

Vijaya College, RV Road, Bengaluru-560004

Department of Electronics

NAAC criteria-1: CURRICULAR ASPECTS for the academic year 2023-2024

1. Academic Planner with unitisation of the Entire Syllabus (on hourly basis) SEP
(PME/MECs)

2nd Semester BSc Electronics

ELE - CT2: ANALOG AND DIGITAL ELECTRONICS

Credits : Theory - 04

Practicals – 02

Total Teaching : 56 hours

<i>Week of the Month</i>	<i>Topics Covered</i>	<i>Remarks</i>
February		
3rd Week	Unit 1: Introduction to Varactor, Schottky, and Tunnel diodes. Start with basic semiconductor theory. Emphasize construction and characteristics.	
4th Week	Unit 1: JFETs (p-channel and n-channel). Cover working principle, I-V characteristics, parameters, and comparison with BJT.	
MARCH	Unit 1: MOSFETs (E-MOSFET and D-MOSFET). Focus on construction, working, and symbols.	
1st Week	Unit 1: MOSFET characteristics and special types. Drain and transfer characteristics, VMOS, UMOS Power MOSFETs, and handling.	
2nd Week	Unit 1: MOS Logic, NMOS, and CMOS. Cover logic, symbols, switching action, inverters, and characteristics.	
3rd Week	Unit 1: IGBT, UJT, and SCR. Explain construction and working of IGBT. For UJT, include equivalent circuit and I-V characteristics. For SCR, include VI characteristics and applications.	
4th Week	Unit 1: Diac, Triac, and Unit 1 Review. Finish with Diac and Triac construction, working, and characteristics. Review Unit 1 and practice numerical problems.	
APRIL	Unit 2: Op-Amp fundamentals. Introduce Differential Amplifiers, Op-Amp block diagrams, and characteristics of ideal and practical Op-Amps.	
1st Week	Unit 2: Op-Amp characteristics and applications. Cover Open and closed loop configurations, CMRR, Slew Rate, and the concept of Virtual Ground.	
2nd Week	Unit 2: Negative feedback and Op-Amp circuits. Discuss feedback concepts and advantages of negative feedback. Cover Inverting and Non-inverting amplifiers.	
3rd Week	Unit 2: Advanced Op-Amp applications.	
4th Week		
MAY		

<i>Week of the Month</i>	<i>Topics Covered</i>	<i>Remarks</i>
1st Week	Focus on Summing and Difference Amplifiers, Differentiators, Integrators, Comparators, and Zero-crossing detectors.	
2nd Week	Unit 2: Active Filters and Oscillators.	
3rd Week	Explain First and Second order Butterworth filters. Introduce Barkhausen criterion. Unit 2: Oscillator circuits.	
4th Week	Cover Colpitt's, Crystal, Phase Shift, and Wien-bridge oscillators. Unit 2: IC 555 Timer and Unit 2 Review.	
JUNE	Explain Block diagram, Astable and Monostable multivibrator circuits. Review Unit 2 and solve numerical examples.	
1st Week	Unit 3: Logic Families and Combinational Logic.	
2nd Week	Begin with pulse characteristics, logic family classification, and characteristics. Compare TTL and CMOS families. Unit 3: Boolean Algebra and Logic Gates.	
3rd Week	Introduce SOP, POS, Minterms, Maxterms, and K-Maps for 3 and 4 variables. Cover Half/Full Adders/Subtractors and 4-bit parallel adders. Unit 3: Combinational Circuits.	
4th Week	Discuss Comparators, Encoders, Decoders, Multiplexers, and Demultiplexers. Include realization of adders/subtractors using Mux/Decoders. Unit 4: Sequential Logic and Converters.	
5th Week	Introduce Flip-Flops (SR, D, JK, T) and their applications in memories (RAM, ROM). Cover DAC and ADC principles. Unit 4: Registers and Counters.	
JULY	Cover types of Shift Registers and their applications. Explain Ring and Johnson counters. Introduce Asynchronous and Synchronous counters.	
1st Week	Final Review. Comprehensive revision of all units. Focus on key concepts, circuit diagrams, and numerical problems.	

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1. Academic Planner with unitisation of the Entire Syllabus (on hourly basis) NEP
(PE/ME/ECs)

4th Semester BSc Electronics

ELE CT 4: Electronic Communication-I

Credits : Theory - 04 Practicals – 02 Total Teaching : 56 hours

Week of the month	Topics to be Covered	Remarks
February		
Week 3	UNIT 1: Noise-Introduction, internal and external noises, signal to noise ratio and noise figure, numerical examples. UNIT 2: Block diagram of electronic communication system. UNIT 3: Introduction to Microwaves, frequency bands and applications. UNIT 4: Introduction – need for OFC. Block diagram of OFC system.	
Week 4	UNIT 1: Transmission lines - types and equivalent circuit of T-lines, primary and secondary constants. UNIT 2: Modulation, need and types of modulation (AM, FM & PM). UNIT 3: RADAR Systems: RADAR– principles, maximum unambiguous range. UNIT 4: Fiber optic cables, light propagation through fiber – step index fiber, graded index fiber.	
March		
Week 1	UNIT 1: Reflection coefficient, VSWR and CSWR-numerical examples. UNIT 2: Amplitude modulation – representation, modulation index, Derivation for instantaneous voltage. UNIT 3: Detailed block diagram of pulsed RADAR system. UNIT 4: Snell’s law, numerical aperture (derivation).	
Week 2	UNIT 1: Losses and distortions in T-lines.	

Week of the month	Topics to be Covered	Remarks
	UNIT 2: Frequency spectrum, power relations. Limitations of AM. UNIT 3: RADAR range equation-derivation, factors influencing maximum range. UNIT 4: Types of optical fiber cables, light sources – requirements.	
Week 3	UNIT 1: Wave propagation -ground wave, sky-wave and space wave propagations, ionosphere and its effects. UNIT 2: Frequency Modulation- definition, modulation index, frequency spectrum, bandwidth requirements. UNIT 3: Doppler effect, MTI RADAR-block diagram. UNIT 4: LEDs and semiconductor laser diodes.	
Week 4	UNIT 1: Antennas: Radiation mechanism, wire radiators in space-resonant antennas. UNIT 2: Frequency deviation and carrier swing. UNIT 3: CW RADAR-block diagram, advantages, applications and limitations. UNIT 4: Photo detectors – PN, PIN and avalanche photodiodes.	
April		
Week 1	UNIT 1: Radiation pattern and current distribution for different lengths, non - resonant antenna. UNIT 2: Block diagram of AM and FM transmitter. UNIT 3: FM CW RADAR-block diagram. 4: Losses in optical fibers – Rayleigh scattering, absorption, leaky modes.	
Week 2	UNIT 1: Antenna parameters-gain, directive gain, power gain, bandwidth, beam width, polarisation. UNIT 2: Comparison of AM and FM, numerical examples wherever applicable. UNIT 3: Numerical examples wherever applicable. UNIT 4: Bending, joint junction losses.	
Week 3	UNIT 1: Efficiency, radiation resistance, total effective resistance. UNIT 2: Introduction to pulse communication: types- PAM, PWM, PPM, PCM. UNIT 3: Introduction to Microwaves, frequency bands and applications. UNIT 4: Advantages and disadvantages of OFC over metallic cables.	

Week of the month	Topics to be Covered	Remarks
Week 4	UNIT 1: Expression for the power radiated by antenna and radiation resistance. UNIT 2: Quantization, advantages and applications of pulse communication. UNIT 3: RADAR Systems: RADAR– principles, maximum unambiguous range. UNIT 4: Numerical examples wherever applicable.	
May		
Week 1	UNIT 1: Ungrounded and grounded antenna. UNIT 2: Satellite Communication - Introduction, need, geosynchronous satellite orbits. UNIT 3: Detailed block diagram of pulsed RADAR system. UNIT 4: Advantages and disadvantages of OFC over metallic cables.	
Week 2	UNIT 1: Qualitative study of –folded dipole, micro strip, dish, helical, horn, and loop antennas. UNIT 2: Geostationary satellite advantages of geostationary satellites. UNIT 3: RADAR range equation-derivation, factors influencing maximum range. UNIT 4: Review of losses and numerical examples.	
Week 3	UNIT 1: Numerical examples wherever applicable. UNIT 2: Satellite visibility, transponders (C - Band). UNIT 3: Doppler effect, MTI RADAR-block diagram. UNIT 4: Review of light sources and detectors.	
Week 4	UNIT 1: Review of Transmission lines, Wave propagation. UNIT 2: Path loss, ground station, simplified block diagram of earth station. UNIT 3: CW RADAR-block diagram, advantages, applications and limitations. UNIT 4: Review of fiber types and numerical aperture.	
June		
Week 1	UNIT 1: Review of antenna parameters. UNIT 2: Uplink and downlink. UNIT 3: FM CW RADAR-block diagram. UNIT 4: Review of all OFC topics.	

Week of the month	Topics to be Covered	Remarks
Week 2	UNIT 1: Review and numerical examples. UNIT 2: Review of all modulation techniques. UNIT 3: Numerical examples wherever applicable. UNIT 4: Review and numerical examples.	
Week 3	UNIT 1: Final review. UNIT 2: Final review of Satellite Communication. UNIT 3: Final review of all Radar topics. UNIT 4: Final review of all OFC topics.	
Week 4	Syllabus completion and revision.	
July		
Week 1	Syllabus completion and revision.	
Week 2	Syllabus completion and revision.	
Week 3	Syllabus completion and revision.	

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NAAC criteria-1: CURRICULAR ASPECTS for the academic year 2023-2024

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6th Semester BSc Electronics

DSCEL601: Paper - 7

Electronic Instrumentation and Biomedical Instruments

(Credits: Theory – 04, Practical – 02)

Total Teaching: 60 Hrs

Hours of Teaching: 4 Hrs / Week

Week of the month	Topics Covered	Remarks
February		
Week 3	UNIT 1: Introduction to general measurement system, significance of measurements, methods of measurements, instruments and measurement systems. UNIT 2: Introduction to sensors, types of sensors, typical applications of sensors. UNIT 3: Origin of bio potential and its propagation. UNIT 4: Temperature, respiration rate and pulse rate measurements.	
Week 4	UNIT 1: Instruments Performance Characteristics: Definitions and problems as applicable. UNIT 2: Basic principles and operations of Thermal Sensors. UNIT 3: Electrode-electrolyte interface, electrode– skin interface, half cell potential, impedance, polarization effects of electrode. UNIT 4: Blood Pressure: indirect methods - auscultatory method, oscillometric method.	
March		
Week 1	UNIT 1: Static Characteristics-Static error, static correction, scale range and scale span, reproducibility and drift, repeatability. UNIT 2: Optical Sensors, Acoustic Sensors. UNIT 3: Types of electrodes - surface, needle and micro electrodes and their	

Week of the month	Topics Covered	Remarks
	equivalent circuits. UNIT 4: Direct methods: electronic manometer, Pressure amplifiers - systolic, diastolic, mean detector circuit.	
Week 2	UNIT 1: Signal to noise ratio, sources of noise, accuracy, precision, linearity, hysteresis, threshold, dead time. UNIT 2: MEMS, Nano-sensors, Ultrasonic Sensors. UNIT 3: Bio signals characteristics – frequency and amplitude ranges. UNIT 4: Blood flow and cardiac output measurement: Indicator dilution, thermal dilution and dye dilution method.	
Week 3	UNIT 1: Dynamic Characteristics-Fidelity, frequency response, dynamic error, etc. UNIT 2: Thin Film Sensors, Liquid Level Sensors. UNIT 3: ECG – Einthoven’s triangle, standard 12 lead system. UNIT 4: Electromagnetic and ultrasound blood flow measurement.	
Week 4	UNIT 1: Measurement Errors: Introduction, gross errors and systematic errors, absolute and relative errors. UNIT 2: Magnetic Sensors, Radiation Sensor. UNIT 3: EEG – 10-20 electrode system, unipolar, bipolar and average mode. UNIT 4: Ion selective Field effect Transistor (ISFET), Immunologically sensitive FET (IMFET).	
April		
Week 1	UNIT 1: Basic concepts of accuracy, precision, resolution. UNIT 2: Introduction to actuators, types of actuators, Logical and Continuous Actuators. UNIT 3: EMG, ERG and EOG – unipolar and bipolar mode. UNIT 4: Blood glucose sensors, Blood gas analyzers.	
Week 2	UNIT 1: Classification of transducers, basic requirement of transducers. UNIT 2: Pneumatic actuator, Electro-Pneumatic actuator, cylinder, rotary actuators. UNIT 3: Need for bio-amplifier - single ended bio-amplifier, differential bio-amplifier – right leg driven ECG amplifier. UNIT 4: Colorimeter, flame photometer, spectrophotometer.	
Week 3	UNIT 1: Principle of operation and construction details of resistive, inductive, capacitive, temperature, ultrasonic, photoelectric transducers.	

Week of the month	Topics Covered	Remarks
	UNIT 2: Review of all sensor types and their applications. UNIT 3: Band pass filtering, isolation amplifiers – transformer and optical isolation. UNIT 4: Blood cell counter, auto analyzer (simplified schematic description).	
Week 4	UNIT 1: Pressure, fiber optic and MEMS based transducers. UNIT 2: Review of actuators and their types. UNIT 3: Isolated DC amplifier and AC carrier amplifier. Chopper amplifier. UNIT 4: Review of all non-electrical parameter measurement topics.	
May		
Week 1	UNIT 1: Measurement techniques for motion, seismic, flow. UNIT 2: Review and problem-solving on sensor applications. UNIT 3: Review of all Bio-potential electrodes and configurations. UNIT 4: Review and problem-solving on blood pressure and flow measurements.	
Week 2	UNIT 1: Measurement techniques for level, humidity, pH, viscosity. UNIT 2: Review and problem-solving on actuator applications. UNIT 3: Review and problem-solving on Bio Amplifiers. UNIT 4: Review of all bio-chemical measurement instruments.	
Week 3	UNIT 1: Review of all measurement system topics. UNIT 2: Final review of all sensors and actuators. UNIT 3: Final review of all Bio-potential topics. UNIT 4: Final review of all non-electrical parameter measurements.	
Week 4	Syllabus completion and revision.	
June		
Week 1	Syllabus completion and revision.	
Week 2	Syllabus completion and revision.	
Week 3	Syllabus completion and revision.	
Week 4	Syllabus completion and revision.	

Week of the month	Topics Covered	Remarks
July		
Week 1	Syllabus completion and revision.	
Week 2	Syllabus completion and revision.	
Week 3	Syllabus completion and revision.	

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6th Semester BSc Electronics

DSCEL602: PAPER 8

Internet of Things and Robotics

(Credits: Theory – 04, Practical – 02)

Total Teaching: 60 Hrs

Hours of Teaching: 4 Hrs / Week

Week of the month	Topics Covered	Remarks
February		
Week 3	UNIT 1: Definition and evolution of the Internet of Things, IoT architecture and components. UNIT 2: Wireless communication technologies for IoT: Wi-Fi, Bluetooth, Zigbee. UNIT 3: Definitions of Robots: Robotics, Motivation, A Brief History of Robotics, A Robot System. UNIT 4: Getting Started with Programming platform of Robots: Installation of IDE.	MSB
Week 4	UNIT 1: IoT communication protocols: MQTT, CoAP, HTTP. UNIT 2: LoRaWAN, NodeMCU and ESP 32 modules - Overview of these modules. UNIT 3: Interdisciplinary Areas in Robots, Classification of Robots. UNIT 4: Pin configuration and architecture of Microcontroller (Atmel series/Arduino), Device and platform features.	JV
March		

Week of the month	Topics Covered	Remarks
Week 1	UNIT 1: IoT application domains and use cases. UNIT 2: IoT network topologies: star, mesh, and hybrid networks. UNIT 3: Introduction to embedded system, Understanding Embedded System. UNIT 4: Concept of digital and analog ports.	JV
Week 2	UNIT 1: Overview of IoT devices: microcontrollers, sensors, actuators. UNIT 2: IoT data management and storage. UNIT 3: Sensors, Classification of sensors (contact & non contact), characteristics of sensors. UNIT 4: Familiarizing with Interfacing Board, Introduction to Embedded C platform, Review of Basic Concepts.	JV
Week 3	UNIT 1: Types and characteristics of sensors used in IoT applications. UNIT 2: IoT protocols for device-to-device and device-to-cloud communication. UNIT 3: Touch sensor, Position sensor. UNIT 4: Arduino data types, Variables and constants.	JV
Week 4	UNIT 1: Interfacing sensors with microcontrollers. UNIT 2: IoT application development platforms and frameworks. UNIT 3: Optical sensor, IR, PIR, Ultrasonic sensors. UNIT 4: Operators, Control Statements, Arrays, Functions.	JV
April		
Week 1	UNIT 1: Data acquisition and sensor fusion techniques. UNIT 2: Design and implementation of IoT applications. UNIT 3: Temperature, displacement sensor. UNIT 4: I/o Functions, Pins Configured as INPUT, Pins Configured as OUTPUT.	JV

Week of the month	Topics Covered	Remarks
Week 2	UNIT 1: Review of IoT architecture and protocols. UNIT 2: IoT security challenges and solutions. UNIT 3: Review of sensor types and characteristics. UNIT 4: Incorporating time delay() function, delay Microseconds() function.	JV
Week 3	UNIT 1: Review of sensors and their interfacing. UNIT 2: Privacy and ethical considerations in IoT. UNIT 3: Review and problem-solving on sensor characteristics. UNIT 4: millis() function, micros() function.	JV
Week 4	UNIT 1: Final review of Unit 1. UNIT 2: Review and case studies of IoT applications. UNIT 3: Final review of Unit 3. UNIT 4: Review of all Arduino programming concepts.	JV
May		
Week 1	Syllabus completion and revision.	
Week 2	Syllabus completion and revision.	
Week 3	Syllabus completion and revision.	
Week 4	Syllabus completion and revision.	
June		
Week 1	Syllabus completion and revision.	

Week of the month	Topics Covered	Remarks
Week 2	Syllabus completion and revision.	
Week 3	Syllabus completion and revision.	
Week 4	Syllabus completion and revision.	
July		
Week 1	Syllabus completion and revision.	
Week 2	Syllabus completion and revision.	
Week 3	Syllabus completion and revision.	