

Resolution No. AC/I/(23-24).2.RUS10

**S. P. Mandali's**  
**Ramnarain Ruia Autonomous College**  
*(Affiliated to University of Mumbai)*



**Syllabus for**  
**Program: F.Y.B.Sc. (VSC)**  
**Program Code: (RUSPHY)**  
**2024-25**

(As per the guidelines of National Education Policy 2020-  
Academic year 2023-24)

(Choice based Credit System)

## Graduate Attributes

S. P. Mandali's Ramnarain Ruia Autonomous College has adopted the Outcome Based Education model to make its science graduates globally competent and capable of advancing in their careers. The Bachelors Program in Science also encourages students to reflect on the broader purpose of their education.

| <b>Graduate Attributes</b>    | <b>Graduate Attributes Description</b>  |
|-------------------------------|---|
|                               | <b>A student completing Bachelor's Degree in Science program will be able to:</b>   |
| <b>Graduate Attributes- 1</b> | Recall and explain acquired scientific knowledge in a comprehensive manner and apply the skills acquired in their chosen discipline. Interpret scientific ideas and relate its interconnectedness to various fields in science. |
| <b>Graduate Attributes- 2</b> | Evaluate scientific ideas critically, analyse problems, explore options for practical demonstrations, illustrate work plans and execute them, organise data and draw inferences   |
| <b>Graduate Attributes- 3</b> | Explore and evaluate digital information and use it for knowledge upgradation. Apply relevant information so gathered for analysis and communication using appropriate digital tools.   |
| <b>Graduate Attributes- 4</b> | Ask relevant questions, understand scientific relevance, hypothesize a scientific problem, construct and execute a project plan and analyze results.  |
| <b>Graduate Attributes- 5</b> | Take complex challenges, work responsibly and independently, as well as in cohesion with a team for completion of a task. Communicate effectively, convincingly and in an articulate manner.                                    |
| <b>Graduate Attributes- 6</b> | Apply scientific information with sensitivity to values of different cultural groups. Disseminate scientific knowledge effectively for upliftment of the society.   |
| <b>Graduate Attributes- 7</b> | Follow ethical practices at work place and be unbiased and critical in interpretation of scientific data. Understand the environmental issues and explore sustainable solutions for it.   |
| <b>Graduate Attributes- 8</b> | Keep abreast with current scientific developments in the specific discipline and adapt to technological advancements for better application of scientific knowledge as a lifelong learner                                       |

## PROGRAM OUTCOMES

| PO          | Description  |
|-------------|--|
|             | <b>A student completing Bachelor's Degree in Science program in the subject of Physics will be able to:</b>  |
| <b>PO 1</b> | To demonstrate fundamental and procedural knowledge related to different areas of study in Physics including mechanics, optics, modern physics, thermodynamics, electronics, electrodynamics at a level attuned with graduate programs in physics at peer institutions |
| <b>PO 2</b> | To demonstrate comprehensive, quantitative and conceptual understanding of the core areas of physics.  |
| <b>PO 3</b> | To apply the principles and acquired skill-set related to physics, to handle innovative and unfamiliar problems, so that effective solution or strategy to deal with, could be developed.  |
| <b>PO 4</b> | To explore and deduce quantitative results in the extents of physics.  |
| <b>PO 5</b> | To use contemporary experimental apparatus and analysis tools to acquire, analyse and interpret scientific data in the extents of physics.   |
| <b>PO 6</b> | To communicate scientific results effectively in presentations or posters in the extents of physics to both the scientists and public at large.  |
| <b>PO 7</b> | Utilize acquired ICT skills, physics practical skills, mathematical skills to prepare for employment, for advancement of a career path and also for lifelong learning in Physics.  |

## CREDIT STRUCTURE BSc

| Semester   | Subject 1 |       | Subject 2 | GE/ OE course (Across disciplines) | Vocational and Skill Enhancement Course (VSC) & SEC | Ability Enhancement Course/ VEC/IKS      | OJT/FP/CEP CC, RP | Total Credits |
|--|-----------|-------|-----------|------------------------------------|---|--|-------------------|---------------|
|  | DSC       | DSE   |           |                                    |   |  |                   |               |
| 1  | 4         |       | 4         | 4 (2*2)                            | VSC-2 + SEC -2                                      | AEC- 2 (CSK) + VEC- 2 (Env Sc.) + IKS-2  |                   | 22            |
| 2  | 4         |       | 4         | 4 (2*2)                            | VSC-2 + SEC-2                                       | AEC-2 (CSK)+ VEC-2 (Understanding India) | CC-2              | 22            |
| <b>Total</b>   | <b>8</b>  |       | <b>8</b>  | <b>8</b>                           | <b>8</b>  | <b>10</b>                                | <b>2</b>          | <b>44</b>     |
| Exit option: award of UG certificate in Major with 44 credits and an additional 4 credit Core NSQF course/ Internship or Continue with Major and Minor |           |       |           |                                    |   |  |                   |               |
| 3  | Major 8   |       | Minor 4   | 2                                  | VSC-2   | AEC-2 MIL                                | FP -2, CC-2       | 22            |
| 4  | Major 8   |       | Minor 4   | 2                                  | SEC-2   | AEC-2 MIL                                | CEP-2, CC-2       | 22            |
| <b>Total</b>   | <b>16</b> |       | <b>8</b>  | <b>4</b>                           | <b>4</b>  | <b>4</b>                                 | <b>8</b>          | <b>44</b>     |
| Exit option: award of UG Diploma in Major with 88 credits and an additional 4 credit Core NSQF course/ Internship or Continue with Major and Minor     |           |       |           |                                    |   |  |                   |               |
| 5  | DSC 12    | DSE 4 | Minor 2   |                                    | VSC-2   |  | CEP/FP-2          | 22            |

|              |  |          |            |  |          |  |          |           |
|--------------|--|----------|------------|--|----------|--|----------|-----------|
| 6            | DSC<br>12  | DSE<br>4 | Minor<br>2 |  |          |  | OJT-4    | 22        |
| <b>Total</b> | <b>24</b>  | <b>8</b> | <b>4</b>   |  | <b>2</b> |  | <b>6</b> | <b>44</b> |
|              | Exit option: award of UG Degree in Major with 132 credits or Continue with Major for Honours/ Research |          |            |  |          |  |          |           |

**Course Code:- RUSVSCPHY. E111**

**Course Title: Digital and Analog Electronics**

**Type of Course: Vocational Skill Course**

**Academic year 2024-25**

**COURSE OUTCOMES:**

| <b>COURSE OUTCOME</b> | <b>DESCRIPTION</b>  |
|-----------------------|---|
|                       | <b>A student completing this course will be able to:</b>  |
| <b>CO 1</b>           | Understand the basic concepts of electrical circuit theorems, its applications at various levels and basic concepts of working of alternating current circuits. |
| <b>CO 2</b>           | Understand the working of electronic equipment -rectifier   |
| <b>CO 3</b>           | Understand the conversion from among various number system viz decimal, Binary and hexadecimal and difference between digital and analog system.                |
| <b>CO 4</b>           | Understand the working of digital electronic equipment such digital sensors and adder using logic gates etc.  |
| <b>CO 5</b>           | Able to understand the construction and working of bipolar transistor.  |
| <b>CO 6</b>           | Designing for the desired biasing of the transistor and Demonstration qualitative problem-solving skills in the topics covered                                  |

## DETAILED SYLLABUS

| Course Code     | Unit     | Title   | Credits/ Hours  |
|-----------------|----------|---|-----------------|
| RUSVSCPHY. E111 |          | <b>Digital and Analog Electronics</b>   | <b>1 credit</b> |
| Unit I          | <b>I</b> | <b>Digital and Analog Electronics</b>   | <b>15 Hours</b> |
|                 |          | Review - Logic Gates-AND,OR,NOT,NOR,NAND,EX-OR<br>Implementation of basic gates using NAND & NOR gates and their applications<br>VKM: 28.8 to 28.14, 28.19, LMS: 6.7<br>binary addition and subtraction Half Adder, Full adder<br>Decimal, binary, hexadecimal number system and their mutual conversions.<br><b>LMS</b> -5.2 to 5.5, 5.7<br>Transistor as an amplifier: Definition of gain $\alpha$ , $\beta$ (dc & ac gains) and relation between them.<br>CE amplifier: operation, dc and ac-Load line Analysis, operating point, cut off and saturation points<br><b>VKM</b> : 11.7 to 11.17, 11.21<br>Operational Amplifiers: Introduction, Schematic symbol of OPAMP, Output voltage from OPAMP, Inverting Amplifier, Non-Inverting Amplifier, Voltage Follower <b>MM</b> |                 |

### References:

1. Digital Principles and Applications – Leach & Malvino Goutam Saha(**LM**)(13<sup>th</sup> ed
2. Principles of Electronics – V. K. Mehta & Rohit Mehta (**VKM**)
3. Principles of Electronics – V. K. Mehta and Rohit Mehta. (S. Chand – Multi-colored illustrative edition) (**MM**)

### Additional References:

1. Digital Principles and Applications by Leach & Malvino
2. Digital Electronics by Tolkheim

## Practical

**Course Code: RUSVSCPHYP. E111**

| Sr. No.           | Regular Experiments   |
|-------------------|---|
| 1.                | Common emitter transistor (NPN) amplifier                         |
| 2.                | Bridge Rectifier – Load Regulation                                |
| 3.                | Zener diode as Regulator  |
| 4.                | NAND & NOR gate   |
| 5.                | EX-OR gate, Half Adder & Full Adder                               |
| 6.                | NAND/NOR gates as Universal Building Blocks                       |
| Skill Experiments |   |
| 1.                | Use of Cathode Ray Oscilloscope (or Digital Storage Oscilloscope) |
| 2.                | Charging -Discharging of a Capacitor                              |
| 3.                | Light Dependent Switch  |

- **Any one out of the following activity is equivalent to two experiments.**
  1. Student doing **mini-project** up to the satisfaction of the Professor or In-Charge of the Practical.
  2. Study Tour: Students participated in study tour must submit a **study tour report**.
- **Regular 5experiments out of 6 experiments and 2 Demonstration out of 3 experiments** from the list should be completed in the first semester and reported in the Journal for final practical examination.
- **Certified Journal is a MUST** for a candidate to be eligible in the **end semester practical examination**.

For **External practical examination**, student will be **examined in 1 regular experiment**.

### **Modality of Assessment: Vocational Skill Course (1 Credit Theory Course for BSc)**

#### **A) Internal Assessment- 40%- 10 Marks**

| Sr No | Evaluation type   | Marks     |
|-------|-------------------|-----------|
| 1     | <b>Class Test</b> | 10        |
|       | <b>TOTAL</b>      | <b>10</b> |

**B) External Examination (Semester End)- 60%- 15 Marks****Semester End Theory Examination:**

1. Duration – The duration for these examinations shall be of **45 Minutes**.
2. Theory question paper pattern:

**Paper Pattern:**

| Question | Options      | Marks     | Questions Based on             |
|----------|--------------|-----------|--------------------------------|
| 1        | Class Test   | 15        | Digital and Analog Electronics |
|          | <b>TOTAL</b> | <b>15</b> |                                |

**Modality of Assessment: Vocational Skill Course (1 Credit Practical course)****Practical Examination Pattern: Total Marks 50****A. Internal Examination: 40%- 20 Marks**

| Question | Options         | Marks |
|----------|-----------------|-------|
| 1        | Journal         | 10    |
| 2        | Class test      | 10    |
|          | Total (= 1 + 2) | 20    |

**B. External Examination: 60%- 30 Marks****Semester End Practical Examination:****C) External Examination (Semester End)- 30 Marks****Semester End Practical Examination:**

1. Duration – The duration for these examinations shall be of **90 minutes**.
2. Practical question paper pattern:

**Paper Pattern:**

| Question | Options         | Marks |
|----------|-----------------|-------|
| 1        | Laboratory work | 25    |
| 2        | Viva            | 5     |
|          | Total (= 1 + 2) | 30    |