NEP 2.0

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's

New Arts, Commerce, and Science College Ahmednagar (Autonomous)

(Affiliated to Savitribai Phule Pune University, Pune)

National Education Policy (NEP)
Choice Based Credit System (CBCS)

Programme Framework
B. Sc. - I (Electronic Science)

Implemented from

Academic Year 2024-25

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's

New Arts, Commerce and Science College, Ahmednagar (Autonomous)

Board of Studies in Electronic Science

Sr. No.	Name	Designation
1.	Mr. D. K. Sonawane	Chairman
2.	Mrs. S. D. Shelke	Member
3.	Dr. D. S. Shelar	Member
4.	Dr. M. A. Shaikh	Member
5.	Miss. M. R. Markad	Member
6.	Dr. S. N. Helambe	Academic Council Nominee
7.	Mr. S. K. Shinde	Academic Council Nominee
8.	Dr. M. S. Zambare	Vice-Chancellor Nominee
9.	Mr. Bipinchandra Todmal	Alumni
10.	Mr. P. D. Nirmal	Industry Expert
11.	Mrs. B. M. Danave	Member (co-opt)

1. Prologue/ Introduction of the programme: At least one page

The Department of Electronic Science offers B.Sc. programme for 3 academic years and 6 semesters and B.Sc. (Honours) programme of 4 years and 8 semesters. For B.Sc. the minimum total number of credits requirements is 132 credits and for B.Sc. (Honours) the minimum total number of credits requirements is 176 credits. The overall credits divided in three subjects at first year entry level followed by three groups i.e. major, minor and other courses. The students must take any three subject group given by college admission committee at first year later out of three subject students has to left one subject and out of remaining two subject one subject can be major course as a specialization followed by minor course of other subject and other courses as per structure of credits distribution. At first year there is one theory and one practical course for semester I and II for all three subjects, later at second and third year major and minor courses credits. For 3-year B.Sc. there are 66 credits for core and elective theory practical, Vocational Skill Courses

(VSC), Field Project (FP), Community Engagement and Service (CEP). 18 credits for minor theory and practical, additionally 6 credits for Skill Enhancement Courses (SEC), 8 credit for General Elective / Open Elective (GE/OE), 04 credit for Indian Knowledge System (IKS), 08 credit for Ability Enhancement Courses (AEC), 04 credit for Value Education Courses (VEC) and 08 credit for Co-Curricular Courses (CC). For 4-year B.Sc. (Honours) additional 44 credit added in 3-year BSc i.e. 28 credits for core theory and practical 8 credit for elective theory and practical and 8 credit for Research Methodology (RM), On-Job Training (OJT) each 4 credits.

The syllabus has been designed such that the knowledge of fundamental concepts, advanced technologies and specific practical skills will be developed among students. To understand advanced electronics technologies students should first understand the basic concepts of electronics. In the first year of the B.Sc. and B.Sc. (Honours) electronic science course, the basic concepts of analog and digital electronics with the required theoretical understanding and practical skills have been covered. During the second year of the B.Sc. and B.Sc. (Honours), students will learn about some designing aspects of analog and digital electronics with practical based on system design. In addition, the students will learn about communication electronics and the microcontroller programming which has large application areas. In the third year of the B.Sc. and B.Sc. (Honours) course, advanced concepts of the electronics field are covered, where the students will get knowledge about sensor transducers & process control systems, 'C' programming, advanced microcontrollers, advanced digital, Programmable Logic Control (PLC), will be covered which has great industrial weightage. Also perform project work and On-Job Training in the third year that improves their practical knowledge as well as allows them to express themselves. In the fourth year of B.Sc. (Honours) course, some more applied courses will teach like modern communication, advanced analog, programming Raspberry Pi using Python, advanced embedded system design, electromagnetic fields and antennas, Internet of Things, optical fiber communication, digital image processing or artificial intelligence and in addition to that Research Methodology course is introduce which will help for scientific temper at UG level.

Electronic Science is an important branch of science devoted to the design, implementation and analysis of electronic circuits and systems. Electronics technology has revolutionized various fields including communication, consumer appliances, medical, defense and so on. The advances in electronics technology make systems

smaller, smarter and powerful. The designing-based approach has been used mostly in the syllabus that trains students to apply the acquired knowledge to design and analyze circuits for specific applications.

2. Programme Outcomes (POs)

Students enrolled in the program complete a curriculum that exposes and trains students in afull range of essential skills and abilities. They will have the opportunity to master the following objectives.

To get the knowledge of technological and practical aspects of electronic science.

i. To familiarize with the concepts of electronics technologies.

ii. To create the foundation for research and development in Electronics.

iii. To enhance the programming skill in Electronics.

iv. To get the practical skills required for electronics industries.

v. To develop the analytical abilities towards the use of electronics in real-world problems.

vi. To familiarize with the current and recent technological developments.

vii. To enrich knowledge through activities such as industrial visits, seminars, projects etc.

B. Sc. Programme Framework: Credit Distribution

Level / Difficulty	Sem	Subject-1 (Selected as Major)						Subject-2		Subject-3		(SEC)	GE/OE		IKS	AEC	VEC	CC	Total
		T		P				T	P	P	T	P	T	P					
Certificate 4.5 / 100	I	02		02				02	02	02	02	-	02		02	02	02	02	22
	II	02		02				02	02	02	02	02	-	02	--	02	02	02	22
		Credits Related to Major						Selected as Minor											
		Core		Elective		VSC	FP / OJT/ CEP/RP												
		T	P	T	P	P	P	T	P	-		P	T	P	-	-	-	-	-
Diploma 5.0 / 200	III	04	02	--		02	02	02	02	-		02	02		-	02	-	02	22
	IV	04	02	--		02	02	02	02	-		02		02	--	02	-	02	22
Degree 5.5 /300	V	06	04	02	02	2	2	02	-	-		-	-		02	-	-	-	22
	VI	06	04	02	02	2	4	02	-	-		-	-		-	-	-	-	22
Total		24	16	04	04	08	10	10	08	04	04	06	08		04	08	04	08	132
6.0/400 Honours	VII	08	06	02	02	-	RM-04												22
	VIII	08	06	02	02		OJT-04												22
6.0/400 Honours with Research	VII	06	04	02	02		RM-04 RM-04												22
	VIII	06	04	02	02		RM-08												22
Total		40/36	28/24	08	08	08	18/26	10	08	04	04	06	04	04	04	08	04	08	176

B.Sc. Programme Framework: Course Distribution

Level / Difficulty	Sem	Subject-1 (Selected as Major)						Subject-2		Subject-3		(SEC)	GE/OE		IKS	AEC	VEC	CC	Total
		T		P				T	P	P	T	P	T	P					
Certificate 4.5 / 100	I	01		01				01	01	01	01	-	01		01	01	01	01	11
	II	01		01				01	01	01	01	01	-	01	--	01	01	01	11
		Credits Related to Major						Selected as Minor											
		Core		Elective		VSC	FP / OJT/ CEP/RP												
		T	P	T	P	P	P	T	P	-		P	T	P	-	-	-	-	-
Diploma 5.0 / 200	III	02	01	--		01	FP-01	01	01	-		01	01		-	01	-	01	11
	IV	02	01	--		01	CEP-01	01	01	-		01		01	--	01	-	01	11
Degree 5.5 /300	V	03	02	01	01	01	FP-01	01	-	-		-	-		01	-	-	-	11
	VI	03	02	01	01	01	OJT-01	01	-	-		-	-		-	-	-	-	10
Total		12	08	02	02	04	04			02	02	03	04		02	04	02	04	65
6.0/400 Honours	VII	03	03	01	01	-	RM-01												09
	VIII	03	03	01	01		OJT-01												09
6.0/400 Honours with Research	VII	02	02	01	01		RM-01 RM-01												08
	VIII	02	02	01	01		RM-01												07
Total		18/16	14/12	04	04	04	06/07	06	04	02	02	03	04		02	04	02	04	83/80

B. Sc. –Electronic Science: Credit and Course Distribution in Brackets

Level / Difficulty	Sem	Subject-1							Total
		T		P					
4.5	I	02 (01)		02 (01)					04(02)
	II	02 (01)		02 (01)					04(02)
		Credits Related to Major						IKS	
		Core		Elective		VSC	FP / OJT/ CEP		
		T	P	T	P	P	P	T	
5.0	III	04(02)	02(01)	--		02(01)	FP-02(01)		10(05)
	IV	04(02)	02(01)	--		02(01)	CEP-02(01)		10(05)
5.5	V	06(03)	04(02)	02(01)	02(01)	02(01)	FP-02(01)	02(01)	20 (10)
	VI	06(03)	04(02)	02(01)	02(01)	02(01)	OJT-04(01)		20(09)
Total		**12**	**08**	**(02)**	**(02)**	**04**	**04**	**(01)**	**33**
6.0	VII	03	03	(01)	(01)	-	RM-04(01)		22(09)
	VIII	03	03	(01)	(01)		OJT-04(01)		22(09)
6.0	VII	(02)	(02)	(01)	(01)		RM-04(01) RP-04(01)		22(08)
	VIII	(02)	(02)	(01)	(01)		RM-08(01)		22(07)
		18/16	14/12	04	04	04	06/07	(01)	51/48

Programme Framework (Courses and Credits): B. Sc. Electronic Science

Sr. No.	Year	Semester	Level	Course Type	Course Code	Title	Credits
1.	I	I	4.5	DSC-01	BS-ES 111T	Analog Electronics	02
2.	I	I	4.5	DSC-02	BS-ES 112P	Practical Course-I	02
3.	I	II	4.5	DSC-03	BS-ES 121T	Digital Electronics	02
4.	I	II	4.5	DSC-04	BS-ES 122T	Practical Course-II	02
5.	II	III	5.0	DSC-05	BS-ES 231T	Analog Circuit Design	**02**
6.	II	III	5.0	DSC-06	BS-ES 231T	Digital System Design	**02**
7.	II	III	5.0	DSC-07	BS-ES 231P	Practical Course – I	**02**
8.	II	III	5.0	VSC-01	BS-ES 234P	Practical Course – II	**02**
9.	II	III	5.0	FP-01	BS-ES 235T	Field Project-I	**02**
10.	II	IV	5.0	DSC-08	BS-ES 241T	Communication Electronics	**02**
11.	II	IV	5.0	DSC-09	BS-ES 242T	Microcontroller Programming and Applications	**02**
12.	II	IV	5.0	DSC-10	BS-ES 243P	Practical Course – III	**02**

13.	II	IV	5.0	VSC-02	BS-ES 243T	Practical Course – IV	**02**
14.	II	IV	5.0	CEP-01	BS-ES 245P	Community Engagement Project	02
15.	III	V	5.5	DSC-11	BS-ES 351T	Sensors and Process Control Systems	02
16.	III	V	5.5	DSC-12	BS-ES 352T	'C' Programming	02
17.	III	V	5.5	DSC-13	BS-ES 353T	Power Electronics	02
18.	III	V	5.5	DSC-14	BS-ES 354P	Practical Course – I	02
19.	III	V	5.5	DSC-15	BS-ES 355P	Practical Course – II	02
20.	III	V	5.5	DSE-01	BS-ES 356T	Microcontrollers	02
21.	III	V	5.5	DSE-02	BS-ES 357P	Practical Course – III	02
22.	III	V	5.5	VSC-03	BS-ES 358P	Practical Course – IV	02
23.	III	V	5.5	FP-02	BS-ES 359P	Field Project-II	02
24.	III	V	5.5	IKS-02	BS-ES 360T	IKS (Major Specific)	02
25.	III	VI	5.5	DSC-16	BS-ES 361T	Digital System Design using Verilog	02
26.	III	VI	5.5	DSC-17	BS-ES 362T	PLC and its Applications	02
27.	III	VI	5.5	DSC-18	BS-ES 363T	Embedded System Design	02
28.	III	VI	5.5	DSC-19	BS-ES 364P	Practical Course – V	02
29.	III	VI	5.5	DSC-20	BS-ES 365P	Practical Course – VI	02
30.	III	VI	5.5	DSE-03	BS-ES 366T	Python Programming	02
31.	III	VI	5.5	DSE-04	BS-ES 367P	Practical Course – VII	02
32.	III	VI	5.5	VSC-04	BS-ES 368P	Practical Course – VIII	02
33.	III	VI	5.5	OJT-01	BS-ES 369P	On Job Training - I	04

B. Sc. Electronic Science (Honours)

34.	IV	VII	6.0	DSC-21	BS-ES 471T	Modern Communication Technologies	03
35.	IV	VII	6.0	DSC-22	BS-ES 472T	Advanced Analog Circuit Design	03
36.	IV	VII	6.0	DSC-23	BS-ES 473T	Programming Raspberry Pi	02
37.	IV	VII	6.0	DSC-24	BS-ES 474P	Practical Course – I	02
38.	IV	VII	6.0	DSC-25	BS-ES 475P	Practical Course – II	02
39.	IV	VII	6.0	DSC-26	BS-ES 476P	Practical Course – III	02
40.	IV	VII	6.0	DSE-05	BS-ES 477T	Advanced Embedded System Design	02
41.	IV	VII	6.0	DSE-06	BS-ES 478P	Practical Course – IV	02
42.	IV	VII	6.0	RM-01	BS-ES 479T/P	Research Methodology	04
43.	IV	VIII	6.0	DSC-27	BS-ES 481T	Electromagnetic Fields and Antennas	03
44.	IV	VIII	6.0	DSC-28	BS-ES 482T	Internet of Things	03
45.	IV	VIII	6.0	DSC-29	BS-ES 483T	Optical Fiber Communication	02
46.	IV	VIII	6.0	DSC-30	BS-ES 484P	Practical Course – V	02
47.	IV	VIII	6.0	DSC-31	BS-ES 485P	Practical Course – VI	02
48.	IV	VIII	6.0	DSC-32	BS-ES 486P	Practical Course – VII	02
49.	IV	VIII	6.0	DSE-07	BS-ES 487T	Digital Image Processing	02
50.	IV	VIII	6.0	DSE-08	BS-ES 485P	Practical Course – VIII	02
51.	IV	VIII	6.0	OJT-02	BS-ES 486P	On Job Training - II	04

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's

New Arts, Commerce and Science College, Ahmednagar

(Autonomous)

Syllabus

B. Sc. -I (Electronic Science)

Title of the Course: Analog Electronics								
Year: I				**Semester: I**				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-01	BS-ES 111T	02	00	02	30	15	35	50

Learning Objectives:

1. To study the different electronic components.
2. To study Network theorems.
3. To study different semiconductor diodes.
4. To understand concept of BJT, FET, MOSFET.

Course Outcomes (Cos)

1. Select proper electronic components as per the need of the application.
2. Understand the concept of semiconductor diodes
3. Understand the different applications of FET, BJT and MOSFET.

Detailed Syllabus:

Unit I: Electronic Components (06)

Classification of components. Passive components: resistors, capacitors, inductors, transformer (types, symbol, working principle, applications), series and parallel combination of resistors, capacitors and inductors.

Unit II: Basic Electrical Circuits and Circuit Theorems (08)

Ohm's law, Kirchhoff's voltage law, Kirchhoff's current law, Thevenin's theorem, Norton's theorem, Superposition theorem and Maximum power transfer theorem. Numerical problems based on these network theorems.

AC applied to R, C and L, LCR series and parallel resonant circuit, RC low and high pass filter.

Unit III: Semiconductor Diodes and Circuits (08)

Semiconductor, intrinsic and extrinsic semiconductor, formation of PN junction diode, forward and reverse bias characteristics, Zener diode, Light Emitting Diode, Photo Diode,

Solar Cell (construction, working principle, characteristics and applications), Opto-coupler concept.

Applications: Rectifiers (half, full wave and bridge), Zener regulator (load and line regulation).

Unit IV: Transistors and Its Applications (08)

BJT: Bipolar Junction Transistor (BJT) types, symbol, construction, working principle, transistor configurations - CB, CC (only concept), CE configuration: input and output characteristics, the definition of α, β and ϒ. Potential divider bias, transistor as a CE amplifier, concept of gain and bandwidth, Application: transistor as a switch.

FET, MOSFET: Symbol, types, construction, working principle, I-V characteristics.

Applications: JFET as voltage variable resistor, MOSFET as a switch.

Suggested Readings/Material:

1. Electronic Devices and Circuit Theory - Robert L. Boylestad and Louis Nashelsky.
2. Electronic Devices and Circuits I – T.L.Floyd- PHI.
3. Integrated Electronics – Millmam and Halkias.
4. Electronic Devices and Circuits – Bogart.
5. Principals of Electronics - V.K. Mehta, S.Chand and Co.
6. A text book of electrical technology - B.L.Theraja, S.Chand.

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's

New Arts, Commerce and Science College, Ahmednagar

(Autonomous)

Syllabus

B. Sc. -I (Electronic Science)

Title of the Course: Practical Course-I								
Year: I				**Semester: I**				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-02	BS-ES 112P	00	02	02	60	15	35	50

Learning Objectives:

1. To identify and calculate values of electronic components.
2. How to use different laboratory instruments for measuring different parameters.
3. To use breadboard / tag-board for building small electronic circuits.

Course Outcomes (Cos)

After completion of the course, the students will be able to,

1. Identify different electronic components and instruments.
2. Understand the operation of different laboratory instruments and used them for measuring different parameters.
3. Use breadboard / tag-board for building small electronic circuits.

Detailed Syllabus:

GROUP A (Any 10)

1. To verify the Superposition theorem.
2. To verify Kirchhoff's voltage and current laws.
3. To verify Thevenin's and Norton's Theorem.
4. To verify Maximum Power Transfer Theorem.
5. To study forward and reverse characteristics of diode.
6. To study the forward cha. of LED for different colours.
7. To study diode rectifier circuits.
8. To design Zener as a voltage regulator.
9. To study transistor as a switch.
10. Study of Single stage RC coupled CE transistor Amplifier (Gain/ Bandwidth).

11. Study of solar cells.
12. To build and test Low pass and High pass RC filters.
13. To study series resonance of LCR Circuit.
14. Study of FET characteristics.

GROUP B (Any 2)

1. Identification of components (Passive and Active) and study of multimeter -

a. Minimum 10 different types of components are expected.

b. Identification based on visual inspection / data sheets.

c. Measure the various parameters using multimeter.

2. Study of Signal Generator and CRO -

a. Study of front panel controls.

b. Measurement of amplitude, frequency and phase of waveform.

3. Perform survey of following topics –

a. Study of laboratory safety and precautionary measures.

b. Study of e-waste management or any relevant topic of Electronics.

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's

New Arts, Commerce and Science College, Ahmednagar

(Autonomous)

Syllabus

B. Sc. -I (Electronic Science)

Title of the Course: Digital Electronics								
Year: I				**Semester: II**				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-03	BS-ES 121T	02	00	02	30	15	35	50

Learning Objectives:

1. To learn different number system and their interconversion.
2. To understand logic gates and their applications.
3. To study rules and laws of Boolean Algebra.
4. To understand design of combinational circuit and their different types.

Course Outcomes (COs)

On completion of the course, the students will be able to:

1. Solve problems based on inter-conversion of number systems.
2. Use the various rules and laws of Boolean Algebra for designing digital circuits.
3. Minimize the logical equations using K-maps.
4. Design different combinational circuits.

Detailed Syllabus:

Unit I: Number Systems and Digital Codes **(08)**

Introduction to decimal, binary, octal and hexadecimal number system and their inter-conversions, the concept of 1's and 2's complements, binary addition, binary subtraction using 1's and 2's complements. BCD code, Excess-3 code, Gray code and ASCII code.

Unit II: Logic Gates and Logic Families **(06)**

Logic gates – basic and derived (symbol, Boolean equation and truth table), concept of universal gates. Introduction of CMOS and TTL logic families. Parameters of logic families: voltage levels, propagation delay, noise margin, fan in, fan out, power dissipation Comparison between CMOS and TTL logic families.

Unit III: Boolean Algebra and Karnaugh Map (06)

Laws of Boolean Algebra, De-Morgan's theorems, simplification of logic equations using Boolean algebra, minterms, maxterms, Boolean expression in SOP and POS form, conversion of SOP/POS expression to its standard SOP/POS form. Introduction to Karnaugh map, problems based on SOP (up to 4 variables), digital designing using K-map for 3-bit gray to binary and binary to gray conversion. Ex-OR gate as a 4-bit Parity Checker and Generator.

Unit III: Combinational Circuits (10)

Introduction to Arithmetic Circuits, half adder, full adder, half subtractor, full subtractor, four-bit parallel adder, universal adder / subtractor, digital comparator, introduction to ALU. Introduction, Multiplexer (2:1, 4:1), demultiplexer (1:2, 1:4) and their applications. Encoders: decimal to BCD/binary, 3x4 matrix keyboard encoder and priority encoder. Decoders: BCD to decimal and BCD to seven segment decoder.

Suggested Readings/Material:

1. Digital Design - M. Morris Mano, PHI, New Delhi.
2. Digital Systems Principles and Applications - Ronald J. Tocci.
3. Digital electronics - G. K. Kharate, Oxford University Press.
4. Fundamentals of Digital Circuits - Anand Kumar.
5. Digital Principles and Applications - Malvino and Leach, TMG Hill Edition.

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(Autonomous)

Syllabus

B. Sc. -I (Electronic Science)

Title of the Course: Practical Course-II								
Year: I				**Semester: II**				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-04	BS-ES 122P	00	02	02	60	15	35	50

Learning Objectives:

1. To understand logic gates ICs and their applications in Digital Design.
2. To design different digital circuits using logic gates.
3. To study different combinational circuits.

Course Outcomes (Cos)

After completion of the course, the students will be able to –

1. Understand the design and build of digital circuits using logic gates.
2. Use breadboard / tag-board for building small electronic circuits.
3. Design digital circuits for different applications.
4. Validate observed outputs with expected theoretical outputs.

Detailed Syllabus:

GROUP A (Any 10)

1. Verification of logic gates by using digital ICs.
2. Realization of basic gates using discrete components.
3. Realization of basic gates using universal logic gates.
4. Verification of De Morgan's theorems.
5. Study of half adder and full adder using logic gates.
6. Study of half subtractor and full subtractor using logic gates.
7. 4-bit binary parallel adder and subtractor using IC7483.
8. 3-bit binary to Gray conversion using logic gates.
9. 3-bit Gray to Binary conversion using logic gates.
10. Study of EX-OR gate as a 4-bit parity checker.
11. Study of EX-OR gate as a 4-bit parity generator.

12. Study of 1-bit digital comparator.
13. Study of ALU using IC 74181.
14. Study of multiplexer and demultiplexer.
15. Study of Decimal to BCD/Binary encoder.
16. Study of Priority Encoder IC 74148
17. Study of BCD to seven segment decoder using IC 7447.

GROUP B (Any 1)

1. Perform any 2 experiments from Group A using circuit simulation software LTSPICE / CircuitMod / Proteus etc. (Give preference to not performed experiments).
2. Perform survey of following topics –
   a. Study of laboratory safety and precautionary measures.
   b. Study of e-waste management or any relevant topic of Electronics.