SEMESTER - VI

## COMPLEX VARIABLES

### 1. Course Description

**Programme: B.Sc.** **Max. Hours: 60**
**Course Code: U24/MAT/DSE/601** **Hours per week: 4**
**Course Type: DSE I** **Max. Marks: 100**
**No. of credits:4**

### 2. Course Objectives

- To familiarize students with the basic notion of complex analysis, covering functions of a complex variable, limits, theorems on limits and continuity.
- To illustrate how complex analysis concepts, including derivatives, contour integrals, and the Cauchy Integral Formula, finds application in disciplines such as physics, engineering and social sciences like economics, and psychology.

### 3. Course Outcomes

On completion of the course the student will be able to:

**CO 1:** Discuss the theorems and problems on limits, continuity and derivatives.**(DISCUSS)**

**CO 2:**Predict a given function is analytic, using the Cauchy-Riemann (C-R) equations along with sufficient condition for differentiability.**(PREDICT)**

**CO 3:**Evaluate contour integrals of functions of complex variable and , Cauchy's Integral formula. **(EVALUATE)**

**CO 4:**Classify different types of Series and Singularities. **(CLASSIFY)**

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**4. Course Content**

**MODULE I** **(15 HRS)**

**FUNCTIONS OF COMPLEX VARIABLES:**

Functions of a Complex Variable, Geometrical representation of Complex function or mapping, Extended Complex Number System, Neighbourhood of a point and Region., Limit of a Function, Continuity of a function, Derivative of f(z),Differentiation Formulae.

**Section15.1 of Ch15, Section 15.2 of Ch15.**

**MODULE II:** **(15 HRS)**

**ANALYTIC FUNCTIONS:**

Necessary and sufficient condition for f(z) to be analytic, Cauchy-Riemann Equations in polar form, examples, Harmonic functions and properties of analytic function- Construction of an analytic function whose real or imaginary part is given Milne-Thomson Method- examples.

**Sections 15.3, 15.4 of Ch15.**

**MODULE III:** **(15 HRS)**

**CONTOUR INTEGRALS**

Introduction, Contour Integral, properties of contour integrals- Examples,Simply connected domains, Multiply connected domains,Cauchy's Integral Theorem or Cauchy's Fundamental Theorem, Cauchy-Goursat Theorem (without proof), Cauchy's Integral formula, Cauchy's Integral formula for derivatives.

**Sections 16.0, 16.1, 16.2, 16.3 of Ch 16.**

**MODULE IV:** **(15 HRS)**

**INTEGRALS**

Talyor's Series and Laurent's Series- Talyor's Series, Laurent's Series- examples, Classification of Singularities, Residue-Methods of finding residue,Cauchy's Residue Theorem.

**Sections 16.4, 16.5, 16.7 of Ch 16.**

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**5. References**

1. Enginnering Mathematics by P. Sivaramakrishna Das and C. Vijayakumari
2. James Ward Brown and Ruel. V- Churchill, "Complex Variables and Applications" (8th Edition), McGraw-Hill INTERNATIONAL EDITION.
3. A. R. Vasishtha, "Complex Analysis" (Fifteenth Edition: 2012), KRISHNA Prakashan Media(P)Ltd.
4. . Daniel Alpay, "A Complex Analysis Problem Book", Brik Hauser, Springer Basel AG 2011.
5. J.N. Sharma 2013 "Functions of a Complex Variable", Krishna Prakashan Media Pvt Ltd, Meerut.

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## 6.Syllabus Focus

a)Relevance to Local,Regional, National and Global Development Needs

| Local /Regional/National /Global Development Needs | Relevance |
|---|---|
| Global | Complex variables act as essential tools in math, serving as global problem-solvers. They play a key role in designing advanced technology, predicting economic trends, and understanding medical imaging and diseases. In environmental science, they contribute to climate change decisions, and in the realm of artificial intelligence, complex variables are vital for teaching computers to make smart decisions. In essence, these mathematical superheroes drive progress and problem-solving on a global scale. |

**b) Componentson Skill Development/Entrepreneurship Development/Employability**

| SD/ED/EMP | Syllabus Content | Description of Activity |
|---|---|---|
| Skill Development | Module 2: Analytic Functions | Working with analytic functions requires critical thinking skills to understand and apply the Cauchy-Riemann equations. It involves solving complex mathematical problems, enhancing problem-solving abilities. |
| Employability | Module 3: Cauchy Integral Formula | Problems involving heat conduction, fluid flow, or electromagnetic fields often apply integral formulas, enhancing employability in engineering sectors. |

## 7. Pedagogy

| S. No | Student Centric Methods Adopted | Type / Description of Activity |
|---|---|---|
| 1. | Participative Learning | Presentation |
| 2. | Experiential Learning | Interactive Class room games/Quiz |
| 3. | Problem solving | Research Projects |

## 8. Course Assessment Plan

### a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination

| CO | Continuous Internal Assessments CIA - 40% | End Semester Examination-60% |
|---|---|---|
| CO1 | CIA-I(Written Exam) | End Semester Examination |
| CO2 | CIA-I(Written Exam) | |
| CO3 | CIA-II (Skill Tests) | |
| CO4 | CIA-II (Assignments) | |

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**b) Model Question Paper- End Semester Exam**

## COMPLEX VARIABLES

**Course Code: U24/MAT/DSE/601** **Max Marks: 60**

**Credits: 04** **Time : 2 hrs**

**SECTION-A**

**I. Answer the following Questions:** **(4x10 = 40M)**

1. Show that the function $f(z) = \bar{z}$ is continuous at the point $z = 0$ but not differentiable at $z = 0$.

**OR**

2. Show that $\lim_{z\to 0} f(z)$ doesn't exist, if $f(z) = \frac{z}{\bar{z}}$.

3. Show that the function defined by $f(z) = \sqrt{|xy|}$ is not analytic at origin, although C-R equations are satisfied.

**OR**

4. Find the values of a and b such that the function $f(z) = x^2 + ay^2 - 2xy + i(bx^2 - y^2 + 2xy)$ is analytic. Also find f '(z).

5. Evaluate $\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)}\, dz$, where Cis $|z| = 3$.

**OR**

6. Using Cauchy's integral formula evaluate $\int_C \frac{7z-1}{z^2-3z-4}\, dz$, where C is the ellipse $x^2 + 4y^2 = 4$.

7. Expand $f(z) = \frac{z^2-1}{(z+2)(z+3)}$ as a Laurent's series if (i) 2 < | z | < 3, (ii) | z | >3.

**OR**

8. Evaluate $\int_C \frac{z-1}{(z+1)^2(z+2)}\,dz$ where C is the circle $|z-i|=2$ using Cauchy's residue theorem.

## SECTION –B

**II. Answer any FOUR of the following Questions:** **(Marks:4x5=20)**

9. Show that $\lim_{z\to 1} f(z) = \frac{i}{2}$, if $f(z) = \frac{i\bar{z}}{2}$ in the open disk $|z|<1$, the point 1 being in the boundary of the domain of definition of f.

10. If $f(z)$ and $\overline{f(z)}$ are analytic functions prove that $f(z)$ is a constant.

11. Evaluate $\int_C \frac{e^{iz}}{z^3}dz$ where C is | z | = 2 using Cauchy's integral formula.

12. Find the Laurent's series of the function $f(z) = z^2 e^{1/z}$ about z=0.

13. Show that the function $u(x,y) = 3x^2y + 2x^2 - y^3$ is harmonic. Find the conjugate harmonic function v and express u + iv as an analytic function of z.

14. Evaluate $\int_C \frac{\tan\frac{z}{2}}{(z-1-i)^2}\,dz$, where C is the boundary of the square whose sides are the lines $x = \pm 2$ and $y = \pm 2$.

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# COMPLEX VARIABLES

## PRACTICAL

**Programme : B.Sc.**
**Course Code : U24/MAT/DSE/601**
**Type Of Course : DSE I**
**No. Of Credits : 1**

**Max.Hours : 30**
**Hours Per Week : 2**
**Max.Marks : 50**

**Course Outcomes:**

- To develop proficiency in calculating limits, applying Cauchy-Riemann equations, and evaluating contour integrals.
- To cultivate the ability to solve complex problems in derivatives, analytic functions, harmonic functions, and applications of Cauchy's theorems.

**PRACTICAL SESSIONS**

**Practical 1**: Limits & Continuity.

**Practical 2**: Derivatives.

**Practical 3**: Analytic Functions.

**Practical 4**:Cauchy-Riemann Equations.

**Practical 5**: Harmonic Functions& Properties of Analytic Functions.

**Practical 6**: Contour Integrals&Cauchy-Goursat Theorem.

**Practical 7**: Cauchy's Integral Formula& Cauchy's Integral Formula for Derivatives.

**Practical 8**: Taylor's & Laurent's Series.

**Practical 9**: Classification of Singularities.

**Practical 10**: Methods of finding residue & Cauchy's Residue Theorem.

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## MODEL QUESTION PAPER
## PRACTICAL

**Course Code: U24/MAT/DSE/601/P** **Max. Marks:30**

**No. Of Credits: 1** **Time: 2 Hrs.**

**I. Answer the following.** **6 x 5= 30 M**

1. Show that $\lim_{z\to 0} f(z)$ doesn't exist, if $f(z) = \frac{z}{\bar{z}}$.

**OR**

2. Show that the function $f(z) = \bar{z}$ is continuous at the point $z = 0$ but not differentiable at $z = 0$.

3. Find the analytic function $f(z) = u + iv$ given that $2u + 3v = e^x(\cos y - \sin y)$.

**OR**

4. If $f(z) = \begin{cases} \frac{x^3(1+i)-y^3(1-i)}{x^2+y^2} & , z \neq 0 \\ 0 & 'z = 0 \end{cases}$, Prove that f(z) is continuous and the C-R equations are satisfied at z=0 , yet f '(0) does not exist.

5. Show that the function $u(x, y) = 3x^2y + 2x^2 - y^3$is harmonic. Find the conjugate harmonic function v and express u + iv as an analytic function of z.

**OR**

6.. Evaluate $\int_C z^2\, dz$ where C is the arc from A (1, 1) to B (2, 4) along y = 3x-2.

7. Evaluate $\int_C \frac{e^{iz}}{z^3} dz$ where C is | z | = 2 using Cauchy's integral formula.

**OR**

8. Find the Taylor's series to represent the function $\frac{z^2-1}{(z+2)(z+3)}$ in | z | <2.

9. Determine poles and their orders for the function$\frac{z+2}{(z+1)^2(z-2)}$.

**OR**

10. Calculate the residue of $f(z) = \frac{1-e^{2z}}{z^3}$

**SEMESTER - VI**

**CYBER SECURITY**

## 1. Course Description:

**Programme: B.Sc. Computer Science** **Max. Hours: 30**

**Course Code: U24/CSC/SEC/601** **Hours per week: 2**

**Course Type: SKILL ENHANCEMENT COURSE** **Max. Marks**

**No. of credits: 2**

## 2. Course Objectives:

- To learn the foundations of Cyber security and the threat landscape.
- To equip students with the technical knowledge and skills needed to protect and defend against cyber threats.
- To expose students to responsible use of online social media networks and digital payments.

## 3. Course Outcomes:

This SEC paper will help students to enhance their overall skills and to

**CO1**: ***Discuss*** and ***outline*** cyber security and issues and challenges associated with it. (Cognitive level – 2)

**CO2**: ***Analyze*** privacy and security concerns on online social media and various digital payment modes and related cyber security aspects. (Cognitive level – 4)

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**4. Course Content:**

**MODULE I: INTRODUCTION TO CYBER SECURITY AND CYBER LAWS (15 Hrs)**

Defining Cyberspace, Architecture of cyberspace, Internet infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security; Classification of cyber-crimes, Common cyber-crimes, Reporting of cyber-crimes, Remedial and mitigation measures, Legal perspective of cyber-crime.

**MODULE II: SOCIAL MEDIA AND DIGITAL PAYMENT SECURITY (15 Hrs)**

Introduction to Social networks. Types of social media, Social media privacy, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content, Introduction to digital payments, Components of digital payment and stake holders, Modes of digital payments- Banking Cards, Unified Payment Interface (UPI), e-Wallets, Digital payments related common frauds and preventive measures.

**5. References:**

1. Cyber Crime Impact in the New Millennium, by R. C Mishra, Author Press. Edition 2010.
2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011)
3. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson, 13th November, 2001)
4. Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt Ltd...
5. Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers.

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**6. Syllabus Focus:**

**a)** Relevance to Local, Regional, National and Global Development Needs

| Local/Regional/National /Global Development Needs | Relevance |
|---|---|
| Global Development | Cybersecurity is crucial because it safeguards all types of data against theft and loss. It's essential for organizations and individuals to take measures to protect their information assets from potential attacks or leaks. |

**b) Components on Skill Development/Entrepreneurship Development/Employability**

| SD/ED/EMP | Syllabus Content | Description of Activity |
|---|---|---|
| SD | Modules 1 and 2 | Develop a deeper understanding and familiarity with various types of cyberattacks, cyber crimes, vulnerabilities and remedies thereto. Analyse and evaluate the digital payment system security and remedial measures against digital payment frauds. |

**7. Course Assessment Plan:**

**a) Weightage of Marks in Formative and Summative Assessments**

| Formative Assessment - FA (40%) | Summative Assessment - SA (60%) |
|---|---|
| CIA-20 marks<br>Mini project/Assignment/<br>Problem solving/Case studies | End Semester Exam – 30 Marks |

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**b) Question Paper Pattern**

**EXTERNAL- MODEL QUESTION PAPER**
**PRACTICAL**

**Course code: U24/CSC/SEC/601** **Max Time: 1 Hr.**

**Credits:2** **Max Marks: 30Marks**

**Answer the following.**

1. Explain the architecture of cyberspace and classify the cyber-crimes.
2. Explain the following
   a. Security issues related to social media
   b. Unified Payment Interface (UPI)
   c. e-Wallets

| Prepared by | Checked & Verified by | Approved by |
|---|---|---|
| Ms. Afeefa Noorain<br>Teaching Faculty | Ms. D. Sowjenya<br>HOD | Dr. Uma Joseph<br>Principal |

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**SEMESTER – VI**

**DATA MINING**

## 1. Course Description

**Programme: B.Sc.** **Max. Hours: 60**

**Code: U24/CSC/DSE/602** **Hours per week: 4**

**Course Type: DISCIPLINE SPECIFIC ELECTIVE** **Max. Marks: 100**

**No. of credits: 4**

## 2. Course Objectives

- To identify the scope and essentiality of Data Warehousing and Mining.
- To develop research interest towards advances in data mining.

## 3. Course Outcomes

**CO1**: To ***Discuss*** Data Warehouse fundamentals, Data Mining Principles (Cognitive level – 2)

**CO2**: To ***Design*** data warehouse with dimensional modelling and apply OLAP operations (Cognitive level – 6)

**CO3**: To ***Identify*** appropriate data mining to solve real world problems (Cognitive level – 3)

**CO4**: To ***Compare*** and evaluate different data mining techniques like classification, prediction, clustering and association rule mining (Cognitive level – 4)

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**4.Course Contents**

**MODULE 1: INTRODUCTION & DATA PREPROCESSING (15 Hrs )**

Introduction to data mining, patterns for mining, technologies used, getting to know data, data visualization, measuring similarity, data pre-processing, data cleaning and integration, data reduction, data transformation.

**MODULE 2: DATA WAREHOUSING & ONLINE ANALYTICAL PROCESSING (15 Hrs)**

Data warehousing and OLAP, ETL, data cube, data warehouse design and usage, data generalization, data cube technology, strategies for data cube computation, processing advanced kinds of queries, mining frequent patterns, associations, and correlations.

**MODULE 3: ADVANCED PATTERN MINING & CLASSIFICATION TECHNIQUES (15 Hrs)**

Advanced pattern mining, constraint-based frequent pattern mining, pattern exploration and application, classification, decision tree induction, Bayes classification methods, rule-based classification, techniques to improve accuracy, advanced classification methods, Bayesian belief networks, classification using backpropagation, frequent patterns, genetic algorithms, rough set and fuzzy set approaches

**MODULE 4: CLUSTER & ADVANCED CLUSTER ANALYSIS (15 Hrs)**

Cluster analysis, basic clustering methods, partitioning, hierarchical methods, density-based methods, evaluation of clustering, advanced cluster analysis, clustering high-dimensional data, clustering graph and network data, clustering with constraints.

**5.References**

1.Data Mining Concepts and Techniques 4E, Jiawei Han, Elsevier, 2022
2. Introduction to Data Mining by Pang -Ning Tan, Micheal Steinbach, Anuj Karpatne Vipin Kumar, Pearson, 2021
3.Data Mining: Practical Machine Learning Tools and Techniques by Ian H. Witten & Eibe Frank, Elsevier, 2019

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**6.Syllabus Focus**

**a) Relevance to Local, Regional, National and Global Development Needs**

| Local/Regional/National/Global Development Needs | Relevance |
|---|---|
| Global Development | To introduce the concepts of Data Mining and Cluster analysis |

**b) Components on Skill Development/Entrepreneurship Development/Employability**

| SD/ED/EMP | Syllabus Content | Description of Activity |
|---|---|---|
| SD | Modules 1 and 2 | To Understand the concept of Data mining and. data warehousing and OLAP. |
| EMP | Modules 3 and 4 | Detailed understanding of Pattern Mining and cluster analysis. |

**7.Pedagogy**

| S. No | Student Centric Methods Adopted | Type / Description of Activity |
|---|---|---|
| 1. | Seminar Presentation | Participative Learning |
| 2. | Quiz | Experiential Learning |
| 3. | Group Discussion | Participative Learning |

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**8. Course Assessment Plan**

**a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination**

| Cos | Continuous Internal Assessments – CIA (40%) | End Semester Examination - (60%) |
|---|---|---|
| CO1 | CIA-1 Written Test | Written Exam |
| CO2 | CIA-1 Written Test | |
| CO3 | CIA-2 Presentation | |
| CO4 | CIA-2 Quiz | |

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**b) Model Question Paper- End Semester Exam**

## DATA MINING

**Course Code: U24/CSC/DSE/602** **Max. Marks: 60**
**No. of Credits :4** **Time: 2hrs**

### SECTION-A

**I. Answer the following:** **4x10= 40M**

1. Describe the various approaches to data visualization.

OR

2. Describe the strategies for data reduction and transformation.

3. Describe the different techniques for cube computation.

OR

4. Describe the APRIORI algorithm for determining frequent item sets.

5. Describe the methods for mining quantitative association rules.

OR

6. Describe the decision tree method of classification.

7. Describe the partitioning methods for cluster analysis.

OR

8. Describe hierarchical methods for clustering.

### SECTION-B

**II. Answer any FIVE:** **5 X 4 = 20 M**

9. Discuss the relationship between data mining and knowledge discovery.
10. Describe the schemas for multidimensional data modelling.
11. Write a brief note on rule-based classification.
12. Describe Bayesian belief networks for data classification.
13. Write a brief note on bolstering.
14. Describe clustering in high-dimensional data.

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# DATA MINING
# PRACTICAL

## 1.Course Description:

**Programme: B.Sc.**

**Course Code: U24/CSC/DSE/602/P**

**Course Type: DISCIPLINE SPECIFIC ELECTIVE**

**No. of credits: 1**

**Max. Hours: 30**

**Hours per week:2**

**Max. Marks: 50**

## 2.Course Objectives

- To identify the scope and essentiality of Data Warehousing and Mining
- To develop research interest towards advances in data mining.

## 3.Course Outcomes

**CO1**: To Identify appropriate data mining to solve real world problems (Cognitive level – 3)

**CO2**: To Compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining (Cognitive level – 4)

## PRACTICAL SESSIONS

1. OLAP queries using SQL Server
2. Design and implement a data warehouse using dimensional modelling
3. Extract, transform Load
4. Building a cube
5. Classification using K nearest neighbour classification
6. decision tree-based algorithm for classification
7. K means algorithm for clustering
8. Apriori algorithm for association rule
9. Bayesian Classification
10. Mini Project

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**DATA MINING**
**PRACTCIAL MODEL PAPER**

**Course code: U24/CSC/DSE/602/P** **Max. Time: 2 hrs**
**No. of Credits:1** **Max. Marks: 50**

**Answer any ONE from the following**

1. Write a program to implement Building a cube.
2. Write OLAP queries using SQL Server

**c) Question Paper Blueprint**

| Modules | Hours Allotted in the Syllabus | COs Addressed | Section A (No. of Questions) | Total Marks | Section B (No. of Questions) | Total Marks |
|---|---|---|---|---|---|---|
| 1 | 15 | CO-1 | 2 | 10 | 2 | 5 |
| 2 | 15 | CO-2 | 2 | 10 | 2 | 5 |
| 3 | 15 | CO-3 | 2 | 10 | 1 | 5 |
| 4 | 15 | CO-4 | 2 | 10 | 1 | 5 |

**9.C0 -PO Mapping:**

| CO | PO | Cognitive Level | Classroom sessions (hrs) |
|---|---|---|---|
| 1 | 1 | 2 | 15 |
| 2 | 2 | 6 | 15 |
| 3 | 1 | 3 | 15 |
| 4 | 2 | 4 | 15 |

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# SEMESTER-VI
# ELECTRONICS

## 1. Course Description

**Programme : B.Sc.**
**Course Code: U24/PHY/DSE/601**
**Type of course: DSE -2**
**No. of credits: 4**

**Max. Hours : 60**
**Hours per week: 4**
**Max. Marks : 60**

## 2.Course Objectives

- To acquaint the basics of semiconductors, transistors and their configurations.
- To familiarize the basic principles of digital principles and logic gates.

## 3. Course Outcomes

On completion of the course the student will be able to:

**CO1:** Explain the behaviour of P-N junction diodes and their applications in rectification circuits (L2).

**CO2:** Apply the principles of feedback in oscillators (L3).

**CO3:** Describe the construction and characteristics of a special diode (L2).

**CO4:** Classify the different types of logic gates based on their operation and truth table (L4).

## 4. Course Content

**MODULE I** **(15 Hrs)**

**Band Theory of P-N junction:**

Energy bands in Solids (band Theory), Valence band, conduction band and forbidden energy gap in solids, insulators, semiconductors and pure or intrinsic semiconductors and impure or extrinsic semiconductors. N-type semiconductors, P-type semiconductors, Fermi level, continuity equation.

**Diodes:**

P- N junction diode, Half-Wave, Full-wave and bridge rectifier. Zener diode & its characteristics. Zener diode as voltage regulator.

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**MODULE II** **(15 Hrs)**

**Bipolar Junction Transistor (BJT):**

PNP and NPN transistors, current components in transistors, CB, CE and CC configurations - transistor as an amplifier - RC coupled amplifier - Frequency response (Qualitative analysis).Feedback concept & Oscillators: Feedback, General theory of feedback-Concepts of Oscillators, Barkhausen's criteria, phase shift oscillator- Expression for frequency of oscillation.

**MODULE III** **(15 Hrs)**

**Special devices:**
Construction and Characteristics: Photo diode- Shockley diode -Solar cell, Opto-couplers- Field Effect Transistor (FET)- FET as an Amplifier-Uni Junction Transistor (UJT), UJT as a relaxation oscillator-Silicon controlled rectifier (SCR)- SCR as a switch.

**MODULE IV** **(15 Hrs)**

**Digital Electronics:**

Binary number system, converting Binary to Decimal and vice versa. Binary addition and subtraction (1's and 2's complement methods). Hexadecimal number system. Conversion from Binary to Hexadecimal - vice versa and Decimal to Hexadecimal vice versa.

Logic gates: OR, AND, NOT gates truth tables, realization of these gates using discrete components. NAND, NOR as universal gates, Exclusive-OR gate, De Morgan's Laws - statement and proof, Half and Full adders.

NOTE: Problems should be solved from every chapter of all units.

**5. Reference Text Books**

a) Electronic devices and circuits- Millman and Halkias. *Mc. Graw-Hill Education.*
b) Principles of Electronics by V.K . Metha-S. Chand & Co.
c) Basic Electronics ( Solid State)- B.L. Theraja, S. Chand & Co.
d) A First course in Electronics-Anwar A Khan &Kanchan K. Dey, PHI.
e) Physics of Semiconductor Devices-S. M. Sze.
f) Physics of Semiconductors-Streetman.
g) Basic Electronics-Bernod Grob.
h) Third year Electronics-Telugu academy.
i).Digital Principles & Applications-A.P. Malvino and D.P. Leach.

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## 6. Syllabus Focus

### a) Relevance to Local , Regional , National and Global Development Needs

| Local /Regional/National /Global Development Needs | Relevance |
|---|---|
| Global | Understanding semiconductor behaviour and electronic components like diodes, transistors, and logic gates is the basis for designing and analysing electronic circuits. These are integral to various fields such as telecommunications, computer engineering, power electronics, and consumer electronics. |

### b) Components on Skill Development/Entrepreneurship Development/Employability

| SD/ED/EMP | Syllabus Content | Description of Activity |
|---|---|---|
| Skill Development | Module 1<br><br>Module 4 | Hands-on lab sessions to construct P-N junction diode circuits, measure their characteristics, and analyse their behaviour .<br><br>Hands-on -lab sessions to design digital logic circuits, followed by testing and debugging to reinforce understanding of binary arithmetic and logic gate operation. |
| Entrepreneurship Development | Module 2<br><br>Module 3 | Entrepreneurship workshops where students brainstorm and pitch ideas for electronic products or systems that leverage transistor amplifiers and feedback oscillators for innovative applications.<br><br>Design challenges where students work in teams to develop novel applications or prototypes utilizing special semiconductor devices, with a focus on addressing real-world problems or market needs. |

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## 7. Pedagogy

| S. No | Student Centric Methods Adopted | Type/Description of Activity |
|---|---|---|
| 1. | Experiential Learning | Experiments/Quiz |
| 2. | Participative Learning | Presentation/Seminar |

## 8. Course Assessment Plan

### a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination

| Cos | Continuous Internal Assessments – CIA ( 40%) | End Semester Examination (60%) |
|---|---|---|
| CO1 | CIA-I(Written Exam) | End Semester examination |
| CO2 | CIA-I (Written Exam) | |
| CO3 | CIA-II Assignment /MCQ | |
| CO4 | CIA-II -Presentation | |

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**b) Question Paper Pattern**

## ELECTRONICS

**Course Code: U24/ PHY / DSE/601** **Time: 2 hours**

**Max Marks: 60**

## SECTION –A

**I. Answer All questions:** **4 x10=40M**

1. Explain the working of a full wave rectifier with a neat circuit diagram and derive an equation for its efficiency.

OR

2. Discuss the V-I characteristics of a zener diode and its function as a voltage regulator.

3. Explain the working of an NPN transistor in CE mode. Explain its input and output characteristic curves.

OR

4. Draw the circuit diagram of two stage R.C. coupled amplifier and explains its operation in different frequency ranges.

5. Describe the working of a photodiode.

OR

6. Explain the construction and working of a JFET.

7. State De-morgan's law. Give equivalent logic gate diagram and corresponding truth tables.

OR

8. Compare the working of AND, ORand NOT gates using resistors, diodes and transistors.

## SECTION B

II. Answer any **FOUR:** **4 x 5 = 20 M**

9. What are N-type and P-type semiconductors? Distinguish between intrinsic and impurity semiconductor

10. The current gain in CB configuration is 0.92. Calculate current gain in CE configuration.

11. Explain the barkhausen condition for oscillations.

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12.Explain SCR as a Switch.

13. Subtract the following using 2'complement:

(i) $(100111)_2$ from $(110011)_2$

(ii) $(1101)_2$ from $(1010)_2$

14. What are universal gates? Discuss the working of NAND as Universal gate.

**c) Question Paper Blueprint**

| Modules | Hours Allotted in the Syllabus | CO Addressed | Section A (No. of Questions) | Total Marks | Section B (No. of Questions) | Total Marks |
|---|---|---|---|---|---|---|
| 1 | 15 | CO-1 | 2 | 4x10=40 | 6 (By taking atleast one questions from each model) | 4x5=20 |
| 2 | 15 | CO-2 | 2 | | | |
| 3 | 15 | CO-3 | 2 | | | |
| 4 | 15 | CO-4 | 2 | | | |

**8. CO-PO Mapping:**

| CO | PO | Cognitive Level | Class room sessions (hrs) |
|---|---|---|---|
| 1 | 1,2 | COMPREHENSION | 15 |
| 2 | 1,2 | APPLICATION | 15 |
| 3 | 1,6 | COMPREHENSION | 15 |
| 4 | 1,2 | ANALYSIS | 15 |

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# ELECTRONICS

## PRACTICAL

## SEMESTER -VI

**Programme : B.Sc.**

**Course Code: U24/PHY/DSE/601/P** **Max.Marks : 50**

**1.Course Objectives**

- Ability to use skills/techniques to perform experimentation Course Outcome

**2. Course Outcomes:**

**CO 1:** Summarise the voltage-current characteristics of p-n junction diode & Zener diode. (L2)

**CO 2:** Carry Demonstrate the construction and functionality of NAND and NOR gates.(L3).

## PRACTICAL SESSIONS

1. AND, OR, NOT – gates constructions using universal gates – Verification of truth tables.
2. Construction of NAND and NOR gates truth table verification
3. Characteristics of a transistor in CE configuration
4. Verification of De Morgan's Theorem.
5. Zener diode V-I characteristics.
6. P-N junction diode V- I characteristics.
7. Zener diode as a voltage regulator
8. Construction of a model D.C. power supply
9. R C phase shift Oscillator –determination of output frequency
10. Construction and working of a full adder.
11. R. C. coupled amplifier- Frequency Response.

**3. Reference Books**

1. B.Sc. Practical Physics – C. L. Arora – S. Chand & Co.
2. Viva-voce in Physics – R.C. Gupta, PragathiPrakashan, Meerut.
3. Laboratory manual for Physics Course by B.P. Khandelwal.
4. Practical Physics by M. Arul Thakpathi by Comptex Publishers.
5. B.Sc. practical physics – Subbi Reddy.

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**ELECTRONICS**

**PRACTICAL MODEL QUESTION PAPER**

**SEMESTER -VI**

Course Code: **U24/PHY/DSE/601/P**

Max Time: 2 hrs

Max. Marks: 50

**Answer any ONE of the Following**

1. Construct AND, OR, NOT – gates using universal gates and Verify truth tables.
2. Construct NAND and NOR gates and Verify truth tables.
3. Determine characteristics of a transistor in CE configuration.
4. Verify De Morgan's Theorem.
5. Determine V-I characteristics of Zener diode.
6. Determine V- I characteristics of P-n junction diode.
7. Study the operation of Zener diode as a voltage regulator.
8. Construct a model D.C. power supply

| Prepared by Course Teacher [Name & Signature] | Checked &Verified by HoD / Programme Coordinator [Name & Signature] | Approved by the Principal |
|---|---|---|
| Devy. k. | | |

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SEMESTER VI

## LOGIC AND SETS

### 1. Course Description

**Programme : B. Sc** **Max. Hours : 30**
**Course Code : U24/MAT/SEC/601** **Hours per week : 2**
**Course Type : SEC IV** **Max. Marks : 50**
**No. of credits : 2**

### 2. Course Objectives

- The objectives of set theory and logics are to provide formal frameworks for mathematical thinking and reasoning.

### 3. Course Outcomes

On completion of the course the student will be able to:

**CO 1:** Demonstrate the fundamentals of strong reasoning and inference using Logics. **(DEMONSTRATE)**

**CO 2:** Set theory develops the properties and structure of collections of things. **(DEVELOP)**

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## 4. Course Content

**MODULE I:** **(15 HRS)**

Basic Connectives and truth tables, Logical equivalence: Laws of Logic, Logical Implication: Rules Inference: The use of Quantifiers, Quantifiers, and Definitions.

**Sections:2.1-2.5.**
**Pg No's 47-116.**

**MODULE II:** **(15 HRS)**

Sets and Subsets, Set Operations and the laws of Set Theory, Counting and Venn Diagrams, Well ordering Principle and Mathematical Induction. A first word on Probability, the axioms of probability, conditional probability, independence, discrete random variables.

**Sections: 3.1-3.7.**
**Pg No's 123-185.**

## 5. References

1. Ralph P Girmaldi, Discrete and Combinatorial Mathematics (5e) Pearson.
2. Kenneth H. Rosen, Discrete Mathematics and its applications, 7th edition,.
3. P R Halmos, Naïve set Theory, Springer – Verlag New York.
4. E Kamke, Theory of set Dover Publication.

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**6. Syllabus Focus**

**a)** Relevance to Local , Regional , National and Global Development Needs

| **Local /Regional/National /Global Development Needs** | **Relevance** |
|---|---|
| Global | The fundamental framework that logic and set theory provide for reasoning, problem-solving, and knowledge representation in a wide range of fields and disciplines makes them vital to society at large. |

**7. Components on Skill Development/Entrepreneurship Development/Employability**

| **SD/ED/EMP** | **Syllabus Content** | **Description of Activity** |
|---|---|---|
| Employability | Module 1: LOGICS<br>Module 2: SETS | This course Bridges between Industrial tasks and Academic knowledge in the field of electronics and Computer Science |

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## 8. Course Assessment Plan

### a) ) Weightage of Marks in Formative and Summative Assessments

| Formative Assessments – FA (50%) | Summative Assessments – SA (50%) |
|---|---|
| CIA- 20 Marks | End Semester Exam |

### b) Question Paper Pattern

**EXTERNAL - MODEL QUESTION PAPER**

**LOGICS AND SETS**

**THEORY**

**Course Code : U24/MAT/SEC/601** **Max. Time : 1Hr**

**No. Of Credits: 2** **Max. Marks: 30M**

**SECTION –A**

**I. Answer any FIVE of the following.** **5 x 6 = 30 M**

1. (a) Construct a truth tale for each of the following compound statements where p,q, r denote

   primitive statements $\sim(p\wedge\sim q)\rightarrow\sim p$.

   (b) Determine whether $[p\rightarrow(q\rightarrow r)]\rightarrow[(p\rightarrow q)\rightarrow(p\rightarrow r)$ is a tautology.

2. Find the validity of the argument

   $p\rightarrow q$

   $q\rightarrow(r\wedge s)$

   $\sim r\vee(\sim t\vee u)$

   $p\wedge t$

   ---

   $\therefore u$

3. Show that $p \leftrightarrow q \Leftrightarrow (p \rightarrow q) \wedge (q \rightarrow p)$ is logically equivalent using Truth table.
4. Define universal and existential Quantifiers. Translate the given statement into symbols using quantifiers, variables and predicate the symbols "An equilateral triangle has three angles of $60^{o}$."
5. Define power set. Construct power set for the set C={1,2,3,4}.
6. Simplify the expression $\overline{\overline{(A \cup B) \cap C} \cup \bar{B}}$.
7. Let X be a random variable with the following probability distribution.

| x | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Pr(X=x) | 1/8 | 1/4 | 1/4 | 1/4 | 1/8 |

Determine a) Pr(x≤4) b) Pr($1 \leq X \leq 3$)

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# SEMESTER-VI
# MEDICAL PHYSICS

## 1. Course Description

**Programme : B.Sc.** **Max. Hours : 60**
**Course Code: U24/PHY/DSE/602** **Hours per week: 4**
**Type of course: DSE-2** **Max. Marks : 60**
**No. of credits: 4**

## 2. Course Objectives

- To acquaint the principles of radioactivity and radiation counters .
- To comprehend physical laws and principles in medical physics.

## 3. Course Outcomes

On completion of the course the student will be able to:

**CO 1:** Explain the electromagnetic spectrum, mechanisms of X-rays. (L2)

**CO 2:** Demonstrate interactions of radiation with matter, principles of radiation detection using various detectors such as Geiger counters and scintillation counters.(L3)

**CO 3:** Describe the basic theory of imaging and related applications.(L2)

**CO 4:** Analyse radiation dosage required for therapies. (L4)

## 4. Course Content

**MODULE I** **(15 Hrs)**

**PHYSICS OF DIAGNOSTIC AND THERAPEUTIC SYSTEMS-I**

**X-RAYS:** Electromagnetic spectrum – production of x-rays – x-ray spectra- Brehmsstrahlung- Characteristic x-ray – X-ray tubes – Coolidge tube – x-ray tube design– tube cooling stationary mode – Rotating anode x-ray tube – Tube rating – quality and intensity of x-ray.

**RADIATION PHYSICS:** Radiation units - exposure - absorbed dose – units: rad, gray-relative biological effectiveness - effective dose - inverse square law - interaction of radiation with matter - linear attenuation coefficient. Radiation Detectors –Thimble chamber- condenser chambers – Geiger counter – Scintillation counter – ionization chamber – Dosimeters – survey methods – area monitors – TLD and semiconductor detectors.

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**MODULE II** **(15 Hrs)**

**MEDICAL IMAGING PHYSICS:**

X-ray diagnostics and imaging, Physics of nuclear magnetic resonance (NMR) – NMR imaging – MRI Radiological imaging – Radiography – Filters –grids – cassette – X-ray film – film processing – fluoroscopy – computed tomography scanner –principle function – display – generations – mammography. Ultrasound imaging – magnetic resonance imaging – thyroid uptake system – Gamma camera (Only Principle, function and display)

**MODULE III** **(15 Hrs)**

**RADIATION THERAPY PHYSICS:** Radiotherapy – kilo voltage machines – deep therapy machines – Telecobalt machines – Medical linear accelerator. Basics of Teletherapy units – deep x-ray, Telecobalt units, medical linear accelerator – Radiation protection – external beam characteristics – phantom – dose maximum and build up – bolus – percentage depth dose – tissue – air ratio – back scatter factor.

**RADIATION AND RADIATION PROTECTION:** Principles of radiation protection – protective materials-radiation effects – somatic, genetic stochastic & deterministic effect, Personal monitoring devices – TLD film badge – pocket dosimeter. Radiation dosimetry, Natural radioactivity, Biological effects of radiation, Radiation monitors.

**MODULE IV** **(15 Hrs)**

**PHYSICS OF DIAGNOSTIC AND THERAPEUTIC SYSTEMS-II**

**Diagnostic nuclear medicine:** Radiopharmaceuticals for radioisotope imaging, Radioisotope imaging equipment, Single photon and positron emission tomography Therapeutic nuclear medicine: Interaction between radiation and matter Dose and isodose in radiation treatment

**5. Reference Text Books**

a. J.R. Cameron and J.G.Skofronick Medical Physics,1978, Wiley

b. Dr. K. Thayalan,Basic Radiological Physics,2003, Jayapee Brothers Medical Publishing Pvt. Ltd. New Delhi

c. F M Khan - Williams and Wilkins, Physics of Radiation Therapy,2003,Third edition (2003)

d. Irving P,Physics of the human body, Herman, Springer (2007).

e. H E Johns and Cunningham,The Physics of Radiology.

## 6. Syllabus Focus

a) Relevance to Local , Regional , National and Global Development Needs

| Local /Regional/National /Global Development Needs | Relevance |
|---|---|
| Global | Students receive a comprehensive understanding of the physics principles underpinning medical imaging, radiation therapy, and radiation protection. |

b) Components on Skill Development/Entrepreneurship Development/Employability

| SD/ED/EMP | Syllabus Content | Description of Activity |
|---|---|---|
| Skill Development | Module 1 | Provide simulation software or phantoms for students to practice positioning and adjusting X-ray equipment parameters, enhancing their technical skills in X-ray imaging. |
| | Module 2 | Providing a variety of medical imaging studies (X-rays, CT scans, MRI and guide them through the process of interpreting these images. |
| Entrepreneurship Development | Module 3 | Radiation therapy start up ideas help students to refine their entrepreneurial skills |

## 7. Pedagogy

| S. No | Student Centric Methods Adopted | Type/Description of Activity |
|---|---|---|
| 1. | Experiential Learning | Experiments/Quiz |
| 2. | Participative Learning | Presentation/Seminar |

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## 8. Course Assessment Plan

### a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination

| Cos | Continuous Internal Assessments – CIA ( 40%) | End Semester Examination (60%) |
|---|---|---|
| CO1 | CIA-1 (Written Exam) | End Semester examination |
| CO2 | CIA-1 (Written Exam) | |
| CO3 | CIA-2- Assignment/ MCQ | |
| CO4 | CIA-2 – Presentation | |

### b) Question Paper Pattern

Medical Physics **Time: 2 hours**
**Course Code: U24/PHY/DSE/602/P** **Max Marks: 60**

**SECTION –A**

**I. Answer All questions:** **4 x10=40 M**

1. Describe different types of X-Ray tubes in detail.

OR

2. Describe the working of any two radiation detectors.

3. Describe the principle and working of NMR.

OR

4. Explain the physics involved in MRI technique.

5. Explain the principle of Medical linear accelerator.

OR

6. Explain the Biological effects of radiation.

7. Describe single photon and positron emission tomography.

OR

8. Explain the interaction of radiation with matter. What is dose and isodose in radiation treatment?

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## SECTION B

**II. Answer any FOUR** **4 x 5 = 20 M**

9. Explain the principle of gamma camera.

10. Define linear attenuation coefficient.

11. Define bremstraulung.

12. Define backscatter factor.

13. What are principles of radiation protection?

14. What is radioisotope imaging?

### c) Question Paper Blueprint

| Modules | Hours Allotted in the Syllabus | CO Addressed | Section A (No. of Questions) | Total Marks | Section B (No. of Questions) | Total Marks |
|---|---|---|---|---|---|---|
| 1 | 15 | CO-1 | 2 | 4x10=40 | 6 (By taking at least one questions from each model) | 4x5=20 |
| 2 | 15 | CO-2 | 2 | | | |
| 3 | 15 | CO-3 | 2 | | | |
| 4 | 15 | CO-4 | 2 | | | |

### 9. CO-PO Mapping:

| CO | PO | Cognitive Level | Class room sessions (hrs) |
|---|---|---|---|
| 1 | 1,2 | COMPREHENSION | 15 |
| 2 | 1,2 | APPLICATION | 15 |
| 3 | 1,6 | COMPREHENSION | 15 |
| 4 | 1,7 | ANALYSIS | 15 |

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## PRACTICAL

## SEMESTER -VI

**Programme : B.Sc.**

**Course Code: U24/PHY/DSE/602/P** **Max. Marks : 50**

### 1.Course Objectives

- Gain understanding of principles and apply it in medicine.

### 2. Course Outcomes:

**CO 1:** Prepare the technical report on the experiments carried.

**CO 2:** Carry out experiments and compare results with theoretical predictions.

### PRACTICAL SESSIONS

1. Understanding the working of a manual Hg Blood Pressure monitor and measure the Blood Pressure.

2. Understanding the working of a manual optical eye-testing machine and to learn eye-testing.

3. Correction of Myopia (short sightedness) using a combination of lenses on an optical bench/breadboard.

4. Correction of Hypermetropia/Hyperopia (long sightedness) using a combination of lenses on an optical bench/breadboard.

5. To learn working of Thermoluminescent dosimeter (TLD) badges and measure the background radiation.

6. Familiarization with Geiger-Muller (GM) Counter and to measure background radiation.

7.Familiarization with Radiation meter and to measure background radiation.

8. Familiarization with the construction of speaker-receiver system and to design a speaker-receiver system of given specification.

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**5.Reference Books**

1. J.R. Cameron and J.G.Skofronick Medical Physics,1978, Wiley
2. Dr. K. Thayalan,Basic Radiological Physics,2003, Jayapee Brothers Medical Publishing Pvt. Ltd. New Delhi
3. F M Khan - Williams and Wilkins, Physics of Radiation Therapy,2003,Third edition (2003)
4. Irving P,Physics of the human body, Herman, Springer (2007).
5. H E Johns and Cunningham, The Physics of Radiology.

## MEDICAL PHYSICS

## PRACTICAL MODEL QUESTION PAPER

## SEMESTER -VI

Course Code: **U24/PHY/DSE/602/P**

Max Time: 2 hrs

Max. Marks: 50

**Answer any ONE of the Following**

1. Determine the working of a manual Hg Blood Pressure monitor and measure the Blood Pressure.
2. Determine the working of a manual optical eye-testing machine and to learn eye-testing.
3. Determine the correction of Myopia (short sightedness) using a combination of lenses on an optical bench/breadboard.
4. Determine the correction of Hypermetropia/Hyperopia (long sightedness) using a combination of lenses on an optical bench/breadboard.
5. Determine the working of Thermoluminescent dosimeter (TLD) badges and measure the background radiation.
6. Determine the characteristics of GM Counter and measure background radiation.
7. Determine the characteristics of Radiation meter and measure background Radiation.
8. Construct speaker-receiver system and design a speaker-receiver system of given specification.

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| Prepared by Course Teacher [Name & Signature] | Checked &Verified by HoD / Programme Coordinator [Name & Signature] | Approved by the Principal |
|---|---|---|
| Devy.k. | R.S. Kanthi Lata | |

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SEMESTER - VI

## NUMERICAL ANALYSIS

### 1. Course Description

**Programme : B.Sc**
**Course Code : U24/MAT/DSE/602**
**Course Type : DSE II**
**No. of credits : 4**

**Max. Hours : 60**
**Hours per week : 4**
**Max. Marks : 100**

### 2. Course Objectives

- Solutions to problems in science and engineering.
- To train students to choose and apply appropriate numerical techniques to solve the problem and interpret the result.

### 3. Course Outcomes

On completion of the course the student will be able to:

**CO 1:** Calculate the roots of algebraic and transcendental equations. **(CALCULATE)**

**CO 2:** Assess the given function by means of a polynomial. **(ASSESS)**

**CO 3:** Discuss various methods of numerical differentiation and integration. **(DISCUSS)**

**CO 4:** Analyze appropriate numerical methods and determine the solutions to ordinary Differential equations and Linear systems. **(APPLY)**

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**4. Course Content**

**MODULE I:**

**SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS (15 HRS)**

Errors and their computations, The Bisection Method, The Method of False Position, The Iteration Method, Newton-Raphson Method, Generalized Newton's Method, Muller's Method.

**Sections: 1.3, 2.1 to 2.6,2.8.**
**Pg No's: 7 to 11, 20 to 43,44 to 46 .**

**MODULE II:**

**INTERPOLATION (17 HRS)**

Introduction : Finite Differences, Forward Differences, Backward Differences, Central Differences, Symbolic Relations and Separation of Symbols, Differences of a Polynomial, Newton's Formula for Interpolation, Central Difference Interpolation Formula, Gauss's Central Difference formula,Interpolation with unevenly spaced points and Polynomial Approximation.Lagrange's Interpolation Formula, Divided Differences and their properties, Newton's General Interpolation Formula.

**Sections: 3.1,3.3,3.6 to 3.7,3.9 TO 3.9.2,3.10,3.11,**

**Pg No's :. 63, 65-70, 72-86, 90-103.**

**MODULE III:**

**NUMERICAL DIFFERENTIATION & INTEGRATION (15 HRS)**

Introduction, Least-Squares Curves Fitting Procedures, Fitting a Straight Line.
Numerical differentiation and Integration.Introduction-, Numerical differentiation, Maximum and minimum values of a tabulated function. Numerical Integration-Trapezoidal Rule ,Simpson's 1/3 Rule ,Simpsons 3/8 Rule.

**Sections: 4.1 – 4.2.2, 5.1,5.2, 5.2.1,5.4-5.4.3**

**Pg No's . 137-143,187-201**

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**MODULE IV:**

**NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS AND SOLUTIONS OF LINEAR SYSTEMS (13 HRS)**

Introduction , Taylor's Series method, Picard's Method, Euler's method, Runge – Kutta method, Solution of Linear systems-Direct methods,Matrix Inversion method,Gauss Elimination method,Gauss-Jordan method,Iterative methods.

**Sections: 7.1-7.5 ,6.3,6.3.1,6.3.2,6.3.3,6.4**
**Pg. No's : 295 to 308,255-261,275 to 278**

5. **Reference Books:**

1. S.S.Sastry, **Introductory Methods of Numerical Analysis**,Publication: Prentice Hall India (4th Edition)
2. G.M. Philips and P. J. Taylor,**Theory and Applications of Numerical Analysis** Elsivier Publications.
3. Francis Sched, Numerical **Analysis** (2nd Edition) By, Schaum's Outlines, Tata Mcgrawhill Publications.
4. M.K Jain, S.R.K. Iyengar, R.K. Jain, **Numerical Methods For Scientific And Engineering Computation** (4th Edition) New Age International Publications.
5. James E. Miller, David G. Moursund, Charles S. Duris, **Elementary Theory And Application Of Numerical Analysis.**

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## 6. Syllabus Focus

**a)** Relevance to Local , Regional , National and Global Development Needs

| Local /Regional/National /Global Development Needs | Relevance |
|---|---|
| Global | Numerical analysis plays a crucial role in computational physics, Finance, Computer Science i.e in Crypotography. |

**b)Components on Skill Development/Entrepreneurship Development/Employability**

| SD/ED/EMP | Syllabus Content | Description of Activity |
|---|---|---|
| Skill Development | Module 1: Solution Of Algebraic And Transcendental Equations | Apply your skills to solve real-world problems that involve algebraic and transcendental equations in various fields such as engineering, physics, finance, and biology. |
| Employability | Module 2 Interpolation | Practice implementing interpolation algorithms in a programming language like Python, MATLAB and Sage Math. |
| Skill Development | Module 3: Curve Fitting | Apply your skills to solve real-world problems that involve curve fitting, such as predicting future trends, analyzing experimental data. |
| Skill Development | Module 4: Numerical Solutions Of Ordinary Differential Equations | Study different numerical methods for solving ODEs, such as: Euler's method and Runge-Kutta methods |

**7. Pedagogy**

| S. No | Student Centric Methods Adopted | Type / Description of Activity |
|---|---|---|
| 1. | Participative Learning | Presentation |
| 2. | Experiential Learning | Interactive Class room games/Quiz |
| 3. | Problem solving | Skill test |

**8. Course Assessment Plan**

**a)Weightage of Marks in Continuous Internal Assessments and End Semester Examination**

| CO | Continuous Internal Assessments CIA - 40% | End Semester Examination-60% |
|---|---|---|
| CO1 | CIA-I(Written Exam) | End Semester Examination |
| CO2 | CIA-I(Written Exam) | |
| CO3 | CIA-II (Skill Tests) | |
| CO4 | CIA-II (Assignments) | |

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**b) Model Question Paper- End Semester Exam**

## NUMERICAL ANALYSIS

**Course Code: U24/MAT/DSE/601** **Max. Marks: 60**

**Credits: 4** **Time : 2 Hrs**

### SECTION – A

**I. Answer the following.** **4 x 10 = 40 M**

1. Find a real root of the equation $x^3 - 2x - 5 = 0$using Bisection Method.

OR

2. Use the Newton –Raphson method to find a root of the equation $x^3 - 2x - 5 = 0$.
3. From the following table find the number of students who obtained marks between 60 And 70

| Marks Obtained | 0- 40 | 40-60 | 60-80 | 80-100 | 100-120 |
|---|---|---|---|---|---|
| No. of students | 250 | 120 | 100 | 70 | 50 |

OR

4. Applying Lagrange's formula, Find a cubic polynomial which approximates the following data

| x | y |
|---|---|
| 0 | -12 |
| 1 | 0 |
| 3 | 12 |
| 4 | 24 |

5. Find the values of $a_0 and\ a_1$ so that $Y = a_0 + a_1 x$ fits the data given in the table

| x | Y |
|---|---|
| 0 | 1.0 |
| 1 | 2.9 |
| 2 | 4.8 |
| 3 | 6.7 |
| 4 | 8.6 |

OR

6. Evaluate $\int_0^{\frac{\pi}{2}} \sqrt{sin\theta}\, d\theta$ using Simpson's rule with h=$\frac{\pi}{12}$.
7. Given the differential equation $y'' - xy' - y = 0$ with the conditions $y(0) = 1$ and $y'(0) = 0$, Use Taylor's series method to determine the value of $y(0.1)$.

OR

8. Solve the system $2x + y + z = 10, 3x + 2y + 3z = 18, x + 4y + 9z = 16$ by Gauss Jordan Method.

## SECTION-B

**II. Answer any FOUR** **4 x 5 = 20 M**

9. Explain the Graphical representation of Newton -Raphson method.
10. Using the method of separation of symbols show that
$\Delta^n u_{x-n} = u_x - nu_{x-1} + n(n-1)/2\, u_{x-2} + \ldots\ldots + (-1)^n u_{x-n}$.
11. Find the missing term in the following table

| x | Y |
|---|---|
| 0 | 1 |
| 1 | 3 |
| 2 | 9 |
| 3 | — |
| 4 | 18 |

Explain why the result differs from $3^3$=27.

12. Explain about Numerical differentiation.
13. From the following table find x, correct to two decimal places for which y is maximum and find this value of y.

| x | Y |
|---|---|
| 1.2 | 0.9320 |
| 1.3 | 0.9636 |
| 1.4 | 0.9855 |
| 1.5 | 0.9975 |
| 1.6 | 0.9996 |

14. Explain Trapezoidal Rule.

# NUMERICAL ANALYSIS

## PRACTICAL

**Programme: B.SC.**

**Course Code: U24/MAT/DSE/602/P**

**Course Type: DSE**

**No. of credits: 1**

**Max. Hours: 30**

**Hours per week: 2**

**Max. Marks: 50**

**Course Outcomes:**

- Find numerical solutions to algebraic, transcendental and differential equations.
- Learn to fit a polynomial or curve in a given data.

## PRACTICAL SESSIONS

1. Errors and Approximations , Bisection method .
2. Iteration Method and Newton – Raphson Method.
3. Newton – Raphson Method, Muller's Method.
4. Finite Difference interpolation
5. Divided differences interpolation.
6. Central Difference Interpolation and Langranges Interpolation formula.
7. Curve fitting
8. Numerical Differentiation and Integration
9. Taylor's series and Picard's method
10. Solution of Linear Systems.

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CBCS 2024

NUMERICAL ANALYSIS

## MODEL QUESTION PAPER

## PRACTICAL

**Course Code: U20/MAT/DSE/602/P** **Max. Marks: 30**

**No. Of Credits: 1** **Time : 2 Hrs**

**I. Answer the following:** **5 x 6 = 30 M**

1. Find a real root of the equation correct to to three decimal places using bisection method $x^3 + x^2 - 1 = 0$

OR

2. Find a root of the equation $xsinx + cosx = 0$ using Newton Raphson method
3. Find a root of the equation $x^3 - 2x - 5 = 0$ using Muller's method

OR

4. Prove that(i) $E \equiv 1 + \Delta$ (ii) $E^{-1} = 1 - \nabla$ (iii) $y = \sqrt{1 + \frac{\Delta^2}{4}}$
5. From the following table of values of x and f(x) determine (i)f(0.23) and (ii) f(0.29)

| x | 0.20 | 0.22 | 0.24 | 0.26 | 0.28 | 0.30 |
|---|---|---|---|---|---|---|
| f(x) | 1.6596 | 1.6698 | 1.6804 | 1.6912 | 1.7024 | 1.7139 |

OR

6. Using Lagrange's formula explain the rational function $\frac{3x^2+x+1}{(x-1)(x-2)(x-3)}$ as a sum of partial functions.

7. Fit a straight line of the form Y=$a_0 + a_1 x$ to the data

| x | 1 | 2 | 3 | 4 | 6 | 8 |
|---|---|---|---|---|---|---|
| y | 2.4 | 3.1 | 3.5 | 4.2 | 5.0 | 6.0 |

OR

8. Evaluate $\int_{-2}^{2} \frac{t}{5+2t} dt$ using trapezoidal rule.

9. Given that $y' = \frac{y-x}{y+x}$ , y(0)=1. Use Picard's method to find y(0.1).

OR

10. Solve the equations $3x + y + 2z = 3, 2x - 3y - z = -3, x + 2y + z = 4$ by Matrix Inversion Method.

## SEMESTER -VI
## PROJECT

**1. Course Description:**

**Programme: B.Sc.**
**Course Code: U20/PHY/PRJ/601**
**Type of course: Project**
**No. of credits: 4**

**Max. Hours: 60**
**Hours per week: 4**
**Max. Marks: 100**

**2. Course Objectives:**

Our graduates will be able to design an experimental procedure, tabulate and interpret the obtained results.

**3. Course Outcome:**

**CO1**: Plan appropriate research topics through review of literature.

**CO 2**: Prepare to work autonomously in an effective manner, setting and meeting deadlines.

**CO 3**: Design experiments, prepare appropriate methodologies, perform critical analysis and interpretation of results.

**CO 4**: Compose project to thesis that includes aim, objectives, methodologies, and potential outcomes.

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## PROJECT PLAN & ASSESMENT

- Every student has to complete one project in any one of the optional subjects.
- Each faculty of the Dept. will supervise 5 students.
- The topic of the project would be selected by each student in consultation with the faculty to whom she is assigned.
- The students will be trained to retrieve the literature and collate the information sufficient to make a presentation, the collated literature would also prepare the base for initiating the research.
- The student would carry out experiments in the lab to achieve the planned objectives.
- The collation and analysis of experimental data would lead to the presentation of the result in the form of a Dissertation.
- The evaluation includes submission of project report and viva. Continuous evaluation includes punctuality, hard work, record keeping, intellectual inputs, data presentation, interpretation etc.

### Internal Evaluation of Project-40 M

**Scheme of evaluation**

1. Synopsis - Submission & Presentation (10 M)
2. Mid Term Evaluation (10 M)
3. Project Presentations (20 M)

**External Evaluation -60 M (External Examiner)**

| Prepared by Course Teacher [Name & Signature] | Checked &verified by HOD [Name & Signature] | Approved by the Principal |
|---|---|---|
| Dr. Usha Praveena | | |

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**SEMESTER - VI**

**PROJECT**

## 1. Course Description

**Programme: B.Sc.** **Max. Hours:60**

**Course Code: U24/CSH/PRJ/601** **Max. Marks: 100**

**Course Type: PROJECT** **Hours per week:4**

**No. of credits: 4**

## 2. Course Objectives

1. To improve the team building, communication and management skills of the students.
2. To enable students to gain hands on experience
3. To inculcate research spirit of enquiry into the subject

## 3. Course Outcomes:

**CO1**: Demonstrate an ability to work in teams and manage the conduct of the research study.

**CO2**: Formulate and propose a plan for creating a solution for the research plan identified

**CO3:** To develop a sample project integrating the knowledge gained during the course

**Internal Evaluation of Project-40 M**

**Scheme of evaluation**

| | |
|---|---|
| Synopsis - Submission & Presentation | 10M |
| Mid Term Evaluation | 10 M |
| Project Presentations | 20 M |

**External Evaluation of Project -60 M**

| Prepared by | Checked &verified by | Approved by |
|---|---|---|
| Ms. Ummiya Mohammedi<br>Teaching Faculty | Ms. D. Sowjenya<br>HOD | Dr. Uma Joseph<br>Principal |



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## SEMESTER – VI
## PYTHON PROGRAMMING

### 1. Course Description

**Programme: B.Sc.** **Max. Hours: 60**

**Course Code: U24/CSC/DSE/601** **Hours per week: 4**

**Course Type: DISCIPLINE SPECIFIC ELECTIVE** **Max. Marks: 100**

**No. of credits: 4**

### 2. Course Objectives:

- To learn and develop object-oriented programming in python.
- To focus on the applicability of different object types like lists, tuples, dictionaries and modules.

### 3. Course Outcomes:

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

**CO1:** ***Illustrate*** and ***explain*** type of branching/looping construct to solve common problems. (Cognitive level –2)

**CO2:** ***Design*** python programs that illustrate how functions are utilize (Cognitive level –6)

**CO3:** ***Choose*** and ***apply*** the correct type of Modules construct to solve common problems (Cognitive level -3)

**CO4:** ***Design*** Python programs that implementing OOPs concept in Python (Cognitive level –6)

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## 4. Course Content

**MODULE I: FUNDAMENTALS OF PYTHON PROGRAMMING** **(15 Hrs)**

Introduction to Python, Installing and Writing Python Program, Data types in Python: Comments, Doc strings, Variables, Data types, Built-in data types, bool, Sequences, Sets, Literals, Characters, User-defined Data types, Constants, Identifiers, Reserved words, Naming Conventions. Operators in Python: Arithmetic, Assignment, Unary Minus, Relational, Logical, Boolean, Bitwise, Membership, Identity, Operator Precedence and Associativity, Mathematical Functions. Input and Output, Control Statements: Control Statements, if, if else, if elif else, while, for, Infinite and Nested Loops, else Suite, break, continue, pass, assert and return

**MODULE II: ARRAYS, STRINGS, FUNCTIONS** **(15 Hrs)**

Arrays in Python: Introduction, Creating, Importing Array Module, Indexing, Slicing, Processing, Types, Working with Arrays using numpy, Creating Arrays using array(), Mathematical Operations, Comparing, Aliasing, Viewing, Copying, Slicing and Indexing in numpy Arrays, Dimensions, Attributes, reshape and flatten methods, Multi-dimensional Arrays, Indexing and Slicing in Multi-dimensional Arrays, Matrices in numpy, Getting Diagonal Elements of a Matrix, Finding Maximum, Minimum, Sum and Average, Products of elements, Sorting and Transpose of Matrix, Matrix Addition and Multiplication, Random Numbers. Strings and Characters. Functions: Difference between a Function and a Method, Defining, Calling, Returning Results and Multiple Values, Pass by ObjectReference, Formal and Actual, Positional, Keyword, Default, Variable Length Arguments, Local and Global Variables, Recursive Functions, Anonymous Functions or Lambdas

**MODULE III: LISTS, TUPLES, DICTIONARIES, FILES, AND EXCEPTIONS** **(15 Hrs)**

Lists and Tuples: List, Creating Lists using range() Function, Operations on Lists, Nested Lists, List Comprehensions, Tuples, Creating Tuples, Accessing Tuple Elements, Basic Operations on Tuples, Nested Tuples, Inserting, Modifying and Deleting Elements from a Tuple. Dictionaries- Operations on Dictionaries, Dictionary Methods, Sorting using Lambdas, Converting Lists and Strings into Dictionary, Passing Dictionaries to Functions, Ordered Dictionaries. File and Exceptions: Introduction to File Input and Output, Using Loops to Process Files, Processing Records, Exceptions.

**MODULE IV: OOP CONCEPTS** **(15 Hrs)**

Introduction to Oops: Problems in Procedure Oriented Approach, Specialty of Python, Features of Object Oriented Programming systems (OOPS); Classes and Objects-Creating a Class, The Self Variable, Constructor, Types of Variables and Methods, Namespaces, Passing Members of One Class to Another Class, Inner Classes; Inheritance and Polymorphism: Constructors in Inheritance, Overriding Super Class Constructors and Methods, super() Method, Types of Inheritance, Polymorphism, Operator Overloading, Method Overloading, Method Overriding

## 5. References:

1. Python programming, Ch Satyanarayana, M Radhika mani, B N Jagadish, University Press,2018
2. Core Python Programming – 3rd edition, Dr R Nageshwar Rao, Dreamtech press,2021.

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**6. Syllabus Focus**

a) **Relevance to Local, Regional, National and Global Development Needs**

| **Local /Regional/National /Global Development Needs** | **Relevance** |
|---|---|
| Global Development | Python has become one of the most popular programming languages in recent years. It's been used in everything from machine learning to building websites and software testing. |

**b) Components on Skill Development/Entrepreneurship Development/Employability**

| **SD/ED/EMP** | **Syllabus Content** | **Description of Activity** |
|---|---|---|
| SD | Module -1,2 | Designing and writing python programs for given problem statements. |
| EMP | Module 3,4 | Testing programming skills in Python, including using its libraries and troubleshooting code |

**7. Pedagogy**

| **S. No** | **Student Centric Methods Adopted** | **Type / Description of Activity** |
|---|---|---|
| 1. | Seminar Presentation | Participative Learning |
| 2. | Quiz | Experiential Learning |
| 3. | Group Discussion | Participative Learning |

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**8. Course Assessment Plan**

**a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination**

| COs | Continuous Internal Assessments - CIA (40%) | End Semester Examination - (60%) |
|---|---|---|
| CO1 | CIA-1 Written Test | Written Exam |
| CO2 | CIA-1 Written Test | |
| CO3 | CIA-2 Written Assignment | |
| CO4 | CIA-2 Lab Test | |

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**b) Model Question Paper Pattern**

## PYTHON PROGRAMMING

**Course Code: U24/CSC/DSE/601** **Max Marks: 60**

**Credits: 4** **Time: 2 Hrs**

### SECTION – A

**I. Answer the following** **4 x 10 = 40 M**

1. (a) Discuss about the Features of Python.
   (b) Explain the differences between Java and Python.

OR

2. Explain about Arithmetic Operators, Assignment Operators, Relational Operators, Logical Operators and Boolean Operators with necessary examples.
3. Explain Multi-dimensional Arrays, Indexing and Slicing in Multi-dimensional Arrays.

OR

4. Explain how to create Functions in Python and discuss about Positional arguments and Keyword arguments.
5. Explain Files and Exceptions.

OR

6. Discuss about Lists and Dictionaries in detail.
7. Explain Operator Overloading with suitable examples.

OR

8. Define Class and discuss about inheritance with an example.

### SECTION B

**II. Answer Any FOUR:** **4 x 5 = 20 M**

9. Explain different data types in Python.
10. Explain Strings and characters.
11. Discuss about Tuples and its operations.
12. Discuss about Inner Classes.
13. Explain anonymous functions.
14. Explain about the Constructor.

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# PYTHON PROGRAMMING

## PRACTICAL

### 1. Course Description

**Programme: B.Sc.** **Max. Hours: 30**

**Course Code: U24/CSC/DSE/601/P** **Max. Marks: 50**

**Course Type: DISCIPLINE SPECIFIC ELECTIVE** **Hours per week:2**

**No. of credits: 1**

### 2. Course Objective

To strive and strengthen ability to develop programs using versatile object types and OOPs concepts using Python.

### 3. Course Outcomes

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

**CO1:** To illustrate basic object types, control structures and modular programming.

**CO2:** To develop Object-Oriented programming using Python.

### PRACTICAL SESSIONS

1. Program to illustrate Control Statements
2. Program to demonstrate Arrays
3. Program to illustrate String operations.
4. Program to create List and perform operations on it.
5. Program to illustrate Tuple operations.
6. Program to create Dictionaries and perform operations on it.
7. Program to create a User defined function.
8. Program to illustrate Positional Arguments, Keyword Arguments, Default Argument.
9. Program to illustrate Recursive Functions and Anonymous Functions.
10. Program to implement Python modules.
11. Program to implement String modules
12. Program to illustrate Classes and Objects.
13. Program to illustrate Inheritance.
14. Program to illustrate Operator overloading.
15. Program to illustrate Method Overloading.

**PYTHON PROGRAMMING**

**PRACTICAL MODEL PAPER**

**COURSE CODE: U24/CSC/DSE/601/P** **MAX.MARKS: 50**

**Credits: 1** **EXAM DURATION: 2 hrs**

**Answer any 2 questions:**

1. Write a Python Program to illustrate Tuple operations.
2. Program to illustrate Recursive Functions and Anonymous Functions.
4. Program to illustrate Operator overloading.

**c) Question Paper Blueprint**

| Modules | Hours Allotted in the Syllabus | COs Addressed | Section A (No. of Questions) | Total Marks | Section B (No. of Questions) | Total Marks |
|---|---|---|---|---|---|---|
| 1 | 15 | CO-1 | 2 | 10 | 2 | 5 |
| 2 | 15 | CO-2 | 2 | 10 | 2 | 5 |
| 3 | 15 | CO-3 | 2 | 10 | 2 | 5 |
| 4 | 15 | CO-4 | 2 | 10 | 2 | 5 |

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## SEMESTER – VI

## SEC-IV- WEATHER FORECASTING

### 1. Course Description

**Programme: B.Sc.**
**Course Code: U24/PHY /SEC/601**
**Type of course: SEC**
**No. of credits: 2**

**Max. Hours: 30**
**Hours per week: 2**
**Max. Marks: 50**

### 2. Course Objectives:

- To impart theoretical knowledge to the students and enable them to develop awareness and understanding regarding the causes and effects of different weather phenomenon.
- Study of Synoptic charts and weather reports.

### 3. Course Outcome:

This SEC paper will help students to enhance their overall skills

**CO1:** Acquire basic knowledge of the elements of the atmosphere, its composition at various heights, variation of pressure and temperature with height.

**CO2:** Analyze basic techniques to measure temperature and its relation with cyclones and anti-cyclones.

**CO3:** Know simple techniques to measure wind speed and its directions, humidity and rainfall.

**CO4:** Knowledge of global wind systems, jet streams, local thunderstorms, tropical cyclones, tornadoes and hurricanes.

### 4. Course Content:

**Module I: INTRODUCTION TO ATMOSPHERE** **(15 Hrs)**

Elementary idea of atmosphere: physical structure and composition; compositional layering of the atmosphere; variation of pressure and temperature with height; air temperature; requirements to measure air temperature; temperature sensors: types; atmospheric pressure: its measurement; cyclones and anticyclones: its characteristics.

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## Module II: BASICS OF WEATHER FORECASTING (15 Hrs)

Weather forecasting: analysis and its historical background; need of measuring weather; types of weather forecasting; weather forecasting methods; criteria of choosing weather station; basics of choosing site and exposure; satellites observations in weather forecasting; weather maps; uncertainty and predictability; probability forecasts.

**Demonstrations and Experiments:**

1.Study of synoptic charts & weather reports, working principle of weather station.
2.Processing and analysis of weather data:
(a) To calculate the sunniest time of the year.
(b) To study the variation of rainfall amount and intensity by wind direction.
(c) To observe the sunniest/driest day of the week.
(d) To examine the maximum and minimum temperature throughout the year.
(e) To evaluate the relative humidity of the day.
(f) To examine the rainfall amount month wise.
**3.** Exercises in chart reading: Plotting of constant pressure charts, surfaces charts,upper wind charts and its analysis.

## 5. Reference Books:

1. Aviation Meteorology, I.C. Joshi, 3rd edition 2014, Himalayan Books
2. The weather Observers Hand book, Stephen Burt, 2012, Cambridge University Press.
3. Meteorology, S.R. Ghadekar, 2001, Agromet Publishers, Nagpur.
4. Text Book of Agrometeorology, S.R. Ghadekar, 2005, Agromet Publishers,Nagpur.

## 6. Syllabus Focus

**a)** Relevance to Local, Regional , National and Global Development Needs

| Local /Regional/National /Global Development Needs | Relevance |
|---|---|
| Local | Accurate forecasts help to make informed decisions and mitigate the impacts of weather-related events. |
| National | Accurate and reliable weather forecasts contribute to the well-being and prosperity of nations. |
| Global | Reliable weather forecasts contribute to building resilience, and enhancing the well-being of communities around the world. |

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**b)** Components on Skill Development/Entrepreneurship Development/Employability

| SD/ED/EMP | Syllabus Content | Description of Activity |
|---|---|---|
| SD | Module-II | Hands on training in Weather forecasting Tools |

## 7. Course Assessment Plan

### a) Weightage of Marks in Formative and Summative Assessments

| Formative Assessment - FA (40%) | Summative Assessment - SA (60%) |
|---|---|
| CIA-20 marks<br>Mini project/Assignment/<br>Problem solving/Case studies | End Semester exam-30Marks |

### b) Question Paper Pattern

**Course Code: U24/PHY/SEC/601** **Max Time: 1 Hr**
**Credits: 2** **Max. Marks: 30**

**Answer the following.**

I. Draw Weather Symbols for the following. (5M)
1. Completely clear sky
2. Snow
3. Fog
4. Drizzle
5. Rain
6. Thunder
7. Shower
8. Mist
9. Heavy rain
10. Hail

II. Complete Weather maps in the given Worksheets. (5 M)

III. Write short note for the following. (10 M)
1. What is the climate of Telangana?
2. What are the characteristics of cyclone and anticyclone?
3. What is atmosphere? Describe the composition of atmosphere.

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4. What are Synoptic charts? Explain with an example.
5. Describe any two instruments used for weather forecasting.

III. Do the Dew point and Relative Humidity exercises in the given worksheets? (10 M)

| Prepared by Course Teacher [Name & Signature] | Checked & Verified by HOD [Name & Signature] | Approved by the Principal |
|---|---|---|
| R.S. Kaushik<br>M. Lal | R.S. Kaushik<br>M. Lal | |

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