VIDYASAGAR UNIVERSITY

Midnapore, West Bengal

PROPOSED CURRICULUM&SYLLABUS (DRAFT) OF

BACHELOR OF SCIENCE WITH ELECTRONICS(MULTIDISCIPLINARY STUDIES)

3-YEAR UNDERGRADUATE PROGRAMME

(w.e.f. Academic Year 2023-2024)

Based on

Curriculum & Credit Framework for Undergraduate Programmes (CCFUP), 2023& NEP, 2020

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VIDYASAGAR UNIVERSITY

BACHELOR OF SCIENCE IN PHYSICAL SCIENCES with ELECTRONICS

(*Under CCFUP, 2023*)

Level	YR.	SEM	Course Type	Course Code	Course Title	Credit	L-T-P	Marks		
								CA	ESE	TOTAL
B.Sc. in Physical Sc. with Electronics	2nd	III	**SEMESTER-III**							
			Major-A2	ELCPMJ02	**T: Digital Circuits; P: Practical** ***(To be studied by students taken Electronics as Discipline- A)***	4	3-0-1	15	60	75
			Major-A3	ELCPMJ03	**T: Digital Electronics & Logic Circuits; P: Practical** ***(To be studied by students taken Electronics as Discipline- A)***	4	3-0-1	15	60	75
			SEC	SEC03	***To be taken from SEC-03 of Discipline C.***	3	0-0-3	10	40	50
			AEC	AEC03	Communicative English-2 (***common for all programmes***)	2	2-0-0	10	40	50
			MDC	MDC03	Multidisciplinary Course-3 (***to be chosen from the list***)	3	3-0-0	10	40	50
			Minor-3 (Disc.-C3)	ELCMIN03	**T: Digital Electronics & Logic Circuits; P: Practical** ***(To be studied by students taken Electronics as Discipline- C)***	4	3-0-1	15	60	75
			Semester-III Total			20				375
		IV	**SEMESTER-IV**							
			Major-B2		***(Same as MajorA2 for Electronics taken as Discipline-B)***	4	3-0-1	15	60	75
			Major-B3		***(Same as Major–A3 for Electronics taken as Discipline-B)***	4	3-0-1	15	60	75
			Major (Elective) -1	ELCMJE-01	**T: Fundamentals of Semiconductor Devices & Applications P: Practical** ***(To be studied by students taken Electronics as Discipline- A)***	4	3-0-1	15	60	75
			AEC	AEC04	MIL-2 (***common for all programmes***)	2	2-0-0	10	40	50
			Minor -4 (Disc.-C4)	ELCMIN04	**T: Fundamentals of Semiconductor Devices & Applications; P: Practical** ***(To be studied by students taken Electronics as Discipline- C)***	4	3-0-1	15	60	75
			Summer Intern.	IA	Internship / Apprenticeship- **activities to be decided by the Colleges following the guidelines to be given later**	4	0-0-4	-	-	50
			Semester-IV Total			22				400
			TOTAL of YEAR-2			42	-	-	-	775

MJP = Major Programme(Multidisciplinary), MI = Minor, A/B = Choice of Major Discipline; C= Choice of Minor Discipline; SEC = Skill Enhancement Course, AEC = Ability Enhancement Course, MDC = Multidisciplinary Course, CA= Continuous Assessment, ESE= End Semester Examination, T = Theory, P= Practical, L-T-P = Lecture-Tutorial-Practical, MIL = Modern Indian Language

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MAJOR (MJ)

MJ A2/B2: Digital Circuits **Credits 04(FM: 75)**

MJ A2/B2T:Digital Circuits (Theory) **Credits 03 [45L]**

Course contents:

Number Systems and Boolean algebra

Number System and Codes: Decimal, Binary, Hexadecimal, Octal, BCD, Conversions, Complements (1'sand2's), Signed and unsigned numbers, addition and subtraction, multiplication and subtraction, Gray Codes, Boolean algebra and Logic gates: Boolean algebra- Positive and negative logic. Boolean laws. De Morgan's theorems, simplification of Boolean expressions-SOP and POS. Logic gates- basic logic gates-AND, OR, NOT, logic symbol and truth table. Derived logic gates (NAND, NOR, XOR & XNOR). Universal property of NOR and NAND gates. K-map-3 and 4 variable expressions. Characteristics of logic families: Fan In and Fan out, power dissipation and noise Immunity, propagation delay, comparison of TTL and CMOS families.

Combinational Logic

Combinational logic analysis and design: Multiplexers and Demultiplexers, Adder (half and full) and their use as subtractor, Encoder and Decoder, Code Converter (Binary to BCD and vice versa)

Sequential Logic

Sequential logic design: Latch, Flip flop, S-R FF , J-K FF, T and D type FFs, clocked FFs, registers, Counters (ripple, synchronous and asynchronous, ring, modulus)

MJ A2/B2P: Digital Circuits Lab (Practical) **Credits 01**

1. To verify and design AND, OR, NOT and XOR gates using NAND gates.
2. To convert a Boolean expression into logic gate circuit and assemble it using logicgate IC's.
3. Design a Half and Full Adder Half and Full Subtractor,.
4. Design of a decoder / Multiplexer circuit using gates.
5. Design a seven segment display driver.
6. Boolean Function implementation using Decoder and Multiplexer.
7. To build a Flip- Flop Circuits using elementary gates. (RS, Clocked RS, D-type).
8. Design a counter using D/T/JK Flip-Flop.
9. Design a shift register and study Serial and parallel shifting of data.

Reference Books

1. M. Morris Mano Digital System Design, Pearson Education Asia,(Fourth Edition)
2. Thomas L.Flyod, Digital Fundamentals, Pearson Education Asia (1994)
3. W.H.Gothmann, Digital Electronics: An Introduction To Theory And Practice, Prentice Hall of India (2000)
4. R.L.Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw-Hill (1994)

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MJ A3/B3: Digital Electronics & Logic Circuits **Credits 04 (FM: 75)**

MJ A3/B3T: Digital Electronics & Logic Circuits(Theory) **Credits 03 [45L]**

Number Systems and Boolean algebra-

Number System and Codes: Decimal, Binary, Hexadecimal, Octal, BCD, Conversions, Complements (1's and 2's), Signed and unsigned numbers, addition, subtraction and multiplication, Gray Codes.

Boolean algebra and Logic gates: Boolean algebra- Positive and negative logic. Boolean laws. De Morgan's theorems, simplification of Boolean expressions-SOP and POS. Logic gates- AND, OR, NOT, NAND, NOR, XOR & XNOR, logic symbol and truth table, Universal gates. Fan In and Fan out, power dissipation and noise Immunity, propagation delay, K-map.

Combinational Logic: Combinational logic analysis and design: Adder, Subtractor (half and full), Encoder and Decoder, Multiplexers and Demultiplexers.

Sequential Logic
Sequential logic design: Latch, Flip flop (FF), S-R FF , J-K FF, T and D type FFs, clocked FFs, registers, Counters (ripple, synchronous and asynchronous, ring, modulus).

MJ A3/B3P: Digital Electronics & Logic Circuits (Practical) **Credits 01**

Course Outline:

1. To verify and design AND, OR, NOT and XOR gates using NAND gates.
2. To convert a Boolean expression into logic gate circuit and assemble it using logicgate IC's.
3. Design a Half and Full Adder Half and Full Subtractor,.
4. Design of a decoder / Multiplexer circuit using gates.
5. Design a seven segment display driver.
6. Boolean Function implementation using Decoder and Multiplexer.
7. To build a Flip- Flop Circuits using elementary gates. (RS, Clocked RS, D-type).
8. Design a counter using D/T/JK Flip-Flop.
9. Design a shift register and study Serial and parallel shifting of data.

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Major Elective (MJE)-01: Fundamentals of Semiconductor Devices & Applications

Credits 04 (Full Marks: 75)

MJE-01T: Fundamentals of Semiconductor Devices & Applications (Theory) Credits 03

Course contents:

Basic Circuit Concepts: Resistors, Inductors and Capacitors: classifications and basic concepts. Voltage and Current Sources.
Circuit Analysis: Kirchhoff's Current Law (KCL), Kirchhoff's Voltage Law (KVL), Star-DeltaConversion.
Network Theorems: Principal of Duality, Superposition Theorem, Thevenin's Theorem, Norton's Theorem,Maximum Power Transfer Theorem.
P-N Junction Diode: Formation of Depletion Layer, Diode Equation and I-V Characteristics. Zener and Avalanche Junction Breakdown Mechanism.
Diode Circuits: Rectifiers–DC power supply, Filters, Clipping and clamping circuits. Regulation using Zener, Concepts of Metal Semiconductor Junctions.
Bipolar Junction Transistors (BJT): PNP and NPN Transistors, Basic Transistor Action, Current Gain, Energy Band Diagram of Transistor in Thermal Equilibrium, Quantitative Analysis of Static Characteristics (Minority Carrier Distribution and Terminal Currents), Base-Width Modulation, Input and Output Characteristics of CB, CE and CC Configurations.
Circuits using Bipolar Junction Transistor: Hybrid parameters, Different Transistor biasing, DC load line, operating point, thermal runaway, stability and stability factor. Transistor as a switch; Transistor as amplifier, Types of Amplifier: Voltage and Power amplifier, Classes of amplifiers.
Feedback Amplifiers:
Concept of feedback, negative and positive feedback, Feedback topologies, Barkhausen criteria for oscillations, Oscillators.
Regulated power supply: series and shunt (using BJT) Circuit diagram, Working and Frequency Response for each, Limitations of single tuned amplifier, Applications of tuned amplifiers in communication circuits.
JFET–Types - p-channel and n-channel, working and I-V characteristics of JFET, parameters and their relationships, Comparison of BJT and JFET.
MOSFET Circuits:
Review of Depletion and Enhancement MOSFET, Biasing of MOSFETs, Small Signal Parameters, Common Source amplifier circuit analysis, CMOS circuits.
Op-Amp: Block diagram of Op-Amp, Characteristics of an Ideal and
Practical Op-Amp, offset voltage, offset current, input bias current, concept of Virtual Ground, differential input resistance, CMRR, Slew Rate, Differential Amplifier, Open and closed loop configuration, supply voltage rejection ratio.
Applications of op-amps: Inverting and non- inverting amplifiers, Adder, Subtractor, Differentiator, Integrator, Comparator, Differential amplifier and Zero-crossing detector.

MJE-01P: Fundamentals of Semiconductor Devices & Applications (Practical) Credits 01

Course Outline:

01. Studyof the forward and reverse I-VCharacteristics of a Diode.
02. Studyoftheinput and outputCharacteristicsoftheofBJT.
03. StudyoftheI-VCharacteristicsofJFET.
04. Studyof the half wave rectifierandFullwaverectifier.
05. Studyofvoltage regulatorusingZenerdiode.
06. DesigningofaSingleStageCEamplifier.

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07. Designingofanamplifierofgivengainforaninvertingandnon-invertingconfigurationusinganop-amp.
08. Study of the zero-crossing detector and comparator using OP-AMP.
09. Designingofanalogadderandsubtractorcircuit.
10. Designingofanintegratorusingop-ampforagivenspecificationandstudyitsfrequencyresponse.
11. Designingofadifferentiatorusingop-ampforagivenspecificationandstudyitsfrequencyresponse.
12. Study of a differential amplifier circuit using OP-AMP.

Reference Books

1. Electronic Devices and circuit theory, Robert Boylstead and Louis Nashelsky,9thEdition, 2013, PHI
2. Electronic Devices, David A Bell, Reston Publishing Company
3. D.L.Schilling and C.Belove, Electronic Circuits :Discrete and Integrated, Tata McGraw Hill (2002)
4. DonaldA.Neamen, Electronic Circuit Analysis and Design, Tata McGrawHill (2002)
5. J.Millman and C.C.Halkias, Integrated Electronics, TataMcGraw Hill(2001)
6. J.J.Cathey,2000
7. Solved Problems in Electronics, Schaum' soutline Series, TataMcGraw Hill (1991)
8. Allen Mottershed, Electronic Devices and Circuits, Goodyear Publishing Corporation
9. Sedra Smith, Microelectronic Circuits, 6/E Oxford
10. Bogart Electronic Devices and Circuits,6ePearson

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MINOR (MI)

MI-3/C3: Same as Minor-3 (ELCMIN03) of Electronics (Hons) programme — **Credits 04**, **Full Marks: 75**

MI-4/C4: Same as Minor-4 (ELCMIN04) of Electronics (Hons) programme — **Credits 04**, **Full Marks: 75**

SKILL ENHANCEMENT COURSE (SEC)

(To be studied by students taken Electronics as Discipline- C)

SEC-03 P: Same as SEC-03(ELCSEC03) of Electronics (Hons) programme — **Credits 03**, **Full Marks: 50**

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