MODERN EDUCATION SOCIETY'S

NOWROSJEE WADIA COLLEGE, PUNE -01

(An Autonomous college affiliated to Savitribai Phule Pune University)

S.Y. B. Sc. Electronic Science

SYLLABUS

UNDER NATIONAL EDUCATION POLICY 2020

TO BE IMPLEMENTED FROM

ACADEMIC YEAR 2024-25

(Faculty of Science and Technology)

CREDIT FRAMWORK IN NEP

Savitribai Phule Pune University, Pune

Credit Framework for Under Graduate (UG)

Level / Difficulty	Semester	Credits Related to Major					Minor	GE/OE	SEC	AEC	VEC	CC	Total
		Major Core	Major Elective	VSC	IKS	FP / OJT/ CEP							
Vertical (V)		V-1		V-4	V-5	V-6	V-2	V-3	V-4	V-5	V-5	V-6	
4.5 / 100	I	4 (T) + 2 (P)	0	2 (T)	2 (T)	0	0	2 (T) + 2 (P)	2 (T/P)	2 (T)	2	2	22
	II	4 (T) + 2 (P)	0	2 (P)	0	0	2 (T)	2 (T) + 2 (P)	2 (T/P)	2 (T)	2	2	22
Exit option: Award of UG Certificate in Major with 44 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor													
5.0 / 200	III	6 (T) + 2 (P)	0	2 (T)	0	2 (FP)	2(T)+2(P)	2 (T)	0	2	0	2	22
	IV	6 (T) + 2 (P)	0	0	0	2 (CEP)	2(T)+2(P)	2 (P)	2 (T/P)	2	0	2	22
Exit option: Award of UG Diploma in Major and Minor with 88 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor													
5.5 /300	V	6 (T) + 4 (P)	2 (T) + 2 (T/P)	2 (P)	0	2 (FP/CEP)	2(T)+2(P)	0	0	0	0	0	22
	VI	6 (T) + 4 (P)	2 (T) + 2 (T/P)	0	0	4 (OJT)	2(T)+2(P)	0	0	0	0	0	22
Total 3 Years		**48**	**8**	**8**	**2**	**10**	**18**	**12**	**6**	**8**	**4**	**8**	**132**
Exit option: Award of UG Degree in Major with 132 credits OR Continue with Major and Minor													
6.0 /400	VII	6 (T) + 4 (P)	2 (T) + 2 (T/P)	0	0	4 (RP)	4(RM)(T)	0	0	0	0	0	22
	VIII	6 (T) + 4 (P)	2 (T) + 2 (T/P)	0	0	8 (RP)	0	0	0	0	0	0	22
Total 4 Years		**68**	**16**	**8**	**2**	**22**	**22**	**12**	**6**	**8**	**4**	**8**	**176**
Four Year UG Honours with Research Degree in Major and Minor with 176 credits **OR**													
6.0 /400	VII	10(T) + 4(P)	2 (T) + 2 (T/P)	0	0	0	4 (RM)	0	0	0	0	0	22
	VIII	10(T) + 4(P)	2 (T) + 2 (T/P)	0	0	4 (OJT)	0	0	0	0	0	0	22
Total 4 Years		**76**	**16**	**8**	**2**	**14**	**22**	**12**	**6**	**8**	**4**	**8**	**176**
Four Year UG Honours Degree in Major and Minor with 176 credits													

Title of the Course: B. Sc (Electronic Science)

Preamble:

Electronics technology has revolutionized various fields including communication, consumer appliances, medical, defence and so on. The advances in technology are making systems smaller, smarter and powerful. Electronics is an important branch of Science devoted to design implementation and analysis of circuits and systems. Knowledge of Electronics is based on fundamental laws of Physics and though new chips/SOC's are fabricated every day, basic principles remain the same.

The goal of the three-year course is to instill in students a confidence that they can get a grip of the subject and apply it for designing, testing and analyzing systems. The course will also make use of problem-solving approach wherein the students will be trained to apply the acquired knowledge to design and analyze circuits for specific applications. The students will be familiarized with programming languages, various development tools, modelling and simulation tools through lab sessions.

The syllabus has been designed such that basic fundamental concepts, knowledge and specific practical skills of the students are developed. The students will be first introduced to various components, devices and their applications, Network theorems and applications of electronics in day to day life. Digital Electronics fundamentals, Operational amplifier circuits, and its applications will be covered in the second semester. In the Second year the students will be taught the basic principles of communication, Analog and digital circuit design and Microcontrollers. In the third year the students will be given an insight to concepts of Embedded System Design, VLSI Technology, Communication systems and various discipline specific courses with a Project in the final semester.

Course Outcome:

The course aims to generate trained manpower with adequate theoretical and practical knowledge of the various facets of electronic circuits and systems. In this course, the students will get a comprehensive understanding of electronic devices and circuits. To acquaint the students with the fundamental principles of various devices is one of the principle objectives of this course. The student will get profound knowledge to design electronic circuits and conduct investigations, as well as to analyze and interpret data. They will develop the ability to use current techniques, skills, and modern tools necessary for practice.

Following are the objectives -

i. To design the syllabus with specific focus on key Learning Areas.
ii. To equip student with necessary fundamental concepts and knowledge base.
iii. To develop specific practical skills.
iv. To impart training on circuit design, analysis, building and testing.
v. To prepare students for demonstrating the acquired knowledge.
vi. To encourage student to develop skills for accepting challenges of upcoming technological advancements.

Eligibility: As per Savitribai Phule Pune University, Pune.

COURSE STRUCTURE

Semester I- F.Y.B.Sc.

Course Type	Course	Course / Paper Title	Hours / Week	Credit
Major Mandatory (4 + 2)	Major Paper 1 (Theory)	Basics of Analog Electronics	2	2
	Major Paper 2 (Theory)	Fundamentals of Digital Electronics	2	2
	Major Paper (Practical)	Practical Course I	4	2
Major Electives				
Minor				
OE (2 + 2)		1) Domestic Equipment Maintenance	2	4
		2) Entertainment Electronics	2	
VSC (2)	Major Specific Practical I	Circuit Simulation using P-Spice	4	2
SEC (2)	Skill Paper I (Theory)	Applications of Electronics in Agriculture	2	2
AEC(2),	English Theory	English Communication I	2	2
VEC (2)	EVS Theory	Environment Science I	2	2
IKS (2)	Major Specific Theory	History of Indian Telecommunication	2	2
CC (2)	CC-I Course	Physical Education / Cultural Activities, NSS/NCC and Fine/ Applied/ Visual/ Performing Arts Course	2	2

Abbreviations:

OE: Open Elective, **AEC:** Ability Enhancement Course, **VEC:** Value Education Courses,
CC: Co-Curricular Courses, **IKS:** Indian Knowledge System, **OJT:** On Job Training,
FP: Field Project, **VSC:** Vocational Skill Courses, **CEP:** Community Engagement Project

Semester II- F.Y.B.Sc.

Course Type	Course	Course / Paper Title	Hours / Week	Credit
Major Mandatory (4 + 2)	Major Paper 3 (Theory)	Electronic Devices and Circuits	2	4
	Major Paper 4 (Theory)	Digital Circuits and it's Applications	2	
	Major Paper (Practical)	Practical Course II	4	2
Major Electives				
Minor	Minor Paper I (Theory)	Basics of Electronics	2	2
OE (2 + 2)		3) Computer Hardware and Networking	2	4
		4) Basics of Electricity and E-Vehicles	2	
VSC (2)	Major Specific Practical II	Project: PCB Design and Fabrication	4	2
SEC (2)	Skill Paper II (Theory)	Mobile Communication	2	2
AEC(2),	English Theory	English Communication II	2	2
VEC (2)	EVS Theory	Environment Science II	2	2
IKS (2)				
CC (2)	CC-II Course	Physical Education / Cultural Activities, NSS/NCC and Fine/ Applied/ Visual/ Performing Arts Course	2	2

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Semester III (S.Y.B.Sc.)

Course Type	Course	Course / Paper Title	Hours / Week	Credit
Major Mandatory (4 + 4)	Major Core Paper 5 (Theory)	Analog Circuit Design	2	4
	Major Core Paper 6 (Theory)	Digital System Design	2	
	Major Core Paper 7 (Theory)	Sensors and Systems	2	2
	Major (Practical)	Practical Course III	4	2
Major Electives				
Minor (4)	Minor Paper II (Theory)	Basics of Analog Circuit Design	2	4
	Minor (Practical) On Minor Paper II	Practicals based on Basics of Analog Circuit Design	4	
OE (2)		5) Fundamental of Electronics and Computer	2	2
VSC (2)	Major Specific Practical III	C programming Practicals	4	2
SEC (2)				
AEC(2),	MIL	MIL-I (Hindi) / MIL-I (Marathi)	2	2
VEC (2)				
IKS (2)				
FP/CEP (2)	FP –I	Industrial Visit	6	2
CC(2)	CC III	Physical Education / Cultural Activities, NSS/NCC and Fine/ Applied/ Visual/ Performing Arts Course	2	2

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Semester IV (S.Y.B.Sc.)

Course Type	Course	Course / Paper Title	Hours / Week	Credit
Major Mandatory (4 + 4)	Major Core Paper 8 (Theory)	Communication Electronics	2	4
	Major Core Paper 9 (Theory)	Microcontroller Architecture & Programming	2	
	Major Core Paper10 (Theory)	Fundamentals of Internet of Things	4	2
	Major (Practical)	Practical Course IV	4	2
Major Electives				
Minor (4)	Minor Paper III (Theory)	Basics of Digital Circuit Design	2	4
	Minor (Practical) on Minor paper III	Practicals based on Basics of Digital Circuit Design	4	
OE (2)		6) Consumer Electronics	2	2
VSC (2)				
SEC (2)	Skill Paper III (Theory)	Automotive Electronics and E-Vehicles	2	2
AEC(2),	MIL	MIL-II (Hindi) / MIL-II (Marathi)	2	2
VEC (2)				
IKS (2)				
CEP(2)	CEP –I	Project	6	2
CC(2)	CC-4	Physical Education / Cultural Activities, NSS/NCC and Fine/ Applied/ Visual/ Performing Arts Course	2	2

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Semester V (Third Year)

Course Type	Course	Course / Paper Title	Hours / Week	Credit
Major Mandatory (4 + 4 + 2)	Major Core Paper 9 (Theory)	Modern Communication System	2	2
	Major Core Paper 10 (Theory)	Embedded System Design using Microcontroller	2	2
	Major Paper 11 (Theory)	Analog Circuit Design and Applications	2	2
	Major (Practical) on Major Core Paper 09, 10	Practical Course VA	4	2
	Major (Practical) on Major Core Paper 10 ,11	Practical Course VI A	4	2
Major Electives	Elective I (Theory)	PLC and SCADA	2	4
	Elective I (Practical)	PLC and SCADA-Practical	4	
	OR			
	Elective II (Theory)	Process Control System	2	
	Elective II (Practical)	Process Control System-Practical	4	
Minor (4)	Minor Paper IV (Theory)	Nanoelectronics	2	4
	Minor (Practical) On Minor Paper IV	Nanoelectronics-Practical	4	
OE (2)				
VSC (2)	Major Specific Practical IV	Circuit Design using EDA Tools	4	2
SEC (2)				
AEC(2),				
VEC (2)				
IKS (2)				
FP / CEP(2)	FP –II/CEP II	Industrial Visit	6	2

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Semester VI (Third Year)

Course Type	Course	Course / Paper Title	Hours / Week	Credit
Major Mandatory (4 + 4 + 2)	Major Core Paper 12 (Theory)	Basics of VLSI using Verilog	2	2
	Major Core Paper 13 (Theory)	Arduino Interfacing and Python Programming	2	2
	Major Paper 14 (Theory)	Signals and Systems	2	2
	Major (Practical) on Major Core Paper 12, 13	Practical Course VII	4	2
	Major (Practical) on Major Core Paper 13, 14	Practical Course VIII	4	2
Major Electives	Elective III (Theory)	Sensors and Systems	2	4
	Elective III (Practical)	Sensors and Systems- Practical	4	
	OR			
	Elective IV (Theory)	Power Electronics	2	
	Elective IV (Practical)	Power Electronics-Practical	4	
Minor (4)	Minor Paper V (Theory)	Fibre Optic Communication	2	4
	Minor (Practical) On Minor Paper V	Fibre Optic Communication-Practical	4	
OE (2)				
VSC (2)				
SEC (2)				
AEC(2),				
VEC (2)				
IKS (2)				
FP / CEP(2)				
OJT(4)	OJT	On Job Training	12	4

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	MODERN EDUCATION SOCIETY'S **NOWROSJEE WADIA COLLEGE, PUNE**	**Academic Year 2024-2025**
Bachelor of Science in Electronic Science		
Major Paper-ELMJ231		
YEAR-II	**Name of Paper-** **Analog Circuit Design (ELMJ231)**	**CREDITS-II**
SEMESTER-III		**HOURS-30**

Course specific outcomes-

1. *Design single/multistage amplifier using transistor and analyze their frequency response base on gain-bandwidth product due to coupling /bypass capacitors*
2. *Classify and compare different power amplifiers*
3. *Understand and design push pull amplifier and need of heat sinks*
4. *Distinguish between Op amp Feedback circuits based on their configurations*
5. *Analyse the effect of negative and positive feedback on characteristics of Op amp*
6. *Understand and analyse the need of positive feedback in oscillator circuits*
7. *Design , develop and build circuits for identified applications*

Sr no	COURSE CONTENT / SYLLABUS	Lectures
UNIT I	**Amplifiers:** Small signal amplifiers: A.C and D.C. analysis, frequency response, gain Bandwidth product, Design of single stage amplifier, effect of coupling capacitor and bypass capacitoron frequency response (qualitative approach), Design of two stage amplifier	**8**
UNIT II	**Power amplifier:** Classification of power amplifiers on the basis of conduction: class-A, class-B,class-AB, class-C, Class-D amplifier: resistive load/transformer coupled load, efficiency calculation. Concept of harmonic distortion. Class B amplifier: Push-pull amplifier concept, complimentary symmetry class-B push pull amplifier, crossover distortion, class AB push pull amplifier, Types of heat sinks.	**10**
UNIT III	**Op-amp based System:** Concept of negative feedback, Types of feedback circuits: current shunt, current series, voltage shunt and voltage series, Effect of Negative feedback: on gain, Bandwidth, input and output impedance, Circuits: Adder, subtractor, integrator, differentiator, First order Butterworth active filter, Concept of Positive Feedback: Barkhousan criterion, Oscillator circuits -Wien bridge, Phase Shift oscillator , astable multivibrator.	**8**
UNIT IV	**Application of Analog Systems:** Design of Audio Amplifier, Design of Public Address System Design of function generator.	**4**
References:	1. Boylested , Electronic devices and circuits, PHP 2. Ramakant Gaikwad, Operational amplifiers and linear Integrated Circuits, 3rd edition, PHP 3. G. B. Clayton, Operational amplifier, ELBS 4. B.L.Thereja ,Principles of Electronics , S.Chand and Company	

	MODERN EDUCATION SOCIETY'S **NOWROSJEE WADIA COLLEGE, PUNE**	**Academic Year 2024-2025**
Bachelor of Science in Electronic Science		
Major Paper-ELMJ232		
YEAR-II	**Name of Paper-** **Digital Circuit Design(ELMJ232)**	**CREDITS-II**
SEMESTER-III		**HOURS-30**

Course specific outcomes-

1. *Distinguish between different logic families based on their performance parameters*
2. *Analyze basic combinational logic circuits for simple applications*
3. *Design combinational logic circuits using K maps for identified applications*
4. *Design Sequential logic circuits using state diagram, excitation table for identified Applications*
5. *Understand and compare different types of ADC and their performance parameters using data sheets/manuals*
6. *Understand and compare different types of DAC and their performance parameters using data sheets/manuals*

Sr no	COURSE CONTENT / SYLLABUS	Lectures
UNIT I	**Logic families**: Revision of logic gates using diodes, transistors and MOSFETS. Introduction to logic families and its performance parameters, Comparative studyof TTL, CMOS, ECL with reference to performance parameters.	**4**
UNIT II	**Combinational logic circuit design:** OR gate for Event detection, AND gate for Frequency measurement, EX-OR gate for Parity generation and checker, NOT gate for square wave generator, NAND gate for key de-bouncer circuit, Design of code converters using K maps: BCD to Seven segment, Binary to grey and grey to binary convertor, Concept of adder using Look ahead carry generator, Keyboard encoder circuits, Priority encoder.	**8**
UNIT III	**Sequential logic circuit design:** State table, State diagram, excitation table and transition table, Design of counters using state machines: asynchronous, modulus and up-down counter, Design of sequence generator.	**8**
UNIT IV	**Data converters:** Analog to digital convertor, digital to analog convertor, Parameter of ADC and DAC R-2R, binary weighted, counter type, successive approximation ADC: flash, Dual slope. Comparative performance analysis of ADC: 0808, 0804 and ICL7106 and DACs: 0808, 0804.	**10**
References:	1) Morris Mano, Digital Design, 3rd Edition, Prentice Hall of India. 2) R. P. Jain, Modern Digital Electronics, 4th edition, Tata MacGraw Hill EducationIndia, 3) K. R. Botkar, Integrated Circuits, 3rd Edition, Khanna Publications.	

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Bachelor of Science in Electronic Science		
Major Paper-ELMJ233		
YEAR-II	**Name of Paper-**	**CREDITS-II**
SEMESTER-III	**Sensors and Systems(ELMJ 233)**	**HOURS-30**

Course specific outcomes-

1.The students will be able toUnderstand basic principles and types of different sensors.

2.Understand basic principles and types of sensors

3.*Know about parameters of sensors.*

Sr. no	COURSE CONTENT / SYLLABUS	Lectures
UNIT I	**Fundamentals of Sensors** Definition, Classification and types of sensors, Specification and performance parameters: Accuracy, Resolution, Threshold, impedance, noise, Sensitivity, Hysteresis, Linearity, Range, Reliability, Selectivity, bandwidth, calibration of sensors. Sensors: Temperature: Thermocouple, thermistor, LM35, AD590, stress and strain: strain gauge and load cell, light sensor: LDR, IR chemical: Potentiometric sensor, pH Sensor, gas sensors: MQ3, vibration sensors: Piezoelectric, Displacement sensors: LVDT, Smart Sensors.	**14**
UNIT II	**Introduction to Sensor Systems** Sensor systems: Sensor characteristics, signal conditioning circuits, power supply, data acquisition and readout, measurement issues and criteria. Bridge amplifiers, Precision Op-amps characteristics for amplifiers, instrumentation amplifiers.	**10**
UNIT III	**Applications of Sensors** Healthcare and biomedical applications, applications in building management system, industry, security and surveillance, marine, military and space, case study of nonlinear to linear.	**6**
References:	1. Sensor technology handbook John Wilson, Elsevier 2. Fundamentals of industrial instrumentation and process control, William C. Dunn, McGaw Hill Publication 3. Sensors and Transducers, D Patranabis, Prentice Hall Publication.	

	MODERN EDUCATION SOCIETY'S NOWROSJEE WADIA COLLEGE, PUNE	Academic Year 2024-2025
Bachelor of Science in Electronic Science		
Major Practical		
YEAR-II	**Name of Paper- Practical (ELMJ 234)**	**CREDITS-II**
SEMESTER-III		**HOURS-30**
Sr no	**COURSE CONTENT / SYLLABUS**	**Lectures**
UNIT I	**Group A (Any FOUR)** 1) Design of low pass filter and high pass filter using Op-amp IC 741 2) Wein bridge oscillator 3) Phase shift oscillator. 4) Design and build two stage amplifier using Transistor. 5) Effect of negative feedback on amplifier parameters. 6) Push Pull amplifier. 7) Design V to I convertor using Op-amp. **Group B (Any FOUR)** 1) 3-bit synchronous counter using flipflop. 2) Decimal to BCD encoder using logic gates. 3) Study of RAM 4) Study of 4-bit arithmetic unit using IC 74181 5) Study of DAC using R-2R ladder network. 6) Study of DAC using IC DAC0808 7) Sequence generator for stepper motor. **Group C (Any FOUR)** 1. Temperature measurement system 2. Light Sensor measurement system 3. Gas sensor system 4. Optical sensor system 5. Use of Whetstone Bridge for temperature measurement. 6. Load cell sensor system. 7. LVDT (Light / Speed) 8. Hall sensor	

	MODERN EDUCATION SOCIETY'S NOWROSJEE WADIA COLLEGE, PUNE	Academic Year 2024-2025
Bachelor of Science in Electronic Science		
Minor (Theory)		
YEAR-II	**Name of Paper-**	**CREDITS-II**
SEMESTER-III	**Basics of Analog Circuit Design (ELMN 235)**	**HOURS-30**

Course specific outcomes-

1) To understand the concept of semiconductors, diodes and its types.
2) To know the details about P-N junction diode, Applications and Special diodes.
3) To make the students learn through practical demonstration.
4) To understand diode, rectifiers and transistor-based circuits.

Sr no	COURSE CONTENT / SYLLABUS	Lectures
UNIT I	**Semiconductor diode and its types:** Formation of P-N junction, Formation of Depletion layer, Junction or Barrier potential, P-N Junction Diode, Forward Biasing, Reverse Biasing, I/V Characteristic. Zener Diode, Photodiode, Light Emitting Diode and Varactor diode, solar cell.	**10**
UNIT II	**Applications of Diodes:** Rectifiers: Half Wave, Full Wave, and Bridge rectifiers, ripple factor. Wave shaping circuits: Clipper, Clamper, Voltage regulator using Zener diode, Use of diode in Mobile charger and power supply.	**10**
UNIT III	**Introduction to Transistor:** Types of BJT, configurations, characteristics of common emitter configuration. Transistor biasing, concept of DC load line Transistor as a switch. Problems based on Transistor Biasing. FET: Types, Output characteristics of FET. Comparison of BJT and FET.	**10**
References:	1) Basic Electronics, Solid State: B. L. Theraja, S. Chand and Co. 1st Multicolour Edition 2005. 2) Basic Electronics: Bernard Grob, McGraw Hill Publication, 8th Revised Edition. 3) Electronic Principles: Albert Malvino, David Bates, McGraw Hill Publication, 8th Revised Edition.	

	MODERN EDUCATION SOCIETY'S **NOWROSJEE WADIA COLLEGE, PUNE**	**Academic Year 2024-2025**
Bachelor of Science in Electronic Science		
Minor(Practical)		
YEAR-II	**Name of Paper-**	**CREDITS-II**
SEMESTER-III	**Practical Based on Basics of Analog Circuit Design (ELMN 236)**	**HOURS-30**

Course specific outcomes-

1) To teach students how to draw different symbols and circuit diagrams
2) To develop skill of circuit connections
3) To familiarize the student with different components and devices used in the laboratory and the device manuals
4) To familiarize students with laboratory instruments like Ammeter, voltmeter, DMM, Signal Generator, Function Generator, CRO and tools like cutter, stripper etc.
5) To train them to design and analyze the circuits for specific purpose
6) To teach the students how to analyze the results and calculate performance parameters
7) To motivate them to work on different mini projects

Sr no	COURSE CONTENT / SYLLABUS	Lectures
	List of Practical's: (Any 12) 1. Study of Electronics Components. 2. Study of instruments: DMM, Signal Generator and CRO. 3. To study / verification of Ohm's Law. 4. Resistor in series and parallel. 5. Capacitor in series and parallel. 6. Study of low pass and high pass filters using R and C. 7. Characteristics of PN junction diode. 8. To study the reverse characteristics of Zener diode. 9. To study the reverse characteristics of photodiode. 10. To study the forward characteristics of LED. 11. To study clipper circuit. 12. To study clamper circuit. 13. To study Half Wave, Full Wave, and Bridge wave rectifiers. 14. To study of transistor output characteristics. 15. To study the transistor and FET as a switch.	

	MODERN EDUCATION SOCIETY'S **NOWROSJEE WADIA COLLEGE, PUNE**	**Academic Year 2024-2025**
Bachelor of Science in Electronic Science		
OE (5) Subject-I		
YEAR-II	**Name of Paper-** **Basics of Electronics and Computer** **(ELOE238)**	**CREDITS-II**
SEMESTER-III		**HOURS-30**

Course specific outcomes-

1)To understand importance of Electronics in day today life
2)To understand fundamentals of electronic circuits and computers to non-electronics students
3)To understand few electronic systems.

Sr. no.	COURSE CONTENT / SYLLABUS	Lectures
UNIT I	**Fundamentals of Electronics** Introduction to circuit components- Resistors, capacitors, inductor, transformer, diode and transistor. Symbols, principles and applications.LED and LCD display, relay, fuse, switches. AC and DC applications. Concept of Power supply. Introduction to CRO and DMM, measurement using CRO and DMM	**15**
UNIT II	**Basics of Computers** Block diagram of computer – explanation of each block Hardware and software Memories – types, specifications and applications Types of processors used in computers and mobile phones (mention only) Brief Introduction to operating systems, Types of Operating System, Functions of Operating System Overview of MS word, Excel and Power point.	**15**
References:	1) Basic Electronics, Solid State: B. L. Theraja, S. Chand and Co. 1st Multicolour Edition 2005. 2) Basic Electronics: Bernard Grob, McGraw Hill Publication, 8th Revised Edition. 3) Electronic Instrumentation and Measurement Techniques by WD Cooper, AD Helfrick, Prentice Hall of India Pvt. Ltd. New Delhi 4) Fundamentals of computer, E. Balagurusamy, 2009 5) Computer Fundamentals, Anita Goel, 2010	

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Bachelor of Science in Electronic Science		
VSC Practical		
YEAR-II	**Name of Paper-** **C Programming (ELVSC 237)**	**CREDITS-II**
SEMESTER-III		**HOURS-30**
Sr no	**COURSE CONTENT / SYLLABUS**	**Lectures**
	1. Introduction to C Programming 2. Installation of Turbo C 3. Introduction to Pseudo code, algorithm and flowchart. **List of Practicals (Any 12 Practicals)** 4. C Programme to find sum of n numbers 5. C Programme to accept two integers and perform all arithmetic operations. 6. Use of bitwise operators in C programming. 7. Use of shift operators in C programming. 8. Use of if-else statement in C Programming 9. To find largest and smallest of given numbers. 10. Prime numbers between given range of numbers. 11. Illustration of increment and decrement operators 12. Use of switch case. 13. Use of for loop in C Programming 14. Use of nested for loop in C Programming 15. Use of while loop in C Programming 16. Pass by value and pass by reference	

	MODERN EDUCATION SOCIETY'S NOWROSJEE WADIA COLLEGE, PUNE	Academic Year 2024-2025
Bachelor of Science in Electronic Science		
Major Paper		
YEAR-II	**Name of Paper- Communication Electronics (ELMJ 241)**	**CREDITS-II**
SEMESTER-IV		**HOURS-30**

Course specific outcomes-

1. *Understand different blocks in communication systems, types of noise in communication systems and its different parameters*
2. *Understand need of modulation, modulation process and amplitude modulation and demodulation methods*
3. *Analyze generation of FM Modulation and demodulation methods and comparison between amplitude and frequency modulation*

Sr no	COURSE CONTENT / SYLLABUS	Lectures
UNIT I	**Basics of Communication and Telephone Systems** Block diagram of communication system, types of communication system: simplex, duplex, analog and digital communication, Electromagnetic spectrum, base band and broad band communication. Noise concept and types, signal to noise ratio, noise figure, noise temperature. Problems based on noise calculations. Error detection and correction codes, hamming code. Block diagram of Telephone handset, types of dialing, Block diagram of PSTN.	**10**
UNIT II	**Amplitude Modulation and AM Receiver** Need of modulation, concept of modulation, AM waveform, mathematical expression of AM, concept of sideband, Definition and problems: modulation index, power distribution. AM using diode/transistor, demodulation principles, and demodulator circuit using diode.AM Receiver: TRF and super-heterodyne receiver, characteristics of receiver: selectivity, sensitivity, Image frequency and dynamic range.	**10**
UNIT III	**Frequency Modulation and FM receiver** FM modulation: definition, mathematical representation, frequency spectrum, bandwidth and modulation index. FM using varactor diode, problems based on modulation index, frequency deviation, and average power. FM Demodulator: Slope detector, Foster-Seeley detector. Block Diagram of FM Receiver. Introduction to mobile apps for AM/FM.	**10**
References:	1. Communication Electronics: Principles and applications by Louis E Frenzel 3rd edition TMH Publications. 2. Electronics Communication Systems by Keneddy 3. Telecommunication Switching Systems and Network by Vishwanathan Thiagarajan, PHI publication. 4. Electronics Communication Systems by Denis Roddy, John Coolen, PHI publication.	

	MODERN EDUCATION SOCIETY'S **NOWROSJEE WADIA COLLEGE, PUNE**	**Academic Year 2024-2025**
Bachelor of Science in Electronic Science		
Major Paper		
YEAR-II	**Name of Paper-** **Microcontroller Architecture and Programming (ELMJ 242)**	**CREDITS-II**
SEMESTER-IV		**HOURS-30**

Course specific outcomes-

1. *To identify I/O pins, block diagram and memory of microcontroller.*
2. *To learn to use timers, counters and interrupts.*
3. *To be able to perform serial communication with microcontroller*

Sr no	COURSE CONTENT / SYLLABUS	Lectures
UNIT I	**Basics of Microcontroller & Intel 8051 architecture** Introduction to microcontrollers, difference in controller and processor. Architecture of 8051, Internal block diagram, Internal RAM organization, SFRS, pin functions of 8051, I/O port structure & Operation, External Memory Interface.	**7**
UNIT II	**Programming model of 8051** Instruction classification, Instruction set, Addressing Modes: Immediate, register, direct, indirect and relative, assembler directives (ORG, END), features with examples, I/O Bit & Byte programming using assembly language for LED and seven segment display (SSD) interfacing.	**8**
UNIT III	**Timer /Counter, Interrupts.** Timer / counter: TMOD, TCON, SCON, SBUF, PCON Registers, Timer modes, programming for time delay using mode 1 and mode 2. Interrupts: Introduction to interrupt, Interrupt types and their vector addresses, Interrupt enableregister and interrupt priority register (IE, IP)	**7**
UNIT IV	**Interfacing, Serial Communication.** Programming of serial port without interrupt, Serial Communication: Synchronous and asynchronous serial communication, Use of timer to select baud rate for serial communication. Interfacing: ADC, DAC, LCD, stepper motor.	**8**
References:	1.8051 microcontroller and Embedded system using assembly and C : Mazidi and McKinley, Pearson publications 2. The 8051 microcontroller – Architecture, programming and applications: K.Uma Rao and Andhe Pallavi, Pearson publications.	

	MODERN EDUCATION SOCIETY'S **NOWROSJEE WADIA COLLEGE, PUNE**	**Academic Year 2024-2025**
Bachelor of Science in Electronic Science		
Major Paper X		
YEAR-II	**Name of Paper-** **Fundamentals of Internet of Things (ELMJ 243)**	**CREDITS-II**
SEMESTER-IV		**HOURS-30**

Course specific outcomes-

1. *To learn the basic architecture of IoT.*
2. *To learn the various protocols.*
3. *To study the different applications of IoT.*

Sr no	COURSE CONTENT / SYLLABUS	Lectures
UNIT I	**Introduction to IoT** Definition and characteristics of IoT, Technical Building blocks of IoT, Devices, Communication Technologies, Physical design of IoT, IoT enabling technologies, IoT Issues and Challenges-Planning, Costs and Quality, Security and Privacy, Risks.	**8**
UNIT II	**IoT Protocols** MQTT, CoAP, XMPP and AMQT, IoT communication models, IoT Communication technologies: Bluetooth, BLE, Zigbee, Zwave, NFC, RFID, Zigbee etc. **Applications of Actuators:** Actuators: IOT, Robotics, Factory Automation, Agriculture, Industrial Automation, Automative, Packaging, Material Handling, Medical Equipments, Food Processing.	**8**
UNIT III	**Health Care and Smart City applications of IoT** **Smart Healthcare:** Characteristics of e-health and applications: monitoring of health parameters, smart medicine box, elderly people monitoring, challenges Smart City: Characteristics and applications–Smart Economy, Smart People, Smart Goverence, Smart Mobility, Smart Environment, Smart Living, Smart Grid, Transport and Traffic Management, cyber security.	**8**
UNIT IV	**Smart Home and Agriculture applications of IoT** **Smart Home:** Characteristics of Smart Home, Smart Home Energy Management, Smart Appliances, Communication Technologies for Smart Homes, maintenance, security, challenges. **Smart Agricultural:** Characteristics and Applications, Scarecrow, Smart Irrigation System, Crop Water Management, Integrated Pest Management, Sensor-based field and resource mapping, Remote equipment monitoring.	**6**
References:	1. Internet of Things –A hands-on approach, Arshdeep Bahga, Vijay Madisetti, Universities Press. 2. IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things, David Hanes, Cisco Press 3. The Internet of Things: Applications to the Smart Grid and Building Automation, Olivier Hersent, Omar Elloumi and David Boswarthick, Wiley	

	MODERN EDUCATION SOCIETY'S **NOWROSJEE WADIA COLLEGE, PUNE**	**Academic Year 2024-2025**
Bachelor of Science in Electronic Science		
Major Practical		
YEAR-II	**Name of Paper-** **Practical (ELMJ 244)**	**CREDITS-II**
SEMESTER-IV		**HOURS-30**
Sr no	**COURSE CONTENT / SYLLABUS**	**Lectures**
	Group A(Any FOUR) 1. Design ,Build and Test Amplitude Modulator and Demodulator 2. Time Division Multiplexing Circuit 3. Frequency Modulation 4. Frequency Shift Keying using XR-2206 5. VCO by using LM 566 6. Hamming Code Generation and error Detection. **Group B**(Any FOUR) 1. Arithmetic Programs(assembly language programs) 2. Largest smallest numbers from an array of 10 number. 3. Data Transfer Programming 4. Boolean and Logical instruction 5. Interfacing of LED /Buzzer 6. Interfacing of DAC 7. Interfacing of Stepper Motor 8. LCD Interfacing 9. Seven Segment Display Interfacing. **Group C**(Any FOUR) 1. Interfacing of LED with Arduino write a program to on and off 2. Interfacing of Push Button with Arduino write a program. 3. Interfacing of Bluetooth with Arduino . 4. Interfacing of DHT11 Sensor with Arduino . 5. DC motor interfacing with Arduino. 6. Stepper Motor interfacing with Arduino.	

	MODERN EDUCATION SOCIETY'S **NOWROSJEE WADIA COLLEGE, PUNE**	**Academic Year 2024-2025**
Bachelor of Science in Electronic Science		
Minor (Theory)		
YEAR-II	**Name of Paper-**	**CREDITS-II**
SEMESTER-IV	**Basics of Digital Circuit Design (ELMN 245)**	**HOURS-30**

Course specific outcomes-

1. *To understand importance of Digital Electronics in day today life*
2. *To understand combinational and sequential digital circuits*
3. *To make the students learn through problem solving*
4. *To understand digital electronic circuits*

Sr no	COURSE CONTENT / SYLLABUS	Lectures
UNIT I	**Boolean Algebra and K-map:** Revision of Logic gates, Boolean Theorems, De-Morgan's laws. Basic gates using universal gates, Standard representation of logic functions (SOP and POS), Minimization Techniques (Karnaugh Map Method). Binary to Gray and Gray to binary converter, Problems based on combinational digital circuits.	**16**
UNIT II	**Combinational and Sequential Digital Circuits:** Arithmetic Logic Unit (ALU), Multiplexer (2:1, 4:1), Demultiplexer (1:2, 1:4), Adders- Half adder, full adder and parallel adder. Flip-Flops and truth tables: S-R Flip Flop, J-K Flip Flop, T and D type Flip Flop, Encoder: BCD encoder (K-map Designing) and Priority encoder, Decoder.	**14**
References:	1. Donald Leach. "Digital Principles and Applications". TMG Hill Edition. 2. Morris Mano, "Digital Design "3rd Edition, PHI, New Delhi. 3. B. L. Theraja, Basic Electronics, Solid State, S. Chand and Co. First Multicolour Edition 2005. 4. Malvino and David Bates, Electronic Principal, 8th Edition, 2007. 5. R P. Jain, Digital Electronics, Tata McGraw Hill.	

	MODERN EDUCATION SOCIETY'S **NOWROSJEE WADIA COLLEGE, PUNE**	**Academic Year 2024-2025**
Bachelor of Science in Electronic Science		
Minor(Practical)		
YEAR-II	**Name of Paper-**	**CREDITS-II**
SEMESTER-IV	**Practical Based on Basics of Digital Circuit Design (ELMN 246)**	**HOURS-30**

Course specific outcomes-

1. *To teach students how to draw different symbols and circuit diagrams*
2. *To develop skill of circuit connections*
3. *To familiarize the student with different components and devices used in the laboratory and the device manuals*
4. *To familiarize students with laboratory instruments like Ammeter, voltmeter, DMM, Signal*
5. *Generator, Function Generator, CRO and tools like cutter, stripper etc.*
6. *To train them to design and analyze the circuits for specific purpose*
7. *To teach the students how to analyze the results and calculate performance parameters*
8. *To motivate them to work on different mini projects*

Sr no	COURSE CONTENT / SYLLABUS	Lectures
	List of Practical's: (Any 12) 1. To illustrate the working of AND, OR & NOT gate. 2. Binary to gray code and Gray to Binary code conversion. 3. Designing of logic gates using universal gates. 4. Study of logic gates using ICs. 5. Verify Half adder and full adder using gates. 6. 4-bit binary parallel adder using IC7483. 7. Study of R-S, J-K & D Flip-Flop. 8. Study of 2:1 Multiplexer & 1:2 Demultiplexer. 9. BCD to seven segment Decoder. 10. Study of priority Encoder. 11. Simulation of Logic Gates. 12. Simulation of half adder and full adder. 13. Simulation of Flip flops. 14. Simulation of multiplexer/Demultiplexer. 15. Simulation of binary to gray and gray to Binary decoder.	

	MODERN EDUCATION SOCIETY'S **NOWROSJEE WADIA COLLEGE, PUNE**	**Academic Year 2024-2025**
Bachelor of Science in Electronic Science		
OE		
YEAR-II	**Name of Paper-** **Consumer Electronics (ELOE 249)**	**CREDITS-II**
SEMESTER-IV		**HOURS-30**

Course specific outcomes-

1) Acquire the knowledge of consumer hardware.
2) Understand working of household Equipments.
3) Understand configuration of Equipments.
4) Identification of faults in the appliances.
5) Discussion of the possible solutions.
6) Online survey of Equipments.

Sr no	COURSE CONTENT / SYLLABUS	Lectures
	List of Practicals 1. Study of Electric Iron box and its fault finding. 2. Study of Electric geyser. 3. Study of faults in the geyser and its troubleshooting. 4. Study of Microwave oven. 5. Study of faults in microwave oven and its troubleshooting. 6. Study of Refrigerator. 7. Study of faults on refrigerator and its troubleshooting. 8. Online survey of Electric iron 9. Online survey of Electric geyser 10. Online survey of Microwave oven 11. Online survey of Refrigerator 12. Online survey of Vacuum cleaners.	

	MODERN EDUCATION SOCIETY'S **NOWROSJEE WADIA COLLEGE, PUNE**	**Academic Year 2024-2025**
Bachelor of Science in Electronic Science		
SEC		
YEAR-II	**Name of Paper-** **Automotive Electronics and E-Vehicles (ELSEC 247)**	**CREDITS-II**
SEMESTER-IV		**HOURS-30**

Course specific outcomes-

1. *Acquire the knowledge of generation and electricity distribution systems*
2. *Understand working of Electric Vehicles and recent trends*
3. *Analyse different power converter topology used for electric vehicle application*
4. *Develop the electric propulsion Unit and its control for application of electric vehicles*

Sr no	COURSE CONTENT / SYLLABUS	Lectures
UNIT I	**Generation of and Distribution of Electricity:** Mention of hydro electric generator, diesel generator, thermal generator, wind power, solar, ocean waves. Generation of DC power – Mention of batteries. Single phase, Two phase and Three phase. Transformers. Power transmission and distribution. Domestic electrical wiring – connection from AC line to the meter, sockets, mention of phase neutral and the need of earthing. Mention of electric shock and safety. Mention of power type (ac or dc) and current ratings for home appliances. Mention of tester. Electric motor working principle. Inverter, Uninterrupted Power supply (UPS) – online and off line UPS, SMPS.	**15**
UNIT II	**E-Vehicles:** Electric and Hybrid Electric Vehicles Configuration of Electric Vehicles, Performance of Electric Energy storage for EV and HEV Energy storage requirements, Battery parameters, Types of Batteries, Modelling of Battery, Fuel Cell basic principle and operation, Types of Fuel Cells, Super Capacitors. Power Electronic Converter for Battery Charging, charging methods for battery, Termination methods, charging from grid.	**15**
References:	1. Electrical Circuits, K.A. Smith and R.E. Alley, Cambridge University Press, 2012. 2. A Text Book in Electrical Technology - B L Theraja - S Chand & Co., 2005 3. Performance and design of AC machines - M G Say, CBS Publishers and Distributers Pvt Ltd., 3rd Edition, 2002, e-book edition 2017. 4. Basic Electrical Engineering - V K Mehta and Rohit Mehta, 6th Edition, S Chand and Company, 2006	

NEP, Exam pattern (UG)

The Examination pattern for Under graduate (UG) courses.

EVALUATION PATTERN: For Two Credit Courses

(i) Each course shall be evaluated with Continuous Evaluation (CE) and EndSemester Examination (EE).

(ii) Continuous Evaluation shall be of 15 marks and End Semester Examination(EE) shall be of 35 marks

(iii) To pass a course of 2credits, a student has to earn minimum 20 marks, provided that he/she should earn minimum 6 marks in Continuous Evaluation and minimum 14 marks in End-Semester Examination. That ispassing criterion is minimum 40% marks in the examination.

(iv) For Internal evaluation (out of 15 marks), There has to be one written test of 10 marks (Mid-Semester Examination). For remaining 5 marks shall be based on the continuous evaluation consisting of tutorial, viva, seminars, home-assignments, mini project, survey, group discussion etc.(on approvalof Head of the Department)

(v) There shall be revaluation of the answer scripts of End-Semester Examination (out of 35 marks) of theory papers only, but not of internalassessment papers as per Ordinance No. **134 A and B.**

ATKT RULES

(i) Minimum number of credits required to take admission to Second year of B.Sc. course is 31 (70%) (As same as SPPU) minimum number of credits required to take admission to Third year of B. Sc.course is 44 (100%) to be completed from First year of B. Sc. and pass in physical education examination in first year of B. Sc. and 22 credits from second year of B. Sc (As same as SPPU).

AWARD OF GRADES AND GRADE POINTS

The mapping of percentage to letter grade and grade point is given in the followingTable 1

CGPA will be calculated as follows:

Table No. 1

Sr. No.	Grade Letter	Grade Point	Marks
1.	O (Outstanding)	10	$90 \leq$ Marks ≤ 100
2.	A+ (Excellent	9	$80 \leq$ Marks ≤ 89
3.	A (Very Good)	8	$70 \leq$ Marks ≤ 79
4.	B+ (Good)	7	$55 \leq$ Marks ≤ 69
5.	B (Above Average)	6	$50 \leq$ Marks ≤ 54
6.	C (Average)	5	$45 \leq$ Marks ≤ 49
7.	D (Pass)	4	$40 \leq$ Marks ≤ 44
8.	F (Fail)	0	Marks < 40
9.	Ab (Absent)	0	

PERFORMANCE INDICES:

The performance of a student in a Semester is indicated by a number called the Semester Grade Point Average (SGPA). Similarly, the performance of a student in the Course is indicated by a number called the Course Grade Point Average (CGPA).

The End-Semester results and final result of the courses will contain SGPAand CGPA,respectively.

(1) **SGPA**: The SGPA is the weighted average of the grade points obtained by students in all the courses during the Semester. That is

$$SGPA = \frac{\sum_{i=1}^{p} C_i G_i}{\sum_{i=1}^{p} C_i}$$

(2) For example, suppose in a Semester, student has registered for five courses having credits C1, C2, C3, C4 and C5 and suppose his/her grade points are G1,G2, G3, G4 and G5, respectively. The SGPA is calculated as

$$SGPA = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4G_4 + C_5G_5}{C_1 + C_2 + C_3 + C_4 + C_5}$$

SGPA is calculated correct up to two decimal places by rounding off.

(3) **CGPA**: The CGPA is the weighted average of the grade points obtained in all courses (theory and Practicals) by students in all the courses in 6 semesters. Itis calculated in the same manner as the SGPA.

RESULTS:

Based on the performance of the student in the Semester Examinations, NowrosjeeWadia College will declare the results and issue the Semester Grade sheets. Also, the College will declare the results and issue the Grade sheets at the end of the course.

The class will be awarded to a student on the basis of CGPA. The award of the classshall be as per Table 2 and corresponding percentage calculation for the CGPA is given in Table No. 3

Table 2

Sr. No.	CGPA	Class of the degree awarded
1	9.50 or more than 9.50	OUTSTANDING (O)
2	8.50 or more but less than 9.50	EXCELLENT (A+)
3	7.50 or more but less than 8.50	VERY GOOD (A)
4	6.25 or more but less than 7.50	GOOD (B+)
5	5.25 or more but less than 6.25	ABOVE AVERAGE (B)
6	4.75 or more but less than 5.25	AVERAGE (C)
7	4.00 or more but less than 4.75	PASS (D)

Percentage of marks corresponding to CGPA is calculated by the formulae which aregiven in the following Table 3.

Table 3

GRADE	Formula for the percentage of marks
O	20 × CGPA - 100
A+	10 × CGPA -5
A	10 × CGPA - 5
B+	12× CGPA - 20
B	5× CGPA + 23.75
C	10 × CGPA -2.50
D	6.6× CGPA + 13.6

The above percentage calculations are illustrated in the following Table 4

Table 4

Some examples of CGPA to Percentage calculations

CGPA obtained	Formula	Percentage (%)	Grade
10	20 × 10 - 100 = 100	100	O
9.75	20 × 9.75 - 100 = 95	95	O
9.5	20 × 9.5 - 100 = 90	90	O
9.0	10 × 9 – 5 = 85	85	A+
8.0	10 × 8.0 – 5 = 75	75	A
7.0	12 × 7.0 – 20 = 64	64	B+

6.67	12 × 6.67 – 20 = 60.04	60.04	B+
6.25	12× 6.25 – 20 = 55	55	B+
5.25	5 × 5.25 + 23.75 = 50	50	B
4.75	10 × 4.75 – 2.50 = 45	45	C
4.0	6.6 × 4.0 + 13.6 = 40	40	D

While declaring the results, the existing ordinances are applicable. There is also a provision for verification and revaluation. In case of verification, the existing rules will be applicable. The revaluation result will be adopted if there is a change of at least 10% marks and in the grade of the course.

PATTERN OF THE QUESTION PAPER: Two Credits

(1) Internal Examination:

(Mid-Semester Examination of 10 marks, Duration: 30 Mins)

Question No.	Total Marks	No. Of questions	Remarks
Q. 1.	5	Attempt any 5 out of 7	Definitions/Counter examples/Short answer objective type of questions/True or False.(Each question carries 1 mark.)
Q. 2.	5	Solve any 1 out of 2 questions	Descriptive type questions (Each question carries 5marks)

(2) End Semester Examination (EE):

Shall be of 35 marks, 2 hours duration. The pattern of the question papershall be as follows:

Question No.	Total Marks	No. Of questions	Remarks
Q. 1.	5	Solve any 5 out of 7	Definitions/Counter examples/Short answer / objective type of questions/True or False. (Each question carries 1 mark.)
Q. 2.	10	Solve any 5 out of 7OR Solve any 2 out of 3	Descriptive type questions (Each question carries 5 marks)
Q. 3.	10	Solve any 2 out of 3	Descriptive type questions (Each question carries 5 marks)
Q. 4.	10	Solve any 2 out of 3OR Solve any 1 out of 2	Descriptive type questions

EVALUATION PATTERN: For Four Credit Courses

(i) Each course shall be evaluated with Continuous Evaluation (CE) and EndSemester Examination (EE).

(ii) Continuous Evaluation shall be of 30 marks and End Semester Examination(EE) shall be of 70 marks.

(iii) To pass a course of 4credits, a student has to earn minimum 40 marks, provided that he/she should earn minimum 12 marks in Continuous Evaluation and minimum 28 marks in End-Semester Examination. That ispassing criterion is minimum 40% marks in the examination.

(iv) For Internal evaluation (out of 30 marks), There has to be one written test of 20 marks (Mid-Semester Examination). For remaining 10 marks shall be based on the continuous evaluation consisting of tutorial, viva, seminars, home-assignments, mini project, survey, group discussion etc.(on approvalof Head of the Department)

(v) There shall be revaluation of the answer scripts of End-Semester Examination (out of 70 marks) of theory papers only, but

not of internalassessment papers as per Ordinance No. **134 A and B.**

PATTERN OF THE QUESTION PAPER: Four Credits

(1) Internal Examination:

(Mid-Semester Examination of 10 marks, Duration: 30 Mins)

Question No.	Total Marks	No. Of questions	Remarks
Q. 1.	10	Attempt any 5 out of 7	Definitions/Counter examples/Short answer /objective type of questions/True or False. (Each question carries 2 mark.)
Q. 2.	10	Solve any 1 out of 2 questions	Descriptive type questions(Each question carries 10 marks)

(2) End Semester Examination (EE):

Shall be of 70 marks, 2 hours and 30 Minutes duration. The pattern of the question paper shall be as follows:

Question No.	Total Marks	No. Of questions	Remarks
Q. 1.	10	Solve any 5 out of 7	Definitions/Counter examples/Short answer /objective type of questions/True or False. (Each question carries 2 mark.)
Q. 2.	20	Solve any 5 out of 7OR Solve any 2 out of 3	Descriptive type questions
Q. 3.	20	Solve any 2 out of 3	Descriptive type questions (Each question carries 5 marks)
Q. 4.	20	Solve any 2 out of 3OR Solve any 1 out of 2	Descriptive type questions

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