Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
CHHATRAPATI SAMBHAJINAGAR.

CIRCULAR NO.SU/ Sci./College/NEP-2020/104/2024

It is hereby inform to all concerned that, In continuation circular No.SU./Revised B.Sc./NEP/72/2024/25588-96 dated 29.04.2024, the revised syllabi prepared by the Board of Studies/Ad-hoc Boards and recommended by the Dean, Faculty of Science & Technolgy, the Academic Council at its meeting held on 08 April 2024 has accepted **the following Revised B.Sc. Course Structure & Curriculum** as per direction by the State Government dated on 13 March 2024 under the Faculty of Science & Technology (as per National Education Policy – 2020) run at the Affiliated Colleges, Dr.Babasaheb Ambedkar Marathwada University as appended herewith.

Sr.No.	Courses	Semester
1	Physics	Ist and IInd semester
2	Instrumentation Practice	Ist and IInd semester
3	Electronics	Ist and IInd semester
4	Mathematics	Ist and IInd semester
5	Industrial Chemistry	Ist and IInd semester
6	Agrochemical Fertilizer	Ist and IInd semester
7	Horticulture	Ist and IInd semester
8	Biochemistry	Ist and IInd semester
9	Botany	Ist and IInd semester
10	Zoology	Ist and IInd semester
11	Biotechnology	Ist and IInd semester
12	bioinformatics	Ist and IInd semester
13	Microbiology	Ist and IInd semester
14	Dairy Science & TEchnology	Ist and IInd semester
15	Statistics	Ist and IInd semester
16	computer Science	Ist and IInd semester
17	Geology	Ist and IInd semester
18	Chemistry	Ist and IInd semester
19	Analytical Chemistry	Ist and IInd semester
20.	Polymer Chemistry	Ist and IInd semester
21.	Environmental Science	Ist and IInd semester
22.	Fishery Science	Ist and IInd semester

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This is effective from the Academic Year 2024-25 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Chhatrapati Sambhajinagar
-431 004.
REF.NO. SU/SCI./2024/27128-35
Date:-27.05.2024.

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Deputy Registrar,
Academic Section.

Copy forwarded with compliments to :-

1] **The Principal of all concerned Colleges,**
Dr. Babasaheb Ambedkar Marathwada University,

2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

Copy to :-

1] The Director, Board of Examinations & Evaluation, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajinagar.

2] The Section Officer,[B.Sc.Unit] Examination Branch, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajinagar.

3] The Programmer [Computer Unit-1] Examinations, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

4] The Programmer [Computer Unit-2] Examinations, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajinagar.

5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajinagar.

6] The Public Relation Officer, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

7] The Record Keeper, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
CHHATRAPATI SAMBHAJINAGAR- 431004 (M. S.), INDIA

FACULTY OF SCIENCE AND TECHNOLOGY

B. Sc. Degree Programme

[3 Years/4 Years (Honors)/4 Years (Honors with Research)]

As Per

National Education Policy-2020

Revised

Course Structure and Curriculum

(As per NEP-2020)

Subject (Major): Instrumentation Practice

For

B. Sc. First Year

(Semester-I and II)

Effective from Academic Yea: 2024-25

30/3/2024

PREFACE

As we stand on the threshold of a new era in education, the dawn of the National Education Policy 2020 illuminates our path toward a holistic, inclusive, and progressive educational landscape. The Bachelor of Science (B. Sc.) curriculum outlined herein reflects the ethos and aspirations of this transformative policy, aiming to equip learners with the knowledge, skills, and values necessary to thrive in the dynamic world of the 21st century.

At its core, the National Education Policy 2020 envisions an educational framework that is learner-centric, multidisciplinary, and geared towards fostering creativity, critical thinking, and innovation. It emphasizes the integration of knowledge across disciplines, breaking down traditional silos to encourage holistic understanding and application of concepts. The Bachelor of Science (B. Sc.) curriculum embodies these principles by offering a diverse array of courses spanning various scientific domains, while also incorporating interdisciplinary studies to nurture well-rounded graduates capable of addressing complex challenges with agility and insight.

Furthermore, the curriculum is designed to promote experiential learning, research, and hands-on exploration, recognizing the importance of practical engagement in deepening understanding and cultivating real-world skills. Through laboratory work, field experiences, internships, and project-based learning opportunities, students will have the chance to apply theoretical knowledge in practical settings, develop problem-solving abilities, and cultivate a spirit of inquiry and discovery.

Integral to the National Education Policy 2020 is the commitment to inclusivity, equity, and access to quality education for all. The Bachelor of Science (B. Sc.) curriculum reflects this commitment by embracing diversity in perspectives, backgrounds, and experiences, and by fostering an inclusive learning environment where every student feels valued, supported, and empowered to succeed.

Moreover, the curriculum emphasizes the cultivation of ethical values, social responsibility, and global citizenship, instilling in students a sense of accountability towards society and the environment. By integrating courses on ethics, sustainability, and social sciences, the Bachelor of Science (B. Sc.) program aims to produce graduates who are not only proficient in their respective fields but also compassionate, ethical leaders committed to making a positive impact on the world.

As we embark on this journey of educational transformation guided by the National Education Policy 2020, the Bachelor of Science (B. Sc.) curriculum stands as a testament to our collective vision of a more equitable, inclusive, and enlightened society. It is our hope that through rigorous academics, innovative pedagogy, and unwavering dedication to excellence, we can inspire the next generation of scientists, scholars, and change-makers to realize their full potential and contribute meaningfully to the advancement of knowledge and the betterment of humanity.

INTRODUCTION TO UNDERGRADUATE DEGREE COURSE IN IP

As per the recommendations of the NEP-2020, the undergraduate degree course in IP is a six/ eight semester course spread over three/ four academic years. The teaching –

Learning process is student-centric, and it involves both theory and practical components. It offers a flexibility of programme structure while ensuring that the student gets a strong foundation in the subject and gains in-depth knowledge. Besides the Discipline Specific Core (DSC) courses, a student can opt courses from the syllabus comprising of Discipline Specific Electives (DSEs), Generic Electives (GEs), Skill Enhancement Courses (SECs), Ability Enhancement courses (AECs) and Value Addition Courses (VACs). Thereby, bringing out the multidisciplinary approach and adherence to innovative ways within the curriculum framework. Moreover, it allows a student maximum flexibility in pursuing his/her studies at the undergraduate level to the extent of having the liberty to eventually design the degree with multiple exit options depending upon the needs and aspirations of the student in terms of his/her goals of life, without compromising on the teaching learning, both in qualitative and quantitative terms. This will suit the present day needs of students in terms of securing their paths towards higher studies or employment.

Courses of Study:

Courses of the study indicate pursuance of study in a particular discipline. Every discipline shall offer four categories of courses of study, viz. Discipline Specific Core (DSC) courses, Discipline Specific Electives (DSEs), Skill Enhancement Courses (SECs) and Generic Electives (GEs). Besides these four courses, a student will select Ability Enhancement Courses (AECs) and Value-Added Courses (VACs) from the respective pool of courses offered by the University.

a) **Discipline Specific Core (DSC):** Discipline Specific Core is a course of study, which should be pursued by a student as a mandatory requirement of his/ her programme of study. In Bachelor of Science (Hons.) Physics programme, DSCs are the core credit courses of Physics which will be appropriately graded and arranged across the semesters of study, being undertaken by the student, with multiple exit options as per NEP 2020.

b) **Discipline Specific Elective (DSE):** The Discipline Specific Electives (DSEs) are a pool of credit courses of Physics from which a student will choose to study based on his/ her interest.

c) **Generic Elective (GE):** Generic Electives is a pool of courses offered by various disciplines of study (excluding the GEs offered by the parent discipline) which is meant to provide multidisciplinary or interdisciplinary education to students. In case a student opts for DSEs beyond his/ her discipline specific course(s) of study, such DSEs shall be treated as GEs for that student.

d) **Ability Enhancement course (AEC), Skill Enhancement Course (SEC) and Value Addition Course (VAC):** These three courses are a pool of courses offered by all the Departments in groups of odd and even semesters from which a student can choose.

i) **AEC:** AEC courses are the courses based upon the content that leads to knowledge enhancement through various areas of study. They are based on Language and Literature, and Environmental Science which are mandatory for all disciplines.

ii) **SEC:** SECs are skill-based courses in all disciplines and are aimed at providing hands-on training, competencies, proficiency and skills to students. SEC courses may be chosen from a pool of courses designed to provide skill-based instruction.

iii) **VAC:** VACs are common pool of courses offered by different disciplines and aimed towards personality building, embedding ethical, cultural and constitutional values; promote critical thinking, Indian knowledge systems, scientific temperament, communication skills, creative writing, presentation skills, sports and physical education and teamwork which will help in all round development of students.

Structure of B. Sc. (Three/Four Years Honours/Honours with Research Degree) Programme with Multiple Entry and Exit Options

B. Sc. First Year: 1st Semester **Subject (Major): Instrumentation Practice**

Course Type	Course Code	Course Name	Teaching Scheme (Hrs/Week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major (Core) M1 Mandatory: **IP**	DSC-1	Basics of Instrumentation	2	---	2	---	2+2=4
	DSC-2	Practicals Based on DSC-1	---	4	---	2	
Major (Core) M2 Mandatory:	DSC-1	----	2	---	2	---	2+2=4
	DSC-2	Practicals Based on DSC-1	---	4	---	2	
Major (Core) M3 Mandatory:	DSC-1	----	2	---	2	---	2+2=4
	DSC-2	Practicals Based on DSC-1	---	4	---	2	
Generic / Open Elective (GE/OE) (Choose any one from pool of courses) It should be chosen from the faculty other than that of Major	GE/OE - 1	To be chosen from other faculty	2	---	2	---	2
SEC (Skill Enhancement Course) (Choose any one from SEC- 1 and accordingly Choose relevant practical paper from SEC - 2)	SEC-1	1) Measuring Devices 2) Electronic Measurements	1	---	1	---	2
	SEC-2	1) Practicals Based on SEC – 1 (Measuring Devices) 2) Practicals Based on SEC – 1 (Electronic Measurements)	---	2	---	1	
AEC, VEC, IKS	AEC-1	English (Common for all faculty)	2	---	2	---	2+2=4
	IKS-1	Choose any one from pool of Courses	2	---	2	---	
OJT/ FP/CEP/CC/RP	CC-1	Health and Wellness (Common for all faculty)	---	4	---	2	2
			13	**18**	**13**	**09**	**22**

GE/OE-1: Artificial Intelligence (This course will be available for the students from other faculty)

Structure of B. Sc. (Three/Four Years Honours/Honours with Research Degree) Programme with Multiple Entry and Exit Options

B. Sc. First Year: 2nd Semester **Subject (Major): Instrumentation Practice**

Course Type	Course Code	Course Name	Teaching Scheme (Hrs/Week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major (Core) M1 Mandatory: IP	DSC- 3	Electronic Measurements & Instrumentation	2	---	2	---	2+2=4
	DSC- 4	Practicals Based on DSC-3	---	4	---	2	
Major (Core) M2 Mandatory:	DSC- 3	---	2	---	2	---	2+2=4
	DSC- 4	Practicals Based on DSC-3	---	4	---	2	
Major (Core) M3 Mandatory:	DSC- 3	---	2	---	2	---	2+2=4
	DSC- 4	Practicals Based on DSC-3	---	4	---	2	
Generic / Open Elective (GE/OE) (Choose any one from pool of courses) It should be chosen from the faculty other than that of Major	GE/OE - 2	To be Chosen from other Faculty	2	---	2	---	2
VSC (Vocational Skill Courses) (Choose any one from VSC - 1 and accordingly choose relevant practical paper from VSC - 2)	VSC- 1	1) Computer Assembling 2) Wireless Communication Devices	1	---	1	---	2
	VSC- 2	1) Practicals Based on VSC – 1 (Computer Assembling) 2) Practicals Based on VSC – 1 (Wireless Communications Devices)	---	2	---	1	
AEC, VEC, IKS	AEC- 2	English (Common for all faculty)	2	---	2	---	2+2=4
	VEC- 1	Constitution of India (Common for all the faculty)	2	---	2	---	
OJT/ FP/CEP/CC/RP	CC- 2	Yoga Education / Sports and Fitness (Common for all the faculty)	---	4	---	2	2
			13	**18**	**13**	**09**	**22**

Exit Option: Award of UG Certificate in 3 Majors with 44 credits and an additional 4 credits of core NSQF course/ Internship OR continue with Major and Minor

GE/OE-2: Semiconductor Devices (This course will be available for the students from other faculty)

Students will have to choose any three subjects as **Major 1, Major 2, Major 3,** from Basket 1 under the **Faculty of Science and Technology**.

Students will be having three subject options of equal credits (instead of Major and / or minor verticals) in the first year. Students will have to select / declare choice of one subject **as a major subject** in the beginning of second year **out of three major options M1, M2 and M3 (which were opted in the first year).**

Detailed Illustration of Courses included in 1st and 2nd semester:

1) **Major** (Core) subject are mandatory.

   DSC-1: This is a 2 credit theory course corresponding to Major (core) subject
   DSC-2: This is a 2 credit practical course based on DSC-1
   DSC-3: This is a 2 credit theory course corresponding to Major (core) subject
   DSC-4: This is a 2 credit practical course based on DSC-3

2) **Generic / Open Elective (GE/OE)**: (Needs to be chosen (any two) from pool of courses available at respective college). **These courses should be chosen compulsorily from faculty other than that of Major.**

   GE/OE -1: This is a 2 credit theory course should be chosen compulsorily from faculty other than that of Major.
   GE/OE -2: This is a 2 credit theory course should be chosen compulsorily from faculty other than that of Major.

3) **SEC** (Skill Enhancement Courses): Choose any one from pool of courses. These courses needs to be designed to enhance the technical skills of the students in specific area.

   SEC-1: This is a 1 credit theory course to enhance the technical skills of the students in specific area.
   SEC-2: This is a 1 credit practical course based on SEC-1.

4) **VSC** (Vocational Skill Courses) : Choose any one from pool of courses. These courses should be based on Hands on Training corresponding to Major (core) subject.

   VSC-1: This is a 1 credit theory course based Hands on Training corresponding to Major (core) subject.
   VSC-2: This is a 1 credit practical course based on VSC-1.

5) **AEC** (Ability Enhancement courses): The focus of these courses should be based on linguistic and communication skills. In first semester it will be English and will be common for all the faculty.

AEC-1: English

This is a 2 credit theory course based on linguistic proficiency. It will be common for all the faculty.

AEC-2: English

This is a 2 credit theory course based on linguistic proficiency. It will be common for all the faculty.

6) **IKS** (Indian Knowledge System) : The courses related to traditional and ancient culture of India will be included in this section. The respective college will have to choose one of the courses from the pool of courses designed by the University.

IKS-1: To be chosen from the pool of courses designed by the University

This is a 2 credit theory course based on Indian Knowledge System. It will be common for all the faculty.

7) **VEC** (Value Education Courses): The courses such as understanding India, Environmental Science / Education, Digital and Technological solutions etc will be part of Value Education Courses.

VEC-1: Constitution of India

This is a 2 credit theory course based on value education. It will be common for all the faculty.

8) **CC** (Curricular Courses): The courses such as Health and wellness, Yoga education, Sports and Fitness, Cultural activities, NSS/NCC, Preforming Arts.

CC-1: Health and Wellness

This is a 2 credit practical course based on Co-curricular activities. It will be common for all the faculty.

CC-2: Yoga education / Sports and Fitness

This is a 2 credit practical course based on Co-curricular activities. It will be common for all the faculty.

General Guidelines for Course Selection

1) The Major subject is the discipline or course of main focus, bachelor's degree shall be awarded in that discipline / subject.
2) Students will have to choose any three subjects as a Major 1, Major 2, Major 3, from **Basket 1** under the Faculty of Science and Technology.
3) Students will be having three subject options of equal credits (instead of Major and / or minor verticals) in the first year.
4) In the beginning of second year, students will have to select / declare choice of **one major subject** and **one minor subject** from three major options **M1, M2 and M3 (which were opted in the first year).**
5) Once the students finalize their **Major Subject** and **Minor Subject** in the beginning of the second year of the programme, they shall pursue their further education in that particular subject as their **Major and Minor** subjects. Therefore, from second year onwards curriculum of the Major and Minor subjects shall be different.
6) Students are required to select **Minor subject** from **other discipline of the same faculty**.
7) Students are required to select **Generic /Open Elective** (vertical 3 in the credit framework)

   compulsorily from the faculty different than that of their Major / Minor subjects.
8) Vocational Skill Courses and Skill Enhancement Courses (VSC and SEC) shall be related to the Major subject.
9) Curriculum of Ability Enhancement Courses (AEC), Value Education Courses (VEC), Indian Knowledge System (IKS), and Co-curricular Courses (CC) will be provided by the University separately.

Programme Educational Objectives (PEOs):

Programme Educational Objectives (PEOs) for the Bachelor of Science Curriculum under the National Education Policy 2020:

1. **Mastery of Discipline-Specific Knowledge**: Graduates of the Bachelor of Science program will demonstrate a deep understanding of fundamental principles, theories, and methodologies in their chosen scientific discipline, enabling them to analyze complex problems, propose innovative solutions, and contribute to advancements in their field.

2. **Interdisciplinary Proficiency**: Graduates will possess the ability to integrate knowledge and skills from multiple scientific disciplines, fostering a holistic approach to problem-solving and innovation. They will be equipped to address multifaceted challenges by drawing upon diverse perspectives and methodologies.

3. **Critical Thinking and Analytical Skills:** Graduates will develop strong critical thinking abilities, enabling them to evaluate information rigorously, analyze data effectively, and make informed decisions based on evidence. They will demonstrate proficiency in applying logical reasoning and scientific methods to solve problems and generate new knowledge.

4. **Leadership and Innovation:** Graduates will demonstrate leadership qualities and entrepreneurial mindset, capable of initiating and driving positive change in their organizations and communities. They will exhibit creativity, resilience, and adaptability, harnessing innovation to address complex challenges and seize opportunities for growth and advancement.

5. **Global Citizenship and Cultural Sensitivity**: Graduates will possess a global perspective and cultural sensitivity, recognizing the interconnectedness of diverse communities and the importance of collaboration across borders. They will engage in cross-cultural dialogue, embrace diversity, and contribute to the advancement of knowledge and understanding on a global scale.

These Programme Educational Objectives serve as guiding principles for the Bachelor of Science curriculum, reflecting our commitment to nurturing well-rounded graduates who are prepared to excel in their careers, contribute to society, and lead meaningful lives in a rapidly changing world.

Programme Outcomes (POs):

The National Education Policy (NEP) 2020 for India emphasizes several key aspects for Bachelor of Science (B.Sc.) programs, aiming to produce graduates who are not only well-versed in their respective disciplines but also equipped with skills necessary for holistic development and employability. While specific program outcomes may vary between institutions and disciplines within B.Sc. programs, here are some common outcomes aligned with NEP 2020:

- **PO1. The citizenship and society:** Apply broad understanding of ethical and professional skill in science subjects in the context of global, economic, environmental and societal realities while encompassing relevant contemporary issues.
- **PO2. Environment and sustainability**: Apply broad understanding of impact of science subjects in a global, economic, environmental and societal context and demonstrate the knowledge of, and need for sustainable development.
- **PO3. Ethics:** Apply ability to develop sustainable practical solutions for science subject related problems within positive professional and ethical boundaries.
- **PO4. Individual and teamwork:** Function effectively as a leader and as well as team member in diverse/ multidisciplinary environments.
- **PO5. Communication:** Communicate effectively on complex science subject related activities with the scientific community in particular and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **PO6. Project management and finance**: Demonstrate knowledge and understanding of the first principles of science and apply these to one's own work as a member and leader in a team, to complete project in any environment.
- **PO7. Life-long learning**: Recognize the need for lifelong learning and have the ability to engage in independent and life-long learning in the broadest context of technological change.

These program outcomes align with the broader goals of NEP 2020 to transform higher education in India and prepare students for the challenges and opportunities of the 21st century. Board of Studies designing B.Sc. curricula are encouraged to incorporate these outcomes into their program objectives and learning outcomes.

Programme Specific Outcomes (PSOs):

PSO1. **Domain knowledge:** Apply the knowledge of Instrumentation Practice fundamental, and advanced areas of Instrumentation Practice to provide comprehensive solution of problems in complex Instrumentation Practice.

PSO2. **Problem Analysis:** Identify Instrumentation Practice related problems at varied complexity and analyze the same to formulate/ develop substantiated conclusion using first principles of Instrumentation Practice

PSO3. **Design Development of solutions:** Design/ develop solutions for problems at varied complexity in various areas of Instrumentation Practice to address changing challenges put forward by market demand/ stakeholder

PSO4. **Conduct Investigation of complex problems:** Use established knowledge and methods to design of experiments, analyze resulting data and interpret the same to provide valid conclusions.

PSO5. **Modern tools:** Create, select, and apply appropriate techniques, resources, and modern Instrumentation Practice and relevant IT tools including prediction and modeling to complex Instrumentation Practice technology related activities with clear understanding of the limitations.

SEMESTER-I

DSC- 1: Basics of Instrumentation

Total Contact Hours: 30 **Credits: 02** **Max. Marks: 50**

Learning Objective of the Course:

i. Study Atoms, Structure of Elements, free electrons, AC & DC Source
ii. Understand Ohm's law and types of fixed resistors
iii. To understand the Kirchhoff's law
iv. Study of Loop current's sign conventions

Course Outcomes (COs):

After Completion of the course, students will be able to -

i. Understand basics of electrons and various terms in electronics.
ii. Understand the basic elements of electrical circuits.
iii. Understand fundamental laws in electricity.
iv. Solve the simple electrical circuits.

Module No.	Topics / Actual contents of the syllabus	Contact Hours
I	**Atoms and Charges:** Introduction, structure of Elements (The Electron, Energy of electron, valance electron, free electrons), conductors and Insulators, electric Current, electric voltage and voltage sources (Dc Source, AC source, Constant voltage source, constant current source)	**10**
II	**Ohm's law:** Introduction, Ohm's law, resistors, colour coding of resistors, types of fixed resistors, variable resistors, combination of resistors, series resistances, Parallel resistances.	**10**
III	**Kirchhoff's Laws:** Introduction, Kirchhoff's voltage law, Loops, Loop current's sign conventions, Kirchhoff's voltage law in action, Kirchhoff's current law, Nodes, Kirchhoff current law in action.	**10**

Reference Books:

1. Delton T. Horn, Basic Electricity and Electronics:, McGrawHill
2. V.K. Mehta and Rohit Mehta, Principles of Electronics:, Publication : S. Chand

DSC-2: Practicals Based on DSC-1
(Basics of Instrumentation)

Total Contact Hours: 60 **Credits: 02** **Max. Marks: 50**

Learning Objectives of the Course:

i Understand Zener diode.
ii Demonstrate the Ohm's law.
iii Understand the concepts of Color code

Course Outcomes (Cos): After completion of the course, students will be able to -

i Understand Kirchhoff's Laws.
ii Recognize different color codes.
iii Acquire deep knowledge of AC, DC meters

List of Experiments

1. Study of resistance using color code and finding their values when they are in series and in parallel.
2. Characteristics of Zener Diode.
3. Characteristics of Displays.
4. Study of capacitors in series and in parallel.
5. Characteristics of Rectifier Diode.
6. Study of Kirchhoff's voltage law.
7. Study of Kirchhoff's current law.
7. Study of DC meters.
8. Study of AC meters.
9. Study of analog and digital multimeters.
10. Study the dependence of potential difference (V) across a resistor on the current (I) passing through it and determine its resistance. (Ohm's Low)
11. To verify the Ohm's Law for a given conductor and to determine the resistance of a given conductor by using the I-V characteristics.

Note Students should perform at least six experiment

SEC-1: Measuring Devices

Total Contact Hours: 15 **Credit: 01** **Max. Marks: 50**

Learning Objective of the Course:

i. Acquire proficiency in designing, assembling analog electrochemical system.
ii. Explore real-world applications of analog electromechanical instruments across industries.
iii. Understand the fundamental principles of electromechanical system.

Course Outcomes (COs): After completion of the course, students will be able to -

i. Evaluate the performance and effectiveness of analog electromechanical systems.
ii. Develop the practical skills in assembling, testing analog electromechanical instruments.
iii. Apply theoretical knowledge to calibrate and maintain analog and digital meters effectively.

Module No.	Topics/Actual contents of the syllabus	Contact Hours
I	**Analog electromechanical instruments** Introduction, classification, functions of instruments, electrical instruments, measurement accuracy and error analysis.	05
II	**Analog and Digital meters** Galvanometer, types of Galvanometer, Voltmeter, Ammeter, Analog multimeters, Digital panel meters (DPM), Digital Multimeters (DMM) and their types, features, and specifications. Measurement of voltage, current, resistance, and continuity, applications of millimeters in circuit testing and troubleshooting, LCR meter, Q-meter Potentiometer, D.C. potentiometer and their applications, A.C. potentiometer and their applications. Wattmeters, dynamometer wattmeter, induction wattmeter, electrostatic wattmeter, thermal wattmeter.	10

Learning Resources:

1. Principles of Electronics: V.K. Mehta and Rohit Mehta, Publication : S. Chand

SEC- 1: Electronic Measurements

Total Contact Hours: 15 **Credit: 01** **Max. Marks: 50**

Learning Objective of the Course:

i. Gain practical experience in designing and conducting electronic measurement experiments.
ii. Explore advanced topics in electronic measurements.
iii. Learn to analyze and interpret measurement data obtained from electronic instruments.

Course Outcomes (COs): After completion of the course, students will be able to -

i. Interpret and analyze measurement data accurately.
ii. Explore advanced measurement techniques.
iii. Communicate findings through reports and presentations.

Module No.	Topics /Actual contents of the syllabus	Contact Hours
I	**Resistance** Introduction, measurement of resistance, classification of resistance, different methods of resistance measurements. Measurement of insulation resistance when power is ON, measurement of Earth resistance,	**10**
II	**Inductance** Introduction, measurement of Inductance, A.C. Bridge, Maxwell bridge, Hay bridge, Anderson bridge, Owen bridge,	**05**

Learning Resources:

1. Electrical and electronic measurements and instrumentation – R. K. Rajput

SEC- 2: Practical Based on SEC-1
(Measuring Devices)

Total Contact Hours: 30 **Credit: 01** **Max. Marks: 50**

Learning objectives of the course:

i. Measure resistance accurately.
ii. Understand resistance and its role in circuits.
iii. Apply knowledge to analyze and design circuits.

Course Outcomes (COs): After completion of the course, students will be able to –

i. Grasp fundamentals of resistance and pd concepts.
ii. Understand galvanometer principles and its role.
iii. Demonstrate proficiency in practical applications through laboratory experiments.

1. To determine resistance per unit length of a given wire by plotting a graph of potential difference versus current.
2. To determine the resistance of a galvanometer by half-deflection method and to find it's figure of merit.
3. To determine the internal resistance of a given primary cell using a potentiometer.
4. To compare the emf of two given primary cells (Daniel and Leclanche cells) using a potentiometer.

Note Students should perform at least Three experiments.

SEC-2: Practical Based on SEC-1
(Electronic Measurements)

Total Contact Hours: 30 **Credit: 01** **Max. Marks: 50**

Learning Objective of the Course:

i. Determine key parameters of transformers.
ii. Analyze circuits containing resistors connected in series and parallel circuits.
iii. Understand fundamental principles of capacitors and their behavior in circuits.

Course Outcomes (COs): After completion of the course, students will be able to -

i. Calculate total resistance and capacitance in series and parallel circuits accurately.
ii. Determine transformer parameters.
iii. Apply knowledge to design circuits with capacitors, resistors and transformers for specific applications.

1. Identification of components and their values
   I. Resistor and their types
   II. Capacitor and their types
   III. Inductor
   IV. Transformers
   V. Connectors
2. Measuring the values of components using colour code or values marked on it
3. To measure value of resistors in series and parallel
4. Value of capacitors in series and parallel

Note Students should perform at least Three experiments.

GE/OE- 2: Artificial Intelligence

Total Contact Hours: 30 **Credits: 02** **Max. Marks: 50**

Learning Objectives of the Course:

i. Machine learning and pattern recognition.
ii. Deep learning in Instrumentation and measurements.
iii. Autonomous learning and adaptation.

Course Outcomes (COs):

After completion of the course, students will be able to –

i. Understanding of ethical considerations and implications in AI developments.
ii. Skills in optimizing AI models for performance and efficiency.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Basics of AI** What is AI, how does AI works, Goals of AI, Types of AI: rule based, decision tree, neural network;	**10**
II	**Subfield of AI** Subfield of AI: Machine Learning, Deep learning, Natural learning process; Applications of AI, Drawbacks of AI.	**10**
III	**Applied AI in Instrumentation and Measurement** Deep learning basics, Uncertainty in deep learning, Deep learning in Instrumentation & Measurement: CNN (convolutional neural netork), RNN (Recurrent neural network), Autoencoder.	**10**

Learning Resources:

1. www.gurugg.com/artificial-intellegence-tutorial.html
2. www.ibm.com/design/ai/basics/ai
3. https://ieee-ims.org/sites/ieeeims/files/2021-01/Deep%20Learning%20Topical%20Guide.pdf

SEMESTER-II

DSC- 3: Electronic Measurements & Instrumentation

Total Contact Hours: 30 **Credits: 02** **Max. Marks: 50**

Learning Objective of the Course:

i. Study Bridge circuits, DC-Wheatstone Bridge, Kelvin Bridge
ii. Understand Fundamental Concept of Bridges Circuit
iii. To understand the Electronic multimeter
iv. Study of Digital Voltmeters

Course Outcomes (COs):

After Completion of the course, Students will be able to -

i. Understand basics of electrons and various terms in electronics.
ii. Understand the basic elements of electrical circuits.
iii. Understand fundamental laws in electricity.
iv. Solve the simple electrical circuits.

Module No.	Topics / Actual contents of the syllabus	Contact Hours
I	**Bridge Circuits:** Fundamental Concept of Bridges Circuit, Types of Bridges, DC-Wheatstone Bridge (Construction, Working, & Usages, Balance state, Sensitivity, Thevenin Voltage & thevenin Resistance) Kelvin Bridge (Construction, Working, & Usages) Bridges in the Null condition, DC bridge applications, DC Null Indicators.	10
II	**AC Bridges:** Types of AC Bridges, Maxwell's Bridge, The Hay's Bridge, The Schering Bridge.	10
III	**Electronic Multimeters**: Basic Electronic multimeter, AC multimeters, Electronic Ohm-meters, Digital Voltmeters (RMS, True RMS, AC & DC)	10

Reference Books:

1. Elements of Electronic Instrumentation and Measurements Joseph J. Carr Pearson Education Ill edition.
2. Electronic Measurements & Instrumentation, Dr. R. S. Sedha, Publication : S. Chand

DSC- 4: Practicals Based on DSC-3
(Electronic Measurements & Instrumentation)

Total Contact Hours: 60 **Credits: 02** **Max. Marks: 50**

Learning Objective of the Course:

i. Differentiate PNP and NPN transistors.
ii. Explore photovoltaic cells and their conversion of light energy into electricity.
iii. Understand potentiometers as voltage dividers and control elements.

Course Outcomes (COs):

After Completion of the course, students will be able to –

i. Understand the role of potentiometer in voltage division and control.
ii. Master the principles and applications of photovoltaic cells.
iii. Analyze transistor behavior in amplification and switching circuits.

List of Experiments

1. Study of Potentiometers.
2. Study of CRT.
3. Characteristics of NPN transistor.
4. Study of photovoltaic cell.
5. Study of Inverting amplifier using IC 741,
6. Study of Whetstone's bridge.
7. Characteristics of PNP transistor.
8. Characteristics of NPN transistor.
9. Measurement of frequencies using C.R.O.
10. To study and perform an experiment to measure the unknown inductance and capacitance by Maxwell's Bridge.
11. To study and perform an experiment to measure the frequency by Wien's bridge.

Note Students should perform at least six experiments.

VSC-1: Wireless Communication Devices

Total Contact Hours: 15 **Credit: 01** **Max. Marks: 50**

Learning Objective of the Course:

i. Design and optimize wireless networks for performance.
ii. Understand wireless communication principles and technologies.
iii. Stay updated in wireless technologies.

Course Outcomes (COs):

After Completion of the course, students will be able to –

i. Understand principles and fundamentals of wireless communication systems.
ii. Evaluate the performance and reliability of wireless devices.
iii. Apply security measures to protect wireless communication systems.

Module No.	Topics / Actual contents of the syllabus	Contact Hours
I	**Basics of Wireless Communication** Introduction, What is wireless communication, Guided and unguided medium, What is electromagnetic wave, Basic elements of wireless communication: transmission path. Channel, reception path; Need of wireless communication, Advantages of wireless communication, Disadvantages of wireless commination.	07
II	**Wireless Technology and Devices** Types of Wireless Data Transmission: Radio Frequency Transmission, Infrared Transmission, Microwave Transmission, Light wave transmission. Types of wireless communication: Satellite, Radio, Cellular, Wifi, Infrared Communication, Radio Frequency, Bluetooth, Microwave. Wireless Devices: Wireless phones, wireless adoptor, wireless repeater, etc. Application Of Wireless communication.	08

Learning Resources:

1. https://www.electronicshub.org/wireless-communication-introduction-types-applications/
2. https://www.atriauniversity.edu.in/types-and-advantages-of-wireless-communication/

VSC-1: Computer Assembling

Total Contact Hours: 15 **Credit: 01** **Max. Marks: 50**

Learning Objective of the Course:

i. Understand the purpose and usage of assembly tools.
ii. Implement proper handling techniques to prevent personal injury.
iii. Demonstrate proficiency in computer disassembly and reassembly.

Course Outcomes (COs):

After Completion of the course, students will be able to –

i. Mastery of essential assembly tools and their applications.
ii. Proficiency in computer disassembly and reassembly procedures.
iii. Utilization of anti-static precautions to protect hardware components.

Module No.	Topics / Actual contents of the syllabus	Contact Hours
I	**Tools and Safety in Computer Assembly** ESD tools, Hand tools, Electronic cutter, Precise Screwdriver, wire stripper, crimper, cleaning tools, Diagnostic tools, Basic safety guidelines,	**10**
II	**Computer Assembly** Introduction, Material required, Steps for connecting all hardware devices.	**05**

Learning Resources:

1. https://www.coursehero.com/file/167048257/keit104pdf/

VSC-2: Practicals Based on VSC-1
(Wireless Communication Devices)

Total Contact Hours: 30 **Credit: 01** **Max. Marks: 50**

Learning Objective of the Course:

i. Explore the broader dimension of rectangular waveguide
ii. Understand cut-off wavelength equation for rectangular waveguide.
iii. Analyze the different modulation techniques in time and frequency domain.

Course Outcomes (COs): After Completion of the course, students will be able to –

i. Demonstrate the safety measures to protect personal injury.
ii. Understand how to apply the theoretical knowledge of wireless communication Devices for performing Practicals.
iii. Familiarity with wireless communication devices such as wi-fi, Ethernet, hots-spot.

List of Experiments

1. To study and analyse different modulation techniques in time and frequency domain using SDR kit.
2. Study rectangular waveguide
3. Find cut-off wavelength equation for rectangular waveguide.
4. Determine experimentally the broader dimension of rectangular waveguide using microwave test bench at X-band of microwave frequency.

Note Students should perform at least Three experiments.

VSC-2: Practicals Based on VSC-1
(Computer Assembling)

Total Contact Hours: 30 **Credit: 01** **Max. Marks: 50**

Learning Objective of the Course:

i. Identify hardware components and their functions
ii. Implement thermal management strategies.
iii. Apply effective cable management techniques.

Course Outcomes (COs): After Completion of the course, students will be able to –

i. Proficiency in CPU installation and their management.
ii. Competence in motherboard installation and cable management.
iii. Understanding compatibility considerations for components.

List of Experiments

1. To Installing the motherboard
2. To Installing the CPU
3. To Installing the RAM
4. To Installing the Video card

Note Students should perform at least Three experiments.

GE/OE-2: Semiconductor Devices

Total Contact Hours: 30 **Credits: 02** **Max. Marks: 50**

Learning Objective of the Course:

- **i.** Understand semiconductor physics principles.
- **ii.** Identify semiconductor materials properties.
- **iii.** Evaluate device performance parameters.

Course Outcomes (COs): After Completion of the course, students will be able to –

- i. Explain device operation.
- ii. Evaluate device performance.
- iii. Explore emerging technologies.

Module No.	Topics / Actual contents of the syllabus	Contact Hours
I	**Silicon Controlled Rectifier (SCR)** Introduction, Definition, Circuit Symbol, SCR Structure, Characteristics of SCR, Advantages of SCR, Disadvantages of SCR, Uses of SCR, Applications of SCR.	**10**
II	**Field effect Transistor (FET)** Introduction, Types of FET i) Junction Field Effect Transistor (JEFT) ii) Metal Oxide Semiconductor Field Effect Transistor (MOSFET) Junction Field Effect Transistor (JEFT) Circuit diagram of JEFT, Schematic Symbol of JEFT, Importance of JEFT, Salient Feature of JEFT, Applications of JEFT.	**10**
III	**Metal Oxide Semiconductor Field Effect Transistor (MOSFET)** Introduction, Types of MOSFET'S i) D-MOSFET ii) E-MOSFET Circuit diagram of MOSFET, Schematic Symbol of MOSFET, Importance of MOSFET, Feature of MOSFET, Applications of MOSFET.	**10**

Learning Resources:

1. Principles of Electronics by V.K. Mehta, S. Chand publication.
2. Electronic Principles - Albert Malvino, David J. Bates, 7th Edition (2016).
3. Basic Electronics - B, Grob, Mitchel E. Schultz, 11th Editio, (2007).

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