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	3rd	V	**SEMESTER-V**							
			Major-A4	ELCPMJ04	T: Communication Electronics; P: Practical *(To be studied by students taken* Electronics *as Discipline- A)*	4	3-0-1	15	60	75
			Major-A5	ELCPMJ05	T: Analog and Digital Communications; P: Practical *(To be studied by students taken* Electronics *as Discipline- A)*	4	3-0-1	15	60	75
			Major-A6	ELCPMJ06	T: Fundamentals of Microprocessor and Microcontroller; P: Practical *(To be studied by students taken* Electronics. *as Discipline- A)*	4	3-0-1	15	60	75
			Major (Elective) -2	ELCMJE-02	T: Numerical Analysis; P: Practical *(To be studied by students taken* Electronics *as Discipline- A)*	4	3-0-1	15	60	75
			Minor-5 (Disc.-C5)	ELCMIN05	T: Communication Electronics*;* P*:* Practical *(To be studied by students taken* Electronics *as Discipline- C)*	4	3-0-1	15	60	75
			Semester-V Total			20				375
		VI	**SEMESTER-VI**							
			Major-B4		*To be decided(Same as Major- A4 for* Electronics *taken as Discipline-B)*	4	3-0-1	15	60	75
			Major-B5		*To be decided(Same as Major–A5 for* Electronics *taken as Discipline-B)*	4	3-0-1	15	60	75
			Major-B6		*To be decided(Same as Major–A6 for* Electronics *taken as Discipline-B)*	4	3-0-1	15	60	75
			Major (Elective) -3	ELCMJE-03	T: Control System; P: Practical *(To be studied by students taken* Electronics *as Discipline- A)*	4	3-0-1	15	60	75
			Minor -6 (Disc.-C6)	ELCMIN06	T: Analog and Digital Communications; P: Practical *(To be studied by students taken* Electronics *as Discipline- C)*	4	3-0-1	15	60	75
			Semester-VI Total			20				375
			TOTAL of YEAR-3			40	-	-	-	700
			Eligible to be awarded Bachelor of Science in Multidisciplinary Studies with Electronics *on Exit*			126	Marks (Year: I+II+III)			2325

MJP = Major Programme (Multidisciplinary), MI = Minor, A/B = Choice of Major Discipline; C= Choice of Minor Discipline; CA= Continuous Assessment, ESE= End Semester Examination, T = Theory, P= Practical, L-T-P = Lecture-Tutorial-Practical

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MAJOR (MJ)

Major A/B 4: Communication Electronics

(Credits 04; Full Marks: 75)

MJ A4/B4T: Communication Electronics **Credits 03**

Course contents:

Unit-1 **(16 Lectures)**

Noise and Transmission lines: Noise-Introduction, internal and external noises, signal to noise ratio and noise figure. Different noise.
Amplitude Modulation/demodulation techniques: Modulation: AM, FM & PM.
Amplitude modulation: Modulation index, expression for instantaneous voltage, power relations, frequency spectrum, DSBTC, DSBSC and SSBSC Modulation techniques. Limitations of AM.
Demodulation- AM detection: principles of detection, Rectifier and envelope detector.
Block diagram of AM transmitter and Receiver, Super Heterodyne receiver.

Unit-2 **(12 Lectures)**

Frequency Modulation/demodulation techniques: Frequency Modulation: definition, modulation index, FM frequency spectrum, bandwidth requirements, frequency deviation, direct and indirect generation of FM.
FM detector – Slope detector-circuit, FM detection by PLL. Block diagram of FM transmitter and Receiver. Comparison of AM and FM.

Unit- 3 **(16 Lectures)**

Digital communication: Introduction to pulse and digital communications, sampling theorem, types- PAM, PWM, PPM, PCM – quantization, advantages and applications, digital modulations (FSK, PSK, and ASK). Advantage and disadvantages of digital transmission, characteristics of data transmission circuits – Shannon limit for information capacity, bandwidth requirements, data transmission speed, concepts of TDM and FDM.

Unit- 4 **(16 Lectures)**

Cellular Communication: Concept of cellular mobile communication – cell and cell splitting, frequency bands used in cellular communication, absolute RF channel numbers (ARFCN), frequency reuse, roaming and hand off, authentication of the SIM card of the subscribers, IMEI number, concept of TDMA, FDMA, CDMA and GSM technology, 2G, 3G and 4G concepts
Satellite communication: Introduction to Satellite communication, Orbits of Satellites, Block diagram of satellite transponder and its importance.

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Suggested Books:

1. Electronic Communication, George Kennedy, 3rd edition, TMH.
2. Electronic Communication, Roddy and Coolen, 4th edition, PHI.
3. Electronic Communication systems, Kennedy & Davis, IV edition-TATA McGraw Hill.
4. Advanced Electronic Communication systems, Wayne Tomasi- 6th edition, Low priced edition-Pearson education

MJ A4/B4 P: Communication Electronics (Practical) **Credits 01**

1. Amplitude modulator and Amplitude demodulator
2. Study of FM modulator using IC8038
3. Study of VCO using IC 566
4. Study of Time Division Multiplexing and de multiplexing
5. Study of AM Transmitter/Receiver
6. Study of FM Transmitter/Receiver
7. ASK modulator and demodulator
8. Study of FSK modulation
9. Study of PWM and PPM
10. Study of PAM modulator and demodulator

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Major A/B5: Analog and Digital Communications

(Credits 04; Full Marks: 75)

MJ A5/B5: Analog and Digital Communications Credits 04(Full Marks: 75)

MJ A5/B5T: Analog and Digital Communications (Theory) Credits 03 (45l)

Course contents:

Unit-1 (16 Lectures)

Noise and Transmission lines: Noise-Introduction, internal and external noises, signal to noise ratio and noise figure. Different noise.

Amplitude Modulation/demodulation techniques: Modulation: AM, FM & PM.

Amplitude modulation: Modulation index, expression for instantaneous voltage, power relations, frequency spectrum, DSBTC, DSBSC and SSBSC Modulation techniques. Limitations of AM.

Demodulation- AM detection: principles of detection, Rectifier and envelope detector.

Block diagram of AM transmitter and Receiver, Super Heterodyne receiver.

Unit-2 (12 Lectures)

Frequency Modulation/demodulation techniques: Frequency Modulation: definition, modulation index, FM frequency spectrum, bandwidth requirements, frequency deviation, direct and indirect generation of FM.

FM detector – Slope detector-circuit, FM detection by PLL. Block diagram of FM transmitter and Receiver. Comparison of AM and FM.

Unit- 3 (16 Lectures)

Digital communication: Introduction to pulse and digital communications, sampling theorem, types- PAM, PWM, PPM, PCM – quantization, advantages and applications, digital modulations (FSK, PSK, and ASK). Advantage and disadvantages of digital transmission, characteristics of data transmission circuits – Shannon limit for information capacity, bandwidth requirements, data transmission speed, concepts of TDM and FDM.

Unit- 4 (16 Lectures)

Cellular Communication: Concept of cellular mobile communication – cell and cell splitting, frequency bands used in cellular communication, absolute RF channel numbers (ARFCN), frequency reuse, roaming and hand off, authentication of the SIM card of the subscribers, IMEI number, concept of TDMA, FDMA, CDMA and GSM technology, 2G, 3G and 4G concepts.

Satellite communication: Introduction to Satellite communication, Orbits of Satellites, Block diagram of satellite transponder and its importance.

Suggested Readings:

1. Electronic Communication, George Kennedy, 3rd edition, TMH.
2. Electronic Communication, Roddy and Coolen, 4th edition, PHI.
3. Electronic Communication systems, Kennedy & Davis, IV edition-TATA McGraw Hill.
4. Advanced Electronic Communication systems, Wayne Tomasi- 6th edition, Low priced edition-Pearson education.

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MJ A5/B56P: Analog and Digital Communications (Practical) Credits 01 (30Hrs.)

1. Amplitude modulator and Amplitude demodulator
2. Study of FM modulator using IC8038
3. Study of VCO using IC 566
4. Study of Time Division Multiplexing and de multiplexing
5. Study of AM Transmitter/Receiver
6. Study of FM Transmitter/Receiver
7. ASK modulator and demodulator
8. Study of FSK modulation
9. Study of PWM and PPM
10. Study of PAM modulator and demodulator

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Major A/B6: Fundamentals of Microprocessor and Microcontroller

(Credits 04; Full Marks: 75)

MJ A6/B6 T: Fundamentals of Microprocessor and Microcontroller (Theory) Credit 03

Unit-1 **(10 Lectures)**

Introduction to Microprocessor: Introduction, bit, byte, word size, block diagram, classification of microprocessors.

Microprocessor 8085: Architecture and Pin diagram of microprocessor 8085, Registers, Memory, Flags, stack pointer, program counter, types of buses. Multiplexed address and data bus, generation of control signals.

Unit-2 **(18 Lectures)**

8085 Instructions: Mnemonics, addressing modes, instruction classification, Instruction set of 8085:

Data transfer, arithmetic, increment & decrement, logical, branch and machine control instructions.

Stack and subroutine, calls and return operations. Delay loops, counters, timing diagrams: instruction cycle, machine cycle, T- states.

Interrupts: Hardware and software interrupts, vectored and non-vectored interrupts, leveled and edged triggered interrupt, memory mapped I/O and peripheral mapped I/O, Interfacing of memory and I/O devices.

Unit- 3 **(12 Lectures)**

Introduction to Microcontrollers: Embedded system, Basic block diagram, comparison of 8 bit, 16 bit and 32 bit microcontrollers.

Microcontrollers 8051- Internal block diagram, key features, pin configuration, special purpose/function registers.

Counters and timers: 8051 program counter, TCON, TMOD, timer counter interrupts, timer modes of operation. Input / output ports and circuits/ configurations, serial data input / output – SCON, PCON, serial data transmission modes.

Unit-4 **(20 Lectures)**

8051 Interrupts, Addressing modes and Instruction set: Interrupts – IE, IP, time flag interrupts, serial port interrupt, external interrupts, reset, interrupt control, interrupt priority.

Addressing modes, immediate addressing, register addressing, direct and indirect addressing,

Data transfer instructions, Push and Pop and data exchange instructions.

Logical Instructions, byte level logical operations, bit level logical operations, rotate and swap operations.

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Arithmetic Instructions, flags, incrementing and decrementing, addition, subtraction, multiplication and division, decimal arithmetic, simple programs in assembly language.

Suggested Books:

1. Microprocessor Architecture, Programming and Applications with 8085, Ramesh S.Gaonkar - Wiley Eastern Limited- IV Edition.
2. Fundamentals of Microprocessor & Microcomputer: B. Ram— Danpat Rai Publications.
3. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. MCKinlay "The 8051 Microcontroller and Embedded Systems", 2nd Edition, Pearson Education 2008.
4. Muhammad Ali Mazidi, "Microprocessors and Microcontrollers", Pearson, 2006

MJ A6/B6 P: Fundamentals of Microprocessor and Microcontroller (Practical): Credit: 01

1. Program to transfer a block of data.
2. Program for multibyte addition
3. Program for multibyte subtraction
4. Program to multiply two 8-bit numbers.
5. Program to divide a 16 bit number by 8 bit number.
6. Program to search a given number in a given list.
7. Program to generate terms of Fibonacci series.
8. Program to sort numbers in ascending/descending order.
9. Program to find the square root of an integer.
10. To study interfacing of IC 8255.
11. Program to verify the truth table of logic gates.

8051 Microcontroller Programming

1. Program to find the sum of N 8-bit numbers.
2. Program to find largest of N numbers.
3. Program to find smallest of N numbers
4. Program to find whether the given data is palindrome.
5. Program to arrange the numbers in ascending order.
6. Interfacing of stepper motor and Rotating stepper motor by N steps clockwise/ anticlockwise with speed control.
7. LCD interfacing.
8. Speed control of DC motor using PWM (pulse delay to be implemented using timers).

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Major Elective

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

Major Elective (MJE)-2:

Numerical Analysis

[Credits: Theory-03, Practicals-01]

Course contents: **Credit-03** **Lectures 60**

Unit-1 (16 Lectures)

Numerical Methods: Floating point, Round-off error, Error propagation, Stability, Programming errors.
Solution of Transcendental and Polynomial Equations: Bisection method, Secant and Regula Falsi Methods, Newton Raphson method, Rate of convergence, General Iteration Methods, Newton's Method for Systems, Method for Complex Roots, Roots of Polynomial Equations.

Unit-2 (14 Lectures)

Interpolation and Polynomial Approximations: Taylor Series and Calculation of Functions, Langrange Interpolation, Newton Divided Difference Interpolation (forward and backward difference formulae), Truncation errors.
Curve Fitting: Least square fitting, Curve fitting, Interpolation by Spline functions.

Unit-3 (16 Lectures)

Numerical Integration: Trapezoidal Rule, Error bounds and estimate for the Trapezoidal rule, Simpson's Rule, Error of Simpson's rule.
Numerical Differentiation: Finite difference method and applications to electrostatic boundary value problems.
Numerical methods for first order differential equations: Euler-Cauchy Method, Heun's Method, Classical Runge Kutta method of fourth order. Methods for system and higher order equations.

Unit- 4 (14 Lectures)

Numerical Methods in Linear Algebra: Linear systems Ax=B, Gauss Elimination, Partial Pivoting, LU factorization, Doolittle's, Crout's and Cholesky's method. Matrix Inversion, Gauss-Jordon, Iterative Methods: Gauss-Seidel Iteration, Jacobian Iteration.
Matrix Eigen value: Power Method.

Recommended Reading:

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons (1999).
2. V. Rajaraman, Computer Oriented Numerical Methods, Prentice Hall India, Third Edition.
3. S. S. Sastry, Introductory Methods of Numerical Analysis, Prentice Hall India (2008).
4. M. K. Jain, S. R. K. Iyengar and R. K. Jain, Numerical Methods: Problems and Solutions, New Age International (2007).
5. B.S. Grewal, Numerical Methods in Engineering and Science with Programs in C and C++, Khanna Publishers (2012).

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Numerical Techniques Lab **Credit 01**

1. Program to implement Bisection Method
2. Program to implement Secant Method
3. Program to implement Regula falsi method
4. Program to implement Newton Raphson Method
5. Program to implement Trapezoidal rule
6. Program to implement Simpson's rule
7. Program to implement RungeKutta Method
8. Program to implement Euler-Cauchy Method
9. Program to implement Gauss-Jordon Method
10. Program to implement Gauss-Seidel Iteration

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Major Elective (MJE)-3:

Control Systems

[Credits: Theory-03, Practicals-01]

Course contents:

Unit 1 **(16 Lectures)**

Introduction to Control Systems: Open loop and Closed loop control systems, Mathematical modeling of physical systems (Electrical, Mechanical and Thermal), Derivation of transfer function, Armature controlled and field controlled DC servomotors, AC servomotors, block diagram representation & signal flow graph, Reduction Technique, Mason's Gain Formula. Effect of feedback on control systems.

Unit 2 **(14 Lectures)**

Time Domain Analysis: Time domain performance criteria, transient response of first, second & higher order systems, steady state errors and static error constants, Performance indices.

Concept of Stability: Asymptotic stability and conditional stability, Routh – Hurwitz criterion, relative stability analysis, Root Locus plots and their applications.

Unit 3 **(14 Lectures)**

Frequency Domain Analysis: Correlation between time and frequency response, Polar and inverse polar plots, frequency domain specifications, Logarithmic plots (Bode Plots), gain and phase margins, Nyquist stability criterion, relative stability using Nyquist criterion, constant M & N circles.

Unit 4 **(16 Lectures)**

State Space Analysis: Definitions of state, state variables, state space, representation of systems, Solution of time invariant, homogeneous state equation, state transition matrix and its properties.

Controllers and Compensation Techniques: Response with P, PI and PID Controllers, Concept of compensation, Lag, Lead and Lag-Lead networks.

Suggested Books:

1. J. Nagrath& M. Gopal, Control System Engineering, New Age International, 2000
2. K. Ogata, Modern Control Engineering, PHI 2002
3. B. C. Kuo , "Automatic control system", Prentice Hall of India, 2000

Control Systems (Practical) **(Credit-1)**

1. To study characteristics of: (a) Synchro transmitter receiver (b) Synchro as an error detector
2. To study position control of DC motor
3. To study speed control of DC motor
4. To find characteristics of AC servo motor
5. To study time response of type 0, 1 and 2 systems
6. To study frequency response of first and second order systems
7. To study time response characteristics of a second order system.
8. To study effect of damping factor on performance of second order system
9. To study frequency response of Lead and Lag networks.
10. Study of P, PI and PID controller.

OR

Tutorial/ Submission of Dissertation/ Term project/ student Seminar on **Control Systems**

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MINOR (MI)

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

MI-5/C5: Same as Minor-5 (ELCMIN05) of Electronics (Hons.) programme **Credits 04**
Full Marks: 75

MI-6/C6: Same as Minor-6 (ELCMIN06) of Electronics (Hons.) programme **Credits 04**
Full Marks: 75

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