



B.Sc. Electronics Syllabus 2024-25

12/07/2024



DEPARTMENT OF PHYSICS,
Government College (A)
RAJAHMUNDRY-AP-533103



Curriculum 2024-25

Version: 1.0

Title of the Program:

B.Sc. (Honours with Research) Electronics

Program Specific Outcomes (PSOs)

PSO 1: Understand basic mechanics and properties of matter.

PSO 2: Illustrate the principles of electricity, magnetism, thermodynamics, optics and spectroscopy.

PSO 3: Identify, formulate and analyze complex problems using basic principles of mathematics, physics and Statistics.

PSO 4: Design, construct and analyze basic electronic and digital circuits.

PSO 5: Understand the basics of programming language and apply it to various numerical problems.

PSO 6: Develop effective communication skills.

PSO 7: To inculcate employability skills through on Job trainings and Internships .

PSO 8: To create the enthusiasm towards research.

CREDIT FRAME WORK

For the Papers offered during I, II, III, IV, V, VI, VII & VIII Semesters

(As Approved in the BOS meeting held on 12th July 2024 for batch 2024-25) COURSE

STRUCTURE

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits		
I	I	1	Essentials and Applications of Mathematical, Physical and Chemical Sciences	3+2	4		
		2	Advances in Mathematical, Physical and Chemical Sciences	3+2	4		
	II	3	FUNDAMENTALS OF ELECTRICITY AND ELECTRONICS		3	3	
			CIRCUIT THEORY AND ELECTRONIC DEVICES		2	1	
		4	Minor (Computer Science)		3	3	
			Practical Course		2	1	
	Community Service Project (CSP)				24	4	
	II	III	5	SEMICONDUCTOR DEVICES AND MATERIALS	3	3	
				Practical Course	2	1	
			6	DIGITAL ELECTRONICS		3	3
Practical Course				2	1		
7			ANALOG ELECTRONICS		3	3	
			Practical Course		2	1	
8			ELECTRONIC COMMUNICATION SYSTEMS		3	3	
			Practical course		2	1	
IV			9	ELECTRICAL AND ELECTRONIC INSTRUMENTATION		3	3
				Practical Course		2	1
			10	MICRO CONTROLLER SYSTEM		3	3
				Practical Course		2	1
11		MICROPROCESSOR SYSTEMS		3	3		
		Practical Course		2	1		
			Minor -1 (Computer Science)		3	3	
			Practical Course		2	1	
		Minor -2 (Computer Science)		3	3		
		Practical Course		2	1		
On Job Training (OJT)				24	4		

B.Sc (Honours) with Single Major																									
Semester	Major* (4 Cr)			Minor (4 Cr)			AECC (3 Cr)			Multi Disney' (2 Cr)			Skill Enhancement Courses (2Cr)			OOTC			Env. Edn (2 Cr)			Total			
	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	
Se m 1	2*	10	8				2	8	6	1	2	2	2	6	4							7	26	20	
Se m 2	2	10	8	1	3+2	4	2	8	6				2	6	4							7	29	22	
Community Service Project of 180 hours with 4 Credits. Student is eligible for Exit Option-1 with the award of Certificate in respective discipline																									
Se m 3	4	12+8	16	1	3+2	4				1	2	2	1	2	2							7	29	24	
Se m 4	3	9+6	12	2	6+4	8				1	2	2	1	2	2							7	29	24	
Short-Term Internship/Apprenticeship/OJT of 180 hours with 4 Credits. Student is eligible for Exit Option-2 with the award of Diploma in respective major with minor																									
Se m 5	4	12+8	16	2	6+4	8													1	2	2	7	32	26	
Se m 6	Semester Internship/Apprenticeship/OJT with 12 Credits. Student is eligible for Exit Option-3 with the award of Degree in respective major with minor																								
	IKS#																								
Se m 7	3	9+6	12										2*	6+4	8	1	2	2	1	2	0	6	29	22	
Se m 8	3	9+6	12										2*	6+4	8	1	2	2	1	2	0	6	29	22	
	21		84	6		24	4		12	3	6	6	#	32	28	2	4	4	2	4	0	47		160	
20 Additional Credits for 10 month mandatory Internship/OJT/Apprenticeship																									
O O T																									
C Courses H Hours C Credits C Open Online Transdisciplinary IKS# Indian Knowledge Systems - Audit Course																									

Government College (Autonomous) Rajahmundry



Curriculum 2024-25

Version: 1.0


COURSES OFFERED IN THE PROGRAM

S.No	SEM	COURSE CODE	COURSE TYPE	TITLE OF THE COURSE	CIA	SEE	Hours / Week			
							L	T	P	C
1	I	124901	MAJOR	Essentials and Applications of Mathematical, Physical and Chemical Sciences	50	50	3	-	2	4
		124902	MAJOR	Advances in Mathematical, Physical and Chemical Sciences	50	50	3	-	2	4
2	II		MAJOR	FUNDAMENTALS OF ELECTRICITY AND ELECTRONICS	50	50	3	-	-	3
				FUNDAMENTALS OF ELECTRICITY AND ELECTRONICS Practical Course	--	50	-	-	2	1
			MAJOR	CIRCUIT THEORY AND ELECTRONIC DEVICES	50	50	3	-	-	3
				CIRCUIT THEORY AND ELECTRONIC DEVICES Practical Course	--	50	-	-	2	1
			MINOR	MINOR (COMPUTER SCIENCE)						
				MINOR PACTICALS		50	-	-	2	1
3	III		MAJOR	SEMICONDUCTOR DEVICES AND MATERIALS	50	50	3	-	-	3
				SEMICONDUCTOR DEVICES AND MATERIALS Practical Course	--	50	-	-	2	1
			MAJOR	DIGITAL ELECTRONICS	50	50	3	-	-	3
				DIGITAL ELECTRONICS Practical Course	--	50	-	-	2	1
			MAJOR	ANALOG ELECTRONICS	50	50	3	-	-	3
				ANALOG ELECTRONICS Practical Course	--	50	-	-	2	1
			MAJOR	ELECTRONIC COMMUNICATION SYSTEMS	50	50	3	-	-	3
				ELECTRONIC COMMUNICATION SYSTEMS Practical course	--	50	-	-	2	1
			MINOR	Minor (Computer Science)	50	50	3	-	-	3

				Minor (Computer Science) Practical course	--	50	-	-	2	1
4	IV		MAJOR	ELECTRICAL AND ELECTRONIC INSTRUMENTATION	50	50	3	-	-	3
				ELECTRICAL AND ELECTRONIC INSTRUMENTATION Practical Course	--	50	-	-	2	1
			MAJOR	MICRO CONTROLLER SYSTEM	50	50	3	-	-	3
				MICRO CONTROLLER SYSTEM Practical Course	--	50	-	-	2	1
			MAJOR	MICROPROCESSOR SYSTEMS	50	50	3	-	-	3
				MICROPROCESSOR SYSTEMS Practical Course	--	50	-	-	2	1
			MINORS	Minor 1 (Computer Science)	50	50	3	-	-	3
				Minor 1 (Computer Science) Practical course	--	50	-	-	2	1
			MINORS	Minor 2 (Computer Science)	50	50	3	-	-	3
				Minor 2 (Computer Science) Practical course	--	50	-	-	2	1

SEM - I

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
I	I	1	Essentials and Applications of Mathematical, Physical and Chemical Sciences	3+2	4
		2	Advances in Mathematical, Physical and Chemical Sciences	3+2	4

	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc., (I SEM)			
Course Code 124901	ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Trigonometric ratios, vector multiplication, Laws of motion, Basics of thermodynamics, kepler's laws, Inverse square law, Periodic table, classification matter	3	0	2	4

Course Objective:

The objective of this course is to provide students with a comprehensive understanding of the essential concepts and applications of mathematical, physical, and chemical sciences. The course aims to develop students' critical thinking, problem-solving, and analytical skills in these areas, enabling them to apply scientific principles to real-world situations.

Learning outcomes:

	On Completion of the course, the students will be able to-	Cognitive Domain
CO1	Apply critical thinking skills to solve complex problems involving complex numbers, trigonometric ratios, vectors, and statistical measures.	Understanding & Application
CO2	To Explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to Connect their knowledge of physics to everyday situations	Application
CO3	To Explain the basic principles and concepts underlying a broad range of fundamental areas of chemistry and to Connect their knowledge of chemistry to daily life.	Understanding, Application
CO4	Understand the interplay and connections between mathematics, physics, and chemistry in various applications. Recognize how mathematical models and physical and chemical principles can be used to explain and predict phenomena in different contexts.	understanding , Application
CO5	To explore the history and evolution of the Internet and to gain an understanding of network security concepts, including threats, vulnerabilities, and countermeasures	Application

SYLLABUS**COURSE 1: ESSENTIALS AND APPLICATIONS OF
MATHEMATICAL, PHYSICAL AND CHEMICAL
SCIENCES****UNIT I: ESSENTIALS OF MATHEMATICS:**

Complex Numbers: Introduction of the new symbol i – General form of a complex number

–Modulus-Amplitude form and conversions

Trigonometric Ratios: Trigonometric Ratios and their relations – Problems on calculation of angles

Vectors: Definition of vector addition – Cartesian form – Scalar and vector product and problems

Statistical Measures: Mean, Median, Mode of a data and problems

UNIT II: ESSENTIALS OF PHYSICS:

Definition and Scope of Physics- Measurements and Units - Motion of objects: Newtonian Mechanics and relativistic mechanics perspective - Laws of Thermodynamics and Significance- Acoustic waves and electromagnetic waves- Electric and Magnetic fields and their interactions- Behavior of atomic and nuclear particles- Wave-particle duality, the uncertainty principle- Theories and understanding of universe

UNIT III: ESSENTIALS OF CHEMISTRY::

Definition and Scope of Chemistry- Importance of Chemistry in daily life -Branches of chemistry and significance- Periodic Table- Electronic Configuration, chemical changes, classification of matter, Biomolecules- carbohydrates, proteins, fats and vitamins.

UNIT IV: APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY:

Applications of Mathematics in Physics & Chemistry: Calculus, Differential Equations & Complex Analysis

Application of Physics in Industry and Technology: Electronics and Semiconductor Industry, Robotics and Automation, Automotive and Aerospace Industries, Quality Control and Instrumentation, Environmental Monitoring and Sustainable Technologies.

Application of Chemistry in Industry and Technology: Chemical Manufacturing, Pharmaceuticals and Drug Discovery, Materials Science, Food and Beverage Industry.

UNIT V: ESSENTIALS OF COMPUTER SCIENCE:

Milestones of computer evolution - Internet, history, Internet Service Providers, Types of Networks, IP, Domain Name Services, applications.

Ethical and social implications: Network and security concepts- Information Assurance Fundamentals, Cryptography-Symmetric and Asymmetric, Malware, Firewalls, Fraud Techniques- Privacy and Data Protection

Recommended books:

1. Functions of one complex variable by John.B.Conway, Springer- Verlag.
2. Elementary Trigonometry by H.S.Hall and S.R.Knight
3. Vector Algebra by A.R.Vasishtha, Krishna Prakashan Media(P)Ltd.
4. Basic Statistics by B.L.Agarwal, New age international Publishers
5. University Physics with Modern Physics by Hugh D. Young and Roger A. Freedman
6. Fundamentals of Physics by David Halliday, Robert Resnick, and Jearl Walker

7. Physics for Scientists and Engineers with Modern Physics" by Raymond A. Serway and John W. Jewett Jr.
8. Physics for Technology and Engineering" by John Bird
9. Chemistry in daily life by Kirpal Singh
10. Chemistry of bio molecules by S. P. Bhutan
11. Fundamentals of Computers by V. RajaRaman
12. Cyber Security Essentials by James Graham, Richard Howard, Ryan Olson

vv CO-PO Mapping:

(1:

Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	1	2	2	3	1	2	1	1	3	2	3	2	2	3	2
CO2	2	1	2	1	2	2	1	2	2	2	2	2	2	1	2	2
CO3	2	1	2	2	3	2	1	2	2	2	2	3	2	1	3	2
CO4	3	2	2	2	3	3	1	3	3	2	2	3	2	1	3	3
CO5	2	1	2	3	2	2	2	2	2	1	2	2	3	2	2	2

STUDENT ACTIVITIES

UNIT I: ESSENTIALS OF MATHEMATICS:

1: Complex Number Exploration

Provide students with a set of complex numbers in both rectangular and polar forms. They will plot the complex numbers on the complex plane and identify their properties

2: Trigonometric Ratios Problem Solving

Give students a set of problems that require the calculation of trigonometric ratios and their relations.

Students will solve the problems using the appropriate trigonometric functions (sine, cosine, tangent, etc.) and trigonometric identities.

3: Vector Operations and Applications

Provide students with a set of vectors in Cartesian form.

Students will perform vector addition and subtraction operations to find the resultant vectors. They will also calculate the scalar and vector products of given vectors.

4: Statistical Measures and Data Analysis

Give students a dataset containing numerical values.

Students will calculate the mean, median, and mode of the data, as well as other statistical measures if appropriate (e.g., range, standard deviation). They will interpret the results and analyze the central tendencies and distribution of the data.

UNIT II: ESSENTIALS OF PHYSICS:

1. Concept Mapping

Divide students into groups and assign each group one of the topics.

Students will create a concept map illustrating the key concepts, relationships, and applications related to their assigned topic.

Encourage students to use visual elements, arrows, and labels to represent connections and interdependencies between concepts.

2. Laboratory Experiment

Select a laboratory experiment related to one of the topics, such as motion of objects or electric and magnetic fields.

Provide the necessary materials, instructions, and safety guidelines for conducting the experiment.

Students will work in small groups to carry out the experiment, collect data, and analyze the results.

After the experiment, students will write a lab report summarizing their findings, observations, and conclusions.

UNIT III: ESSENTIALS OF CHEMISTRY

1: Chemistry in Daily Life Presentation

Divide students into groups and assign each group a specific aspect of daily life where chemistry plays a significant role, such as food and nutrition, household products, medicine, or environmental issues.

Students will research and create a presentation (e.g., PowerPoint, poster, or video) that showcases the importance of chemistry in their assigned aspect.

2: Periodic Table Exploration

Provide students with a copy of the periodic table.

Students will explore the periodic table and its significance in organizing elements based on their properties.

They will identify and analyze trends in atomic structure, such as electronic configuration, atomic size, and ionization energy.

3: Chemical Changes and Classification of Matter

Provide students with various substances and chemical reactions, such as mixing acids and bases or observing a combustion reaction.

Students will observe and describe the chemical changes that occur, including changes in color, temperature, or the formation of new substances.

4: Biomolecules Investigation

Assign each student or group a specific biomolecule category, such as carbohydrates, proteins, fats, or vitamins.

Students will research and gather information about their assigned biomolecule category, including its structure, functions, sources, and importance in the human body.

They can create informative posters or presentations to present their findings to the class.

UNIT IV: APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY

1: Interdisciplinary Case Studies

Divide students into small groups and provide them with interdisciplinary case studies that involve the interdisciplinary application of mathematics, physics, and chemistry.

Each case study should present a real-world problem or scenario that requires the integration of concepts from all three disciplines.

2: Design and Innovation Project

Challenge students to design and develop a practical solution or innovation that integrates mathematics, physics, and chemistry principles.

Students can choose a specific problem or area of interest, such as renewable energy, environmental conservation, or materials science.

3: Laboratory Experiments

Assign students laboratory experiments that demonstrate the practical applications of mathematics, physics, and chemistry.


Examples include investigating the relationship between concentration and reaction rate, analyzing the behavior of electrical circuits, or measuring the properties of materials.

.4: Mathematical Modeling

Present students with real-world problems that require mathematical modeling and analysis.

UNIT V: ESSENTIALS OF COMPUTER SCIENCE:

1. Identifying the attributes of network (Topology, service provider, IP address and bandwidth
your college network) and prepare a report covering network architecture.
2. Identify the types of malwares and required firewalls to provide security.
3. Latest Fraud techniques used by hackers.

	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc.(I SEM)			
Course 2 124902	ADVANCES OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES				
Teaching	Hours Allocated:60 (Theory)	L	T	P	C
Pre-requisites:	Basic knowledge of geometry, matrices, law of conservation of energy, Number system etc.	3	0	2	4

Course Objective:

The objective of this course is to provide students with an in-depth understanding of the recent advances and cutting-edge research in mathematical, physical, and chemical sciences. The course aims to broaden students' knowledge beyond the foundational concepts and expose them to the latest developments in these disciplines, fostering critical thinking, research skills, and the ability to contribute to scientific advancements.

Learning outcomes:

	On Completion of the course, the students will be able to-	Cognitive Domain
CO1	Explore the applications of mathematics in various fields of physics and chemistry, to understand how mathematical concepts are used to model and solve real-world problems.	Understanding & Application
CO2	To Explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to Connect their knowledge of physics to everyday situations.	Application
CO3	Understand the different sources of renewable energy and their generation processes and advances in Nanomaterials and their properties, with a focus on quantum dots. To study the emerging field of quantum communication and its potential applications. To gain an understanding of the principles of biophysics in studying biological systems. Explore the properties and applications of shape memory materials.	Understanding , Application
CO4	Understand the principles and techniques used in computer-aided drug design and drug delivery systems, to understand the fabrication techniques and working principles of Nano sensors. Explore the effects of chemical pollutants on ecosystems and human health.	understanding , Application
CO5	Understand the interplay and connections between mathematics, physics, and chemistry in various advanced applications. Recognize how mathematical models and physical and chemical principles can be used to explain and predict phenomena in different contexts.	Application

SYLLABUS :

UNIT I: ADVANCES IN BASICS MATHEMATICS

Straight Lines: Different forms – Reduction of general equation into various forms –
Point of intersection of two straight lines

Limits and Differentiation: Standard limits – Derivative of a function – Problems on product
rule and quotient rule

Integration: Integration as a reverse process of differentiation – Basic methods of integration

Matrices: Types of matrices – Scalar multiple of a matrix – Multiplication of matrices – Transpose
of a matrix and determinants

UNIT II: ADVANCES IN PHYSICS:

Renewable energy: Generation, energy storage, and energy-efficient materials and devices. **Recent advances in the field of nanotechnology:** Quantum dots, Quantum Communication- recent advances in biophysics- recent advances in medical physics- Shape Memory Materials.

UNIT III: ADVANCES IN CHEMISTRY:

Computer aided drug design and delivery, nano sensors, Chemical Biology, impact of chemical pollutants on ecosystems and human health, Dye removal - Catalysis method

UNIT IV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY

- **Mathematical Modelling applications in physics and chemistry**
- **Application of Renewable energy:** Grid Integration and Smart Grids,
- **Application of nanotechnology:** Nanomedicine,
- **Application of biophysics:** Biophysical Imaging, Biomechanics, Neurophysics,
- **Application of medical physics:** Radiation Therapy, Nuclear medicine
Solid waste management, Environmental remediation- Green Technology, Water treatment.

UNIT V: Advanced Applications of computer Science

Number System-Binary, Octal, decimal, and Hexadecimal, Signals-Analog, Digital, Modem, Codec, Multiplexing, Transmission media, error detection and correction- Parity check and CRC, Networking devices- Repeater, hub, bridge, switch, router, gateway.

Recommended books:

1. Coordinate Geometry by S.L.Lony, Arihant Publications
2. Calculus by Thomas and Finny, Pearson Publications
3. Matrices by A.R.Vasishtha and A.K.Vasishtha, Krishna Prakashan Media(P)Ltd.
4. "Renewable Energy: Power for a Sustainable Future" by Godfrey Boyle
5. "Energy Storage: A Nontechnical Guide" by Richard Baxter
6. "Nanotechnology: Principles and Applications" by Sulabha K. Kulkarni and Raghvendra A. Bohara
7. "Biophysics: An Introduction" by Rodney Cotterill
8. "Medical Physics: Imaging" by James G. Webster
9. "Shape Memory Alloys: Properties and Applications" by Dimitris C. Lagoudas
10. Nano materials and applications by M.N.Borah
11. Environmental Chemistry by Anil.K.D.E.
12. Digital Logic Design by Morris Mano
13. Data Communication & Networking by Bahrouz Forouzan.

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	3	3	3	1	2	2	3	2	3	2	3	2	2
CO2	3	2	3	3	2	3	3	1	3	3	3	2	1	3	1	3
CO3	2	3	2	3	2	3	2	2	2	3	2	2	3	2	2	1
CO4	3	2	3	2	2	2	3	3	1	1	3	1	2	2	2	3
CO5	3	2	3	2	2	2	3	3	1	1	3	1	2	3	2	2

STUDENT ACTIVITIES

UNIT I: ADVANCES IN BASIC MATHEMATICS

1: Straight Lines Exploration

Provide students with a set of equations representing straight lines in different forms, such as slope-intercept form, point-slope form, or general form.

Students will explore the properties and characteristics of straight lines, including their slopes, intercepts, and point of intersection.

2: Limits and Differentiation Problem Solving

Students will apply the concept of limits to solve various problems using standard limits.

Encourage students to interpret the results and make connections to real-world applications, such as analyzing rates of change or optimizing functions.

3: Integration Exploration

Students will explore the concept of integration as a reverse process of differentiation and apply basic methods of integration, such as the product rule, substitution method, or integration by parts.

Students can discuss the significance of integration in various fields, such as physics and chemistry

4: Matrices Manipulation

Students will perform operations on matrices, including scalar multiplication, matrix multiplication, and matrix transpose.

Students can apply their knowledge of matrices to real-world applications, such as solving systems of equations or representing transformations in geometry.

UNIT II: ADVANCES IN PHYSICS:

1: Case Studies

Provide students with real-world case studies related to renewable energy, nanotechnology, biophysics, medical physics, or shape memory materials.

Students will analyze the case studies, identify the challenges or problems presented, and propose innovative solutions based on the recent advances in the respective field.

They will consider factors such as energy generation, energy storage, efficiency, sustainability, materials design, biomedical applications, or technological advancements. **2: Experimental Design**

Assign students to design and conduct experiments related to one of the topics: renewable energy, nanotechnology, biophysics, medical physics, or shape memory materials.

They will identify a specific research question or problem to investigate and design an experiment accordingly.

Students will collect and analyze data, interpret the results, and draw conclusions based on their findings. They will discuss the implications of their experimental results in the context of recent advances in the field.

3: Group Discussion and Debate

Organize a group discussion or debate session where students will discuss the ethical, social, and environmental implications of the recent advances in renewable energy, nanotechnology, biophysics, medical physics, and shape memory materials.

Assign students specific roles, such as proponent, opponent, or moderator, and provide them with key points and arguments to support their positions.

UNIT III: ADVANCES IN CHEMISTRY:

1. Experimental Design and Simulation

In small groups, students will design experiments or simulations related to the assigned topic.

For example, in the context of computer-aided drug design, students could design a virtual screening experiment to identify potential drug candidates for a specific disease target.

For nano sensors, students could design an experiment to demonstrate the sensitivity and selectivity of nano sensors in detecting specific analytes.

Chemical biology-related activities could involve designing experiments to study enzyme-substrate interactions or molecular interactions in biological systems.

Students will perform their experiments or simulations, collect data, analyze the results, and draw conclusions based on their findings.

2. Case Studies and Discussion

Provide students with real-world case studies related to the impact of chemical pollutants on ecosystems and human health.

Students will analyze the case studies, identify the sources and effects of chemical pollutants, and propose mitigation strategies to minimize their impact.

Encourage discussions on the ethical and environmental considerations when dealing with chemical pollutants.

For the dye removal using the catalysis method, students can explore case studies where catalytic processes are used to degrade or remove dyes from wastewater.

Students will discuss the principles of catalysis, the advantages and limitations of the catalysis method, and its applications in environmental remediation.

3: Group Project

Assign students to work in groups to develop a project related to one of the topics.

The project could involve designing a computer-aided drug delivery system, developing a nano sensor for a specific application, or proposing strategies to mitigate the impact of chemical pollutants on ecosystems. Students will develop a detailed project plan, conduct experiments or simulations, analyze data, and present their findings and recommendations.

Encourage creativity, critical thinking, and collaboration throughout the project.

UNIT IV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY

1: Mathematical Modelling Experiment

Provide students with a mathematical modelling experiment related to one of the topics. For example, in the context of renewable energy, students can develop a mathematical model to optimize the placement and configuration of solar panels in a solar farm.

Students will work in teams to design and conduct the experiment, collect data, and analyze the results using mathematical models and statistical techniques.

They will discuss the accuracy and limitations of their model, propose improvements, and

interpret the implications of their findings in the context of renewable energy or the specific application area.

2: Case Studies and Group Discussions

Assign students to analyze case studies related to the applications of mathematical modelling in nanotechnology, biophysics, medical physics, solid waste management, environmental remediation, or water treatment.

Students will discuss the mathematical models and computational methods used in the case studies, analyze the outcomes, and evaluate the effectiveness of the modelling approach.

Encourage group discussions on the challenges, ethical considerations, and potential advancements in the field.

Students will present their findings and engage in critical discussions on the advantages and limitations of mathematical modelling in solving complex problems in these areas.

3. Group Project

Assign students to work in groups to develop a group project that integrates mathematical modelling with one of the application areas: renewable energy, nanotechnology, biophysics, medical physics, solid waste management, environmental remediation, or water treatment.

The project could involve developing a mathematical model to optimize the delivery of radiation therapy in medical physics or designing a mathematical model to optimize waste management practices. Students will plan and execute their project, apply mathematical modelling techniques, analyze the results, and present their findings and recommendations.


Encourage creativity, critical thinking, and collaboration throughout the project.

UNIT V: Advanced Applications of computer Science

Students must be able to convert numbers from other number system to binary number systems

1. Identify the networking media used for your college network
2. Identify all the networking devices used in your college premises.

SEM – II

	Government College (Autonomous) Rajahmundry (As Approved in the BOS meeting held on 30 AUGUST for 2024-25)	Program & Semester II B.Sc. (II Sem)			
Course Code ELE 003	FUNDAMENTALS OF ELECTRICITY AND ELECTRONICS				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:		5	3	2	3+1

Course Objectives:

The students will learn:

- 1) Basics of electrostatics, Gauss theorem and its applications, concept of a capacitor, various types
- 2) instruments like ammeter and voltmeter.
- 3) Basics of p-n junction, rectifying action of a diode, regulated power supplies and wave shaping circuits.
- 4) Transistor and its three modes of operation, h-parameter model of a transistor and the frequency response of an amplifier.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Applications of Gauss law
CO2	Different types of capacitors and their combinations
CO3	Applications of Biot Savart law
CO4	Applications of Transistors
CO5	Construction and application of Basic logic gates

Course with focus on employability / entrepreneurship / Skill Development modules

Skill
Development



Employability



Entrepreneurship



Syllabus: FUNDAMENTALS OF ELECTRICITY AND ELECTRONICS

UNIT-I

Electrostatics: Electric charges - Coulomb's law - Electric field - Electric intensity and electric potential - Relation between electric potential and intensity - Electric intensity and potential due to a uniform charged conducting sphere at a point outside, on, and inside the conductor.

Electric dipole - Dipole moment - Intensity and potential due to a dipole - Statement and proof of Gauss law - Application of Gauss law to uniformly charged solid sphere.

UNIT-II

Capacitors: Definition and unit of capacity - Capacitance of a parallel plate capacitor - Effect of dielectric on capacity - Capacitors in series and parallel - Energy stored in a charged capacitor - Loss of energy on sharing of charges between two capacitors - Force of attraction between plates of charged parallel plate capacitor - Kelvin's attracted disc electrometer - Measurement of potential and dielectric constant.

Type of capacitors - Mica capacitor, Electrolytic capacitors, Variable air capacitor - Uses of capacitors.

UNIT-III

Electrical Measurements: Carey-Foster bridge - Determination of specific resistance - Potentiometer - Calibration of low and high range voltmeters - Calibration of Low range ammeter.

Magnetic Effect of Current: Biot-Savart's law [Force on a conductor carrying current placed in a magnetic field - Principle, construction and theory of a moving coil ballistic galvanometer - Measurement of figure of merit of B.G. - Comparison of capacitors using B.G.

UNIT-IV

Diode circuits and power Supplies: Junction diode characteristics - Half and full wave rectifiers - Expression for efficiency and ripple factor - Construction of low range power peak using diodes - Bridge rectifier - Filter circuits - Zener Diode - Characteristics - Regulated power supply using Zener diode - Clipper and Clamper using diodes.

Differentiator and integrator using resistor and capacitor.

UNIT-V

Transistor circuits: Characteristics of a transistor in CB, CE modes - Relative merits Graphical analysis in CE configuration - Transistor as an amplifier - RC coupled

Single stage amplifier - Frequency response - Thevenin's and Norton's theorems - h parameters.

Basis logic gates AND, OR, and NOT - Construction of basic logic gates using diodes and transistors.

Text books:

Electricity and Magnetism - *M. Narayanamoorthi and Others*, National Publishing Co., Chennai.

Electricity and Magnetism - *R. Murugesan*, S. Chand & Co. Ltd., New Delhi, Revised Edition, 2006.

Principles of Electronics - *V.K. Mehta*, S. Chand & Co., 4/e, 2001. Basic

Electronics - *B.L. Theraja*, S. Chand & Co., 4/e,

Reference books:


Electricity and Magnetism - Brijlal & Subrahmanyam, Ratan Prakashan Mandir, Agra. Fundamentals of Electricity and Magnetism - B.D. Duggal & C.L. Chhabra, ShobanLal Nagin Chand & Co., Jallundur. Physics, Vol. II - Resnick, Halliday & Krane, 5/e, John Wiley & Sons, Inc., Basic Electronics - B. Grob, McGraw - hill, 6/e, NY, 1989. Elements of Electronics - Bagde & Singh, S. Chand

Web Links:

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	1	2	2	3	1	2	1	1	3	2	3	2
CO2	2	1	2	1	2	2	1	2	2	2	2	2	2
CO3	2	1	2	2	3	2	1	2	2	2	2	3	2
CO4	3	2	2	2	3	3	1	3	3	2	2	3	2
CO5	2	1	2	3	2	2	2	2	2	1	2	2	3

	Government College (Autonomous) Rajahmundry (As Approved in the BOS meeting held on 30 AUGUST for 2022-23)	Program & Semester II B.Sc. (II Sem)			
Course Code ELE 004	CIRCUIT THEORY AND ELECTRONIC DEVICES				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:		3	0	-	3

Course Objectives:

To explain the basic concepts and laws of DC and AC electrical networks and solve them using mesh and nodal analysis techniques.

To analyze circuits in time and frequency domain.

To synthesize the networks using passive elements.

To understand the construction, working and V characteristics of electronic devices.

To understand the concept of power supply.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Apply concepts of electric network topology, nodes, branches, loops to solve circuit problems including the use of computer simulation.
CO2	Apply time and frequency concepts of analysis.
CO3	Synthesize the network using passive elements.
CO4	Know about amplifier circuits, switching circuits and oscillator circuits their design and use in electronics.
CO5	Design and construction of a power supply.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development



Employability



Entrepreneurship



Syllabus: CIRCUIT THEORY AND ELECTRONIC DEVICES

UNIT- 1:

SINUSOIDAL ALTERNATING WAVEFORMS:

Definition of current and voltage. The sine wave, general format of sine wave for voltage or current, phase relations, average value, effective (R.M.S) values. Differences between A.C and D.C. Phase relation of R,L and C

UNIT-II:

PASSIVE NETWORKS AND NETWORKS THEOREMS (D.C):

Branch current method, Nodal Analysis, star to delta & delta to star conversions. Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power, Milliman and Reciprocity theorems .

UNIT-III:

RC, RL AND RLC CIRCUITS:

Frequency response of RC and RL circuits, their action as low pass and high pass filters. Passive differentiating and integrating circuits. Series resonance and parallel resonance circuits, Q – Factor.

UNIT-IV:

BJT, FET and UJT:

BJT: Construction, working, and characteristics of CE Configurations. Hybrid parameters and hybrid equivalent circuit of CE Transistor,

FET: Construction, working and characteristics of JFET and MOSFET. Advantages of FET over BJT.

UJT: Construction, working and characteristics of UJT. UJT as a Relaxation oscillator.

UNIT-V:

POWER SUPPLIES & PHOTO ELECTRIC DEVICES

Rectifiers: Half wave, full wave rectifiers-Efficiency-ripple factor- Filters- L-section & π -section filters. Three terminal fixed voltage I.C.regulators (78XX and &79XX). Light Emitting Diode – Photo diode and LDR.

Text books:

1. Introductory circuit Analysis (UBS Publications)----- Robert L. Boylestad.
2. Electronic Devices and Circuit Theory----- Robert L. Boylestad & Louisashelsky.
3. Circuit Analysis by P.Gnanasivam- Pearson Education
4. Electronic Devices and Circuit Theory----- Robert L. Boylestad Louis Nashelsky.
5. Electronic Devices and Circuits I – T.L.Floyd- PHIFifth Edition

Reference books:

1. Engineering Circuit Analysis By: Hayt & Kemmerly - MG.
2. Networks and Systems – D.Roy Chowdary.
3. Unified Electronics (Circuit Analysis and Electronic Devices) by Agarwal- Arora
4. Electric Circuit Analysis- S.R. Paranjothi- New Age International.
5. Integrated Electronics – Millman & Halkias.
6. Electronic Devices & Circuits – Bogart.
7. Sedha R.S., A Text Book Of Applied Electronics, S.Chand & Company Ltd

Web Links:

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	2	3	1	2	1	1	3	2	3	2
CO2	2	1	2	1	2	2	1	2	2	2	2	2	2
CO3	2	2	2	2	3	2	3	2	2	2	2	3	2
CO4	3	2	2	2	3	3	1	3	3	2	2	3	2
CO5	2	1	2	3	2	2	2	1	2	3	2	2	3

GOVERNMENT COLLEGE (A): RAJAMAHENDRAVARAM
DEPARTMENT OF ELECTRONICS
SYLLABUS FOR I B.Sc., ELECTRONICS
MODULE-IV [CIRCUIT THEORY AND ELECTRONIC DEVICES]
SEMESTER II

(As Approved in the BOS meeting held on 30 AUGUST for 2024-25)

Practical	Credits: 1	2 hrs/week
1. Thevenin's Theorem-verification		
2. Norton's Theorem-verification		
3. Maximum Power Transfer Theorem-verification		
4. LCR series resonance circuit.		
5. BJT input and output characteristics		
6. FET output and transfer characteristics		
7. LDR characteristics		
8. UJT VI Characteristics		
9. IC regulated power supply(IC-7805)		

Lab experiments are to be done on breadboard and simulation software (using multi sim) and output values are to be compared and justified for variation.

SEM - 3

SEMESTER-III
COURSE 5: SEMICONDUCTOR DEVICES AND MATERIALS

Theory

Credits: 3

3 hrs/week

Objective:

1. To provide basic knowledge and concepts of Semiconductor materials and devices.
2. To facilitate students learn on the physical principles and operational characteristics of Semiconductor devices and some of its important applications. Pre-requisites: Basic understanding of semiconductors.

Outcomes:

- Ability to apply basic concepts of Inorganic and Organic Semiconductormaterials forelectronic device application in modern electronic industry.
- Detailed knowledge of various classifications and applications to VLSI, LEDsand solarcells.
- Holistic view of the latest progress in two-dimensional (2D)-one-dimensional(1D) andnano materials.
- Emphasis on nano-electronic applications such as Schottky barrier transistors, Flexible Electronics.

Unit I:

Inorganic and Organic Semiconductor: Energy bands, carrier transport, mobility, drift- diffusivity, excess carrier, injection and recombination of the excess carriers, carrier statistics; High field effects: velocity saturation, hot carriers and avalanche breakdown.

Unit II:

Majority carrier Devices: MS contacts rectifier and non-rectifier, MIS structures, MESFET, hetero-junction, HEMT and band diagrams, I-V and C-V characteristics.

Unit III:

MOS structures: Semiconductor surfaces; The ideal and non-ideal MOS capacitor banddiagrams and CVs; Effects of oxide charges, defects and interface states. MOSFET: Structures and Device Characteristics, Short-Channel effects. Charge coupled Devices (CCDs), application to VLSI.

Unit IV:

Nonvolatile Memory Device. Optoelectronic Devices: solar cell, photo detectors, LEDs, laser diodes. Nano structures and concepts: quantum wells, supper lattice structures, nanorod, quantum dot, CNTs, 2D materials: grapheme, BN, MoS₂ etc, matamaterials.

UNIT-V:

Multistage Amplifiers: BJT at high frequencies, frequency response of RC coupledamplifiers and transformer coupled amplifier.

Reference Books

1. Donald A. Neamen, Semiconductor Physics and Devices BasicPrinciples, 3rdedn.McGraw-Hil (2003)
2. B.G. Streetman and Sanjay Banerjee, Solid State Electronic Devices, 6thEdn.,PrenticeHall, 2006.
3. S. M. Sze and Kwok K. Ng Physics of Semiconductor Devices, Wiley (2013).
4. M. Husa, A. Dimoulas and A. Molle, 2D Materials for NanoElectronics,CRC press(2016)
5. M.S.Tyagi, Introduction to Semiconductor Materials and Devices, Willey,StudentEdition

SEMESTER-III
COURSE 5: SEMICONDUCTOR DEVICES AND MATERIALS

Practical

Credits: 1

2 hrs/week

List of Experiments

1. To study the Hall Effect: determine the Hall coefficient, type of semiconductor and carrier concentration in the given semiconductor sample.
2. To study the four probe method: calculate the resistivity and energy band gap of given semiconductor sample.
3. To determine the resistivity of the given semiconductor specimen using Vander Pauw method.
4. To design a MOSFET as switching regulator for given duty cycle and plot the current-voltage (I-V) characteristic of MOSFET using Keithley.
5. To design a phase controlled rectifier using SCR and plot the I-V characteristic of SCR using Keithley.
6. To design a relaxation oscillator using UJT and plot the I-V characteristic of UJT using Keithley.
7. I-V characteristics measurement of a p-n diode/LEDs using Keithley - calculate its ideality factor.

SEMESTER-III
COURSE 6: DIGITAL ELECTRONICS

Theory

Credits: 3

3 hrs/week

Objectives:

- To understand the number systems, Binary codes and Complements.
- To understand the Boolean algebra and simplification of Boolean expressions.
- To analyze logic processes and implement logical operations using combinational logic circuits.
- To understand the concepts of sequential circuits and to analyze sequential systems in terms of state machines.
- To understand characteristics of memory and their classification.
- To implement combinational and sequential circuits using VHDL.

Unit – I

NUMBER SYSTEM AND CODES: Decimal, Binary, Hexadecimal, Octal. Codes: BCD, Gray and Excess-3 codes- code conversions- Complements (1's, 2's, 9's and 10's), Addition -Subtraction using complement methods.

Unit- II

BOOLEAN ALGEBRA AND THEOREMS: Boolean Theorems, De-Morgan's laws. Digital logic gates, Multi level NAND & NOR gates. Standard representation of logic functions (SOP and POS), Minimization Techniques (Karnaugh Map Method: 2,3 variables).

Unit-III

COMBINATIONAL DIGITAL CIRCUITS:

Adders-Half & full adder, Subtractor-Half and full subtractors, Parallel binary adder, Magnitude Comparator, Multiplexers (4:1) and Demultiplexers (1:4), Encoder (8-line-to-3-line) and Decoder (3-line-to-8-line). IC-LOGIC FAMILIES: TTL logic, CMOS Logic families (NAND & NOR Gates).

UNIT-IV

SEQUENTIAL DIGITAL CIRCUITS:

Flip Flops: S-R FF, J-K FF, T and D type FFs, Master-Slave FFs, Excitation tables, Registers:- Serial In Serial Out and Parallel In and Parallel Out, Counters Asynchronous-, Mod-8, Mod-10, Synchronous-4-bit & Ring counter.

UNIT-V

MEMORY DEVICES:

General Memory Operations, ROM, RAM (Static and Dynamic), PROM, EPROM, EEPROM, EAROM

TEXT BOOKS:

1. M. Morris Mano, "Digital Design" 3rd Edition, PHI, New Delhi.
2. Ronald J. Tocci. "Digital Systems-Principles and Applications" 6/e. PHI. New Delhi. 1999. (UNITS I to IV)
3. G.K. Kharate-Digital electronics-oxford university press

4. S.Salivahana&S.Arivazhagan-Digital circuits and design
5. Fundamentals of Digital Circuits by Anand KumarReference Books :
 1. Herbert Taub and Donald Schilling. “Digital IntegratedElectronics” .McGraw Hill. 1985.
 2. S.K. Bose. “Digital Systems”. 2/e. New Age International. 1992.
 3. D.K. Anvekar and B.S. Sonade. “Electronic Data Converters :Fundamentals & Applications”. TMH. 1994.
 4. *Malvino and Leach. “ Digital Principles and Applications ”. TMG Hill Edition.*

Outcomes:-

- ✓ Develop a digital logic and apply it to solve real life problems.
- ✓ Analyze, design and implement combinational logic circuits.
- ✓ Classify different semiconductor memories.
- ✓ Analyze, design and implement sequential logic circuits.
- ✓ Simulate and implement combinational and sequential logic circuits using VHDL

SEMESTER – III

COURSE 6: DIGITAL ELECTRONICS

Practical	Credits: 1	2 hrs/week
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LAB LIST:

1. Verification of IC-logic gates
2. Realization of basic gates using discrete components (resistor, diodes & transistor)
3. Realization of basic gates using Universal gates (NAND & NOR gates)
4. Verify Half adder and full adder using gates
4. Verify Half subtractor and full subtractor using gates.
5. Verify the truth table Multiplexer and demultiplexer.
6. Verify the truth table Encoder and decoder.
7. Verify the truth table of RS , JK, T-F/F using NAND gates
8. 4-bit binary parallel adder and subtractor using IC 7483
9. BCD to Seven Segment Decoder using IC -7447/7448

SEMESTER – III

COURSE 7: ANALOG ELECTRONICS

Theory

Credits: 4

5 hrs/week

Objectives:

1. The design and working of RC coupled amplifiers, transformer coupled amplifiers and power amplifiers,
2. The concept of negative and positive feedback,
3. Pulse shaping and Schmitt trigger, and The op-amp characteristics, frequency response and its linear and non-linear applications.

UNIT-I

Amplifiers: General principles of small signal amplifiers - Classifications - RC Coupled amplifiers - Gain - Frequency response - Input and output impedance - Multistage amplifiers - Transformer coupled amplifiers - Equivalent circuits at low, medium and high frequencies – Emitter follower.

Class A and Class B power amplifiers - Single ended and push-pull configurations - Power dissipation and output power calculations.

UNIT-II

Feedback Amplifiers: Basic concept of feedback amplifiers - Transfer gain with feedback - General characteristics of negative feedback amplifier - Effect of negative feedback on gain - Gain stability - Distortion and bandwidth - Input and output resistance in the case of various types of feedback - Analysis of voltage and current in feedback amplifier circuits.

UNIT-III

Operational Amplifiers: Principles - Transfer characteristics - Various offset parameters - Differential gain - CMRR - Slew rate – Bandwidth

UNIT-IV

Op-amp Circuits: Basic operational amplifier circuits under inverting and non-inverting modes - Adder - Subtractor - Integrator - Differentiator - Comparator - Sine, square and triangular waveform generators - Active filters - Sample and Hold circuits.

UNIT-V

Oscillators: Positive feedback - Stability issues - Feedback requirement of oscillations -

Barkhausen criterion for oscillation - Hartley, Colpitts, Phase shift and Wien bridge oscillators - Condition for oscillation and frequency derivation - Crystal oscillator - UJT relaxation oscillator. Monostable, bistable and astable multivibrators - Schmitt trigger.

Text Books

1. Introduction to Integrated Electronics - *V. Vijayendran, S.Viswanathan* (Printers &Publishers) Pvt. Ltd., Chennai, 2005.
2. Electronic Circuits and Systems - *Y.N. Bapat*, Tata McGraw Hill Publishing Co. Ltd.

Reference Books

1. Electronic Devices and Circuits - *G.K. Mithal*, Khanna Publishers, Delhi.
2. Hand Book of Electronics - *Gupta & Kumar*, Pragati Prakashan, Meerut.
3. Electronic Devices and Circuit Theory - *R. Boylestad & L. Nashelsky*, Prentice Hall of India Private Limited, 6/e.
4. Electronic Devices and Circuits- *J.P. Agarwal & Amit Agarwal*,PrakasamPublishers.
5. Linear Integrated Circuits - *D. Roy Choudhury & Shail Jain*, New Age International (P) Limited.

SEMESTER-III
COURSE 8: ELECTRONIC COMMUNICATION SYSTEMS

Theory

Credits: 3

3 hrs/week

The students will learn :

- a. fundamentals of antenna, their characteristics and types,
- b. amplitude modulation and demodulation and radiowave transmission and reception frequency modulation and demodulation and FM radio wave transmission and reception,
- c. Principle of analog and digital pulse modulation and their applications,
- d. transmission and detection of digital signals.

UNIT-I

Antenna - Effective resistance - Efficiency - Directive gain - Bandwidth, Beam width and polarization - Dipole - Folded dipole - Arrays - Yagi - Uda - Helical - Dish Antennas - Ground wave, sky wave and space wave propagation - Skip distance - Maximum usable frequency.

UNIT-II

Modulation - Needs for Modulation - Types of Modulation - Amplitude Modulation - Generation and detection circuits - Balanced Modulator - DSB/SC and SSB Modulation - VSB modulation. Block diagram of AM Radio transmitter and super heterodyne Receiver.

UNIT-III

Frequency Modulation - Definition - Derivation of Modulated wave - Generation of FM - Varactor diode and Reactance tube Modulators - Detectors - Balanced slope detector, Foster Seeley discriminator, ratio detector - Block diagram of FM transmitter and receiver.

UNIT-IV

Pulse Modulation - Sampling theorem - PAM, PWM, PCM - quantizing, sampling, coding, decoding, quantization error, delta modulation and adaptive delta modulation.

UNIT-V

Multiplexing - FDM, TDM, CDMA - ASK, FSK, PSK - Advantages of Digital Communication - Introduction to Microwave, Fiber optic, Satellite Communications - RADAR - range equation.

Text Books

- Electronic Communication Systems - *George Kennedy*, McGraw Hill Book Company, 4/e, 2005.
- Communication Engineering - *T.G. Palanivelu*, Anuradha Publications, 1/e, 2002.

Reference Books

1. Communication System - *Roddy & Coolen*, 4/e, Pearson Education, 2005.
Principles of Communication Engineering - *Anok Singh*, 4/e, Sathyaprakasam Publications, 2004.
3. Electronic Communication Systems *Wayne Tomasi*, 4/e, Pearson Education, 2004.

SEM - IV

SEMESTER-IV
COURSE 9: ELECTRICAL AND ELECTRONIC INSTRUMENTATION

Theory

Credits: 4

5 hrs/week

The students will learn:

- Basic concepts of indicating instruments.
- Various electronic instruments such as CRO,
- Storage oscilloscopes, function generators,
- Spectrum analyzer etc.,
- Transducers, sensors and display devices.

UNIT-I

DC and AC indicating Instruments: Accuracy and precision - Types of errors - PMMC galvanometer, sensitivity, Loading effect - Conversion of Galvanometer into ammeter, Voltmeter and Shunt type ohmmeter- Multimeter.

Electrodynamometer - Thermocouple instrument - Electrostatic voltmeter - Watt- hour meter.

UNIT-II

DC and AC bridges: Wheatstone bridge - Kelvin's bridge - Balancing condition for AC bridge - Maxwell's bridge - Schering's bridge - Wein's bridge - Determination of frequency.

UNIT-III

Oscilloscopes: Block diagram - Deflection Sensitivity - Electrostatic Deflection - Electrostatic Focusing - CRT Screen - Measurement of Waveform frequency, phase difference and Time intervals - Sampling Oscilloscope - Analog and Digital Storage Oscilloscopes.

UNIT-IV

Instrumentation Amplifiers and Signal Analysers: Instrumentation amplifier - Electronic Voltmeter and Multimeter - Digital Voltmeter - Function Generator - Wave Analyser - Fundamentals of Spectrum Analyser.

UNIT-V

Transducer and Display Devices: Strain Gauge - Unbounded Strain Gauge - LVDT -Resistance Thermometer - Photoelectric Transducer - Pen Recorder - Audio Tape Recorder - Seven Segment Display - LCD.

Text Books

1. Electronic Instrumentation and Measurement Techniques - W.D. Cooper & A.D. Helfrick, Prentice Hall of India.
2. Electronic Instrumentation and Measurement - Kalasi.

Reference Books

1. A Course in Electrical and Electronic Measurement and Instrumentation - A.K. Sawhney, Dhanpat Rai and Sons.
2. Electronic Instrumentation and Measurements - P.B. Zbar, Mc Graw Hill International.
3. Measurement Systems Application and Design - Ernest O. Doebelin, 4/e, TataMcGraw Hill Publishing Co. LTD

Government college(A), Rajahmundry

SEMESTER-IV
COURSE 10: MICRO CONTROLLER SYSTEM

Theory

Credits: 3

3 hrs/week

OBJECTIVES:

- To understand the concepts of microcontroller based system.
- To enable design and programming of microcontroller based system.
- To know about the interfacing Circuits.

UNIT-I: (10Hrs)

Introduction, comparison of Microprocessor and micro controller, Evolution of microcontrollers from 4-bit to 32 bit , Development tools for micro controllers, Assembler-Compiler-Simulator/Debugger.

UNIT -II: (10Hrs)

Microcontroller Architecture: Overview and block diagram of 8051, Architecture of 8051, program counter and memory organization, Data types and directives, PSW register, Registerbanks and stack, pin diagram of 8051, Port organization, Interrupts and timers.

UNIT-III:(10Hrs)

Addressing modes, instruction set of 8051: Addressing modes and accessing memory using various addressing modes, instruction set: Arithmetic, Logical, Simplebit, jump, loop and call instructions and their usage. Time delay generation and calculation, Timer/Counter Programming,

Unit -IV: (15Hrs)

Assemble language programming Examples: Addition, Multiplication, Subtraction, division, arranging a given set of numbers in largest/smallest order.

UNIT-V : (15Hrs)

Interfacing and Application of Microcontroller: Interfacing of – PPI 8255, DAC (0804), Temperature measurement (LM35), interfacing seven segment displays, displaying information on a LCD, control of a stepper Motor (Uni-Polar)

TEXT BOOKS:

1. The 8051 microcontroller and embedded systems using assembly and c- kennet j. Ayalam, Dhananjay V. gadre, cengage publishers
2. The 8051 microcontrollers and Embedded systems - By Muhammad Ali Mazidi and Janice Gillispie Mazidi – Pearson Education Asia, 4th Reprint, 2002.

REFERENCE BOOKS:

1. Microcontrollers Architecture Programming, Interfacing and System Design – Rajkamal.
2. The 8051 Microcontroller Architecture, Programming and Application - Kenneth J. Ajala , west publishing company (ST PAUL, NEW YORK, LOS ANGELES, SAN FRANCISCO).
3. Microcontroller theory and application- Ajay V. Deshmukh

OUTCOMES:

- The student can gain good knowledge on microcontrollers and implement in practical applications
- learn Interfacing of Microcontroller
- get familiar with real time operating system

SEMESTER-IV

COURSE 10: MICRO CONTROLLER SYSTEM

Practical

Credits: 1

2 hrs/week

LAB LIST:

1. Addition And Subtraction Of Two 8-Bit Numbers.
2. Multiplication And Division Of Two 8-Bit Numbers.
3. Largest number /smallest in an array.
4. Exchange Of Higher And Lower Nibbles In Accumulator.
5. Addition Of Two 8-Bit Numbers (Keil Software).
6. Addition Of Two 16-Bt Numbers (Keil Software)
7. Subtraction Of Two 8-Bit Numbers (Keil Software).
8. Subtraction Of Two 16-Bit Numbers (Keil Software).
9. Multiplication Of Two 8-Bit Numbers (Keil Software).
12. Program For Swapping And Compliment Of 8-Bit Numbers (Keil Software).
13. Program To Find The Largest Number In Given Array (Keil Software).
14. Program To Find The Smallest Number In Given Array (Keil Software).
15. Interfacing Led To 8051 Microcontroller (Keil Software).
16. Interfacing Buzzer To 8051 Microcontroller (Keil Software).
17. Interfacing Relay To 8051 Microcontroller (Keil Software)
Interfacing Seven Segments To 8051 Microcontroller

SEMESTER-IV
COURSE 11: MICROPROCESSOR SYSTEMS

Theory

Credits: 3

3 hrs/week

OBJECTIVES:

- To understand basic architecture of 16 bit and 32 bit microprocessors.
- To understand interfacing of 16 bit microprocessor with memory and peripheral chips involving system design.
- To understand techniques for faster execution of instructions and improve speed of operation and performance of microprocessors
- To understand RISC based microprocessors.
- To understand concept of multi core processors.

UNIT -I:

CPU ARCHITECTURE Introduction to Microprocessor, INTEL -8085(P) Architecture, CPU, ALU unit, Register organization, Address, data and control Buses. Pin configuration of 8085. Addressing modes 8086 Microprocessor: Architecture, Pin description. Instruction format, Instruction Execution timing, Addressing modes

UNIT -II:

8085 Instruction Set:

Data transfer Instruction, Logical Instructions, Arithmetic Instructions, Branch Instructions, Machine Control instructions.

UNIT -III:

Assembly Language Programming using 8085, Programmes for Addition, Subtraction, Multiplication, Division, largest and smallest number in an array. BCD to ASCII and ASCII to BCD.

UNIT -IV:

Basic 8086 Configurations – Minimum mode and Maximum Mode, Interrupt Priority Management I/O Interfaces: Serial Communication interfaces, Parallel Communication, Programmable Timers, Keyboard and display, DMA controller

UNIT -V:

ARM PROCESSOR: Introduction to 16/32 bit processors, Arm architecture & organization, Arm based MCUs, Programming model, Instruction set.

TEXTBOOKS:

1. Microprocessor Architecture, Programming and Applications
2. with the 8085 – Penram International Publishing, Mumbai.- Ramesh S. Gaonakar
3. Microcomputer Systems the 8086/8088 family – YU-Cheng Liu and Glenn SA Gibson
4. Microcontrollers Architecture Programming, Interfacing and System Design – Raj Kamal Chapter: 15.1, 15.2, 15.3, 15.4.1
5. 8086 and 8088 Microprocessor by Tribel and avatar singh

REFERENCES:

1. Microprocessors and Interfacing – Douglas V. Hall
2. Microprocessor and Digital Systems – Douglas V. Hall
3. Advanced Microprocessors & Microcontrollers - B.P. Singh & Renu Singh – New Age
4. The Intel Microprocessors – Architecture, Programming and Interfacing – Bary B. Brey.
5. Arm Architecture reference manual – Arm ltd.

OUTCOMES:

- The student can gain good knowledge on microprocessor and implement in practical applications
- Design system using memory chips and peripheral chips for 16 bit 8086 microprocessor.
- Understand and devise techniques for faster execution of instructions, improve speed of operations

- and enhance performance of microprocessors.
- Understand multi core processor and its advantages

SEMESTER-IV
COURSE 11: MICROPROCESSOR SYSTEMS

Practical

Credits: 1

2 hrs/week

List of Experiments

Programs using Intel 8085 /8086

1. Addition and Subtraction (8 bit and 16-bit)
2. Multiplication and Division (8-bit)
3. Largest number in an array.
4. Smallest number in an array.
5. BCD to ASCII and ASCII to BCD .
6. Program To Convert Two Bcd Numbers In To Hex
7. Program To Convert Hex Number In To Bcd Number.
8. Program To Find The Square Root Of A Given Number.
9. Interfacing Experiments Using 8086 Microprocessor (Demo):
 1. Traffic Light Controller
 2. Elevator,
 3. 7-Segment Display

Government college(A), Rajahmundry
II B.Sc -(electronics)- Semester-IV
Microprocessor systems 2024-25
Question bank

Essay Questions

Unit-I

1. Draw the block diagram of 8085 microprocessors and explain terms in it
2. Explain the pin configuration of 8085 microprocessor
3. Draw and Explain the architecture of 8086 microprocessors in detail.

Unit-II

1. Explain data transfer and logical instruction set of 8085 with examples?
2. Explain Arithmetic and Branch instruction set of 8085 with examples?
3. Explain Machine control instruction set of 8085 with examples?

Unit-III

1. Write an ALP for BCD to ASCII in 8085.
2. Write an Assembly language program for Addition of Two 16 bits numbers
3. write an assembly programming in find a largest number in array of 8bit numbers

Unit-IV

1. Explain the Serial Communication interfaces.
2. Explain minimum mode and maximum mode of 8086 microprocessors.

Unit-V

1. Explain the Arm architecture with the help of neat diagram.
2. Explain about ARM processor instruction set.

Short Answer Questions

Unit-I

1. Write a short note on Register organization of 8085 microprocessors.
2. Write a note on Addressing modes 8086 Microprocessor

Unit-II

1. Discuss about arithmetic set of instructions.
2. Discuss about Logical set of instructions

Unit-III

1. Write an ALP for subtraction of two 8 bit numbers.
2. Write an ALP for Multiplication of two 8 bit numbers

Unit-IV


1. write a short note on addressing modes of 8086 microprocessors.
2. Discuss about parallel communication.

Unit-V

1. Explain about ARM based MCUs.
2. Write a short note on ARM Processor.

SEM – V

CBCS

	Government College (Autonomous) Rajahmundry (As Approved in the BOS meeting held on 30 AUGUST 23) For Admitted batch of 2021-22)		Program & Semester III B.Sc. (V Sem)			
	CourseCode ELE 128	<i>A1.Embedded systems</i>				
Teaching	Hours Allocated: 60 (Theory)		L	T	P	C
Pre-requisites:			4	0	-	3

CourseObjectives:

- a. To understand the concepts of microcontroller based system.
- b. To enable design and programming of microcontroller based system.
- c. To know about the interfacing Circuits.
- d.

CourseOutcomes:

OnCompletion of thecourse, the students willbeable to-	
CO1	
CO2	
CO3	
CO4	

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Work load: 60 hrs per semester

4 hrs/week

Unit – I

Introduction : Embedded Systems and general purpose computer systems, history, classifications, applications and purpose of embedded systems. sensors and actuators, communication interface, embedded firmware, other system components, PCB and passive components.

Unit – II

Characteristics and quality attributes of embedded systems : Characteristics, Operational and nonoperational quality attributes, application specific embedded system - washing machine, domain specific -automotive.

Unit - III

Programming Embedded Systems : Structure of embedded program, infinite loop, compiling, linking and locating, downloading and debugging.

Unit - IV

Embedded hardware : Memory map, i/o map, interrupt map, processor family, external peripherals, memory -RAM, ROM, types of RAM and ROM, memory testing, CRC, Flash memory.

Unit – V

Design and Development : Embedded System development environment - IDE, Types of file generated on cross compilation, disassembler / decompiler, simulator, emulator and debugging, embedded product development life-cycle, trends in embedded industry.

Textbooks:

Books :

Programming Embedded Systems in C and C++, First Edition January, Michael Barr, O' Reilly
Introduction to embedded systems, Shibu K V Tata McGraw-Hill.

Reference books:

References :

Embedded Systems, Rajkamal, Tata McGraw-Hill
Term Work :

GOVERNMENT COLLEGE (A): RAJAMAHENDRAVARAM
DEPARTMENT OF ELECTRONICS
SYLLABUS FOR III B.Sc., ELECTRONICS
A1: Embedded systems
(As Approved in the BOS meeting held on 2nd AUGUST 2022-23)

Practical List :

1. **Configure timer control registers of 8051 and develop a program to generate given time delay.**
2. **Port I / O : Use one of the four ports of 8051 for O / P interfaced to eight LED's. Simulate binary counter (8 bit) on LED's.**
3. **Serial I / O : Configure 8051 serial port for asynchronous serial communication with serial port of PC exchange text messages to PC and display on PC screen. Signify end of message by carriage return.**
4. **Interface 8051 with D/A converter and generate square wave of given frequency on oscilloscope.**
5. **Interface 8051 with D/A converter and generate triangular wave of given frequency on oscilloscope.**
6. **Using D/A converter generate sine wave on oscilloscope with the help of lookup table stored in data area of 8051.**
7. **Interface Stepper motor with 8051 and write a program to move the motor through a given angle in clock wise or counter clock wise direction.**
8. **Generate traffic signal.**
9. **Temperature controller.**
10. **Elevator control.**

	Government College (Autonomous) Rajahmundry (As Approved in the BOS meeting held on 02 AUGUST for 2022-23)	Program & Semester III B.Sc. (V Sem)			
Course Code ELE 129	<i>A2: Consumer electronics</i>				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:		4	0	-	3

Course Objectives:

- To understand the concepts of microcontroller based system.
- To enable design and programming of microcontroller based system.
- To know about the interfacing Circuits.
-

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	
CO2	
CO3	
CO4	

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

UNIT-I (9 hrs)

Microwave Ovens:

Microwaves (Range used in Microwave Ovens) – Microwave oven block diagram -LCD timer with alarm - Single-Chip Controllers - Types of Microwave oven - Wiring and Safety instructions -Care and Cleaning.

UNIT-II (9 hrs)

Washing Machines:

Electronic controller for washing machines - Washing machine hardware and software- Types of washing machines - Fuzzy logic washing machines Features of washing machines.

UNIT-III (9 hrs)

Air Conditioners and Refrigerators:

Air Conditioning - Components of air conditioning systems -All water air conditioning systems - All air conditioning systems - Unitary and central air conditioning systems -Split air conditioners.

Refrigerators-Principles and types. BLDC Fans and Reciprocating compressors

UNIT-IV (9 hrs)

Home/Office Digital Devices:

Facsimile machine - Xerographic copier -Calculators - Structure of a calculator - Internal Organization of a calculator - Digital clock - Block diagram of a digital clock, **Multifunctional Printer and Network connectivity.**

UNIT-V (9 hrs)

Digital access devices:

Digital computer -Internet access - Online ticket reservation - Functions and networks - Barcode Scanner and decoder - Electronic Fund Transfer - Automated Teller Machines (ATMs) - Set-Top boxes - Digital cable TV - Video on demand.

Text books:

Suggested Books:

1. S.P. Bali, Consumer Electronics - Pearson Education, New Delhi, 2005.
2. R. G. Gupta Audio and Video systems Tata McGraw Hill (2004)

Reference books:

Web Links:

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1													
CO2													
CO3													
CO4													
CO5													

GOVERNMENT COLLEGE (A):RAJAMAHENDRAVARAM
DEPARTMENT OF ELECTRONICS
SYLLABUS FOR III B.Sc., ELECTRONICS
PRACTICAL PAPER
A2- CONSUMER ELECTRONICS Lab

1. To understand the operation of Micro wave oven.
2. To understand the operation of Washing machines.
3. To understand the operation of Air conditioners
4. To understand the operation of Refrigerators
5. To understand the operation of Xerox copier
6. To understand the operation of Digital calculator
7. To understand the operation of Digital clocks
8. To understand the operation of Digital access devices like Barcode Scanner, ATM's, digital cable TV etc

Note: Students has to perform any 06 PROJECTS