 1. R S Agarwal quantitative aptitude book<br>2. Abhijit Guha quantitative aptitude book<br>3. Minippally, Methukutty. M. 2001. Business Communication Strategies. 11th Reprint. Tata McGraw – Hill. New Delhi. |
|---|---|
| REFERENCE BOOKS | 1. Aptitude books by Arihant publication<br>2. Swets, Paul. W. 1983. The Art of Talking So That People Will Listen: Getting Through to Family, Friends and Business Associates. Prentice Hall Press. New York. |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | | | | | | | | | | 1,2 | 3,4 |

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 100 marks for theory.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 1 | 10 |
| 2. | Sessional Test | 2 | 15 |
| 3. | End Semester Written Exam | 1 | 50 |
| 4. | End Semester Oral Exam | 1 | 25 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

**Theory:**

| Assessments | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Class Test | x | x | x | |
| Quiz | x | x | x | |
| Assignment | | | x | x |

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## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

**SEMESTER-III**

**Management and Professional leadership**      L   T   P
                                                3   0   0

| MODULE CODE | MGMT0101 |
|---|---|
| CREDIT POINTS | 3 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 75 |
| END SEMESTER EXAM DURATION | 3 hrs. |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

**OBJECTIVES:**
The aim of this subject is to teach students how to design, write, and analyse the financial data of a firm or a company. It will also enable students to learn the complete accounting process.

1. To provide knowledge and understanding of the basics of management.
2. To develop an understanding of leadership and its styles.
3. To make them understand the role of planning, organizing and decision making to lead the organization.
4. To identity value of group involvement and team building.
5. To make them understand the role of communication to lead the organization.
6. To provide an understanding of role of motivation to lead in the organization.

**LEARNING OUTCOMES**

Following this course student will be able to:

1. Develop an understanding of the process of management in the organizations and to apply that process for effective utilization of resources.
2. Develop an understanding of role of leadership in the organizations.
3. Acquaint themselves to apply leadership styles and theories as it relates to management practices.
4. Identify value of motivation, emotional intelligence and stability in resolving organizational problems.
5. Develop an understanding of communication and its role to the organization.
6. Analyse group formations, work team and team building strategies of the organization.

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# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**MODULE CONTENT**

| |
|---|
| *Unit 1: Management–introduction* <br> Nature and functions of management, principles of management, levels of management, management as an art, management as science and profession, management process, managerial skills and roles; Evolution of Management Thoughts; Managerial competencies. |
| *Unit II:: Basic concepts of Leadership* <br> Leadership: Functions of leaders, styles of leadership, leadership theories- Trait theory, Behavioral Theory. |
| *Unit III: Planning, Organizing and Decision making* <br> Planning- process of planning, elements of planning; steps in Organizing, authority and responsibility, delegation, centralization vs. decentralization; decision making, rationality in decision making. |
| *Unit IV:: Team Development* <br> Work team, nature of work teams, types of team, stages of team development, role of leadership in team development. |
| *UNIT-V: Communication* <br> Communication: Communication process, importance of communication, communication channels, Roles and barriers to communication. |
| *Unit VI: Motivation* <br> Motivation: Process and motivation models/approaches; relevance of motivation theories in Business. |

**RECOMMENDED BOOKS**

| | |
|---|---|
| **TEXT BOOK** | 1. Fundamentals of Management: Robbins, S.P. and Decenzo, D.A <br> Pearson Education Asia, New Delhi <br> 2. Organizational Behaviour: F Luthan"s <br> Tata McGraw Hill, New Delhi |
| **REFERENCE** | 1. Organizational behaviour: S P Robbins Prentice Hall of India, New Delhi <br> 2. Essentials of management: Chhabra T.N. , Sun India publications |

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 100 marks for Theory.

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|:---:|:---|:---:|:---:|
| 1. | Class Test | 4 | 05 |
| 2. | Sessional Test | 2 | 15 |
| 3. | Group Discussion | 4 | 05 |
| 4. | End Semester Exam | 1 | 75 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 | 6 |
|:---|:---:|:---:|:---:|:---:|:---:|:---:|
| Class Test | x | | | x | | |
| Quiz | | | x | | | x |
| Assignment | x | x | | x | | x |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|:---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Course Learning Outcomes | | | | | | | | | | | |

**EVALUATION**

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
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# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## SEMESTER-III

**Professional Communication-1**

| | L | T | P |
|---|---|---|---|
| | 2 | 0 | 0 |

| | |
|---|---|
| SUBJECT CODE | VALU0123 |
| CREDIT POINTS | 2 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 50 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS :** The question paper will consist of ten questions distributed over three sections A, B and C Section A comprise of one question carrying very short answer type questions and is compulsory, Section B comprise of two short answer type questions and Section C comprises of five long answer type questions These sections will also have internal choices of questions

**OBJECTIVE**
1. To learn the fundamentals of different structures of English grammar
2. To calculate the structures and patterns of English Language and to use them correctly in speaking
3. To learn about the creative literature writings
4. To improve speaking and writing
5. To inculcate professional skills of presenting and working
6. To understand different types of literatures and background with critical insights
7. To make students aware of the detailed exposition of English Language

**LEARNING OUTCOMES**
Following this course students will be able to :-
1. Identify the different structures and patterns of English Language
2. To make students a good Public Speaker
3. To make students aware about different literature of the World
4. To make students speak well in Professional English Speaking and writing highly professional in particular
5. Know the process of Communication and its ethics
6. To make students write in professional manner

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## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**MODULE CONTENT**

---

**UNIT : I  GENERAL COMMUNICATION SKILLS**

- Introduction to Communication
- Nature of Communication
- One-way versus two way Communication
- Characteristics of Communication and its objects
- Various stages of communication process
  - Downward/upward and Horizontal Communication
- Presentation Skills
- Introduction to the Novel
- Reading Comprehension and Group Discussion
- Tense-Formation
- Short Stories
  - Joothan by Prem Chand
  - Raja Rao (Kanthapura)
  - DH Lawrance (Sons and Lovers)

**UNIT : II  PATTERN AND STRUCTURE OF ENGLISH GRAMMAR AND EFFECTIVE SPEAKING**

- Articles
- Quantifiers
- Usage of different comma''s in writing
- Bio-data and resume writing
- Speech (Formation and public speaking)
- The Gift of Magi
- The lament, by Anton Chekov
- The Barber''s trade union by Mulak Raj Anand
- Bertolt Brecht (The Good Woman of Setzuan)

**UNIT : III  LINGUISTICS AND PARALINGUISTIC FEATURES OF DELIVERY OF SPEECH**

- What is Linguistics
- Passive Voice
- Adverbs
- Phrasal Verbs
- Modals
- Conjunctions
- Notice
- Reading Comprehension
- AS Byatt (Virgin in the Garden)
- Caustave Flaubert Madame Bovery
- Alice Walker (Color Purple)

**UNIT : IV  LINGUISTIC PATTERNS OF LANGUAGE AND COMMUNICATIONS**

- Article Writing
- The formation of words
- Formation of abstract Nouns from Concrete Nouns
- Components of communication and their implementation
- Formation of verbs from Noun

LITERARY WORKS
- a. Joe Orton :- What the Butler Saw
- b. Leo Tolstoy :-Anakerenine
- c. Ivan Turgenev :- Fathers and Son

## UNIT : V PROFESSIONAL SPEAKING SKILLS-I

- Professional Speaking (PUBLIC SPEAKING ART)
- Complaint and Job/Sales Letters
- Noun and the number countable/uncountable/collective/abstract and material
- Syntax (Infinitive/General and different structures of Grammar
- Past/Present and Future (Tense formation)
- Literary works
  - o Tess of the d'urbervillers by Thomas hardy
  - o The old man and the sea by Ernest Hemingway
  - o Deliverane by Prem Chand
  - o Jane Austen (Emma)

## UNIT : VI PROFESSIONAL SPEAKING SKILLS -II

- Derrida's views upon language
- Description of Tools of Communication
- One word Substitute
- Sentence Structure
- Verb Patterns and their usage

LITERARY WORKS
- a. GB Shaw :- Arms and the man
- b. JM Synge :- Playboy of the western world
- c. Jeanette winterson :- Oranges are not the only fruit
- d. SomerestMaugham :- Razor's edge

**Recommends Books**

| TEXT BOOK | Essential of Communication by BR Sharma |
|---|---|
| Reference | Derrida (Semiotics and Sign Structure) |

## MAPPING OF COURSE OBJECTIVES AGAINST STUDENTS LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e |
|---|---|---|---|---|---|
| Mapping of Course Objectives with Students Learning Outcomes | 1, 2, 5 | 1, 2 | 2, 3, 5 | 2, 3, 4, 5 | 6, 7 |

# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## METHODS OF TEACHING AND STUDENT LEARNING

The subjects is delivered through lectures, on-line support, text book/course material reading and practical exercises Some videos will be shown to demonstrate certain concepts and research areas will be discussed Resources material is provided with the help of PDM Educational Directory Services (PEDS)

## ASSESSMENT METHODOLOGIES

This subject will be evaluated for a total of 75 marks for theory

| Assessment # | Type of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1 | Class Text | 4 | 05 |
| 2 | Sessional Text | 2 | 15 |
| 3 | Group Discussion | 4 | 05 |
| 4 | End Semester Exam | 1 | 50 |

## EVALUATION

At the end of Semester Subject teacher will submit an evaluation report The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the subject with respect to its strengths as well as those areas which could be improved The review report contains the following

- Approved refinement decisions due for implementation
- Actions taken based on previous subject review
- Problems encountered in the subject delivery
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# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## SEMESTER-III

**Sensors & Transducers**

| | L | T | P |
|---|---|---|---|
| | 4 | 0 | 0 |

| MODULE CODE | ECEN2206 |
|---|---|
| CREDIT POINTS | 4 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

**OBJECTIVES:**

This student aims to make the students aware of various sensors & transducers with their technical specification, so that they will be able to choose & analyze the characteristics of particular transducers so various industrial applications.

1. To Understanding the structural and functional principles of sensors and transducers used for various physical and nonelectric quantities and how to use them to measure these quantities.
2. To Explain the principles of operation of the sensor parameters and generators
3. To Interpretation of the measurement results by using transducers.
4. To Development of measurement schemes for different non electrical quantities
5. To Assimilating knowledge about the implementation of sensors and transducers into a control system structure.


**LEARNING OUTCOMES:**

Students will be able to:

1. Classify and describe resistive, inductive and capacitive transducers which are used for measuring various parameters like displacement, temperature, humidity etc.
2. Define units and standards, their conversions, characteristics and error analysis of measurement systems.
3. To identify the various transducers used for various application
4. Able to design signal conditioning circuit for various transducers.
5. Able to identify or choose a transducer for a specific measurement application

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**MODULE CONTENTS:**

| |
|---|
| *Unit I: Motional and Dimensional measurement* <br> Introduction, Aim of measurement, Roll of sensors in engineering, classification of transducers, Fundamental Standards, units Linear Displacement: Resistive Potentiometers, stain gauge, LVDT, Capacitive Piezoelectric, Hall Effect sensors, magneto-stricitive, Optical displacement sensor fiber optic sensor, Ultrasonic distance Sensor, Piezo-resistive, Linear encoder, Proximity sensors. Rotational Displacement: Revolution counter, Resistive potentiometers, RVDT, DC tachometer, AC tachometer, optical tachometer |
| *Unit II: Force & Torque measurement* <br> Force: Standards and Calibration, Basic methods of force measurement (Spring, beam, diaphragm) Strain gauge: basic principal, gauge factor, types of strain gauge, materials and their properties, bonding material compensation techniques, bridge configuration, Rosettes, Tactile sensors, Piezoelectric sensors, LVDT as secondary sensor Torque: Torsion Bar, Flat Spiral Spring, Magenetostrictive Torsion Transducer, Dynamometers. |
| *Unit III: Pressure Measurement* <br> Standards and calibration Units and relations. Positive Pressure Sensors Manometers – U tube, Well type, inclined tube, Ring balance, Micro manometer, use of seal pots, range of measurement Elastic – Bourdon, Diaphragm, Bellows and their types, materials and their properties, range of measurement Electronic – LVDT, Strain gauge. |
| *Unit IV: Temperature measurement* <br> Temperature Scales, Standards and Units and relations, Classification of temperature sensors Mechanical: Bimetallic Thermometer – Working Principle, Various types, Filled system thermometers – SAMA classifications, Sources of errors and their remedies, Dip effect Electrical: Resistance Temperature Detectors – Principle, materials and their properties, Types and ranges, different sources of errors. |
| *Unit V: Flow Measurement Units* <br> Newtonian and non-Newtonian Fluids, Reynolds number, Laminar and turbulent flows, Velocity profile, Bernoulli‟s equation for incompressible flow, Density, Beta ratio, Reynolds number correction, Square root relation Head type flow meters : Orifice ( Eccentric , segmental , concentric ) , Different pressure taps, Venturi, Flow nozzle, Dahl tube, Pitot tube, Annu bar, Characteristics of head type flow meters. |
| *Unit VI: Miscellaneous Measurement* <br> Level Measurement: Float, Displacer (Torque tube unit), Bubbler, Diaphragm box, DP cell, Ultrasonic, Capacitive & Radioactive |

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOKS** | 1. Mechanical and Industrial Measurement- R.K.Jain- Khanna Publications-9th print <br> 2. Process Control Instrumentation Technology- C. D. Jonhson- PHI-Seventh Edition <br> 3. Electrical and Electronic Measurements and Instrumentation- A. K. Sawhney Dhanpat Rai and Sons , |
| **REFERENCE BOOKS** | 1. Measurement and Analysis- B. G. Liptak- Butterworth Heinemann- Third Edition <br> 2.  Jone‟s Instrument Technology ( Vol. 1 and Vol. 2 )- B. E. Noltingk EL / BS- Fourth Editio |

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 150 marks for theory.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|:---:|:---|:---:|:---:|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 |
|:---|:---:|:---:|:---:|:---:|:---:|
| Class Test | x | | x | | X |
| Quiz | x | x | | x | |
| Assignment | | x | | x | |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | c | D | e | f | g | h | I | j | K |
|:---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Course Learning Outcomes | 1,2 | 2 | 4 | 5 | 3,5 | 5 | 4,2 | | 2 | 2 | |

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;

- Suggested remedies / corrective measures;

- Approved refinement decisions due for implementation;

- Actions taken based on previous course review; and

- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholder

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## SEMESTER-III

**PLC & SCADA Systems**

| | **L** | **T** | **P** |
|---|---|---|---|
| | **4** | **0** | **0** |

| | |
|---|---|
| MODULE CODE | ECEN2207 |
| CREDIT POINTS | 4 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs. |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

## OBJECTIVES:

Programmable Logic Controllers are now in widespread use throughout industry. These high quality versatile units can solve all your process plant and manufacturing plant control problems. This course is designed to give you an (improved) understanding of **P**rogrammable **L**ogic **C**ontrollers and SCADA.

1. To understand the generic architecture and constituent components of a Programmable Logic Controller.
2. To develop architecture of SCADA explaining each unit in detail.
3. To develop a software program using modern engineering tools and technique for PLC and SCADA.
4. To apply knowledge gained about PLCs and SCADA systems to identify few real-life industrial applications.
5. To Understand how sensors and field devices are connected

## LEARNING OUTCOMES:

Students will be able to:

1. Develop and explain the working of PLC with the help of a block diagram.
2. Develop architecture of SCADA and explain the importance of SCADA in critical infrastructure.
3. Execute, debug and test the programs developed for digital and analog operations.
4. Reproduce block diagram representation on industrial applications using PLC and SCADA.
5. Design hardware and software solution based on HMI and PLC system

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## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**MODULE CONTENTS:**

| |
|---|
| *Unit I: Programmable Logic Controller (PLC) Basics*<br>Introduction, Parts of PLC, Principles of operation, PLC size and applications, PLC Advantages and Disadvantages, PLC Manufacturers, PLC hardware components, I/O section, Analog I/O modules. |
| *Unit II: I/O Modules*<br>Digital I/O modules, CPU- Processor memory module, Programming devices, Devices which can be connected to I/O modules, Relay, Contactor, SPST, Push Buttons, NO/NC Concept |
| *Unit III: Programming*<br>Programming of Programmable Logic Controller: General PLC Programming Procedures, Contacts and Coils, Program SCAN, Programming Languages, Ladder Programming. Relay Instructions, Instruction Addressing, Concept of Latching, Branch Instructions, Contact and Coil I/O Programming Examples, Relation of Digital Gate Logic to Contact/Coil Logic. |
| *Unit IV: Programmable Logic controller Functions*<br>Timer Instructions: ON DEAY Timer and OFF DELAY timer, Counter Instructions: UP/DOWN Counters, Timer and Counter Applications, Program Control Instructions: Master Control Reset, Jump and Subroutine, Math Instructions- ADD, SUB. Data Handling: Data Move, Data Compare, Data Selection, Electro-pneumatic Sequential Circuits and Applications. |
| *Unit V: SCADA*<br>Definition of SCADA, Applicable Processes, Elements of SCADA System, A Limited Two-Way System. Real Time Systems: Communication Access and Master-Slave determining scan interval. Introduction to Remote Control. |
| *Unit VI: Communications*<br>A/D Conversion, Long Distance Communication, Communication System components in brief- Protocol, Modems, Synchronous/Asynchronous telephone cable/radio, Half Duplex, Full Duplex System, Brief introduction to RTU and MTU, Applications-Automatic Control, Advisory Applications. |

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOKS** | 1. Frank D. Petruzella "Programmable Logic Controllers", McGraw-Hill Book Company.<br>2. John w. Webb and Ronald A. Reis, "Programmable Logic Controllers", PHI |
| **REFERENCE BOOKS** | 1. Stuart A.Boyer "Supervisors Control and Data Acquisition", ISA<br>2. William I. Fletcher "An Engineering Approach to Digital Design", PHI.<br>3. Simpson, Colin "Programmable Logic Controllers", Englewood Cliffs NJ PHI. |

## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|:---:|:---|:---:|:---:|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

## MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 |
|:---|:---:|:---:|:---:|:---:|:---:|
| Class Test | x | | | x | x |
| Quiz | | x | x | | |
| Assignment | x | x | | | |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | B | c | D | e | f | g | h | i | j | K |
|:---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Course Learning Outcomes | 1 | 1,2 | 4 | 3,5 | 3 | 5 | 5 | | 2 | 4 | |

## EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and

- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

## SEMESTER-III

**Electromechanical Energy Conversion**
<br>
L   T   P
<br>
4   0   0

| MODULE CODE | ECEN2208 |
|---|---|
| CREDIT POINTS | 4 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE |  |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

**OBJECTIVES:**

This course aim to make the student familiar with the different concepts of electromagnetic energy conversion like:

1. To understand the basic concepts of magnetic circuits as applied to electric machines.
2. To understand the two basic principles (generation of force and emf) that govern electromechanical energy conversion.
3. To demonstrate knowledge of 3 phase transformer.
4. To demonstrate the knowledge of ac and dc machines.
5. To learn the requirements and characteristics of selected motors for given applications.

**LEARNING OUTCOMES:**

Following this course:

1. Students will get familiar with functionality of static and rotating electrical machines.
2. Graduates will be able to Relate characteristic of machine with specific application
3. Students will be able to formulate and analyze the working of electrical machines using mathematical model under loaded and unloaded conditions.
4. They will know the concepts of different speed control mechanisms used in the industries
5. Graduates will be able to understand drive equations of different electrical machines.
6. Graduates will be able to use synchronous machines and generators as well as induction machines and D.C machine for different industrial applications .

**MODULE CONTENTS:**

| |
|---|
| *Unit I: . Principles of EMEC*<br>Energy in Electro-Magnetic System, Flow of Energy in Electro-Mechanical Devices, Energy in Magnetic field and co-energy, Dynamics of Electromechanical Systems, Singly excited systems. Torque and EMF equations. |
| *Unit II: Three Phase Transformers*<br>Basic theory, construction, operation at no-load and full-load, parallel operation, equivalent circuit, load division between transformer in parallel, Phasor diagram, open and short circuit tests for parameters determination, efficiency and regulation, auto-transformer. |
| *Unit III: DC Machines*<br>Basic theory of DC generator, brief idea of construction, emf equation, load characteristics, basic theory of DC motor, concept of back emf, torque and power equations, load characteristics, starting and speed control of DC motors, applications. |
| *Unit IV: Poly Phase Induction Motor*<br>Basic theory, construction, Phasor diagram, Equivalent circuit, Torque equation, Load characteristics, starting speed control of induction motor, Introduction to single phase Induction motor double field revolving theory, types of single phase IM and its applications, open circuit & block rotor test. |
| *Unit V: Synchronous Alternator*<br>Constructional features, armature windings, E.M.F. equation, winding coefficients, harmonics in the induced E.M.F., armature reaction, O.C. and S.C. tests, voltage regulation-Synchronous impedance method, MMF Method, Poitier"s triangle method |
| *Unit VI: Special type of motors*<br>Introduction to Universal motor, stepper motors, servo motor, Tachogenerator and Synchros. |

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOKS** | 1. D.P.Kothari & I.J.Nagrath, "Electric Machines", Tata Mc Graw Hill<br>2. P.S.Bimbhra, "Electrical Machines", Khanna Publisher<br>3. P.S. Bimbhra, " Generalized Theory of Electrical Machines", Khanna Publishers<br>4. Ashfaq Hussain"Electric Machines" Dhanpat Rai & Company |
| **REFERENCE BOOKS** | 1. The Performance and Design of Alternating Current Machines, M.G. Say, CBS Publishers, 2005<br>2. Electro-Mechanical Energy Conversion with Dynamics of Machines, Rakosh Das Begamudre, Wiley- Blackwell, 1988.<br>3. Performance and Design of Direct Current Machines: AE Clayton and NN Hancock, CBS Publishers, 2014 |

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## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

| Program Outcomes | a | b | c | D | e | f | g | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 1.2 | 3 | 5 | | 4 | 3,6 | 6,4 | | | 3,4 | |

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 150 marks for theory.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Class Test | | | x | | | |
| Quiz | X | | | | x | x |
| Assignment | | x | | x | | x |

**MAPPING OF COURSE LEARNING OUTCOMES**

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;

- Suggested remedies / corrective measures;

- Approved refinement decisions due for implementation;

- Actions taken based on previous course review; and

- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## SEMESTER-III

**Power Electronics**                                                             **L   T   P**
                                                                                  **4   0   0**

| MODULE CODE | ECEN2209 |
|---|---|
| CREDIT POINTS | 4 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

**OBJECTIVES:**

This course aims to introduce power electronics to the undergraduate students so that they will be able to use various power semi-conductor devices for various industrial applications.

1.  To understand and acquire knowledge about various power semiconductor devices.
2.  To prepare the students to analyze and design different power converter circuits.
3.  To provide the students a deep insight in to the working of different switching devices with respect to their characteristics
4.  To analyze different converters and control with their applications.
5.  To study advanced switching techniques implemented in recent technology

**LEARNING OUTCOMES:**

Students will be able to:

1.  Acquire knowledge about fundamental concepts and techniques used in power electronics.
2.  Analyze various single phase and three phase power converter circuits and understand their applications.
3.  Foster ability to identify basic requirements for power electronics based design application.
4.  To develop skills to build, and troubleshoot power electronics circuits.
5.  Foster ability to understand the use of power converters in commercial and industrial applications.

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## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**MODULE CONTENTS:**

| |
|---|
| *Unit I: .* Introduction<br>Role of power electronics, review of construction and characteristics of power diode, sShottky diode, power transistor, power MOSFET, SCR, DIAC, Triac, GTO, IGBT & SIT. SCR: Ratings and protections, series and parallel connections, R, RC and UJT firing circuit and other firing circuits based on ICs and microprocessors; pulse transformer and opto-coupler, commutation techniques. |
| *Unit II: AC Regulators*<br>Types of regulator, equation of load current, calculation of extinction angle, output voltage equation, harmonics in load voltage and synchronous tap changer, three phase regulator. |
| *Unit III: Inverters*<br>Basic circuit, 120 degree mode and 180 degree mode conduction schemes, modified McMurray half bridge and full bridge inverters, McMurray -Bedford half bridge and bridge inverters, brief description of parallel and series inverters, current source inverter (CSI), transistor and MOSFET based inverters. |
| *Unit IV: Choppers*<br>Basic scheme, output voltage control techniques, one, two, and four quadrant choppers, step up chopper, voltage commutated chopper, current commutated chopper, MOSFET and transistor based choppers. |
| *Unit V:Cycloconverters*<br>Basic principle of frequency conversion, types of cyclo-converter, non-circulating and circulating types of cyclo-converters. |
| *Unit VI: Drives*<br>Introduction to electric drives: DC drives – converter and chopper fed dc drives, ac drives – stator voltage control, V/f control, rotor resistance control, static Scherbius system and static Kramer systems. |

**RECOMMENDED BOOKS:**

| TEXT BOOKS | 1. Power Electronics : MH Rashid; Pearson |
|---|---|
| **REFERENCE BOOKS** | 1. Power Electronics : PC Sen; TMH<br>2. Power Electronics : HC Rai; Galgotia<br>3. Thyristorised Power Controllers : GK Dubey, PHI |

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 150 marks for theory.

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**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Class Test | x | | | | X |
| Quiz | | x | x | | |
| Assignment | | | | x | X |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | B | c | d | e | f | g | h | i | J |
|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 1 | 1,2 | 4 | 5 | 2 | 5 | 3 | - | 3,5 | 4 |

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
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# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

### SEMESTER - III

**YOGA**

|  | L | T | P |
|--|---|---|---|
|  | 2 | 0 | 0 |

| MODULE CODE | VALU0118 |
|---|---|
| CREDIT POINTS | 1 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 25 |
| END SEMESTER EXAM DURATION | 1.5 hrs |
| LAST REVISION DATE |  |

**INSTRUCTIONS:** All questions are compulsory and each of the questions may have multiple options covering all units.

**OBJECTIVES:**

To develop understanding of moral values in different aspects of life for inculcating the skills as mentioned below:
1. To prepare students to develop basic understanding of Yoga.
2. To acquire knowledge on Yoga.
3. To understand the ethics, character building, leadership & goal setting.
4. To understand the success & personal growth.
5. To support the youth empowerment & health awareness.

**LEARNING OUTCOMES:**

1. Able to understand the Importance of Yoga in Life.
2. Able to understand principles, concepts, types, advantages and disadvantages of Yoga.
3. Ability to understand the life style management & self esteem.
4. Would behave morally in the society.

## MODULE CONTENTS:

*UNIT 1: INTRODUCTION OF YOGA*
- Definition, Concept of Yoga
- Path of Yoga
- Jnana Yoga
- Bhakti Yoga
- Karma Yoga
- Raja Yoga

*UNIT 2: PRINCIPLE OF YOGA*
- Sthula Sharira
- Sukshma Sharira
- Karana Sharira

PANCH MAHABHUTA
- Akasha
- Vayu
- Agni

- Jal
- Prithvi

TANMATRAS (Five Elements)
- Sound (Shabda)
- Smell (Gandha)
- Taste (Rasa)
- Form ( Rupa)
- Touch (Sparsha)

PANCHAKOSHA
- Annamya Kosha
- Pranamaya Kosha
- Manomaya Kosha
- Vignanamaya Kosha
- Anandamya Kosha

Panch Prana
- Prana
- Apana
- Samana
- Udana
- Vyana

SHAD CHAKRAS
- Mooldhara Chakra
- Svadisthan Chakra
- Manipur Chakra
- Anahat Chakra
- Vishudhi Chakra
- Ajna Chakra
- Sahastra Chakra

*UNIT 3: YOGA SUTRA OF MAHARSHI PATANJALI*

Yoga sutra deals with the general nature of yoga and its technique. It is meant really to answer the question „What is Yoga?" since Samadhi (self realization) is the essential technique of yoga.

*UNIT 4: PRACTISE OF YOGA*
- Shat Kriya
- Pranayama
- Asana (15 to 20 different asanas with their benefits and limitation)

**RECOMMENDED BOOKS:**

| TEXT BOOKS | 1. PATANJALI YOGA SUTRA BY SRI SRI RAVI SHANKER JI<br>2. BHAGWAT GITA<br>3. HATHA YOGA PRADIPIKA |
|---|---|

# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | | | | | | | | | | 1,2 | 3,4 |

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts, and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 100 marks for theory.

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Sessional Test / Quiz | 2 | 20 |
| 2. | Attendance | 1 | 5 |
| 3. | End Semester Written Exam | 1 | 40 |
| 4. | End Semester Oral Exam | 1 | 10 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

| Assessments | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Quiz & Assignment | x | x | x | |
| End Semester Written Exam | | | x | x |
| End Semester Oral Exam | x | x | | x |

**EVALUATION**

At the end of semester, the module incharge will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback on the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;

- Suggested remedies / corrective measures;

- Approved refinement decisions due for implementation;

- Actions taken based on previous course review; and

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# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## SEMESTER - IV

| MODULE CODE | CATEGORY | SUB-CATEGORY | MODULE | L | T | P | C | INTERNAL MARKS | EXTERNAL MARKS | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|
| ECEN2110 | E | PC | ELECTRONIC MEASUREMENT AND INSTRUMENTATION | 4 | 0 | 0 | 4 | 50 | 100 | 150 |
| ECEN2111 | E | PC | DIGITAL ELECTRONICS | 3 | 1 | 0 | 3.5 | 50 | 100 | 150 |
| ECEN2112 | E | PC | DIGITAL ELECTRONICS LAB | 0 | 0 | 2 | 1 | 25 | 25 | 50 |
| ECEN2113 | E | PC | ANALOG ELECTRONICS CIRCUITS | 3 | 0 | 0 | 3 | 25 | 75 | 100 |
| ECEN2114 | E | PC | ANALOG ELECTRONICS CIRCUITS LAB | 0 | 0 | 2 | 1 | 25 | 25 | 50 |
| ECEN2115 | E | PC | COMMUNICATION SYSTEM | 3 | 1 | 0 | 3.5 | 50 | 100 | 150 |
| ECEN2116 | E | PC | COMMUNICATION SYSTEM LAB | 0 | 0 | 2 | 1 | 25 | 25 | 50 |
| ECEN2117 | E | PC | ELECTRONIC WORKSHOP AND PCB DESIGN LAB | 0 | 0 | 2 | 1 | 25 | 25 | 50 |
| | E | PE | ELECTIVE- III | 4 | 0 | 0 | 4 | 50 | 100 | 150 |
| | E | PE | ELECTIVE-IV | 4 | 0 | 0 | 4 | 50 | 100 | 150 |
| | | TOTAL | | 21 | 2 | 8 | 26 | 375 | 675 | 1050 |

**ELECTIVES**

| MODULE CODE | ELECTIVE-III |
|---|---|
| ECEN2218 | NANOTECHNOLOGY |
| ECEN2219 | MEMS |

| MODULE CODE | ELECTIVE-IV |
|---|---|
| ECEN2220 | DATA COMMUNICATION |
| ECEN2221 | COMPUTER NETWORKS |

L= Lecture

T= Tutorial
P=Practical

## SEMESTER - IV

**Electronic Measurement & Instrumentation**

| | **L** | **T** | **P** |
|---|---|---|---|
| | **4** | **0** | **0** |

| | |
|---|---|
| MODULE CODE | ECEN2110 |
| CREDIT POINTS | 4 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

**OBJECTIVES:**

The aim of teaching this subject is to impart knowledge primarily related to application of electronic measurement and instrumentation of the circuits so that learner will be able to measure electronic circuits in real life. Some of the objectives of the course are:

1. To understand the fundamental construction and working of electronic instrument CRO.
2. To introduce various types of CRO i.e. Dual trace, Dual beam, Sampling & Storage oscilloscope.
3. To introduce various instrument for measurement of current, voltage and other circuit elements like Q Meters.
4. To learn construction and working of digital meter, chopper amplifier type voltmeter, electronic multimeter.
5. To get familiar with Different types of Pulse generators, Function generator and spectrum analyzer.
6. To understand working, basic principle of frequency and time measurement with the help of DCA and counters
7. To teach various types of transducers and signal conditioning & conversion systems.

**LEARNING OUTCOMES:**

1. Our graduates will learn basic fundamentals of electronic measurement instruments.
2. Our graduates will have basic knowledge of working of various equipment used in instrumentation industry.
3. Our graduates will be able to work in different Control and Power Systems.
4. Our graduates will be able to tackle their household related problems as well as house wiring connections.
5. Graduate will be able to get the basic platform to understand Electrical Machines Lab, Power System Lab as well as Power Electronics Lab.
6. Graduates will be able to make their own projects based on electrical instruments and tools like ADC, DAC, Transducers and signal conditioners.
7. Our graduates will be able to work in firm associated with electricity generation and distribution .

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**MODULE CONTENTS:**

| |
|---|
| *Unit-1 Oscilloscope* <br> Block diagram, study of various stages in brief, high frequency CRO considerations measurement of phase &frequency, electrostatic deflection, dual trace &dual beam oscilloscope ,Sampling and storage oscilloscope. |
| *Unit II: A.C Bridges* <br> Maxwell  Inductance Bridge. Maxwell Inductance Capacitance Bridge, Anderson‟s Bridge, Hay‟s Bridge, De-Sauty‟s Bridge. |
| *Unit-III: Generation & Analysis of Waveforms* <br> Block diagram of pulse generators, signal generators, function generators ,wave analysers, distortion analysers, spectrum analyser, Harmonic analyser, FFT analyser |
| *Unit IV : Transducers* <br>  Classification of Transducers, Strain Gauge, Displacement Transducers - Capacitive Transducers, LVDT, Piezo-electric Transducers, Temperature Transducers - resistance thermometer, Thermocouples and Thermistors, Liquid level measurement, Low pressure (vacuum) measurement. |
| *Unit V: Frequency & Time Measurement* <br> Study of decade counting assembly (DCA), frequency measurements, period measurements, universal counter. |
| *Unit VI : Signal Conditioning* <br> DC signal conditioning system, AC signal conditioning system, data acquisition and conversion system. |

## RECOMMENDED BOOKS

| | |
|---|---|
| **TEXT BOOK** | 1. A course in Electrical & Electronics Measurements & Instrumentation, by A.K.Sawhney; Dhanpat  Rai & Sons. |
| **REFERENCE** | 1. Electronics Instrumentation & Measurement Techniques,by Cooper; PHI. |

# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|:---:|---|:---:|:---:|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

## MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Class Test |  |  |  | x | x |  |  |
| Quiz | x |  |  |  |  |  |  |
| Assignment |  | x | x | x |  | x | X |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | K |
|---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Course Learning Outcomes | 1 | 2 | 3 | 4 | 5 | 1,6 | 7 | 6 |  |  |  |

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;

- Suggested remedies / corrective measures;

- Approved refinement decisions due for implementation;

- Actions taken based on previous course review; and

- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## SEMESTER - IV

**Digital Electronics**                                    **L    T    P**
                                                            **3    1    0**

| MODULE CODE | ECEN 2111 |
|---|---|
| CREDIT POINTS | 3.5 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

## OBJECTIVES:

The aim of this subject is to develop understanding on basics of digital circuits, combinational and sequential circuits so that learner will be able to make basic digital circuits in real life. Some of the objectives of the course are:

6. To acquire basic knowledge of the basic concepts of basic digital circuits and its advantages.
7. To inculcate the knowledge of Digital Electronics fundamentals.
8. To enable to solve digital circuits adders, subtractors, multiplexer and demultiplexer.
4.  To get familiar with the concept of designing like flip-flops & Counters.
5. To understand the concept of semiconductor memories like RAM, ROM, PLA, PAL, FPGA etc..
6. To gain knowledge of A/D &D/A converters.

## LEARNING OUTCOMES:

5. Able to understand basic aspects of digital circuits used in any kind of industry.
6. Able to understand various digital electronics applications in day to day life.
7. Get familiar with working of various gates and IC of a circuit.
8. Ability to analyze the behavior of digital circuits in different forms.
9. Able to measure various digital circuit parameters.
10. Able to design different semiconductor memories.
11. Able to convert one analog circuit to digital circuit and vice versa.

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## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**MODULE CONTENTS:**

| |
|---|
| *Unit I: Number System and Binary Code*<br>Introduction, Binary, Octal and Hexadecimal Number System (Conversion, Addition & Subtractions). Signed and unsigned numbers, Binary Subtractions using 1's and 2's compliment, ASCII code, Excess 3 code, Grey code, BCD code and BCD additions. |
| *Unit II: Minimization of logic function*<br>OR, AND,NOT,NOR,NAND,EX-OR, EX-NOR, Basic theorem of Boolean Algebra, Sum of Products and Product of Sums, canonical form, Minimization using K-map and Q-M method. |
| *Unit III: Combinational Circuits*<br>Introduction, Combinational circuit design, Encoders, decoders, Adders, Subtractors and Code converters. Parity checker, seven segment display, Magnitude comparators. Multiplexers, De-multiplexer, Implementation of Combinational circuit using MUX. |
| *Unit IV: Sequential Circuits*<br>Introduction, flip flops, Clocked flip flops, SR, JK, D, T and edge triggered flip-flops. Excitation tables of Flip flops. Shift Registers, Type of Shift Registers, Counter, Counter types, counter design with state equation and state diagrams. |
| *Unit V: D/A and A/D Converters*<br>Introduction, Weighted register D/A converter, binary ladder D/A converter, steady state accuracy test, D/A accuracy and resolution, parallel A/D converter, Counter type A/D converter Successive approximation A/D converter. Single and dual slope A/D converter, A/D accuracy and resolution. |
| *Unit VI: Semiconductor Memories*<br>Introduction, Memory organisation, Classification and characteristics of memories, Sequential memories, ROMs, R/W memories. Content addressable memories. PLA and PAL. |

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOKS** | 1. Digital Design by Morris Mano Prentice Hall of India Pvt. Ltd<br>2. Digital Principles and Applications, by Donald P. Leach and Albert Paul Malvino , Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.<br>3. Modern Digital Electronics, by R. P. Jain, Tata McGraw–Hill publishing Company limited, New Delhi, 2003. |
| **REFERENCEBOOKS** | 3. Digital Fundamentals, by Thomas L. Floyd, Pearson Education, Inc, New Delhi, 2003 |

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 150 marks.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|:---:|---|:---:|:---:|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Class Test | | | | x | x | x | X |
| Quiz | x | x | x | | | | |
| Assignment | | x | x | | | x | X |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | B | c | d | e | f | g | h | i | j | K |
|---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Course Learning Outcomes | 1 | 2 | 5 | 3 | 7 | 5,6 | 4 | 7 | | | |

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;

- Suggested remedies / corrective measures;

- Approved refinement decisions due for implementation;

- Actions taken based on previous course review; and

- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**Digital Electronics Lab**

| | L | T | P |
|---|---|---|---|
| | 0 | 0 | 2 |

| MODULE CODE | ECEN 2112 |
|---|---|
| CREDIT POINTS | 1 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 25 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**OBJECTIVES:**

1. To understand practical aspects of different kits.
2. To get familiar with combinational circuit.
3. To get familiar with sequential circuit.
4. To understand sequential circuits kits of flip-flops & Counters.
5. To get familiar with the different semiconductor memories kits like RAM, ROM, PLA, PAL, FPGA etc.

**LEARNING OUTCOMES:**

1. Capable to work on basics digital electronics kits.
2. Acquire knowledge about solving problems related to number systems and Boolean algebra.
3. Able to identify, analyze and design combinational circuits.
4. Able to design various synchronous and asynchronous sequential circuits.
5. Creates implementation skills.

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## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**LIST OF EXPERIMENTS**:

| | |
|---|---|
| 1. | Study of Logic Gates: Truth-table verification of OR, AND, NOT, XOR, NAND and NOR gates; Realization of OR, AND, NOT and XOR functions using universal gates. |
| 2. | Realization Half Adder / Full Adder using Logic gates. |
| 3. | Realization Half Subtractor / Full Subtractor using Logic gates |
| 4. | Design 4-Bit Binary-to-Gray & Gray-to-Binary Code Converter. |
| 5. | Design 4-Bit magnitude comparator using logic gates. |
| 6. | Multiplexer: Truth-table verification and realization of Half adder and Full adder using MUX. |
| 7. | Demultiplexer: Truth-table verification and realization of Half subtractor and Full subtractor using DEMUX. |
| 8. | Flip Flops: Truth-table verification of RS, JK , D, JK Master Slave Flip Flops. |
| 9. | Design MOD-7 Synchronous up-counter using JK/RS/D Flip Flops. |
| 10. | Shift Register: Study of shift right, SIPO, SISO, PIPO, PISO & Shift left operations using IC7495 chip. |
| **Experiments based on advanced topics:** | |
| 11. | To study the designing of ALU. |
| 12. | To design a finite state machine and verify. |

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 50 marks for practical.

**Practical:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|:---:|:---|:---:|:---:|
| 1 | Internal Assessment | 2 | 25 |
| 2 | External Assessment | 1 | 25 |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|:---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Course Learning Outcomes | 1 | 2 | 5 | 3 | 5 | 1,4 | 1,2 | 3 | | | |

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;

- Suggested remedies / corrective measures;

- Approved refinement decisions due for implementation;

- Actions taken based on previous course review; and

- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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**SEMESTER - IV**

**Analog Electronics Circuits**

| | L | T | P |
|---|---|---|---|
| | 3 | 0 | 0 |

| MODULE CODE | ECEN 2113 |
|---|---|
| CREDIT POINTS | 3 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 75 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

**OBJECTIVES:**

The aim of teaching this subject is to impart knowledge primarily related to application of analog electronics like diodes, transistors etc. so that learner will be able to design analog circuits in real life. Some of the objectives of the course are:

1. To acquire basic knowledge of Analog circuits.
2. To inculcate the knowledge of Analog electronic fundamentals.
3. To enable to familiar with the operational amplifiers.
4. To get familiar with the linear application of IC 741.
5. To understand the non linear applications of IC 741.
6. To gain knowledge of construction and working of filters.
7. To get exposure about working of Timers and power amplifiers.

**LEARNING OUTCOMES:**

1. Able to understand basic aspects of analog electronics used in any kind of industry.
2. Able to understand various analog applications.
3. Get familiar with working of various analog electronics components of a circuit.
4. Ability to analyze the behavior of IC 741.
5. Able to measure various input and output parameters of the circuit.
6. Able to know the design of IC 555 and its applications.
7. Acquiring skills to work on analog circuits.

**MODULE CONTENTS:**

| |
|---|
| *Unit I :Single and Multistage Amplifiers*<br>Classification of amplifiers, distortion in amplifiers, step response of an amplifier, pass-band of cascaded stages, RC-coupled amplifier, frequency response of RC coupled stage, effect of an emitter bypass capacitor, multistage CE amplifier . |
| *Unit II:  Power Amplifiers*<br>Class A, B, and C operations; Class A large signal amplifiers, higher order harmonic distortion, efficiency, transformer coupled power amplifier, class B amplifier , efficiency & distortion; class A and class B push-pull amplifiers; class C power amplifier. |
| *Unit III:* Feedback Amplifiers<br>Feedback concept, transfer gain with feedback, general characteristics of negative feedback amplifiers, input resistance, output resistance, voltage series feedback, current series feedback, current shunt feedback, voltage shunt feedback. |
| *Unit IV: OP-AMP*<br> Introduction to Op-Amp, Block diagram of  op-amp, pin diagram  of 741  IC , equivalent circuit of Op-Amp, Ideal and practical operational amplifiers, inverting and non inverting amplifiers, Differential amplifier, virtual ground, CMRR. |
| *Unit V: Linear Applications of Operational Amplifiers*<br>Scale changer, phase shifter, adder, voltage to current converter, current to voltage converter, DC voltage follower, Bridge amplifier, AC coupled amplifier,  Integrator, differentiator. |
| *Unit VI: Non-Linear  Applications of Operational Amplifiers*<br>Comparators, sample & hold circuits, Logarithmic amplifier, anti-log amplifier, Logarithmic multiplier,Miller  & Bootstrap sweep  generators, regenerative comparator (Schmitt Trigger), multivibrators, ADC. |

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOKS** | 4.  Linear  Integrated  Circuits,by  S  Salivahanan,  V  S Kanchana Bhaaskaran TMH.<br>5.  Op-Amps  and  Linear  integrated  circuits,  by  R  A Gayakwad, PHI. |
| **REFERENCEBOOKS** | 1.  Microelectronic  Circuit,by  M.Rashid  Cengage Learning Publication.<br>2.  Micro Electronic Circuits,by Sedra& Smith, Oxford University Press<br>3.  Operational Amplifiers and Linear IC"s David A Bell. |

## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|:---:|:---|:---:|:---:|
| 1. | Class Test | 4 | 5 |
| 2. | Sessional Test | 2 | 15 |
| 3. | Group Discussion | 4 | 5 |
| 4. | End Semester Exam | 1 | 75 |

## MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|:---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Class Test | x | | | x | x | x | X |
| Quiz | | x | x | | x | | |
| Assignment | | x | x | | | x | X |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | B | c | d | e | f | g | h | i | j | K |
|:---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Course Learning Outcomes | 1 | 2 | 3,4 | 3 | | 5,6 | 7 | 6 | | | |

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;

- Suggested remedies / corrective measures;

- Approved refinement decisions due for implementation;

- Actions taken based on previous course review; and

- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**Analog Electronics Circuits Lab**

| | L | T | P |
|---|---|---|---|
| | **0** | **0** | **2** |

| | |
|---|---|
| MODULE CODE | ECEN 2114 |
| CREDIT POINTS | 1 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 25 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**OBJECTIVES:**

1.  To get familiar with instrument kit of IC 741.
2.  To get the Knowledge of non linear applications of OP-AMPs.
3.  To get Familiar with different kits of waveforms generated and filters.
4.  To get familiar with different kits of Power amplifiers.

**LEARNING OUTCOMES:**

Following this course, students will be able to:

1.  Design and work on  simple circuits like amplifiers using op-amps
2.  Design waveform generating circuits
3.  Gain knowledge in designing a stable voltage regulators
4.  Design and work on power amplifiers using Op-AMP.
5.  Creates implementation skills.

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**LIST OF EXPERIMENTS**:

| | |
|---|---|
| 1. | To study the op-amp (IC 741) as inverting and non-inverting amplifier and calculate its gain. |
| 2. | Observe and plot the output Wave shape of Op-Amp R-C differentiating circuits, R-C integrating circuits for square wave input |
| 3. | To study the op-amp (IC 741) as adder , subtractor and voltage follower, calculate its output voltage.. |
| 4. | Construct biased and unbiased series and shunt clipping circuits & combinational clipper circuit for positive and negative peak clipping of a sine wave. |
| 5. | To study RC phase shift/Wien Bridge oscillator measurement of frequency and amplitude of oscillations using Op-Amp. |
| 6. | To study the waveform of square wave generator using 741 Op-Amp IC. |
| 7. | To study the waveform of Schmitt Trigger circuit & Precision Rectifier using 741 OP-AMP IC. |
| 8. | To make and test the operations of MonostableMultivibrator circuits using 555 timer. |
| 9. | To make and test the operations of Astable Multivibrator circuits using 555 timer. |
| 10. | To study the Sallen Key Voltage controlled voltage source active filters. |
| **Experiments based on advanced topics:** | |
| 11. | To develop a working model of OP-AMP 741 IC based electronic circuit. |
| 12. | To get familiar with the working and use 555 timer IC. |

## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

**Practical:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|--------------|--------------------|--------------|--------------|
| 1 | Internal Assessment | 2 | 25 |
| 2 | External Assessment | 1 | 25 |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|------------------|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 3 | 2 | | 3 | 5 | 1,4 | 1,2 | | | 3 | |

## EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;

- Suggested remedies / corrective measures;

- Approved refinement decisions due for implementation;

- Actions taken based on previous course review; and

- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**SEMESTER - IV**

**Communication System**

| | **L** | **T** | **P** |
|---|---|---|---|
| | **3** | **1** | **0** |

| MODULE CODE | ECEN 2115 |
|---|---|
| CREDIT POINTS | 3.5 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

**OBJECTIVES:**

The aim of teaching this subject is to impart knowledge primarily related to application of communication systems. Some of the objectives of the course are:

1. To acquire basic knowledge of Communication Systems.
2. To inculcate the knowledge of modulation techniques.
3. To enable to work on analog modulation methods.
4. To get familiar with the concept of digital modulation techniques.
5. To understand the concept of design tradeoffs and performance of communications systems.
6. To gain knowledge of Learn about practical communication systems
7. To acquire knowledge about how the signals get affected by different types of noises

**LEARNING OUTCOMES:**

1. Able to understand basic aspects of communication systems used in radio stations.
2. Able to understand various communication applications in day to day life.
3. Get familiar with working of various communication circuit.
4. Ability to analyze the analog and digital modulation methods.
5. Able to measure various parameters such as bandwidth, power, signal to quantization noise ratio and data rate.
6. Understanding practical implementation issues in real communication system
7. Acquiring problem solving skills of the communication systems.

**MODULE CONTENTS:**

| |
|---|
| *Unit I : Introduction to Communication Systems*<br>The essentials of a Communication system, modes and media"s of Communication, Classification of signals and systems, Analog Communication & Digital Communication. Linear & Nonlinear, need of modulation, Basic concepts of Modulation, Demodulators, Channels, Multiplexing & Demultiplexing. |
| *Unit II: Amplitude Modulation*<br>Amplitude modulation, Generation of AM waves, AM power calculations, Low level and high level modulation, Demodulation of AM waves, DSBSC, Generation of DSBSC waves, Coherent detection of DSBSC waves, single side band modulation, generation of SSB waves, demodulation of SSB waves, vestigial sideband modulation (VSB). |
| *Unit III: Angle Modulation*<br>Basic definitions: Phase modulation (PM) & frequency modulation (FM), narrow band frequency modulation, wideband frequency modulation, generation of FM waves, Demodulation of FM waves. |
| *Unit IV: Pulse Analog Modulation*<br>Sampling theory, sampling and hold circuits, Pulse amplitude modulation (PAM), pulse time modulation,pulse position modulation |
| *Unit V: Pulse Digital Modulation*<br>Elements of pulse code modulation, noise in PCM systems, differential pulse code modulation (DPCM). Delta modulation (DM) |
| *Unit VI: Digital Modulation Techniques*<br>ASK, FSK, BPSK, QPSK, S/N ratio, noise figure. |

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOKS** | 1. Communication systems (4th edn.), by Simon Haykins; John wiley & sons.<br>2. Communication systems,by Singh & Sapre,TMH. |
| **REFERENCEBOOKS** | 1. Electronic Communication systems,by Kennedy,TMH.<br>2. Communication Electronics,by Frenzel, TMH.<br>3. Communication system : Taub & Schilling,TMH |

# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|:---:|:---|:---:|:---:|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

## MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|:---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Class Test | x | | | x | | x | X |
| Quiz | x | | | | x | | |
| Assignment | | x | x | | | x | X |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | K |
|:---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Course Learning Outcomes | 1 | 2 | 3 | 3 | 7 | 6 | 4 | 5 | | | |

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;

- Suggested remedies / corrective measures;

- Approved refinement decisions due for implementation;

- Actions taken based on previous course review; and

- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**Communication System Lab**

| | L | T | P |
|---|---|---|---|
| | 0 | 0 | 2 |

| | |
|---|---|
| MODULE CODE | ECEN 2116 |
| CREDIT POINTS | 1 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 25 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**OBJECTIVES:**

1. To get familiar with various communication system instruments.
2. To understand practical aspects of modulation techniques.
3. To get familiar with major parts of Analog communication.
4. To aware students about digital modulation techniques.
5. To analyze different components of practical communication system.

**LEARNING OUTCOMES:**

1. Creates implementation skills.
2. Able to measure various instrumental noises and their solutions.
3. Able to understand various parts of any Analog communication system.
4. Able to understand various parts of any Digital communication system.
5. Get familiar with different digital modulation techniques and their working.
6. Ability to analyze and design AM and FM receiver.

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**LIST OF EXPERIMENTS**:

| | |
|---|---|
| 1. | Generation of DSB/DSB-SC AM signal using balanced modulator& determine modulation |
| 2. | Generation of SSB AM signal & detection of SSB signal using product detector |
| 3. | To study envelop detector for demodulation of AM signal and observe diagonal peak clipping effect. |
| 4. | Frequency modulation using voltage controlled oscillator. |
| 5. | To generate a FM Signal using Varactor & reactance modulation, |
| 6. | Detection of FM Signal using PLL & foster seelay method |
| 7. | To study the circuit of PAM/PWM/PPM modulator & Demodulator |
| 8. | Study of Frequency Division Multiplexing/ Demultiplexing with sinusoidal &audio inputs. |
| 9. | Generation & study of Analog TDM at least 4 channels. |
| 10. | Study pulse data coding & Decoding techniques for various formats |
| **Experiments based on advanced topics:** | |
| 11. | Study of ASK, FSK modulator and demodulator. |
| 12. | Study of PSK & QPSK modulator and   demodulator. |

## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

**Practical:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1 | Internal Assessment | 2 | 25 |
| 2 | External Assessment | 1 | 25 |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 1 | 2,3 | 2 | 4 | 5 | 3 | 1 | 2,6 | | | |

## EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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**Electronic workshop and PCB Design  Lab**         L    T    P

                                                   0    0    2

| MODULE CODE | ECEN 2117 |
|---|---|
| CREDIT POINTS | 1 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 25 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE |  |

## OBJECTIVES:

1.  To get familiar with various PCB designing instruments.
2.  To understand practical aspects of Electronic Workshop.
3.  To get familiar with circuit creation and simulation softwares like TINAPRO.
4.  To aware students about UVexposure and drilling of PCB.
5.  To analyze ETCHING of PCB.
6.  To get familiar with fabrication and placing of components.

## LEARNING OUTCOMES:

1.  Creates implementation skills.
2.  Able to measure various practical aspects of PCB designing.
3.  Able to understand various sofwares of circuit simulation.
4.  Get familiar with design methods of PCB.
5.  Ability to testing of circuit.

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**LIST OF EXPERIMENTS**:

| | |
|---|---|
| 1. | Introduction & Hands on experience to use circuit creation & simulation software like TINAPRO , PSPICE or ORCAD etc. |
| 2. | Design a full wave centre tapped rectifier & study the effect of capacitive filter & its output on a virtual oscilloscope. |
| 3. | Design a RLC resonance circuit & verify the transient & phase response for different values of R,L &C. |
| 4. | Design a circuit for a fixed power supply. |
| 5. | Design a half adder using discrete components & verify the timing diagrams. |
| 6. | Convert the power supply circuit into PCB & simulates its 2D & 3D view. |
| 7. | PCB printing using screen printing or any other technique. |
| 8. | Etching of the above PCB. |
| 9. | UV exposure & Drilling of PCB. |
| 10. | Coating of etched PCB to protect it from oxidation. |
| **Experiments based on advanced topics:** | |
| 11. | Fabrication & placing of components as per above power supply circuit. |
| 12. | Testing of above circuit. |

## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

**Practical:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1 | Internal Assessment | 2 | 25 |
| 2 | External Assessment | 1 | 25 |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 1 | 2 | 5 | 1 | 3 | 1,4 | 5 | 3 | | | |

## EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty‟s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

<u>**ELECTIVES**</u>

### SEMESTER - IV

**Nanotechnology**

| | L | T | P |
|---|---|---|---|
| | **4** | **0** | **0** |

| | |
|---|---|
| MODULE CODE | ECEN 2218 |
| CREDIT POINTS | 4 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

## OBJECTIVES:

The aim of teaching this subject is to impart knowledge primarily related to application of nanotechnology so that learner will be able to design and work on them in real life. Some of the objectives of the course are:

1. To acquire basic knowledge of Nanotechnology.
2. To inculcate the knowledge of pattern Information.
3. To get familiar with the concept of fabrication techniques.
4. To understand the concept of nanostructures.
5. To gain knowledge of different applications.

## LEARNING OUTCOMES:

1. Able to understand basic aspects of Nanotechnology used in any kind of industry.
2. Able to understand various applications of nanotechnology in electronic circuits.
3. Get familiar with working of pattern formation in nanoelectronics.
4. Able to work on nanostructures and applications.
5. Able Acquire knowledge of carbon nanotubes for dataprocessing.

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**MODULE CONTENTS:**

| |
|---|
| *UNIT – I : Introduction to Nanoelectronics* <br> Introduction to Modern Electronics, Nanoelectronics, International Technology roadmap, New Concepts in Electronics, Microelectronics and Nanoelectronics. |
| *UNIT – II: Electromagnetic waves and Quantum Mechanics* <br> Basic Concepts of Electromagnetic waves, Electromagnetic Waves and Maxwell"s Equations, Duality of Electron, Eigen value and Electron in Quantum Well, Electrons in Multiple Quantum Wells, Molecules, Energy Level Splitting, Optical Transitions and Lasers. |
| *UNIT – III : Pattern Formation in Nano electronics* <br> Pattern Formation in Nano electronics, High Resolution Lithography, NEMS: Nano-Electro-Mechanical Systems, Self-Assembly Structures: Chemically – Directed Self-Assembly, Surface-Layer Proteins in Nano lithography. |
| *UNIT – IV : Quantum Wells* <br> Traditional Low-Dimensional Systems: Quantum Wells, Cascade Lasers and Other Quantum-Well Devices, Quantum Wires, Quantum – Dot, Coulomb Effects: Single Electron Devices, Nano scale Sensors and Actuators. |
| *UNIT – V: Nanostructures and Applications* <br> Newly Emerging Nanostructures and Applications: Applications of Inorganic-Organic Hetero structures, Quantum Dots Embedded in Organic Matrix: Organic Light Emitting Diodes, Quantum Wire Interconnects: DNA Computing. |
| *UNIT – VI : Carbons Nanotubes* <br> Carbons Nanotubes for Data Processing, Molecular Electronics Materials and Biomolecules, Future Integrated Circuits: Quantum Computing using super conductors. |

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOKS** | 1. Introduction to NanoTechnology, by C. P. Poole and F. J. Owens John Wiley & Sons, 2003. <br> 2. Nanotechnology: A gentle introduction to the next big Idea by M. A. Ratner and D. Ratner; PHI, 2003. |
| **REFERENCEBOOKS** | 1. Nanotechnology: Global Strategies, Industry Trends and Applications by Jurgen Schulte ; John Wiley, 2004. <br> 2. Nanoscience and Nanotechnology by K.K Chattopadhay A.N. Banerjee ; " PHI learning Pvt limited, Delhi, 2012. |

## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

## MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Class Test | | | x | x | x |
| Quiz | x | | | | |
| Assignment | | x | x | | |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 1 | 2 | 1,5 | 3 | 4 | 3 | 4 | 5 | | | |

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## SEMESTER - IV

**Micro Electronics and Mechanical Systems (MEMS)**

|  |  |  |
|---|---|---|
| **L** | **T** | **P** |
| **4** | **0** | **0** |

| | |
|---|---|
| MODULE CODE | ECEN 2219 |
| CREDIT POINTS | 4 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

## OBJECTIVES:

The aim of teaching this subject is to impart knowledge primarily related to application of nanotechnology so that learner will be able to design and work on them in real life. Some of the objectives of the course are:

1To acquire basic knowledge of Microelectronics.
2. To inculcate the knowledge of pattern Information.
3. To get familiar with the concept of fabrication techniques.
4. To understand the concept of micro matching.
5. To gain knowledge of different applications.

## LEARNING OUTCOMES:

1. Able to understand basic aspects of Microelectronics used in any kind of industry.
2. Able to understand various applications of microelectronics.
3. Get familiar with working of pattern formation in microelectronics.
4. Able to work on polymers and optical MEMS.
5. Able Acquire knowledge of sensors.

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**MODULE CONTENTS:**

| |
|---|
| *UNIT–I:* **Historical Background**: Micro Electro Mechanical Systems.: Introduction, evolution, applications, MEMS system-level design methodology. |
| *UNIT – II:* **Physical Micro sensors**: Classification of physical sensors, Integrated, Intelligent, or Smart sensors, Sensor Principles and Examples: Thermal sensors, Electrical Sensors, Mechanical Sensors, Chemical and Biosensors, Pressure Sensor, Accelerometer. |
| *UNIT–III:* **Micro actuators**: Electromagnetic and Thermal micro-actuation, Microactuator examples, micro grippers, micro valves, micro pumps |
| *UNIT–IV:* **Microfabrication and Micromachining**: Integrated Circuit Processes ,Micromachining Introduction ,Wafer Bonding, High Aspect-Ratio Processes (LIGA). |
| *UNIT – V:* **Micropackaging:** Micro system Packaging, Interfaces in Micro system Packaging, Packaging Technologies, Three dimensional packaging, Microsystems assembly, Selection of Packaging Materials. |
| *UNIT–VI:* **Application Areas**: All-mechanical miniature devices, RF/Electronics devices, Optical/Photonic devices, Medical devices e.g. DNA-chip, micro-arrays |

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOKS** | 1. Stephen D. Senturia, "Microsystem Design" by, Kluwer Academic Publishers, 2001.<br>2. Tai-Ran Hsu, "MEMS & MICROSYSTEMS Design and Manufacture", Mc Graw Hill Pub.,2016. |
| **REFERENCEBOOKS** | 1. Fundamentals of Microfabrication by, CRC Press, 1997.Gregory Kovacs, Micromachined Transducers Sourcebook WCB McGraw-Hill, Boston, 1998.<br>2. M.-H. Bao, Micromechanical Transducers: Pressure sensors, accelrometers, and gyroscopes by Elsevier, New York, 2000. |

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 150 marks.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Class Test | | | x | x | x |
| Quiz | x | | | | |
| Assignment | | x | x | | |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 1 | 2 | 1,5 | 3 | 4 | 3 | 4 | 5 | | | |

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;

- Suggested remedies / corrective measures;

- Approved refinement decisions due for implementation;

- Actions taken based on previous course review; and

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# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## SEMESTER - IV

**Data Communication**

| | **L** | **T** | **P** |
|---|---|---|---|
| | **4** | **0** | **0** |

| | |
|---|---|
| MODULE CODE | ECEN 2220 |
| CREDIT POINTS | 4 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

**OBJECTIVES:**

The aim of teaching this subject is to impart knowledge primarily related to application of Data Communication and associated hardware so that learner will be able to implement the concepts of it in real life. Some of the objectives of the course are:

1. To acquire basic knowledge of Data Communication.
2. To inculcate the knowledge of modulation techniques.
3. To get familiar with the Data Communication hardware.
4. To understand the concept of protocols and network configuration.
5. To gain knowledge of multiplexing in the real circuits.
6. To get exposure about working of internet.

**LEARNING OUTCOMES:**

1. Able to understand various applications of Data Communication in day to day life.
2. Get familiar with working of various modulation techniques.
3. Ability to analyze the hardware in different forms.
4. Able to measure various protocols.
5. Able to know the difference between TDM and FDM.
6. Acquiring problem solving skills.

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**MODULE CONTENTS:**

| |
|---|
| *Unit I : Introduction* <br> Digital communication, Shannon limit for information capacity, digital radio, digital amplitude modulation, frequency shift keying (FSK), phase shift keying (PSK), Quadrature amplitude modulation (QAM), differential phase shift keying,(DPSK) |
| *Unit II : Data Communications* <br> Introduction, standard organization for data communication, Reference Model ISO-OSI, TCP/IP-Overview, topology, transmission mode, data communication circuits. |
| *Unit III: Data Communication Hardware* <br> Serial interfaces: RS-232, RS-449, CCITT, data modems, synchronous modems, asynchronous modems, modem synchronization. |
| *Unit IV: Data Communication Protocols & Network Configuration* <br> Introduction, data transmission mode, asynchronous protocols, synchronous protocols, public data network, integrated services digital network (ISDN), local area networks, token pass ring, Ethernet, RFID Technology. |
| *Unit V: Multiplexing* <br> Introduction, Time division multiplexing, Frequency division multiplexing |
| *Unit VI : Internet & TCP/IP* <br> Introduction, history, use of Internet, accessing the Internet, Internet addresses, security on the internet, authentication, intranet and extranet, TCP/IP reference model, domain name service, world wide web. |

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOKS** | 1. Electronic Communications Systems (4th Ed.);by Wayne Tomasi; Pearson |
| **REFERENCEBOOKS** | 2. Data Communication and Networking (2nd -edition);by Forauzan;Tata McGraw-Hill |

## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|:---:|---|:---:|:---:|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

## MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 | 6 |
|---|:---:|:---:|:---:|:---:|:---:|:---:|
| Class Test | | | | x | x | x |
| Quiz | x | x | x | | | |
| Assignment | | x | x | | | x |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Course Learning Outcomes | 1 | 2 | 5 | 3 | 3 | 4 | 6 | 5 | | | |

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;

- Suggested remedies / corrective measures;

- Approved refinement decisions due for implementation;

- Actions taken based on previous course review; and

- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## SEMESTER - IV

**Computer Networks**
<div align="right">

| L | T | P |
|---|---|---|
| **4** | **0** | **0** |

</div>

| | |
|---|---|
| MODULE CODE | ECEN 2221 |
| CREDIT POINTS | 4 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

## OBJECTIVES:

The aim of teaching this subject is to impart knowledge primarily related to application of Computer networks and associated hardware so that learner will be able to implement the concepts of it in real life. Some of the objectives of the course are:

1. To acquire basic knowledge of Computer networks.
2. To inculcate the knowledge of different network topologies..
3. To get familiar with the network architecture.
4. To understand the concept of protocols and network configuration.
5. To gain knowledge of Reference model.
6. To get exposure about working of internet.

## LEARNING OUTCOMES:

1. Able to understand various applications of Computer Networks in day to day life.
2. Get familiar with working of various layers of Reference model.
3. Ability to analyze the hardware in different forms.
4. Able to measure various protocols.
5. Able to know the difference between LAN, MAN and WAN..
6. Acquiring problem solving skills.

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**MODULE CONTENTS:**

| |
|---|
| *Unit I : Introduction:* : Introduction to Computer Networks, Example networks ARPANET, Internet, Private Networks, Network Topologies: Bus, Star, Ring, Hybrid , Tree , Complete , Irregular –Topology |
| *Unit II :* OSI Reference Model and Network Architecture: Types of Networks : Local Area Networks, Metropolitan Area Networks, Wide Area Networks; Layering architecture of networks, OSI model, Functions of each layer, Services and Protocols of each layer |
| *Unit III:* TCP/IP: Introduction, History of TCP/IP, Layers of TCP/IP, Protocols, Internet Protocol, Transmission Control Protocol , User Datagram Protocol, IP Addressing, IP address classes, Subnet Addressing, Internet Control Protocols, ARP, RARP, ICMP, Application Layer, Domain Name System, Email – SMTP, POP,IMAP; FTP, NNTP, HTTP, Overview of IP version 6. S |
| *Unit IV:* Local Area Networks: Introduction to LANs, Features of LANs, Components of LANs, Usage of LANs, LAN Standards, IEEE 802 standards, Channel Access Methods, Aloha, CSMA, CSMA/CD, Token Passing, Ethernet, Layer 2 & 3 switching, Fast Ethernet and Gigabit Ethernet, Token Ring, LAN interconnecting devices: Hubs, Switches, Bridges, Routers, Gateways |
| *Unit V:* Wide Area Networks: Introduction of WANs, Routing, Congestion Control, WAN Technologies, Distributed Queue Dual Bus (DQDB), |
| *Unit VI :* Introduction to Network Management: Remote Monitoring Techniques: Polling, Traps, Performance Management, Class of Service, Quality of Service, Security management, Firewalls, VLANs, Proxy Servers, Introduction to Network Operating Systems: Client-Server infrastructure, Windows NT/2000. |

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOKS** | 1. Computer Networks (3rd edition), Tanenbaum Andrew S., International edition, 1996. |
| **REFERENCEBOOKS** | 2. Data Communications, Computer Networks and Open Systems (4th edition), Halsall Fred, 2000, Addison Wesley, |

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 150 marks.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Class Test |  |  |  | x | x | x |
| Quiz | x | x | x |  |  |  |
| Assignment |  | x | x |  |  | x |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 1 | 2 | 5 | 3 | 3 | 4 | 6 | 5 |  | 1 | 2 |

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;

- Suggested remedies / corrective measures;

- Approved refinement decisions due for implementation;

- Actions taken based on previous course review; and

- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## SEMESTER - V

| MODULE CODE | CATEGORY | SUB-CATEGORY | MODULE | L | T | P | C | INTERNAL MARKS | EXTERNAL MARKS | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|
| ECEN3101 | E | PC | SIGNALS & SYSTEMS | 3 | 1 | 0 | 3.5 | 50 | 100 | 150 |
| ECEN3102 | E | PC | INFORMATION THEORY AND CODING | 3 | 0 | 0 | 3 | 25 | 75 | 100 |
| ECEN3103 | E | PC | CONTROL SYSTEM ENGINEERING | 3 | 1 | 0 | 3.5 | 50 | 100 | 150 |
| ECEN3104 | E | PC | CONTROL SYSTEM ENGINEERING LAB | 0 | 0 | 2 | 1 | 25 | 25 | 50 |
| ECEN3105 | E | PC | MICROPROCESSORS AND MICROCONTROLLERS | 3 | 1 | 0 | 3.5 | 50 | 100 | 150 |
| ECEN3106 | E | PC | MICROPROCESSORS AND MICROCONTROLLERS LAB | 0 | 0 | 2 | 1 | 25 | 25 | 50 |
| ECEN3107 | E | PD | INDUSTRIAL TRAINING I ( TO BE UNDERGONE   AFTER IV SEMESTER) | 0 | 0 | 0 | 1 | 50 | | 50 |
| ECEN3108 | E | PD | SPECIALIZED MINOR PROJECT (GROUP) | 0 | 0 | 4 | 2 | 50 | 50 | 100 |
| VALU0136 | P | AE | APTITUDE II | 2 | 0 | 0 | 2 | 25 | 50 | 75 |
| VALU0140 | P | SE | PROFESSIONAL COMMUNICATION-2 | 2 | 0 | 0 | 2 | 25 | 50 | 75 |
| | E | PE | ELECTIVE-V | 4 | 0 | 0 | 4 | 50 | 100 | 150 |
| | E | PE | ELECTIVE-VI | 3 | 1 | 0 | 3.5 | 50 | 100 | 150 |
| | | | TOTAL | 22 | 3 | 11 | 30 | 450 | 800 | 1250 |

**L  =  Lecture**
**T  =  Tutorial**
**P  =  Practical**
**C  =  Credit Point**

**ELECTIVES**

| MODULE CODE | ELECTIVE-V |
|---|---|
| ECEN3209 | SATELLITE COMMUNICATION |
| ECEN3210 | OPTICAL COMMUNICATION |

| MODULE CODE | ELECTIVE-VI |
|---|---|
| ECEN3211 | NEURAL NETWORKS AND FUZZY LOGIC |
| ECEN 3212 | IMAGE PROCESSING |

# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## SEMESTER - V

**Control System Engineering**

| | L | T | P |
|---|---|---|---|
| | **3** | **1** | **0** |

| | |
|---|---|
| MODULE CODE | ECEN3103 |
| CREDIT POINTS | 3.5 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

**OBJECTIVES:**

The aim of teaching this subject is to study control system applications in the real life and the learner will be able to design them for the industrial purpose. Some of the objectives of the course are:
1. To study different types of systems with illustrative examples of plants with their inputs & outputs.
2. To study servomechanism controller & its practical implementation in industries.
3. To study open loop & closed loop control system with their illustrative examples.
4. To study effect of feedback on sensitivity, stability & overall gain.
5. To study the concept of transfer function with help of block diagram algebra.
6. To study the concept of stability with the help of Routh Hurwitz criterion & root locus concept.
7. To study the necessity of compensation with the of compensation networks
8. To study different types of motors & generators like servo motor, ac & dc techno generators with their practical application

**LEARNING OUTCOMES:**

1. Our graduates will have basic knowledge of control system which will help them in any kind of the electronics industry.
2. Our graduates will be able to work with automatic servo mechanism in the industries.
3. It helps in industries where the graduates can get idea about the feedback & without feedback system.
4. Graduate will be able to design the automatic control system where they can see the effect of feedback on the system.
5. Graduates will be able to implement any control system by checking its stability.
6. It helps the graduates in designing where they can see how the compensatory networks makes the control system stable

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# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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## COURSE CONTENTS

| |
|---|
| *Unit I: Introduction to Control System :*<br>System/Plant model, types of models, illustrative examples of plants and their inputs and outputs, controller servomechanism, regulating system, linear time-invariant (LTI) system, time-varying system, causal system. |
| *Unit II: Systems:*<br>Open loop control system, closed loop control system, illustrative examples of open-loop and feedback control systems, continuous time and sampled data control systems. Effects of feedback on sensitivity (to parameter variations), stability, external disturbance (noise), overall gain etc. Introductory remarks about non-linear control systems. |
| *Unit III : Mathematical Modelling:*<br>Concept of transfer function, relationship between transfer function and impulse response, order of a system, block diagram algebra, signal flow graphs: Mason's gain formula & its application, characteristic equation, derivation of transfer functions of electrical and electromechanical systems. Transfer functions of cascaded and non-loading cascaded elements. |
| *Unit IV: Time Domain Analysis:*<br>Typical test signals, time response of first order systems to various standard inputs, time response of 2nd order system to step input, relationship between location of roots of characteristics equation, w and $w_n$, time domain specifications of a general and an under-damped 2nd order system, steady state error and error constants, dominant closed loop poles, concept of stability, pole zero configuration and stability, necessary and sufficient conditions for stability Hurwitz stability criterion Routh stability criterion and relative stability. Root locus concept, development of root loci for various systems, stability considerations. |
| *Unit V: Frequency Domain Analysis & Compensation:*<br>Relationship between frequency response and time-response for 2nd order system, polar, Nyquist, Bode plots, stability, Gain margin and Phase Margin, relative stability, frequency response specifications. |
| *Unit VI: Control Components:*<br>Necessity of compensation, compensation networks,application of lag and lead compensation, basic modes of feedback control, proportional, integral and derivative controllers, illustrative examples. AC and DC techo-generators & stepper motors. |

## RECOMMENDED BOOKS

| | |
|---|---|
| **TEXT BOOKS:** | 1. "Automatic control system", by B. C. Kuo, Prentice Hall of India, NagrathGopal<br>2. "Control Systems Engineering -Principles and Design" by NagrathGopal |
| **REFERENCE BOOKS:** | 1. "Control systems engineering" by Norman S. Nise, John Wiley & Sons (Asia) Singapore.<br>2. "Modern control engineering", by K. Ogata, Pearson 2002.<br>3. "Modern control systems", by S. P.Eugene Xavier, S. Chand & Company.<br>4. "Control Systems-Principles and Design" by M. Gopal, TMH 4th Edition |

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks.

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|:---:|:---|:---:|:---:|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

## MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 | 6 |
|:---|:---:|:---:|:---:|:---:|:---:|:---:|
| Class Test | | X | x | x | | |
| Quiz | x | | | x | | x |
| Assignment | | | | | x | x |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | E | f | g | h | i | j | k |
|:---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Course Learning Outcomes | | 5,4 | | 2,3 | | | 4 | 1,6 | | 1 | |

## EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students pnd faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,

- Actions taken based on previous subject review,

- Problems encountered in the subject delivery,

- Suggested remedies / corrective measures, and

- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholder.

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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### SEMESTER - V

**Signals and Systems**
       **L**    **T**    **P**
       **3**    **1**    **0**

| MODULE CODE | ECEN3101 |
| --- | --- |
| CREDIT POINTS | 3.5 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

**OBJECTIVES:**

The aim of teaching this subject is to study various types of signals and systems and to use them various applications using different techniques. Some of the objectives of the course are:
1. The purpose of this course is to introduce students to the fundamentals of signals and systems which are basic to Digital Signal Processing.
2. To classify various Continuous time and Discrete time Signals and Systems.
3. To study spectral analysis of Periodic and Aperiodic Signals using Fourier Transform.
4. To study the Laplace transform for the conversion from continuous domain into frequency domain.
5. To analyze and characterize the DT system through Z transform.

**LEARNING OUTCOMES:**
Following this course, students will be able to:

1. Mathematically analyze different types of signals and their associated systems.
2. Design different LTI systems for various input signals.
3. Design and calculate the magnitude and phase response of any system.
4. Design and calculate frequency response by the use of Laplace Transform.
5. Design DTLTI systems by the use of Z transforms.

**COURSE CONTENT**

| |
|---|
| *Unit I: Continuous And Discrete Time Signals:*<br>Definition of signal, Classification of Signals, Unit impulse, unit step, unit ramp , exponential, sinc function, Signum, Sinusoidal, rectangular pulse etc, Transformation in independent variable of signals: Time scaling, Time shifting, Amplitude scaling etc. |
| *Unit II: Systems:*<br>Definition, types of systems, Linear and nonlinear, static and dynamic, causal and non-causal, time variant and invariant, invertible and non-invertible, stable and non-stable. System described by differential equation and difference equation. |
| *Unit III: Fourier Transform:*<br>Properties of the Continuous time Fourier Transform. Definition, conditions of existence of FT,  magnitude and phase spectra, Parseval"s theorem, Inverse CTFT, relation between LT and FT, Discrete time Fourier transform (DTFT), inverse DTFT, convergence, properties and theorems, Comparison between continuous time FT and DTFT. |
| *Unit IV: Time and frequency damain analysis of systems:*<br>  Analysis of first order and second order systems, continuous-time (CT) system analysis using LT, system functions of CT systems, poles and zeros, illustration of the concepts of system bandwidth and rise time through the analysis of a first order CT low pass filter. |
| *Unit V: Laplace Transform:*<br>Properties of Laplace transform, concept of ROC, one side LT of some common signals, solutions of differential equations using LT, bilateral LT, inverse LT. |
| *Unit VI : Z Transform:*<br>Z Transform of some common signals, Region of convergence (ROC), Properties of Z-transform., solution of difference equations using one-sided ZT, s- to z-plane mapping. |

**RECOMMENDED BOOKS**

| | |
|---|---|
| **TEXT BOOKS:** | 1. Signal and Systems" by  I J NAGRATH, R. RANJAN &Sharan, 2009 Edn., TMH, New Delhi<br>2. „Signals &System", by V. Oppenheim, A.S. Willsky and S. Hamid NawabPEARSON Education, Second Edition, 2003.<br>3. Schaume Series on Signals & Systems by HSU & RANJAN, TMH,India<br>4. "Signals and Systems", by Simon Haykin and Barry Van VeenJohn Wiley, 1999. |
| **REFERENCE BOOKS:** | 1. "Signals and Systems Analysis using Transform Method and MATLAB", by M.J.Roberts, TMH 2003.<br>2. "Signals and Systems", by Tarunkumarrawat, Oxford University Press, Incorporated, 2010<br>3. "Signals and Systems", by A.Anandkumar,  3rd edition , PHI<br>4. "Signals and system", Ramesh Babu and R.Anandanatrajan,4th edition Sci Tech,2013 |

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 150 marks.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Class Test | | x | x | | x |
| Quiz | | | x | x | |
| Assignment | x | | | | x |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 1 | 2,5 | 3,4 | | | | 2,3 | | | | |

**EVALUATION**

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
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# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## SEMESTER – V

**Microprocessors and Microcontrollers**

| | L | T | P |
|---|---|---|---|
| | 3 | 1 | 0 |

| | |
|---|---|
| MODULE CODE | ECEN3105 |
| CREDIT POINTS | 3.5 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

## OBJECTIVES:

The aim of teaching this subject is to study the Intel Microprocessor 8085 and 8086 in detail and some interfacing devices. Some of the objectives of the course are:

1. To learn importance of microprocessors.
2. To learn and understand architecture and programming of 8085 processor.
3. To learn and understand architecture and programming of 8086 processor.
4. To learn and understand interfacing techniques like memory and I/O Interfacing with 8085.
5. To learn and understand architecture interfacing devices 8237, 8255, 8254, 8259.

## LEARNING OUTCOMES:

Following this course, students will be able to:

1. Understand different types of Micro-processors.
2. Understand the theory and basic architecture of microprocessor.
3. Program a microprocessor system using assembly language.
4. Understand and capable of interfacing the microprocessor to the I/O devices.
5. Understand simple applications on microprocessor based systems.

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## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**COURSE CONTENTS**

| |
|---|
| *Unit I :Introduction to 8085 Microprocessor:* <br> History and evolution of Microprocessors, 8085 Microprocessor: Pin description and architecture, 8085 machine cycles and bus timings, addressing modes. |
| *Unit II : 8085 Microprocessor:* <br> 8085 Interrupts: RST Instructions, vectored interrupts; classification of instructions Instruction set, Assembly language Programming. |
| *Unit III:  The 8086 Microprocessor Architecture:* <br> Architecture, block diagram of 8086,  pin diagram and description of various signals, details of sub-blocks such as EU, BIU; memory segmentation and physical address computations, program relocation, addressing modes, instruction formats. |
| *Unit IV: 8255 PPI Chip:* <br> 8255A: Programmable peripheral interface: Block diagram, pin description, BSR mode, IO mode, Interfacing keyboard and seven segment display. |
| *Unit V:  Other interfacing devices:* <br> 8254 (8253) Programmable interval Timer: Block diagram, pin description, modes; <br> 8259A Programmable interrupt controller:  Block diagram, pin description, priority modes and other features; Direct memory access, 8237 DMA controller. |
| *Unit VI: Introduction to Micro-controllers:* Micro-controller 8051 and its basic architecture, difference between types of micro-controllers, choosing a specific micro-controller, applications |

**RECOMMENDED BOOKS**

| | |
|---|---|
| **TEXT BOOKS:** | 1. Microprocessor Architecture, Programming and application with 8085 by Ramesh Gaonkar, PRI publications. <br> 2. Fundamentals of Microprocessors and microcontrollers by B. Ram, DhanpatRai Publications. |
| **REFERENCE BOOKS:** | 1. Microprocessors and Interfacing: Hall; TMH <br> 2. Microprocessors systems: the 8086/8088 family architecture, Programming and design : Yu Chang Liu & Glenn A Gibson; PHI |

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

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## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 150 marks.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

## MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Class Test |   | x |   | x | x |
| Quiz | x | x | x |   | x |
| Assignment | x |   | x | x |   |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 1 | 2 | 3 | 5 | 4 | 3 | 4 | 2 |   |   |   |

## EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
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# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## SEMESTER – V

**Information Theory & Coding**

| | L | T | P |
|---|---|---|---|
| | **3** | **0** | **0** |

| | |
|---|---|
| MODULE CODE | ECEN3102 |
| CREDIT POINTS | 3 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 75 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

**OBJECTIVES:**

The aim of teaching this subject is to study information theory and concept of probability theory along with different information coding techniques. Some of the objectives of the course are:

1. To study the probability theory and random signal theory.
2. To study the information theory and channel capacity.
3. To study the source coding theorems.
4. To learn and understand the linear block codes.
5. To learn and understand the cyclic and convolution codes.

**LEARNING OUTCOMES**:
Following this course, students will be able to:
1. Understand the concept of probability density and distribution functions.
2. Maximize the entropy and design the channel capacity.
3. Understand different source coding theorems.
4. Design and work with the linear block codes.
5. Design and work with the cyclic and convolution codes.

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**COURSE CONTENTS**

| |
|---|
| *Unit I: Review of Probability Theory:* <br><br> Random Variables, random Signal and Characteristics and Random Process. Concept of probability, probability of joint occurrence, conditional probability, discrete probability theory, continuous random variables, probability distribution function, probability density function, joint probability density functions. |
| *Unit II: Information Theory:* <br> Introduction, Uncertainty Information, and Entropy, Information Rate, Conditional and Joint Entropies. Measurement of Information, maximization of entropy, channel model (Discrete Memory less Channels, special channel), channel capacity, continuous channel & Shannon Hartley theorem. |
| *Unit III: Source Coding Theorem:* <br> Shannon,s theorem, Source coding, channel coding and channel capacity theorem. <br> Coding theory:Shannon Coding, Huffman Coding (minimum redundancy coding), run length encoding, Mutual Information, Channel Capacity for Binary erase channel, binary symmetry channel & special type channel |
| *Unit IV: Linear Block codes :* <br> Generation Matrix, Parity check matrixf,error Syndrome Decoding, error detection, minimum distance, Hamming Codes |
| *Unit V : Cyclic Codes :* <br> Generation, syndrome computation and error detection, cyclic Hamming code , cyclic redundancy check , Maximal Length Codes, CRC Codes. |
| *Unit VI : Convolutional Codes:* <br> Code Tree, Trellis and State Diagram, encoding & Decoding of Convolutional Codes: Maximum Likelihood decoding, Viterbi's algorithm, free distance of a convolutional code. |

**RECOMMENDED BOOKS**

| | |
|---|---|
| **TEXT BOOKS:** | 1. "Information Theory, Coding and Cryptography" by ArijitSaha, Nilotpal Manna, SurajitMandal, Pearson Education, 2013. <br> 2. "Communication Systems" by Simon Haykins, 4th edition Wiley, 2001. <br> 3. "Communication Systems" by Singh and Sapre ; TMH. |
| **REFERENCE BOOKS:** | 1. "Elements of Information Theory", by T M Gover, J M Thomos, Wiley, 1999. <br> 2. "Analog and Digital Communications", by Schaum'sOutlines, Second Edition. <br> 3. "Digital Communication", by Amitabha Bhattacharya, TMH 2006. <br> 4. "Introduction to Coding Theory", by J. H. Van Lint, Springer -Verlag. |

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed.

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 100 marks.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 4 | 5 |
| 2. | Sessional Test | 2 | 15 |
| 3. | Group Discussion | 4 | 5 |
| 4. | End Semester Exam | 1 | 75 |

## MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Class Test | x | | x | x | x |
| Quiz | x | x | | | x |
| Assignment | | x | | x | |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | f | g | H | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 1,2 | 2,3 | | 4,5 | 1 | | | | | | |

## EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
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- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
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# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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### SEMESTER - V

**PROFESSIONAL COMMUNICATION – II**  **L  T  P**
                                        **2  0  0**

| | |
|---|---|
| MODULE CODE | VALU0140 |
| CREDIT POINTS | 2 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 50 |
| END SEMESTER EXAM DURATION | 2 hrs |
| LAST REVISION DATE | |

## MODULE CONTENTS

| |
|---|
| *UNIT I:- INTRODUCTION TO PHONETICS AND VOICE & ACCENT–* <ul><li>Definition - Voice & Accent</li><li>Basics of Phonetics and Linguistics</li><li>Exposure to Syllables and Diphthongs</li><li>Naturalization of Speech</li><li>MTI/ RTI</li></ul> |
| *UNIT II –* Business Correspondence: Principles; Features; Sales and Credit Letters: Letters of Enquiry, Quotation, Order, Claim, Complaint and Adjustment letters, Bio-Data Making, Resumes/Job Application Processing. |
| *UNIT III: PRESENTATIONS AND INTERVIEWS SKILLS–* <ul><li>Group Interviews, Personal Interviews, Presentational skills, Mock Interviews</li></ul> |

# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## SEMESTER - V

**SATELLITE COMMUNICATION**

| | L | T | P |
|---|---|---|---|
| | **4** | **0** | **0** |

| | |
|---|---|
| MODULE CODE | ECEN3209 |
| CREDIT POINTS | 4 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

**OBJECTIVES:**

The aim of teaching this subject is to study different terminology and techniques related to satellite communication. Some of the objectives of the course are:
1. To make the students understand the basic concept in the field of Satellite Communication and to know how to place a satellite in an orbit.
2. To calculate the link power budget.
3. To get a complete knowledge about the earth and space subsystems
4. To gain knowledge about the Satellite Access schemes
5. To gain knowledge about the Satellite system and mobile services provided

**LEARNING OUTCOMES:**
Following this course, students will be able to:

1. Explain the principles, concepts and operation of satellite communication systems
2. Describe the concepts of signal propagation affects, link design, rain fading and link availability and perform interference calculations
3. Understand modulation techniques and error correction codes for satellite communication
4. Use software tools to simulate and analyze the performance of satellite communication systems, and use real satellite up/down links (subject to the availability of satellite links) to conduct link experiments
5. Critically analyze the design requirements and the performance of satellite communication systems

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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**COURSE CONTENTS**

| |
|---|
| *Unit I: Introduction:* <br> Evolution & growth of Satellite communication, Brief history, Kepler's laws, Orbits of satellite: Low, Medium and Geo-synchronous main characteristics, Orbital parameters, Look angles, Propagation delay, Earth coverage and slant range, Limits of visibility, Eclipse effects and Orbital perturbations. |
| *Unit II: Satellite Link Design:* <br> General link design equations, Atmospheric & Ionosphere effects on link design, Complete link design, Earth station parameters. Applications of satellite communication, Advantages of satellite communication, Active & Passive satellite. |
| *Unit III: Space Link Design:* <br> Introduction, Baseband analog(Voice) signal, Free space loss, General link design equation, System noise temperature, G/T Ratio & Complete link design.Satellite Subsystems: Transponder, Earth stations, Attitude and Orbit Control System (AOCS), Propulsion sub-system & Telemetry, Tracking and Command (TTC) sub-system. |
| *Unit-IV : Radio Wave Propagation* <br> Frequency window, Ionosphere scintillation and Faraday rotation, TDMA compared to FDMA, TDMA Burst Time Plan, Multiple Beam (Satellite switched) TDMA satellite system, Beam Hopping(Transponder Hopping). |
| *Unit V:Digital Carrier Systems:* <br> ASK, FSK, PSK, and QPSK, Coherent and non-coherent detection, Error rate performance, station keeping, Satellite stabilization. |
| *Unit VI:Satellite Access:* <br> Multiple Access Techniques, Random Access Techniques, FDMA, SPADE system, TDMA system concept and configuration, System-timing frames format, CDMA basic principles, VSAT satellite systems and Global Positioning Satellite Systems, LEOs (Lower earth orbit satellite), Satellite communication with respect to Fiber Optic Communication. |

**RECOMMENDED BOOKS**

| | |
|---|---|
| **TEXT BOOKS:** | 1. "Satellite Communication", by Dennis Roddy, Fourth Ed., TMH New Delhi, 2009. <br> 2. "Satellite Communications", by Timothy Pratt, Second Edition, Wiley India, 2004. |
| **REFERENCE BOOKS:** | 1. "Satellite Communications", by D.C. Aggarwal, Sixth Ed., Khanna Pub., 2006. <br> 2. "Digital Satellite Communications", by Tri T. Ha, McGraw-Hill Pub., 1998. |

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 150 marks.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|:---:|:---|:---:|:---:|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 |
|:---|:---:|:---:|:---:|:---:|:---:|
| Class Test | | x | x | | x |
| Quiz | X | | x | x | x |
| Assignment | X | x | | x | |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | c | D | e | f | g | h | i | j | k |
|:---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Course Learning Outcomes | | 1,2 | 3,4 | 2 | 4 | | | 4,5 | | | |

**EVALUATION**

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures,

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## SEMESTER - V

**Optical Communication**                                    L       T       P
                                                             4       0       0

| MODULE CODE | ECEN3210 |
|---|---|
| CREDIT POINTS | 4 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

**OBJECTIVES:**

The aim of teaching this subject is to study the transmitters, receivers and sources for optical communication in detail. Some of the objectives of the course are:
1. To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
2. To understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors. Design optimization of SM fibers, RI profile and cut-off wave length.
3. To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes and different fiber amplifiers.
4. To learn the fiber optical receivers such as PIN APD diodes, noise performance in photo detector, receiver operation and configuration.
5. To learn fiber slicing and connectors, noise effects on system performance, operational principles WDM and solutions.

**LEARNING OUTCOMES**:
Following this course, students will be able to:


1. Explain the principles of operation of various optical fiber communication systems.
2. Analyze the performance of various digital and analog optical fiber systems.
3. Calculate various key parameters of optical fiber systems. These include the system optical power budget and system rise-time budget, receiver noise power, Q factor, bit error rate and maximum usable bit rate of a digital optical fiber system.
4. Analyze the various optical source and optical receiver"s characteristics.
5. Explain/compare the factors affecting the performance of different optical fiber communication systems

**COURSE CONTENTS**

| |
|---|
| *Unit I :Introduction:* <br> Need of Fiber Optic Communications, Evolution of Light wave Systems, Basic Concepts; Analog & Digital Signals, Channel Multiplexing, Optical Communication Systems, Optical Fibers as a Communication Channel, Optical Transmitters, Optical Receivers. |
| *Unit II: Optical Fibers*: <br> Step-Index Fibers, Graded Index Fibers, Fiber Modes, Single-Mode-Fibers, Dispersion: Dispersion in Single-Mode Fibers, Limitations on the Bit Rate, Fiber Bandwidth , Fiber Losses; Attenuation Coefficient, Material Absorption, Rayleigh Scattering, Stimulated Light Scattering, Cables and Connectors. |
| *Unit III : Optical Transmitters:* <br> Basic Concepts: Semi-conductor Materials, Light Emitting Diodes; LED spectrum, LED Structures: Surface Emitting LED, Semi-Conductor Lasers; DFB Lasers, Tunable Semiconductor Lasers, Laser Characteristics, Small & Large Signal Modulation, Spectral Line width, Source Fiber Coupling. |
| *Unit IV: Optical Receivers:* <br> Basic concepts, p-n Photo Diodes, p-i-n Photo Diodes, Avalanche Photo Diode, Photo detector, Receiver Design, Receiver Noise, Receiver sensitivity; Bit error rate, Sensitivity Degradation, Receiver Performance. |
| *Unit V: Light Wave System:* <br> System Architecture, Dispersion limited Light wave systems, Power Budget, Long Haul systems, Dispersive Pulse Broadening, Noise, Frequency Chirping and Reflection Feedback Noise. |
| *Unit VI :Multi channel Systems:* <br> WDM Light wave systems, Optical TDM Systems, Subscriber Multiplexing, DWDM system. |

**RECOMMENDED BOOKS**

| | |
|---|---|
| **TEXT BOOKS:** | 1. "Optical Fiber CommunicationsPrinciples & Practice", by Senior J., PHI. <br> 2. "Optical Fiber Communication" by Keiser G., Mcgraw-hill. |
| **REFERENCE BOOKS:** | 1. "Fiber Optics Communication Systems"by Govind P. Agrawal, John Wiley & Sons (Asia) Pvt. Ltd. <br> 2. "Fiber-Optics Communications Technology"by Djafar K. Mynbeav, Pearson. |

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**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 150 marks.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|:---:|---|:---:|:---:|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 |
|---|:---:|:---:|:---:|:---:|:---:|
| Class Test | x | | x | | |
| Quiz | x | x | | x | x |
| Assignment | | x | x | x | |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Course Learning Outcomes | 2 | 3 | 5 | 1,4 | | 3 | | 5 | | | |

**EVALUATION**

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,

- Actions taken based on previous subject review,

- Problems encountered in the subject delivery,

- Suggested remedies / corrective measures, and

- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

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**SEMESTER - V**

**NEURAL NETWORKS AND FUZZY LOGIC**

| | L | T | P |
|---|---|---|---|
| | **4** | **0** | **0** |

| | |
|---|---|
| MODULE CODE | ECEN3211 |
| CREDIT POINTS | 4 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

**OBJECTIVES:**

The aim of teaching this subject is to study neural networks and fuzzy logics. Some of the objectives of the course are:
1. To cater the knowledge of Neural Networks and Fuzzy Logic Control and use these for controlling real time systems.
2. To Expose the students to the concepts of feed forward neural networks
3. To provide adequate knowledge about feedback networks.
4. To teach about the concept of fuzziness involved in various systems. To provide adequate knowledge about fuzzy set theory.
5. To provide comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic and  to design the fuzzy control using genetic algorithm.

## LEARNING OUTCOMES:

Following this course, students will be able to:

1. Work with the neural networks and FLC in real time.
2. Use different learning strategies in neural applications
3. Understand the concept of fuzziness involved in various systems.
4. Understand the fuzzy logic control and adaptive fuzzy logic.
5. Design the fuzzy control using genetic algorithm

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**COURSE CONTENTS**

| |
|---|
| *Unit I :Architectures:*<br>Introduction –Biological neuron-Artificial neuron-Neuron modeling-Learning rules-Single layer-Multi layer feed forward network-Back propagation-Learning factors. |
| *Unit II :Neural Networks For Control:*<br>Feedback networks-Discrete time hop field networks-Schemes of neuro–control, identification and control of dynamical systems-case studies (Inverted Pendulum, Articulation Control). |
| *UNIT III :Essentials of Artificial Neural Networks:*<br>Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application. |
| *Unit IV:Fuzzy Systems:*<br>Classical sets-Fuzzy sets-Fuzzy relations-Fuzzification – Defuzzification- Fuzzy rules. |
| *Unit V : Fuzzy Logic Control:*<br>Membership function – Knowledge base-Decision –making logic – Optimizations of membership function using neural networks-Adaptive fuzzy systems-Introduction to generate to genetic algorithm. |
| *Unit VI: Application of FLC:*<br>Fuzzy logic control-Inverted pendulum-Image processing-Home Heating system-Blood pressure during anesthesia-Introduction to neuro fuzzy controller. |

**RECOMMENDED BOOKS**

| | |
|---|---|
| **TEXT BOOKS:** | 1. "*Neural Networks and Fuzzy Systems: A Dynamical Approach to Machine Intelligence*", by Kosko, B,PrenticeHall, NewDelhi, 2004.<br>2. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHI Publication.<br>3."*Fuzzy Logic with Engineering Applications*",by Timothy J Ross, John Willey and Sons, West Sussex, England, 2005. |
| **REFERENCE BOOKS:** | 1. "*Introduction to Artificial Neural Systems*", by Jack M. Zurada, PWS Publishing Co., Boston, 2002.<br>2. "*Fuzzy sets, Uncertainty and Information*", by Klir G.J. &Folger T.A., Prentice –Hall of India Pvt. Ltd., New Delhi, 2008.<br>3. "*Fuzzy set theory and its Applications*", by Zimmerman H.J, Kluwer Academic Publishers Dordrecht, 2001.<br>4. "*Introduction to fuzzy control*", by Driankov,Hellendroonb, Narosa Publishers,2001.<br>5. "*Fundamentals of Neural Networks*", by LauranceFausett, Englewood cliffs, N.J, PearsonEducation, New Delhi, 2008. |

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

## MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Class Test | x | | x | X | |
| Quiz | | x | | | x |
| Assignment | | x | x | X | x |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 1,2 | 2,3 | | 4 | 3 | | 2 | 5 | 4 | 5 | |

## EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
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## SEMESTER - V

**Image Processing**

| L | T | P |
|---|---|---|
| 4 | 0 | 0 |

| | |
|---|---|
| MODULE CODE | ECEN3212 |
| CREDIT POINTS | 4 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

**OBJECTIVES:**

The aim of teaching this subject is to study concept and processing techniques of image processings. Some of the objectives of the course are:

1. To study the concept of digital image processing.
2. To learn the algorithms and techniques involved in Digital Image Processing using different computational tools
3. To study signals, signal processing, digital imagery and digital image processing.
4. To study image enhancement and restoration.
5. To study different coding techniques for image compression.

## LEARNING OUTCOMES:

Following this course, students will be able to:

1. Use image processing in various applications.
2. Use different computational tools, algorithms and techniques involved in Digital Image Processing
3. Perform image transformation and operations.
4. Perform image enhancement and restoration.
5. Implement different coding techniques for image compression.

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**COURSE CONTENTS**

| |
|---|
| *Unit- I Introduction:* <br> Digital image and types, What is digital image processing? Origins of digital image processing,Elements of an image processing system: „CCD and CMOS sensors and image scanners. |
| *Unit II: Storage systems & display:* <br> Image resolution, Image file formats, Components of a DIP system, Elements of visual perception:„Structure of human eye, Image formation, Brightness adaptation and discrimination", A simple imageformation model. |
| *Unit III: Image Transforms and Operations:* <br> Basic concept of sampling and quantization, Toeplitz&circulant matrices, Orthogonal & unitarymatrices, 2-D Z-transform of sequences and its properties. |
| *Unit IV: Circular Convolution :* <br> 2-D linear & circular convolution by matrix method, 2-D linear & circular correlation by matrix method,2-D DFT and its properties, Hadamard transform, Slant transform, Discrete Cosine Transform. |
| *Unit V: Image Enhancement and Restoration:* <br> Gray level transformation functions, Histogram equalization, Spatial filtering of image, its smoothingand sharpening (using 1st and 2nd derivative), LPF & HPF : „Ideal, Butterworth & Gaussian",Degradation/ Restoration model, Inverse filtering, Wiener filtering. |
| *Unit VI:  Image Compression:* <br> Fundamentals, Redundancy and its types, Basic compression model, Compression standards, Huffman coding, Run-length coding, Shannon-Fano coding, Arithmetic coding, LZW coding, Predictive coding,Block truncation coding. |

**RECOMMENDED BOOKS**

| | |
|---|---|
| **TEXT BOOKS:** | 1. "Digital Image Processing", Rafael C. Gonzalez, Richard E. Woods, etal, TMH , 2nd Edition 2010 |
| **REFERENCE BOOKS:** | 1. "Digital Image Processing", by Rafael C. Gonzalez& Richard E. WoodsPearson Education, 2002. <br> 2. "Fundamentals of Digital Image Processing", by Anil K. Jain, PHI, 2003. <br> 3. "Digital Image Processing", S. Jayaraman, S. Esakkirajan & T. Veerakumar, McGraw Hill, 2009. |

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 150 marks.

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## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|:---:|:---|:---:|:---:|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

## MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 |
|:---|:---:|:---:|:---:|:---:|:---:|
| Class Test | | x | x | x | x |
| Quiz | | x | | x | |
| Assignment | x | | x | x | x |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|:---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Course Learning Outcomes | 1 | 1,2 | | 3,4 | 4,5 | | 2 | 1,2 | | | |

## EVALUATION

At the end of semester, Subject teacher will submit an evaluation report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the subject with respect to its strengths as well as those areas which could be improved. The review report contains the following:

- Approved refinement decisions due for implementation,
- Actions taken based on previous subject review,
- Problems encountered in the subject delivery,
- Suggested remedies / corrective measures, and
- Report discussed and analysed, actions taken as a result of this process and are communicated to the main stakeholders.

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### SEMESTER - V

**Control System Engineering Lab**

|  | L | T | P |
|---|---|---|---|
|  | 0 | 0 | 2 |

| MODULE CODE | ECEN3104 |
|---|---|
| CREDIT POINTS | 1 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 25 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE |  |

**Objectives:**
1. To study servomechanism controller & its practical implementation.
2. To study effect of feedback on sensitivity, stability & overall gain.
3. To study a stepper motor & to execute microprocessor or computer-based control of the same by changing number of steps, direction of rotation & speed.
4. To study the necessity of compensation with the of compensation networks
5. To study different types of motors & generators like servo motor, ac & dc techno generators with their practical application.

**Learning Outcomes:**

Following this course:

1. Our graduates will have basic knowledge of control system which will help them in any kind of the electronics industry.
2. Our graduates will be able to work with automatic servo mechanism in the industries.
3. It helps in industries where the graduates can get idea about the feedback & without feedback system.
4. Graduate will be able to design the automatic control system using MATLAB.
5. Graduates will be able to implement any control system using PLC.

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**LIST OF EXPERIMENTS**

| |
|---|
| 1. To study speed Torque characteristics of a) A.C. servo motor b) DC servo motor. |
| 2. (a) To demonstrate simple motor driven closed loop DC position control system.<br>   (b) To study and demonstrate simple closed loop speed control system. |
| 3. To study the lead, lag, lead-lag compensators and to draw their magnitude and phase plots. |
| 4. To study a stepper motor & to execute microprocessor or computer-based control of the same by changing number of steps, direction of rotation & speed. |
| 5. To implement a PID controller for temperature control of a pilot plant. |
| 6. To study behavior of 1 order, 2 order type 0, type 1 system. |
| 7. To study control action of light control device. |
| 8.Introduction to MATLAB (Control System Toolbox), Implement at least any three<br>   a) Different Toolboxes in MATLAB, Introduction to Control Systems Toolbox.<br>   b) Plot unit step response of given transfer function and find peak overshoot, peak time.<br>   c) Plot unit step response and to find rise time and delay time.<br>   d) Plot locus of given transfer function, locate closed loop poles for different values of k.<br>   e) Plot root locus of given transfer function and to find out S, Wd, Wn at given root & to discuss stability.<br>   f) Plot the Nyquist plot for given transfer function and to discuss closed loop stability, gain and phase margin. |
| Experiments from advance topics<br>9.  To study water level control using an industrial PLC. |
| 10. To study motion control of a conveyor belt using an industrial PLC. |

## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

**Practical:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1 | Internal Assessment | 2 | 25 |
| 2 | External Assessment | 1 | 25 |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | | 2,3 | | 3 | | | 4,5 | | | 1 | |

## EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

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**SEMESTER - V**

**Microprocessor & Microcontroller  Lab**

| | L | T | P |
| --- | --- | --- | --- |
| | 0 | 0 | 2 |

| | |
| --- | --- |
| MODULE CODE | ECEN3106 |
| CREDIT POINTS | 1 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 25 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

## OBJECTIVES:
1. To learn and understand architecture and programming of 8085 microprocessor kit.
2. To learn and understand architecture and programming of 8086 processor kit.
3. To learn and understand interfacing techniques like memory and I/O Interfacing with 8086.
4. To learn and understand DMA controller, PPI Chip, Interrupt Controller, Timers.
5. To learn and understand generation of time delay, serial communication and interrupts.

## LEARNING OUTCOMES:
Following this course, students will be able to:

1. Perform different operations with 8085 microprocessor.
2. Perform different operations with 8086 microprocessor.
3. Perform different operations with 8085 and other interfacing devices.
4. Understand and capable of interfacing the microprocessor to the I/O devices.
5. Develop simple applications on microprocessor based systems

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**LIST OF EXPERIMENTS**

| |
|---|
| **Part-A: List of Experiments using 8085:**<br>1. Study of 8085 Microprocessor Kits. |
| 2. Write a program to add two 8-bit number using 8085; result 8 bit. |
| 3. Write a program to add two 8-bit number using 8085; result 16 bit |
| 4. Write a program to subtract two 8-bit number using 8085. |
| 5. Write a program to subtract two 16-bit number using 8085. |
| 6. Write a program for the multiplication of two 8 bit numbers. |
| **Part-B: List of Experiments using 8086:**<br>7. Study of 8086 Microprocessor Kits. |
| 8. Write a program to find largest number in a data array. |
| 9. Write a program to find smallest number in a data array. |
| 10. Write a program to find sum of a series of 16 bit numbers; sum 16 bit. |
| 11. Write a program to find sum of a series of 16 bit numbers; sum 32 bit. |
| **Experiments to be done from advanced topics:** |
| 12. Write a program to divide a string of unpacked ASCII digits. |
| 13. Write a program to sort a string of a no. of bytes in descending order. |

## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

**Practical:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1 | Internal Assessment | 2 | 25 |
| 2 | External Assessment | 1 | 25 |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | c | d | E | f | g | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | | 1,2 | 3,4 | | | | | 4 | 5 | 5 | |

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

### SEMESTER-VI

| MODULE CODE | CATEGORY | SUB-CATEGORY | MODULE | L | T | P | C | INTERNAL MARKS | EXTERNAL MARKS | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|
| ECEN3113 | E | PC | MICROWAVE AND RADAR ENGINEERING | 3 | 0 | 0 | 3 | 25 | 75 | 100 |
| ECEN3114 | E | PC | MICROWAVE AND RADAR ENGINEERING LAB | 0 | 0 | 2 | 1 | 25 | 25 | 50 |
| ECEN3115 | E | PC | ANTENNA AND WAVE PROPAGATION | 3 | 0 | 0 | 3 | 25 | 75 | 100 |
| ECEN3116 | E | PC | ANTENNA AND WAVE PROPAGATION LAB | 0 | 0 | 2 | 1 | 25 | 25 | 50 |
| ECEN3117 | E | PC | DIGITAL SIGNAL PROCESSING | 3 | 0 | 0 | 3 | 25 | 75 | 100 |
| ECEN3118 | E | PC | DIGITAL SIGNAL PROCESSING LAB | 0 | 0 | 2 | 1 | 25 | 25 | 50 |
| ECEN3119 | E | PD | SPECIALIZED MINOR PROJECT (INDIVIDUAL) | 0 | 0 | 8 | 4 | 100 | 100 | 200 |
| | P | CI | $CREATIVITY AND INNOVATION/ACADEMIC WRITING | 0 | 0 | 0 | 1 | 25 | 25 | 50 |
| | E | PE | ELECTIVE-VII | 4 | 0 | 0 | 4 | 50 | 100 | 150 |
| | E | GE | ELECTIVE-A** | 4 | 0 | 0 | 4 | 50 | 100 | 150 |
| | | | TOTAL | 17 | 0 | 14 | 25 | 375 | 625 | 1000 |

L = Lecture

T = Tutorial

P = Practical

C = Credit Point

### ELECTIVES

| MODULE CODE | ELECTIVE-VII |
|---|---|
| ECEN3221 | DIGITAL LOGIC DESIGN |
| ECEN3222 | MOBILE COMPUTING |

| MODULE CODE | **GENERIC ELECTIVE - A |
|---|---|
| SAPM0321 | SAP (MM)ψ |
| SAPS0322 | SAP (SD)ψ |
| SAPH0323 | SAP (HCM)ψ |
| | ONE / TWO MOOCS MODULE |

### $MODULE

| MODULE CODE | MODULE NAME |
|---|---|
| ECEN3120 | CREATIVITY AND INNOVATION |
| ENGL0110 | ACADEMIC WRITING |

ψ Additional fee, if any, shall be borne by the student.

# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## SEMESTER - VI

**Microwave and Radar Engineering**

| | L | T | P |
|---|---|---|---|
| | 3 | 0 | 0 |

| | |
|---|---|
| MODULE CODE | ECEN3113 |
| CREDIT POINTS | 3 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** In total, EIGHT questions will be set. Question ONE will be compulsory and cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

**OBJECTIVES:**

The aim of teaching this subject is to impart knowledge primarily related to microwave and radar engineering. Microwave Engineering pertains to the study and design of microwave circuits, components and system. Radar Engineering uses radio waves to determine range, angle and velocity of objects. Some of the objectives of the course are:

9. To understand the theoretical principles underlying microwave devices.
10. To design microwave components such as power dividers, hybrid junctions, microwave filters, ferrite devices, and single-stage microwave transistor amplifiers.
11. To understand and quantify the effects of noise in microwave systems.
12. To quantify the signal and noise characteristics of microwave systems such as communication networks, radars, and radiometers, and relate this to the design process
13. Apply the microwave devices and RADAR for industrial and scientific purposes.

**LEARNING OUTCOMES:**

12.     Our graduates will have basic knowledge of microwave and radar system which will   help them in any kind of the electronics industry.
13.     Our graduates will be able to design various passive circuits which will help them in solving real life problems.
14.     Our graduates will be able to explain rectangular and circular waveguides and they can establish wave equation solutions using distributed circuit theory concept.
15.     Our graduates can explain various microwave junctions and passive devices.
16.     Assess the performance of different kind of RADARs in the real world.

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## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**MODULE CONTENTS:**

| |
|---|
| *Unit I: Microwave Waveguides* <br> Microwave frequencies, Introduction comparison with Transmission lines, TE modes in Rectangular Waveguides, TM modes in Rectangular Waveguides, Characteristic impedance. |
| *Unit II: Circular Waveguides* <br> TE and TM modes in Circular Waveguides. Power losses in Circular Waveguides, Excitation of modes in Circular Waveguides. |
| *Unit III: Microwave Components & Tubes* <br> Microwave cavities :Rectangular and Circular Cavity Resonators, Q factor of a Cavity Resonators, Microwave Hybrid Circuits: Waveguide Tees and Scattering Matrices, Magic Tee and Hybrid Rings (Rat-race circuits) and their Scattering matrices. Directional couplers. Two-hole Directional Couplers, S-matrix of a Directional Coupler.  Circulators and Isolators. |
| *Unit IV:Microwave Tubes* <br> Construction, Operation and Properties of Klystron amplifier, Reflex Klystron, magnetron, TWT. |
| *Unit V: Microwave Solid State Devices & Measurement* <br> Varactor diode, Tunnel diode, Schottky diode, GUNN diode and  PIN diodes. parametric amplifiers . |
| *Unit VI: Radar* <br> Block Diagram and operation, Radar Frequencies, Simple form of Radar Equation, Prediction of Range Performance, Pulse Repetition frequency and Range Ambiguities,Tracking with Radar, Moving Target Detector; Pulse Doppler Radar. Applications of Radar, Radar Antenna. |

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOKS** | 1. Microwave Devices and Circuits by Samuel Y. Liao, 3rd Edition, Prentice-Hall of India, New Delhi, 2006. <br> 2. Microwave devices & Radar Engg by M .Kulkarni;Umesh |
| **REFERENCEBOOKS** | 1. Foundations of Microwave Engineering by R.E. Collin, McGraw Hill <br> 2. Microwave Engineering and Applications by Om. P. Gandhi |

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 150 marks.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|:---:|:---|:---:|:---:|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 |
|:---|:---:|:---:|:---:|:---:|:---:|
| Class Test | | x | x | x | |
| Quiz | X | | | | x |
| Assignment | | | x | x | |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|:---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Course Learning Outcomes | 1,3 | 2,5 | 2 | 1,5 | 2,4 | 5 | | 1,5 | | | 5 |

# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;

- Suggested remedies / corrective measures;

- Approved refinement decisions due for implementation;

- Actions taken based on previous course review; and

- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

**Digital Signal Processing**

|       | L | T | P |
|-------|---|---|---|
|       | 3 | 0 | 0 |

| MODULE CODE | ECEN3117 |
|-------------|----------|
| CREDIT POINTS | 3 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** In total, EIGHT questions will be set. Question ONE will be compulsory and cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

**OBJECTIVES:**

The aim of teaching this subject is to impart knowledge primarily related to digital processing to perform a wide variety of signal processing operations. Some of the objectives of the course are:

1. To get knowledge for converting the time domain signal into frequency domain or vice versa.
2. To inculcate the role of filters in signal processing & its designing.
3. To learn & design finite impulse response (FIR) & infinite impulse response ( IIR) system.
4. To understand the concept of sampling theorem & its role in converting continuous time signal into discrete time signal with help of nyquist rate.
5. To learn the multirate digital signal processing & its applications in different systems.

**LEARNING OUTCOMES:**

1. Our graduates will be able to design the DSP systems & to distinguish between continuous time signal & discrete time signals.
2. Our graduates will be able to find the spectral analysis of any signal.
3. Graduates will be able to convert continuous time signals into discrete time signal can design any system where it is needed.
4. Graduate will able to design FIR & IIR filters in industries.
5. Graduates will be able to work in R & D departments where they can easily eliminate the noise with help of using filters.

**MODULE CONTENTS**

| |
|---|
| *Unit I: Introduction:* |
| Limitations of analog signal processing, Advantages of digital signal processing and its applications; Some elementary discrete time sequences and systems; Basic elements of digital signal processing, discrete time systems ,Concepts of stability, causality, linearity, difference equations, energy and power theorems. The Discrete Fourier Transform, Properties of the DFT. |
| *Unit II: Sampling of Signals* |
| Sampling theorem, application, frequency domain representation of sampling, reconstruction of band limited signal from its samples, discrete time processing of continuous time signals. |
| *Unit III: Z-Transforms* |
| Introduction, relationship between Z-transform and DTFT, properties of the region of convergence, properties of the Z-transform, inversion of the Z-transform, applications of Z-transform. |
| *Unit IV: Design of Digital Filters* |
| Fundamentals of digital filtering, various types of digital filters, Analog and digital transformation in the frequency domain, design techniques of digital filters,, window technique for FIR, bi-linear transformation and backward difference method, impulse invariant methods for IIR filter design. |
| *Unit V: Quantization Errors in Digital Signal Processing* |
| Analysis of finite word length effects in DSP, Effect of round off noise in digital filters, Limit cycles. |
| *Unit VI: Multirate Digital Signal Processing* |
| Introduction to multirate digital signal processing, sampling rate conversion, filter structures, multistage decimator and interpolators. |

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOKS** | 1. Oppenheim & Schafer, Digital Signal Processing, PHI-latest edition.<br>2. Proakis and Manolakis, Digital Signal Processing, PHI Publication. |
| **REFERENCEBOOKS** | 1. Digital Signal Processing by S. K. Mitra TMH edition.<br>2. Introduction to Digital Signal Processing by Johny. R. Johnson, PHI-latest edition.<br>3. Digital Signal Processing by R.Babu, Scitech Publication. |

# PDM UNIVERSITY
## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed.Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 150 marks.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Class Test | | x | x | | |
| Quiz | | | | | x |
| Assignment | X | | x | x | |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 4 | 4,5 | 2 | 4,5 | 4 | 5 | 4,5 | 5 | | | |

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;

- Suggested remedies / corrective measures;

- Approved refinement decisions due for implementation;

- Actions taken based on previous course review; and

- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

# PDM UNIVERSITY
# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**Antenna & Wave Propagation**

|  | **L** | **T** | **P** |
|---|---|---|---|
|  | **3** | **0** | **0** |

| MODULE CODE | ECEN3115 |
|---|---|
| CREDIT POINTS | 3 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE |  |

**INSTRUCTIONS:** In total, EIGHT questions will be set. Question ONE will be compulsory and cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

## OBJECTIVES:

The aim of teaching this subject is to impart knowledge primarily related to antennas which converts electric power into radio waves and vice versa. Some of the objectives of the course are:

1. To introduce the student to the theory and concepts of antenna, electromagnetic waves, transmission lines, and antennas, and their practical applications.
2. To study transmission lines, and impedance matching.
3. To introduce the working principles of various types of antenna.
4. To explain the characteristics of radio wave propagation.
5. The learners will be groomed up to understand different channel allocations, difference between various systems present in this world, their transmission and reception techniques.

## LEARNING OUTCOMES:

1. Able to identify the mechanism of the atmospheric effects on radio wave propagation.
2. To be able to explain various properties and parameters of antenna.
3. Students will be able to explain how an antenna radiates and capture radio wave energy from the concepts of radiation.
4. Students will be able to identify properties of plane waves.
5. Students will be able to design an antenna system and can find the various radiation parameters.

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**MODULE CONTENTS:**

| |
|---|
| *Unit I:Fundamental of Anteena* <br> Retarded potential, field of short dipole, Antenna pattern & antenna parameters Gain, Directivity, Radiation resistance, Aperture, Beam-width etc, Reciprocity theorem for antenna. radiation mechanism, single wire, two wire, dipole, current distribution of thin wire antenna. |
| *Unit II: Wave equation* <br> Wave equation for radiated fields from current and voltage sources in terms of electric scalar potential and magnetic vector potential fields and pattern of an infinitesimal dipole, duality theorem. |
| *Unit III: Antenna parameters* <br> Definition of various potentials used in antenna theory, Relation between current distribution and field pattern of an antenna, linear antenna, half wave dipole, Antenna impedance, Directional properties, Effect of ground on antenna pattern, Input impedance Broad band matching. radiation pattern, isotropic, directional and omni directional pattern, principal patterns, radiation patterns lobes, field regions, radian and steradian. |
| *Unit IV: Fundamental of radiation* <br> Radiation power density, radiation intensity, , antenna efficiency, half power beam width, beam efficiency, bandwidth efficiency, input impedance, antenna radiation efficiency, antenna aperture, effective height. infinitesimal dipole, radiation field (with derivation), near field, intermediate field, far field ,power density, small/short dipole, half wavelength dipole. folded dipole. |
| *Unit V: Special antennas* <br> Two element array, broad side, End fired pattern, Beam width pattern multiplication, multi element array and their properties, Synthesis of an array. parabolic feed antenna, conical, helix, log periodic, horn,  long wire, V antenna, rhombic antenna. Introduction to smart antennas, Yagi-Uda antenna, Measurement of reflection coefficient and radiation pattern, Introduction of Anechoic chamber and Vector Network Analyzer. |
| *Unit VI: Propagation of radio waves* <br> Microwave antenna ground waves propagation, Space waves propagation, Effect of Earth, Duct formation, Ionosphere, and sky wave, MUF (max. usable frequency), skip distance, virtual height Troposphere. |

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOKS** | 6. Antennas for all Applications(3rd Edition) by John D Kraus, McGraw Hill, 2005. |
| **REFERENCEBOOKS** | 1. Electromagnetic Waves and Radiating Systems by Edward C.Jordan and Keith G.Balmain  Prentice Hall of India, 2006 <br> 2. Antennas and Radiowave Propagation by R.E.Collin, McGraw Hill 1985. |

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**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 150 marks.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Class Test |  | x | x |  | x |
| Quiz | x |  |  |  |  |
| Assignment |  | x |  | x |  |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 1,4 | 2,3 | 5 | 2 | 2 |  |  | 1,5 |  |  |  |

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

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- Problems encountered in the content delivery;

- Suggested remedies / corrective measures;

- Approved refinement decisions due for implementation;

- Actions taken based on previous course review; and

- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

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**Mobile Computing**

|   | **L** | **T** | **P** |
|---|---|---|---|
|   | **3** | **0** | **0** |

| MODULE CODE | ECEN3222 |
|---|---|
| CREDIT POINTS | 3 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** In total, EIGHT questions will be set. Question ONE will be compulsory and cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

## OBJECTIVES:

The aim of teaching this subject is to impart knowledge primarily related to mobile communication, mobile hardware and mobile software. Some of the objectives of the course are:

1. Understand the basic concepts of mobile computing.
2. Be familiar with the network protocol stack.
3. Learn the basics of mobile telecommunication system.
4. Be exposed to Ad-Hoc networks.
5. Gain knowledge about different mobile platforms and application development.

## LEARNING OUTCOMES:

1. Our graduates will be able to explain the basics of mobile telecommunication system.
2. Our graduates will be able to choose the required functionality at each layer for given application.
3. Students will be able to identify solution for each functionality at each layer.
4. Our graduates will be able to use simulator tools and design Ad hoc networks.
5. Students will be able to develop a mobile application.

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## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**MODULE CONTENTS:**

| |
|---|
| *Unit I: Introduction* <br> Mobile Computing - Mobile Computing Vs wireless Networking , Mobile Computing Applications , Characteristics of Mobile computing , Structure of Mobile Computing Application. MAC Protocols , Wireless MAC Issues (Fixed Assignment Schemes , Random Assignment Schemes , Reservation Based Schemes). |
| *Unit II: Mobile Network Layer* <br> Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP). |
| *Unit III: Mobile Transport Layer* <br> Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP. |
| *Unit IV: Mobile Telecommunication System* <br> Global System for Mobile Communication (GSM), General Packet Radio Service (GPRS), Universal Mobile Telecommunication System (UMTS). |
| *Unit V: Mobile Ad hoc Networks (MANETs)* <br> Overview, Properties of a MANET, Spectrum of MANET applications, Routing and various routing algorithms, Security in MANETs. |
| *Unit VI: Mobile Platforms and Applications* <br> Mobile Device Operating Systems, Special Constrains & Requirements , Commercial Mobile Operating Systems , Software Development Kit( iOS, Android), MCommerce (Structure, Pros& Cons ), Mobile Payment System (Security Issues). |

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOKS** | 1. Fundamentals of Mobile Computing by Prasant Kumar Pattnaik & Rajib Mall, PHI Learning Pvt. Ltd. <br> 7. Mobile Communications (2nd Edition) by Jochen H. Schiller Pearson Education. |
| **REFERENCEBOOKS** | 1. Mobile Cellular Telecommunications-Analog and Digital Systems (2nd Edition) by William.C.Y.Lee ,Tata Mc Graw Hill Edition <br> 2. AdHoc Mobile Wireless Networks First Edition by C.K.Toh, Pearson Education |

**METHODS OF TEACHING AND STUDENT LEARNING**

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

**ASSESSMENT METHODOLOGIES:**

This subject will be evaluated for a total of 150 marks.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|:---:|---|:---:|:---:|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

**MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES**

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 |
|---|:---:|:---:|:---:|:---:|:---:|
| Class Test | | x | x | | |
| Quiz | x | x | | | x |
| Assignment | | | x | x | |

**MAPPING OF COURSE LEARNING OUTCOMES**

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Course Learning Outcomes | 4 | 5 | 2 | 4 | 1 | 3 | 4 | 4,5 | | | |

**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

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# DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**Digital Logic Design**

|   | **L** | **T** | **P** |
|---|---|---|---|
|   | **3** | **0** | **0** |

| MODULE CODE | ECEN3221 |
|---|---|
| CREDIT POINTS | 3 |
| FORMATIVE ASSESMENT MARKS | 50 |
| SUMMATIVE ASSESMENT MARKS | 100 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**INSTRUCTIONS:** In total, EIGHT questions will be set. Question ONE will be compulsory and cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

## OBJECTIVES:

Learning design of digital circuits is a fundamental necessity for designing practical systems. To develop standard design practices for digital circuits at a higher level of abstraction a hardware description language is useful. Some of the objectives of the course are:

1. Apply advanced theorems to simplify the design aspects of various practical circuits.
2. To design State Machines.
3. Implement various digital circuits using Programmable Logic Devices.
4. Implement combinational and sequential circuits using VHDL.
5. To impart an understanding of the basic concepts of Boolean algebra and digital circuit design.

## LEARNING OUTCOMES:

1. Our graduates will be able to study different memory structures and technologies.
2. Our graduates will be able to consolidate the design methodologies for combinational and sequential digital systems.
3. Graduates will get knowledge how to use Hardware Description Language (HDL) for system modelling and simulation.
4. Graduate will able to implement digital systems on programmable logic devices.
5. Graduates will be able to understand the functionality of digital systems.

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**MODULE CONTENTS:**

| |
|---|
| *Unit I: Introduction:* <br> Binary Systems: digital system, Binary number, Number base conversion, binary codes |
| *Unit II: Design With Programmable Logic Devices:* <br> Basic concepts, PROM as PLD, Programmable Array Logic (PAL), Programmable Logic Array (PLA), Design of combinational and sequential circuits using PLD"s, Complex PLD (CPLD), Introduction to Field Programmable Gate Arrays (FPGA). |
| *Unit III: Introduction To VHDL:* <br> VHDL Description of combination circuits, VHDL Modules- entity and architecture description, Sequential statements and VHDL processes, VHDL Data types and Operators, Concurrent and Sequential Assignment Statements(All types), |
| *UNIT IV:Modelling in VHDL:* <br> Different types of Modeling in VHDL – Behavioral, dataflow and structural modeling, Variables, Signals and Constants in VHDL, Package in VHDL. |
| *Unit IV:Digital Design of combinational circuits with VHDL:* <br> Combinational Circuit Design using Structural, behavioral and data flow modeling (Circuits like Arithmetic circuits, decoders, encoders, multiplexers, demultiplexers, code converters, comparator. |
| *Unit VI: Design of Sequential Elements with VHDL:* <br> Flip flops, Counters and Synchronous Sequential Circuits using VHDL. |

**RECOMMENDED BOOKS:**

| | |
|---|---|
| **TEXT BOOKS** | 1. Digital Systems Design using VHDL by Charles. H. Roth,3<sup>rd</sup> edition, PWS <br> 2. A VHDL Primer by Bhaskar, Prentice Hall |
| **REFERENCE BOOKS** | 1. VHDL – Analysis & Modelling of digital systems by Navabi, McGraw Hill <br> 2. VHDL by Perry, 4<sup>th</sup> edition, TMH |

## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks.

**Theory:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1. | Class Test | 4 | 10 |
| 2. | Sessional Test | 2 | 30 |
| 3. | Group Discussion | 4 | 10 |
| 4. | End Semester Exam | 1 | 100 |

## MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

**Theory:**

| Assessments | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Class Test | | x | | | |
| Quiz | x | | X | | |
| Assignment | | | | x | x |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | F | g | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 1,5 | 3 | 2,3 | 3 | 4 | | 3 | 3 | | | |

## EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;

- Approved refinement decisions due for implementation;

- Actions taken based on previous course review; and

- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders

**Microwave and Radar Engineering Lab**

| | L | T | P |
|---|---|---|---|
| | **0** | **0** | **2** |

| | |
|---|---|
| MODULE CODE | ECEN3114 |
| CREDIT POINTS | 1 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 25 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

**OBJECTIVES:**

1. To understand basic concept of microwave and transmit of electromagnetic energy through microwave.
2. To learn about microwave components and devices used in generation, transmission and reception of microwave energy.
3. To learn and to measure radiation pattern and gain of various types of antennas.
4. To know the measurement of microwave parameters like frequency, power, VSWR , isolation and amplification factor.
5. Application of microwave for various types of radar like CW and pulsed radar.

**LEARNING OUTCOMES:**

1. Our graduate will learn the practical use of microwave energy in various fields like in communication, radar used in defense & civil.
2. Graduate will have basic knowledge of components & devices which will help them in relevant field of industry.
3. Our graduate will know the generation transmission& reception of microwave communication used in industry.
4. Graduate will have practical experience of using radars.
5. Our graduate will know the advantage & limitation of higher bands of microwave frequency for use of industry.

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**LIST OF EXPERIMENTS**:

| 1. | Study of wave guide components. |
|----|----|
| 2. | To measure frequency of microwave source and demonstrate relationship among guide. |
| 3. | Study of characteristics of Gunn oscillator & Gunn diode as modulated source (PIN modulation) and determination of modulation depth. |
| 4. | Study of insulation & coupling coefficient of a magic Tee & coupling coefficient and directivity of a directional coupler. |
| 5. | Study of insulation, coupling coefficient and directivity of a directional coupler. |
| 6. | Measurement of attenuation of a attenuator and isolation, insertion loss, cross coupling of an circulator. |
| 7. | Study of waveguide horn and its radiation pattern and determination of the beam width. |
| 8. | Measurement of VSWR in a Microwave transmission line. |
| 9. | Study of E Plane, H Plane And Magic Tee. |
| 10. | To Study Propagation Loss & Bending Loss. |
| **Experiments based on advanced topics:** | |
| 11. | To study working of Doppler radar & measure of velocity of the object moving in radar range. |
| 12. | To study characteristics of  reflex klystron tube. |

## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

**Practical:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|:---:|:---|:---:|:---:|
| 1 | Internal Assessment | 2 | 25 |
| 2 | External Assessment | 1 | 25 |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|:---|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| Course Learning Outcomes | 4 | 3,5 | 2,4 | 4 | 5 | 1 | | | 3 | | 1 |

## EVALUATION

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- Approved refinement decisions due for implementation;
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**Digital Signal Processing Lab**

| | L | T | P |
|---|---|---|---|
| | **0** | **0** | **2** |

| MODULE CODE | ECEN3118 |
|---|---|
| CREDIT POINTS | 1 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 25 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

## OBJECTIVES:

1. To understand different types of basic signal by using MATLAB.
2. Able to learn the discrete convolution and correlation of two signals by using MATLAB.
3. To understand Z transform & inverse Z transform by using MATLAB.
4. To learn the transformation of signals using sampling theorem by using MATLAB.
5. To study the stability test by using MATLAB.
6. To get familiar with the various filters by using MATLAB.

## LEARNING OUTCOMES:

1. Our graduates will learn MATLAB in an interactive way where they can study the signal processing of signals.
2. Our graduates will be able to get the convolution and correlation of two discrete time signals for software implementations.
3. Our graduates will be able to convert the discrete time signal into frequency by using Z transform.
4. Graduates will be able to convert the continues time signal into discrete time signal for analog to digital conversion with the help of sampler.
5. Graduates will be able to get idea of stability of any system.
6. Graduates will be able to design the filter like low pass, high pass, band pass & band rejection filter.

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**LIST OF EXPERIMENTS**:

| | |
|---|---|
| 1. | To Represent basic signals (Unit step, unit impulse, ramp, exponential, sine and cosine). |
| 2. | To develop program for discrete convolution. |
| 3. | To develop program for discrete correlation. |
| 4. | To understand sampling theorem. |
| 5. | To understand the stability test. |
| 6. | To understand the z transform. |
| 7. | To design analog filter (low-pass, high pass, band-pass, band-stop). |
| 8. | To design digital IIR filters (low-pass, high pass, band-pass, band-stop). |
| 9. | To study Quantization technique. |
| 10. | To study FIR Filter Implementation. |
| **Experiments based on advanced topics:** | |
| 11. | To design FIR filters using windows technique. |
| 12. | To understand interpolator and decimator. |

## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

**Practical:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1 | Internal Assessment | 2 | 25 |
| 2 | External Assessment | 1 | 25 |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 2 | 6 | 1 | 3,6 | 4 | | 6 | 1,6 | | | 4 |

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**EVALUATION**

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty"s feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

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- Approved refinement decisions due for implementation;

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**Antenna & Wave Propagation Lab**

| | **L** | **T** | **P** |
|---|---|---|---|
| | **0** | **0** | **2** |

| MODULE CODE | ECEN3116 |
|---|---|
| CREDIT POINTS | 1 |
| FORMATIVE ASSESMENT MARKS | 25 |
| SUMMATIVE ASSESMENT MARKS | 25 |
| END SEMESTER EXAM DURATION | 3 hrs |
| LAST REVISION DATE | |

## OBJECTIVES:

1. To be familiar with the most popular antenna design programs.
2. To investigate the different parameters associated with the specific antenna.
3. To deal with various wire antennas, dipole, loop, helix etc.
4. To get close to arrays and the different parameters that control the shape of the pattern.
5. To design various antennas using design graphs and software programs.
6. To investigate the high directional antennas such as Horn and Reflector antennas.

## LEARNING OUTCOMES:

1. Our graduates will understand important and fundamental antenna engineering parameters and terminology.
2. Able to learn the basic concepts of electromagnetic wave radiation and reception.
3. Develop the basic skills necessary for designing a wide variety of practical antennas and antenna arrays.
4. Able to plot the radiation pattern of various antennas.
5. Our graduates will be able to understand various array principles.

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**LIST OF EXPERIMENTS**:

| | |
|---|---|
| 1. | Introduction – Antenna & Wave Propagation. |
| 2. | Performance analysis of Half wave dipole antenna. |
| 3. | Performance analysis of Folded dipole antenna. |
| 4. | Performance analysis of Loop antenna. |
| 5. | Performance analysis of Yagi Uda antenna. |
| 6. | Performance analysis of Helix antenna. |
| 7. | Performance analysis of Slot antenna. |
| 8. | Performance analysis of Log periodic antenna. |
| 9. | Performance analysis of Parabolic antenna. |
| 10. | Performance analysis of Horn antenna. |
| **Experiments based on advanced topics:** | |
| 11. | Radio wave propagation path loss calculations. |
| 12. | Introduction – Linear array, Broadside array, End-Fire array. |

## METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

## ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

**Practical:**

| Assessment # | Type Of Assessment | Per Semester | Maximum Mark |
|---|---|---|---|
| 1 | Internal Assessment | 2 | 25 |
| 2 | External Assessment | 1 | 25 |

## MAPPING OF COURSE LEARNING OUTCOMES

| Program Outcomes | a | b | c | d | e | f | g | h | i | j | k |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes | 1 | 2,4 | 4 | 3,5 | | | | 3 | | 3 | |

## EVALUATION

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