GOVERNMENT COLLEGE (A), RAJAHMUNDRY-2025-26
I B.Sc- ELECTRONICS (H) - SEMESTER-I
COURSE-1 : FUNDAMENTALS OF ELECTRICITY AND ELECTRONICS

Theory 3 hrs/week **Credits:3**

Course Objectives:

The students will learn:

1) Basics of electrostatics, Gauss theorem and its applications, concept of a capacitor, various types of capacitors and dielectric constant, magnetic effects of current, cells and the measuring instruments like ammeter and voltmeter,

2) Basics of p-n junction, rectifying action of a diode, regulated power supplies and wave shaping circuits, and

3) Transistor and its three modes of operation, h-parameter model of a transistor and the frequency response of an amplifier.

UNIT-I (9 Hrs)

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 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 (9 Hrs)

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 capacitors - 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 (9 Hrs)

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 – Ampere's Law - Principle, construction and theory of a moving coil ballistic galvanometer.

UNIT-IV (9 Hrs)

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 –

UNIT-V (9 Hrs)

Transistor circuits: Characteristics of a transistor in CB, CE modes - Relatively merits Graphical analysis in CE configuration - Transistor as an amplifier - RC coupled amplifier - Frequency response - h parameters.
Basis logic gates AND, OR, and NOT - Construction of basic logic gates.

Text Books :

1. Electricity and Magnetism - *M. Narayana moorthi and Others*, National Publishing Co., Chennai.
2. Electricity and Magnetism - *R. Murugeshan*, S. Chand & Co. Ltd., New Delhi, Revised Edition, 2006.
3. Principles of Electronics - *V.K. Mehta*, S. Chand & Co., 4/e, 2001.
4. Basic Electronics - *B.L. Theraja*, S. Chand & Co., 4/e, 2001.

Reference Books :

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

GOVERNMENT COLLEGE(A), RAJAHMUNDRY-2025-26
I B.Sc-ELECTRONICS(H)- SEMESTER-I
COURSE-2 : CIRCUIT THEORY AND ELECTRONIC DEVICES
SYLLABUS

Theory 3 hrs/week **List of practical** **Credits:3**

Course Objectives :

1. To explain the basic concepts and laws of DC and AC electrical networks and solve them using mesh and nodal analysis techniques.
2. To analyze circuits in time and frequency domain.
3. To synthesize the networks using passive elements.
4. To understand the construction, working and VI characteristics of electronic devices.
5. To understand the concept of power supply.

UNIT- 1: (9 Hrs)

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: (9 Hrs)

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: (9 Hrs)

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: (9 Hrs)

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: (9 Hrs)

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- PHI Fifth 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) byAgarwal- Arora

4. Electric Circuit Analysis- S.R. Paranjothi- New Age International.

5. Integrated Electronics – Millmam & Halkias.

6. Electronic Devices & Circuits – Bogart.

7. Sedha R.S., A Text Book Of Applied Electronics, S.Chand & Company Ltd

GOVERNMENT COLLEGE (A), RAJAHMUNDRY-2025-26
I B.Sc-ELECTRONICS (H)- SEMESTER-II
COURSE-3 SEMICONDUCTOR MATERIAS & DEVICES

SYLLABUS

Course Outcomes:

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.

Learning Objectives:

1. Ability to apply basic concepts of Inorganic and Organic Semiconductor materials for electronic device application in modern electronic industry.
2. Detailed knowledge of various classifications and applications to VLSI, LEDs and solar cells.
3. Holistic view of the latest progress in two-dimensional (2D)-one-dimensional (1D) and nano materials.
4. Emphasis on nano-electronic applications such as Schottky barrier transistors, flexible Electronics.

Unit I: (9 Hrs)

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: (9 Hrs)

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: (9 Hrs)

MOS structures: Semiconductor surfaces; The ideal and non-ideal MOS capacitor band diagrams 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: (9 Hrs)

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, MoS_2 etc, matamaterials.

UNIT-V: (9 Hrs)

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

Reference Books :

1. Donald A. Neamen, Semiconductor Physics and Devices Basic Principles, 3rd edn.McGraw-Hil (2003)
2. B.G. Streetman and Sanjay Banerjee, Solid State Electronic Devices, 6th Edn., Prentice Hall, 2006.
3. S. M. Sze and Kwok K. Ng Physics of Semiconductor Devices, Wiley (2013).
4. M. Hussa, A. Dimoulas and A. Molle, 2D Materials for Nano Electronics, CRC press (2016)
5. M .S. Tyagi, Introduction to Semiconductor Materials and Devices, Willey, Student Edition

GOVERNMENT COLLEGE(A), RAJAHMUNDRY-2025-26
I B.Sc-ELECTRONICS(H)- SEMESTER-II
COURSE-4 DIGITAL ELECTRONICS
SYLLABUS

Course Objectives:

To understand the number systems, Binary codes and Complements.

1. To understand the Boolean algebra and simplification of Boolean xpressions.
2. To analyze logic processes and implement logical operations using combinational logic circuits.
3. To understand the concepts of sequential circuits and to analyze sequential systems in terms of state machines.
4. To understands characteristics of memory and their classification.
5. To implement combinational and sequential circuits using VHDL.

Unit – I (9 Hrs)

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 (9 Hrs)

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 (9 Hrs)

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 (9 Hrs)

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 (9 Hrs)

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 Kumar

Reference Books :

1. Herbert Taub and Donald Schilling. "Digital Integrated Electronics", 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.*

GOVERNMENT COLLEGE (A), RAJAHMUNDRY-2025-26
II B.Sc-ELECTRONICS (H) - SEMESTER-III
COURSE-5- SEMICONDUCTOR MATERIALS AND DEVICES

Hrs : 3/week **SYLLABUS** **credits: 3**

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.
3. Pre-requisites: Basic understanding of semiconductors.

Outcomes:

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

Unit I: **9Hrs**

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: **9Hrs**

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: **9Hrs**

MOS structures: Semiconductor surfaces; The ideal and non-ideal MOS capacitor band diagrams 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: **9Hrs**

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, MoS_2 etc, matamaterials.

UNIT-V: **9Hrs**

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

Reference Books

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

GOVERNMENT COLLEGE (A), RAJAHMUNDRY-2025-26
II B.Sc-ELECTRONICS (H) - SEMESTER-III
COURSE-6- DIGITAL ELECTRONICS

Hrs : 3/week **SYLLABUS** **credits: 3**

Objectives:

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

Unit – I **09Hrs**

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 **09Hrs**

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

Unit-III **09Hrs**

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: **09Hrs**

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 **09Hrs**

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 universitypress
4. S.Salivahana&S.Arivazhagan-Digital circuits and design
5. Fundamentals of Digital Circuits by Anand Kumar Reference Books :
1. Herbert Taub and Donald Schilling. "Digital Integrated Electronics" .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 usingVHDL

GOVERNMENT COLLEGE (A), RAJAHMUNDRY-2025-26
II B.Sc.-ELECTRONICS (H) - SEMESTER-III
COURSE-7- ANALOG ELECTRONICS

Hrs : 3/week **SYLLABUS** **credits: 3**

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 **9Hrs**

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 **9Hrs**

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 **9Hrs**

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

UNIT-IV **9Hrs**

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 **9Hrs**

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 Hallof 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.

GOVERNMENT COLLEGE (A), RAJAHMUNDRY-2025-26
II B.Sc-ELECTRONICS (H) - SEMESTER-III
COURSE-8- ELECTRONIC COMMUNICATION SYSTEM

Hrs : 3/week **SYLLABUS** **credits: 3**

The students will learn :

a. fundamentals of antenna, their characteristics and types,
b. amplitude modulation and demodulation and radio wave transmission andrecept frequency modulation and demodulation and FM radio wave transmission andreception,
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 widthand polarization - Dipole - Folded dipole - Arrays - Yagi - Uda - Helical - Discone - Parabolic - Dish Antennas - Ground wave, sky wave and space ware propagation - Skip distance - Maximum usable frequency.

UNIT-II

Modulation - Needs for Modulation - Types of Modulation - Amplitude Modulation - Generation and detections 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 DigitalCommunication - Introduction to Microwave, Fiber optic, Satellite Communications RADAR - range equation.

Text Books

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

Reference Books

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

GOVERNMENT COLLEGE (A) RAJAHMUNDRY

II-B.Sc. Electronics - SEMESTER-IV

COURSE 9: ELECTRICAL AND ELECTRONIC INSTRUMENTATION

3Hrs/week SYLLABUS Credits: 3

Learning Outcomes (LO)

LO 1: Evaluate the working principles, limitations, and error types in various DC and AC indicating instruments.

LO 2: Analyze the balancing conditions of different AC and DC bridges and Calculate unknown electrical quantities.

LO 3: Demonstrate the operation of Analog and Digital Oscilloscopes to Measure waveform parameters (frequency, phase, time intervals).

LO 4: Differentiate between signal analysis instruments and Select appropriate electronic voltmeters (DVM, Function Generator) for various signals.

LO 5: Integrate various Transducers (LVDT, Strain Gauge) and Recorders to Design simple measurement and data acquisition systems.

Theory Syllabus (45 Hours Total / 9 Hours per Unit)

Unit	Topics	Hrs
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.	9
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.	9
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.	9
UNIT-IV: Instrumentation Amplifiers and Signal Analysers	Instrumentation amplifier - Electronic Voltmeter and Multimeter - Digital Voltmeter - Function Generator - Wave Analyser - Fundamentals of Spectrum Analyser.	9
NIT-V: Transducer and Display Devices	Strain Gauge - Unbounded Strain Gauge - LVDT - Resistance Thermometer - Photoelectric Transducer - Pen Recorder - Audio Tape Recorder.	9

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, Tata McGraw Hill Publishing Co. LTD

GOVERNMENT COLLEGE (A) RAJAHMUNDRY
B.Sc. Electronics - SEMESTER-IV COURSE
10: MICRO CONTROLERS

Learning Outcome (LO)

CLO 1: Analyze the functional differences between Microprocessors and Microcontrollers, selecting the suitable device for embedded applications.

CLO 2: Deconstruct the 8051 internal architecture (registers, memory, ports) and relate components to overall system operation.

CLO 3: Apply 8051 instruction sets and addressing modes to implement basic control tasks and calculate precise time delays.

CLO 4: Synthesize assembly programs to solve computational problems like arithmetic operations and data sorting.

CLO 5: Design and **Demonstrate** 8051 interfacing with peripherals (e.g., DAC, Stepper Motor) to create functional application prototypes.

Course Code	Course Name	Theory Credits	Practical Credits	Total Credits	Theory Hours/Week	Practical Hours/Week	Total Hours
EL4T10	MICRO CONTROLLER SYSTEM	3	1	4	3	2	5

Theory Syllabus (45 Hours Total / 9 Hours per Unit)

Unit	Topics	Hrs.
UNIT-I: Introduction to Microcontrollers	Introduction, comparison of Microprocessor and Microcontroller. Evolution of microcontrollers from 4-bit to 32-bit. Development tools for microcontrollers: Assembler, Compiler, Simulator/Debugger.	9
UNIT-II: 8051 Microcontroller Architecture	Overview and block diagram of 8051 Architecture of 8051. Program counter and memory organization. Data types and directives, PSW register, Register banks and stack. Pin diagram of 8051. Port organization, Interrupts and timers	9
UNIT-III: Instruction Set and Programming Fundamentals	Addressing modes and accessing memory using various addressing modes. Instruction set: Arithmetic, Logical, Simple bit, Jump, Loop, and Call instructions and their usage. Time delay generation and calculation. Timer/Counter Programming.	9
UNIT-IV: Assembly Language Programming Examples	Assembly language programming Examples: Addition, Multiplication, Subtraction, Division. Arranging a given set of numbers in largest/smallest order.	9
UNIT-V: Interfacing and Applications	Interfacing of – PPI 8255 , DAC (0804). Temperature measurement (LM35). Interfacing seven segment displays. Displaying information on an LCD. Control of a stepper Motor (Uni-Polar)	9

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.

Reference Books

1. Microcontrollers Architecture Programming, Interfacing and System Design – Raj Kamal.
2. The 8051 Microcontroller Architecture, Programming and Application - Kenneth J. Ajala, West Publishing Company.
3. Microcontroller theory and application - Ajay V. Deshmukh.

GOVERNMENT COLLEGE(A), RAJAHMUNDRY

II-B.Sc. Electronics - SEMESTER-IV

COURSE 11: MICROPROCESSOR

SYLLABUS

CREDITS 3 3 Hrs/Week

LO 1: Analyze the architectural features and signal pins of the 8085 and 8086 microprocessors, relating them to system operation.

LO 2: Classify and **Apply** the 8085 instruction set (Data Transfer, Arithmetic, Logical, Branch, Machine Control) for program development.

LO 3: Synthesize Assembly Language Programs using 8085 to solve complex computational and data manipulation problems (e.g., sorting, BCD-to-ASCII conversion)

LO 4: Design memory and I/O interfaces for the 8086 microprocessor by configuring it in Minimum/Maximum modes and utilizing peripheral controllers (DMA, Timers)

LO 5: Assess the advancements in RISC architecture by explaining the ARM organization, programming model, and instruction set.

Course Code	**Course Name**	**Theory Credits**	**Practical Credits**	**Total Credits**	**Theory Hours/Week**	**Practical Hours/Week**	**Total Hours**
EL4T11	MICROPROCESSOR SYSTEMS	3	1	4	3	2	5

Theory Syllabus (45 Hours Total / 9 Hours per Unit)

Unit	Topics	Hours
UNIT-I: CPU ARCHITECTURE	Introduction to Microprocessor. INTEL -8085(P) Architecture, CPU, ALU unit, Register organization, Address, data and control Buses[13]. Pin configuration of 8085. Addressing modes. 8086 Microprocessor: Architecture, Pin description. Instruction format, Instruction Execution timing, Addressing modes.	9
UNIT -II: 8085 Instruction Set	Data transfer Instruction, Logical Instructions, Arithmetic Instructions, Branch Instructions, Machine Control instructions.	9
UNIT -III: Assembly Language Programming using 8085	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[20].	9
UNIT -IV: Basic 8086 Configurations and I/O Interfaces	Basic 8086 Configurations – Minimum mode and Maximum Mode[21]. Interrupt Priority Management. I/O Interfaces: Serial Communication interfaces, Parallel Communication, Programmable Timers, Keyboard and display, DMA controller.	9
UNIT -V: ARM PROCESSOR	Introduction to 16/32 bit processors. Arm architecture & organization, Arm based MCUs, Programming model, Instruction set.	9

Text Books

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

GOVERNMENT COLLEGE (A), RAJAHMUNDRY-2025-26
III B.Sc-ELECTRONICS (H) - SEMESTER-V
COURSE-12 CELLULAR MOBILE COMMUNICATION

Time:2.30Hrs **SYLLABUS** **Max marks:50**

The students will learn:

1. Basics of digital cellular system, cordless telephony and cell structure
2. GSM wireless protocol and markup language fundamentals
3. Basics of WLL and Bluetooth technology

UNIT-I

Advanced mobile phone service - Global system for mobile communication - Digital

Cellular system - Cordless telephony - Third generation wireless systems.

UNIT-II

7 Cell structure - Hand off - roaming management - Hand off detection - Channel assignment techniques - Interference - ACI, CCI - Intersystem hand off and authentication - Network signaling - Cellular digital packet data

UNIT-III

GSM - Network signaling, mobility management, short message service - International roaming, administration and operation.

UNIT-IV

Wireless application protocol - Architecture - Datagram - Transport layer securities - Transaction protocol - Session protocol application environment, wireless markup language, WML - Script wireless telephony applications.

UNIT-V

Third generation mobile services - Wireless local loop - Bluetooth technology.

Text Books

1. Mobile Communications - *Jochen Schiller*, 7/e, Pearson Education, 2003.

2. Principles of Wireless Networks - *Kauch Pahalavan & Prahanet Krishnamoorthy*, 2/e, Pearson Education, 2004.

Reference Books

1. Wireless and Mobile Networks Architecture - *Yi-Bing Lin & Imnch Chlantee*, John Wiley, 2001.

2. Wireless and Mobile Communication - *Rapparport*, Pearson Education, 2001.

GOVERNMENT COLLEGE(A), RAJAHMUNDRY-2025-26
III B.Sc-ELECTRONICS(H)- SEMESTER-V
COURSE-13 COMPUTER NETWORK

Time:2.30Hrs **SYLLABUS** **Max marks:50**

Course Objectives

The students will learn :

1. provides a general introduction to computer networking that would be useful to all personnel who deal with distributed systems,
2. Encompassing both technical and managerial aspects.
3. To help students better understand the challenges and opportunities faced by modern business,
4. topics include LAN and WAN implementations, the Internet and internet applications.

UNIT-I

Network structure Point to Point, Broadcast, Multicast - Horizontal and vertical distribution - Star, Mesh, tree, bus structures - OSI 7 layer model - Architecture - Functions of layers - Packet switches, circuit switching and message switching.

UNIT-II

Physical layer - Transmission media - Channel allocation methods - ALOHA, S-ALOHA, FINITE ALOHA - LAN Protocols IEEE802.3, 802.4, 802.5, 802.6 and 802.11.

UNIT-III

Data link layer - Framing - Error detection - Error correction - CRC - Stop and wait - Go band N - Sliding window Protocol - Selective repeat.

UNIT-IV

Network layer - Routing algorithms and congestion control algorithms - Repeaters, Bridges, Routers and Gateways, Inter networking - Introduction to transport layer and session layer.

UNIT-V

Presentation layer - coding, compression and cryptography - Introduction to Application layer - High performance networks - ATM, Fast Ethernet, FDDI, DQDB, SONET and SDH.

Text Books

1. Computer Networks - *Andrew S. Tanenbaum*, 4/e, Pearson Education, 2005.
2. Data and Computer Communication - *W. Stallings*, 7/e, Pearson Education, 2006.

Reference Books

1. Introduction to Data Communications and Networking - *Behrouz & Forouzan*,4/e, McGraw Hill Book Company, 2004.
2. Telecommunication Networks - Protocols Modeling and Analysis - *Misha Stewartz*,2/e, Pearson Ed

GOVERNMENT COLLEGE (A), RAJAHMUNDRY-2025-26
III B.Sc.-ELECTRONICS (H) - SEMESTER-V
COURSE 14 A: INDUSTRIAL ELECTRONICS

Time: 2.30Hrs **SYLLABUS** **Max marks: 50**

1. Learning Outcomes: Students after successful completion of the course will be able to:
2. Identify various facilities required to set up a basic Instrumentation Laboratory.
3. Acquire a critical knowledge of various Electrical Instruments used in the Laboratory.
4. Demonstrate skills of using instruments like Rectifiers, Multimeters,
5. Understand the Principle and operation of different Electronic Heating devices.

UNIT-I **(9hours)**

Rectifiers and filters: Rectifiers– Half wave, full wave and bridge rectifiers- Efficiency- Ripple factor- Regulation – Harmonic components in rectified output – Types of filters- Choke input (inductor) filter- Shunt capacitor filter- L section and section filters. Voltage Regulators: Transistor Series voltage regulator - Transistor Shunt voltage regulator – Three terminal regulators (78XX and 79XX).

UNIT-II **(9 hours)**

Power Supplies: Block diagram of regulated power supply – A simple regulated transistorized power supply (circuit and working) – Principle and working of switch mode power supply (SMPS).

UNIT-III **(9 hours)**

Voltage Multipliers: Half wave voltage doubler, Full wavevoltage doubler, Voltage Tripler circuit diagram and working mentioning of applications of voltage multipliers.

UNIT-IV **(9 hours)**

Controlled rectifiers: SCR Half wave rectifier circuit, working with wave forms, mathematical analysis for resistive load - SCR Full wave rectifier circuit, working with wave forms, mathematical analysis for resistive load – SCR as inverter parallel and series circuits.

UNIT-V **(9 hours)**

Heat effects: Resistance, inductance and dielectric heating. Principle of operations and its applications.

Reference Books:

1. .Unified Electronics Volume II by J.P Agarwal and Amit Agarwal.
2. Industrial Electronics, S.B. Biswas, Dhanapur Rai & Sons.
3. Industrial Electronics, G.K. Mithal, Khanna Publishers.
4. Electronic Devices and Circuits – G.K. Mithal.
5. Electronic Devices and Circuits-Millman and Halkias- Tata Mc Graw Hill (TMH)
6. Microelectronics- J. Millman and A. Grabel – TMH

GOVERNMENT COLLEGE(A), RAJAHMUNDRY-2025-26
III B.Sc-ELECTRONICS(H)- SEMESTER-V
COURSE 14 B: EMBEDDED SYSTEMS DESIGN

Time:2.30Hrs **SYLLABUS** **Max marks:50**

UNIT 1: **(9Hrs)**

Introduction to Embedded Systems:

Embedded systems overview, Design Challenge, Processor Technology, IC Technology, and Design Technology.

UNIT 2: **(9Hrs)**

Custom Single Purpose Processor – Hardware Development: Introduction, Combinational logic, Sequential logic, Custom Single Purpose Processor Design, RT-Level Custom Single-Purpose Processor.

UNIT 3: **(9Hrs)**

General Purpose Processor – Software Development: Introduction, Basic Architecture,Operation, Programmer's View, ASIPs, and Development Environment: Host and Target Machines, Linker / Locators for Embedded Software, Getting Embedded Software into the target system. Debugging Techniques: Testing on your Host Machine, and Instruction Set Simulators.

UNIT 4: **(9Hrs)**

RTWA for Embedded Systems: Introduction, Timers, Counters and Watchdog Timers, UART, Pulse Width Modulators, LCD Controllers, Keypad Controllers, Stepper Motor Controllers, Analog – to – Digital Converters, and Real Time Clocks.

UNIT 5: **(9Hrs)**

Advanced Communication Principles: Parallel Communication, Serial Communication, Wireless Communication, Serial Protocols: I2C, CAN,FireWire, and USB.Parallel

Protocols: PCI BUS and ARM BUS. Wireless Protocols: IrDA, Bluetooth, and IEEE 802.11.

TEXT BOOKS:

1. Embedded System Design – A Unified Hardware / Software Introduction By Frank Vahid / Tony Givargis – WILEY EDITION.

2. Embedded Systems Architecture, Programming and Design – 2nd Edition By Raj Kamal – Tata McGraw-Hill Education.

REFERENCES:

1. An Embedded Software Premier - David E- Siman, PEARSON

2. Education Embedded / real - time systems - DR. K.V.K.K. Prasad, dreamtech

3. The art of programming embedded systems, Jack G. Ganssle, academic press

4. Intelligent Embedded systems, Louis L. Odette, Adison Wesly, 1991

GOVERNMENT COLLEGE (A), RAJAHMUNDRY-2025-26
III B.Sc-ELECTRONICS (H) - SEMESTER-V
COURSE 15 A: DIGITAL SYSTEM DESIGN
SYLLABUS

UNIT-I

Boolean Algebra and Logic Gates: Review of binary number systems - Binary arithmetic - Binary codes - Boolean Algebra and theorems - Boolean functions - Simplifications of Boolean functions using Karnaugh map and tabulation methods - Logic gates.

UNIT-II

Combinational Logic: Combinational circuits - Analysis and design procedures - Circuits for arithmetic operations - Code conversions - Introduction to Hardware Description Language (HDL).

UNIT-III

Design with MSI Devices: Decoders and Encoders - Multiplexers and Demultiplexers - Memory and programming logic - HDL for combinational circuits.

UNIT-IV

Synchronous Sequential Logic: Sequential circuits - Flip-flops - Analysis and design procedures - State r eduction and state assignments - Shift registers - Counters - HDLfor sequential logic circuits, shift registers and counters.

UNIT-V

Asynchronous Sequential Logic: Analysis and design of asynchronous sequential circuits - Reduction of state and flow tables - Race free state assignment - Hazards.

Text Books

1. Digital Logic and Computer Design - M. Morris Mano, Prentice Hall of IndiaPrivate Limited.

2.A Verilog HDL Premier - J. Baskar, Pearson Education.

Reference Books

1.Analysis and Modeling of Digital Systems - Zain Allabedin Navabee, 2/e , McGraw Hill Publishing Co. Ltd., New Delhi.
2.An Engineering Approach to Digital Design - Fletcher,Prentice Hall of IndiaPrivate Limited.
3.Modern Digital Electronics - R.P. Jain, 2/e, Tata McGraw HillPublishing Co. Ltd.,New Delhi.
4.Digital Fundamentals - T.L. Floyd, 8/e, Pearson Education.

GOVERNMENT COLLEGE (A), RAJAHMUNDRY-2025-26
III B.Sc.-ELECTRONICS (H) - SEMESTER-V
COURSE 15 B: COSUMER ELECTRONICS

SYLLABUS

Learning Outcomes:

- To study Microwave ovens – block diagram - working - types – wiring and safety instructions. – care and cleaning
- To study washing machines – block diagram - working - types – wiring and safety instructions. – care and cleaning
- To study Air conditioners and refrigerators – block diagram - working - types – wiring and safety instructions. – care and cleaning
- To study Home/Office digital devices – block diagram - working - types – wiring and safety instructions. – care and cleaning
- To study Digital access devices like – block diagram - working - types – wiring and safety instructions. – care and cleaning

Learning outcomes:

•The Student can gain good knowledge on microwave ovens and implement in practical applications.

•The Student can gain good knowledge on Washing Machines and implement in practical applications.

•The Student can gain good knowledge on Air conditioners and Refrigerators and implement in practical applications.

•The Student can gain good knowledge on Digital access devices and implement in practical applications.

•Ability to measure strain, displacement, velocity, angular velocity , temperature, pressure Vacuum, and Flow.

Unit – I **9Hrs**

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 **9Hrs**

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

Unit – III **9Hrs**

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.

Unit – IV **9Hrs**

Home/Office Digital Devices – Fascimile machine – Xerographic copier – calculators – Structure of a calculator – Internal organization of a calculator – Servicing electronic calculators – Digital clocks – Block diagram of a digital clock.

Unit – V **9Hrs**

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.

TEXTBOKS:

1.S.P. Bali, Consumer Electronics – Pearson Education, New Delhi,2005.

2.R.G. Gupta Audio and Video systems Tata McGraw Hill (2004)