Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur 440033

Scheme and Syllabus

Bachelor of Science (Electronics)

Submitted by

Board of Studies,

Bachelor of Science (Electronics)

FYUGP-Scheme I-VIII Semester

Bachelor of Science (Honors/Research)

(ELECTRONICS - Major)

Four Year (Eight Semester Degree Course)

Teaching and Examination Scheme

B.Sc. Sem-I (ELECTRONICS - Major)

SN	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
								Theory				Practical		
				(Th)	TU	P		Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	DSC	Semiconductor Devices & Circuits	BEN1T01	2	-	-	2	3	80	20	40	-	-	-
2	DSC	Semiconductor Theory & Devices	BEN1P01			2	1	-	-	-	-	25	25	25
3	DSC	Digital Electronics	BEN1T02	2	-	-	2	3	80	20	40	-	-	-
4	DSC	Digital Electronics	BEN1P02			2	1	-	-	-	-	-	50	25
5	GE/OE	Refer GE/OE Basket	BGO1T01	2	-	-	2	3	80	20	40	-	-	-
6	GE/OE	Refer GE/OE Basket	BGO1T02	2	-	-	2	3	80	20	40	-	-	-
7	VSC	Basic Electronics Components & Instruments	BVS1P01	-	-	4	2	-	-	-	-	50	50	50
8	SEC	Refer SEC Basket	BVS1P02	-	-	4	2	-	-	-	-	50	50	50
9	AEC	English Compulsory	BAE1T01	2	-	-	2	3	50	50	40	-	-	-
10	VEC	Environmental Sci.	BVE1T01	2	-	-	2	3	80	20	40	-	-	-
11	IKS	Vedic Mathematics	BIK1T01	2	-	-	2	3	80	20	40	-	-	-
12	CC	Refer CC Basket	BCC1P01	-	-	4	2	-	-	-	-	-	100	50
Total				14	-	16	**22**		**530**	**170**		**125**	**275**	

B.Sc. Sem-II (ELECTRONICS - Major)

SN	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
				(Th)	TU	P		Theory				Practical		
								Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	DSC	Network Analysis	BEN2T03	2	-	-	2	3	80	20	40	-	-	-
2	DSC	Network Analysis	BEN2P03			2	1	-	-	-	-	25	25	25
3	DSC	Programming in C	BEN2T04	2	-	-	2	3	80	20	40	-	-	-
4	DSC	Programming in C	BEN2P04			2	1	-	-	-	-	-	50	25
5	GE/OE	Refer GE/OE Basket	BGO2T03	2	-	-	2	3	80	20	40	-	-	-
6	GE/OE	Refer GE/OE Basket	BGO2T04	2	-	-	2	3	80	20	40	-	-	-
7	VSC	Arduino and applications	BVS2P03	-	-	4	2	-	-	-	-	50	50	50
8	SEC	Refer SEC Basket	BVS2P04	-	-	4	2	-	-	-	-	50	50	50
9	AEC	Second Language	BAE2T02	2	-	-	2	3	50	50	40	-	-	-
10	VEC	Constitution of India	BVE2T02	2	-	-	2	3	80	20	40	-	-	-
11	IKS	Indian Astronomy	BIK2T02	2	-	-	2	3	-	-	-	50	50	50
12	CC	Refer CC Basket	BCC2P02	-	-	4	2	-	-	-	-	-	100	50
Total				14	-	16	**22**		**530**	**170**		**125**	**275**	

Exit option: Award of UG Certificate in Major with 40-44 credits and an additional 4 credits core NSQF course/ Internship ORContinue with Major and Minor

B.Sc. Sem-III (ELECTRONICS - Major)

SN	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
				(Th)	TU	P		Theory				Practical		
								Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	DSC	Analog Electronic Circuits	BEN3T05	2	-	-	2	3	80	20	40	-	-	-
2	DSC	Analog Electronic Circuits	BEN3P05	-	-	2	1	-	-	-	-	25	25	25
3	DSC	Micro-controller 8051 Family	BEN3T06	2	-	-	2	3	80	20	40	-	-	-
4	DSC	Micro-controller 8051 Family	BEN3P06	-	-	2	1	-	-	-	-	-	50	25
5	Minor	Minor 1 (Refer Minor Basket)		2	-	-	2	3	80	20	40	-	-	-
6	Minor	Minor 1 (Refer Minor Basket)		-	-	2	1	-	-	-	-	25	25	25
7	Minor	Minor 2 (Refer Minor Basket)		2	-	-	2	3	80	20	40	-	-	-
8	Minor	Minor 2 (Refer Minor Basket)		-	-	2	1	-	-	-	-	-	50	25
9	GE/OE	Refer GE/OE Basket	BGO3T05	2	-	-	2	3	80	20	40	-	-	-
10	VSC	Refer VSC Basket	BVS3P05	-	-	4	2	-	-	-	-	50	50	50
11	AEC	Second Language	BAE3T03	2	-	-	2	3	50	50	40	-	-	-
12	FP	Field Project	BFP3P01	-	-	4	2	-	-	-	-	50	50	50
13	CC	Refer CC Basket	BCC3P03	-	-	4	2	-	-	-	-	-	100	50
Total				12	-	20	**22**		**450**	**150**		**150**	**350**	

B.Sc. Sem-IV (ELECTRONICS - Major)

SN	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
				(Th)	TU	P		Theory				Practical		
								Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	DSC	Linear Integrated Circuits	BEN4T07	2	-	-	2	3	80	20	40	-	-	-
2	DSC	Linear Integrated Circuits	BEN4P07			2	1	-	-	-	-	25	25	25
3	DSC	Signals and Systems	BEN4T08	2	-	-	2	3	80	20	40	-	-	-
4	DSC	Signals and Systems	BEN4P08			2	1	-	-	-	-	-	50	25
5	Minor	Minor 3 (Refer Minor Basket)		2	-	-	2	3	80	20	40	-	-	-
6	Minor	Minor 3 (Refer Minor Basket)				2	1	-	-	-	-	25	25	25
7	Minor	Minor 4 (Refer Minor Basket)		2	-		2	3	80	20	40	-	-	-
8	Minor	Minor 4 (Refer Minor Basket)				2	1	-	-	-	-	-	50	25
9	GE/OE	Refer GE/OE Basket	BGO4T06	2	-	-	2	3	80	20	40	-	-	-
10	SEC	Refer SEC Basket	BVS4T06	-	-	4	2	-	-	-	-	50	50	50
11	AEC	English Compulsory	BAE4T03	2	-	-	2	3	50	50	40	-	-	-
12	CEP	Community Service	BCM4P01	-	-	4	2	-	-	-	-	50	50	50
13	CC	Refer CC Basket	BCC4P04	-	-	4	2	-	-	-	-	-	100	50
Total				12	-	20	**22**		**450**	**150**		**150**	**350**	

Exit option; Award of UG Diploma in Major and Minor with 80-88 credits and an additional 4 credits core NSQF course/ Internship ORContinue with Major and Minor

B.Sc. Sem-V (ELECTRONICS - Major)

SN	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
				(Th)	TU	P		Theory				Practical		
								Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	DSC	Instrumentation system	BEN5T09	2	-	-	2	3	80	20	40	-	-	-
2	DSC	Instrumentation system	BEN5P09	-	-	2	1	-	-	-	-	25	25	25
3	DSC	Communication System	BEN5T10	2	-	-	2	3	80	20	40	-	-	-
4	DSC	Communication System	BEN5P10	-	-	2	1	-	-	-	-	-	50	25
5	DSC	Advanced Microcontrollers and Applications	BEN5T11	2	-	-	2	3	80	20	40	-	-	-
6	DSC	Advanced Microcontrollers and Applications	BEN5P11	-	-	2	1	-	-	-	-	25	25	25
7	DSE	Elective 1 A. Digital Design and VHDL B. Control System	BDS5T12 BDS5T13	3	-	-	3	3	120	30	60	-	-	-
8	DSE	Elective 1 A. Digital Design and VHDL B. Control System	BDS5P12 BDS5P13	-	-	2	1	-	-	-	-	-	50	25
9	Minor	Minor 5 (Refer Minor Basket)		2	-	-	2	3	80	20	40	-	-	-
10	Minor	Minor 5 (Refer Minor Basket)		-	-	2	1	-	-	-	-	25	25	25
11	Minor	Minor 6 (Refer Minor Basket)		2	-	-	2	3	80	20	40	-	-	-
12	Minor	Minor 6 (Refer Minor Basket)		-	-	2	1	-	-	-	-	-	50	25
13	VSC	Refer VSC Basket	BVS5P07	-	-	4	2	-	-	-	-	50	50	50
14	CEP	Community Service	BCM5P02	-	-	2	1	-	-	-	-	25	25	25
Total				**13**	**-**	**18**	**22**	**-**	**520**	**130**	**--**	**150**	**300**	**-**

B.Sc. Sem-VI (ELECTRONICS - Major)

SN	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
				(Th)	TU	P		Theory				Practical		
								Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	DSC	Industrial Instrumentation	BEN6T14	2	-	-	2	3	80	20	40	-	-	-
2	DSC	Industrial Instrumentation	BEN6P14	-	-	2	1	-	-	-	-	25	25	25
3	DSC	Digital Signal Processing	BEN6T15	2	-	-	2	3	80	20	40	-	-	-
4	DSC	Digital Signal Processing	BEN6P15	-	-	2	1	-	-	-	-	-	50	25
5	DSC	Bio-Medical Instrumentation	BEN6T16 BEN6T17	2	-	-	2	3	80	20	40	-	-	-
6	DSC	Bio-Medical Instrumentation	BEN6P16 BEN6P17	-	-	2	1	-	-	-	-	25	25	25
7	DSE	Elective 2 A. Power Electronics B. Reliability of Electronic Equipment	BEN6T18 BEN6T19	3	-	-	3	3	120	30	60	-	-	-
8	DSE	Elective 2 A. Power Electronics B. Reliability of Electronic Equipment	BEN6P18 BEN6P19	-	-	2	1	-	-	-	-	-	50	25
9	Minor	Minor 7 (Refer Minor Basket)		2	-	-	2	3	80	20	40	-	-	-
10	Minor	Minor 7 (Refer Minor Basket)		-	-	2	1	-	-	-	-	25	25	25
11	VSC	Refer VSC Basket	BVS6P08	-	-	4	2	-	-	-	-	50	50	50
12	OJT	Internship (Related to DSC)	BOJ6P01	-	-	8	4	-	-	-	-	100	100	100
Total				11	-	22	**22**		**440**	**110**		**225**	**325**	

Exit option: Award of UG Degree in Major with 120-132 credits OR Continue with Major and Minor

B.Sc. Sem-VII (Honors) (ELECTRONICS - Major)

SN	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
				(Th)	TU	P		Theory				Practical		
								Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	DSC	Reconfigurable Electronics	BEN7T20	2	-	-	2	3	80	20	40	-	-	-
2	DSC	Reconfigurable Electronics	BEN7P20	-	-	2	1	-	-	-	-	25	25	25
3	DSC	Antenna and Advance Communication	BEN7T21	2	-	-	2	3	80	20	40	-	-	-
4	DSC	Antenna and Advance Communication	BEN7P21	-	-	2	1	-	-	-	-	-	50	25
5	DSC	Computer Networks &Internet of Things	BEN7T22	2	-	-	2	3	80	20	40	-	-	-
6	DSC	Computer Networks &Internet of Things	BEN7P22	-	-	2	1	-	-	-	-	25	25	25
7	DSC	Automotive Electronics & Optoelectronics	BEN7T23	2	-	-	2	3	80	20	40	-	-	-
8	DSC	Automotive Electronics & Optoelectronics	BEN7P23	-	-	2	1	-	-	-	-	-	50	25
9	DSE	Elective 3 A. Wearable Technology B. Smart Sensors	BEN7T24 BEN7T25	3	-	-	3	3	120	30	60	-	-	-
10	DSE	Elective 3 A. Wearable Technology B. Smart Sensors	BEN7P24 BEN7P25	-	-	2	1	-	-	-	-	25	25	25
11	RM	Research Methodology	BEN7T22	2	-	-	2	3	80	20	40	-	-	-
12	RM	Research Methodology	BEN7T22	-	-	4	2	-	-	-	-	50	50	50
Total				13	-	14	**20**		**520**	**130**		**125**	**225**	

B.Sc. Sem-VIII (Honors) (ELECTRONICS - Major)

SN	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
				(Th)	TU	P		Theory				Practical		
								Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	DSC	Mechatronics	BEN8T29	2	-	-	2	3	80	20	40	-	-	-
2	DSC	Mechatronics	BEN8P29	-	-	2	1	-	-	-	-	25	25	25
3	DSC	Nanoscience and Nanotechnology	BEN8T30	2	-	-	2	3	80	20	40	-	-	-
4	DSC	Nanoscience and Nanotechnology	BEN8P30	-	-	2	1	-	-	-	-	-	50	25
5	DSC	Design of Electronics instruments	BEN8T31	2	-	-	2	3	80	20	40	-	-	-
6	DSC	Design of Electronics instruments	BEN8P31	-	-	2	1	-	-	-	-	25	25	25
7	DSC	Medical Imaging	BEN8T32	2	-	-	2	3	80	20	40	-	-	-
8	DSC	Medical Imaging	BEN8P32	-	-	2	1	-	-	-	-	-	50	25
9	DSE	Elective 4 A. Hardware design of AL& ML B. Automation & Robotics	BEN8T33 BEN8T34	3	-	-	3	3	120	30	60	-	-	-
10	DSE	Elective 4 A. Hardware design of AL& ML B. Automation & Robotics	BEN8P33 BEN8P34	-	-	2	1	-	-	-	-	25	25	25
11	OJT	Apprenticeship (Related to DSC)	BOJ8P02	-	-	8	4	-	-	-	-	100	100	100
Total				11	-	18	**20**		**440**	**110**		**175**	**275**	

Four Year UG Honours Degree in Major and Minor with 160-176 credits

B.Sc. Sem-VII (Research) (ELECTRONICS - Major)

SN	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
				(Th)	TU	P		Theory				Practical		
								Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	DSC	Reconfigurable Electronics	BEN7T20	2	-	-	2	3	80	20	40	-	-	-
2	DSC	Reconfigurable Electronics	BEN7P20	-	-	2	1	-	-	-	-	25	25	25
3	DSC	Antenna and Advance Communication	BEN7T21	2	-	-	2	3	80	20	40	-	-	-
4	DSC	Antenna and Advance Communication	BEN7P21	-	-	2	1	-	-	-	-	-	50	25
5	DSC	Computer Networks &Internet of Things	BEN7T22	2	-	-	2	3	80	20	40	-	-	-
6	DSC	Computer Networks &Internet of Things	BEN7P22	-	-	2	1	-	-	-	-	25	25	25
7	DSE	Elective 3 A. Wearable Technology B. Smart Sensors	BEN7T24 BEN7T25	3	-	-	3	3	120	30	60	-	-	-
8	DSE	Elective 3 A. Wearable Technology B. Smart Sensors	BEN7P24 BEN7P25	-	-	2	1	-	-	-	-	-	50	25
9	RM	Research Methodology	BEN7T21R	2	-	-	2	3	80	20	40	-	-	-
10	RM	Research Methodology	BEN7P21R	-	-	4	2	-	-	-	-	50	50	50
11	RP	Research Project/ Dissertation (Core)	BRP7P01	-	-	6	3	-	-	-	-	75	75	75
Total				11	-	18	**20**		**440**	**110**		**175**	**275**	

'R' in the subject code indicates 'Research'.

B.Sc. Sem-VIII (Research) (ELECTRONICS - Major)

SN	Course Category	Name of Course	Course Code	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
				(Th)	TU	P		Theory				Practical		
								Exam Hrs.	SEE	CIE	Min	SEE	CIE	Min
1	DSC	Mechatronics	BEN8T29	2	-	-	2	3	80	20	40	-	-	-
2	DSC	Mechatronics	BEN8P29	-	-	2	1	-	-	-	-	25	25	25
3	DSC	Nanoscience and Nanotechnology	BEN8T30	2	-	-	2	3	80	20	40	-	-	-
4	DSC	Nanoscience and Nanotechnology	BEN8P30	-	-	2	1	-	-	-	-	-	50	25
5	DSC	Design of Electronics instruments	BEN8T31	2	-	-	2	3	80	20	40	-	-	-
6	DSC	Design of Electronics instruments	BEN8P31	-	-	2	1	-	-	-	-	25	25	25
7	DSE	Elective 4 A. Hardware design of AL& ML B. Automation & Robotics	BEN8T33 BEN8T34	3	-	-	3	3	120	30	60	-	-	-
8	DSE	Elective 4 A. Hardware design of AL& ML B. Automation & Robotics	BEN8P33 BEN8P34	-	-	2	1	-	-	-	-	-	50	25
9	RP	Research Project / Dissertation (Core)	BRP8P02	-	-	14	7 (4+2+1)	-	-	-	-	175	175	175
Total				09	-	22	**20**		**360**	**90**		**225**	**325**	

'R' in the subject code indicates 'Research'.

Four Year UG Honours with Research Degree in Major and Minor with 160-176 credits

Total Credits:

1. Three Year UG Degree Program: 132
2. Four Year UG Degree Program: 172

Abbreviations: Generic/Open Electives: OE, Vocational Skills & Skill Enhancement Courses: VSEC, Vocational Skill Courses: VSC, Skill Enhancement Courses: SEC, Ability Enhancement Courses: AEC, Indian Knowledge Systems: IKS, Value Education Courses: VEC, On Job Training (Internship/Apprenticeship): OJT, Field Project: FP, Community Engagement & Service: CEP, Co-curricular Courses: CC, Research Methodology: RM, Research Project: RP

VSC Basket (Electronics)

Semester	Course Category	Name of Course	BoS	Course Code
I	**VSC**	Basic Electronics Components & Instruments	Electronics	**BVS1P01**
II	**VSC**	Arduino and applications	Electronics	**BVS2P03**
III	**VSC**	Simulation and Modelling of Electronic Circuits 2	Electronics	**BVS3P05**
V	**VSC**	Electronic Product Design and Entrepreneurship	Electronics	**BVS5P07**
VI	**VSC**	Manual Drafting and Design of Electronic Gadgets	Electronics	**BVS6P08**

Basket for ELECTIVE (DSE) Category Courses (Electronics)

Semester	Course Category	Name of Course	Course Code
V	Elective 1	A. Digital Design and VHDL B. Control System	BDS5T12 BDS5T13
VI	Elective 2	A. Power Electronics B. B. Reliability of Electronic Equipment	BEN6T18 BEN6T19
VII (Honors)	Elective 3	A. Wearable Technology B. Smart Sensors	BEN7T24 BEN7T25
VIII (Honors)	Elective 4	A. Hardware design of AL& ML B. Automation & Robotics	BEN8T33 BEN8T34
VII (Research)	Elective 3	A. Wearable Technology B. Smart Sensors	BEN7T24 BEN7T25
VIII (Research)	Elective 4	A. Hardware design of AL& ML B. Automation & Robotics	BEN8T33 BEN8T34

Semester – 1; Paper – 1: Semiconductor Devices and Circuits

Course outcome:

At the end of this course students will demonstrate the ability to

1. Understand the fundamentals of semiconductor components such as diode, BJT, FET and MOSFET.
2. Plot V-I characteristics of electronic components to observe its performance parameters.
3. Understand the simple applications of circuit made using these semiconductor components.
4. Analyse and solve circuits of electronic devices.

Unit 1: Diode and Circuits:

V-I Characteristics of P-N Junction Diode, load line concepts, DC Analysis and models of P-N Junction Diode, types of special diodes, Applications of PN junction diode ─ Rectifier, Clipper, Clamper; Zener Diode circuits ─ shunt regulator, DC power supply.

Unit 2: Transistor and Circuits

BJT Construction and working, Current Components in BJT, Input-Output and Transfer characteristics in CB, CC and CE configuration, Load line concept, Biasing techniques, Bias Stability, small signal model of BJT, Applications of BJT, BJT Logic inverter, TTL.

Unit 3: FET and MOSFET

FET, MOSFET – Classification, Construction, working, Volt-Ampere Characteristics, DC operating point, biasing the MOSFET; small signal model of the MOSFET, small signal analysis, Applications of MOSFET: Switch, Amplifier, Digital Logic Inverter, CMOS inverter.

Unit 4: Amplifier

Classification of amplifiers, distortions in amplifiers, Single-stage and multi-stage transistor amplifiers, low frequency and high frequency response, effect of emitter (or source) bypass capacitor on the frequency response of amplifier, High frequency model of the MOSFET, Miller's theorem.

Practical – 1 Student will have to perform at least 6 practical.

1. Study of VI Characteristics of Silicon and Germanium diode, LED, and Zener diode.
2. Study of Diode as clipper and clamper.
3. Construction and study of Zener diode regulated power supply
4. Study of characteristics of BJT in CE mode.
5. Study of characteristics of BJT in CB mode.
6. Study of characteristics of FET transfer and drain characteristics.
7. Study of characteristics of MOSFET (D and E Type) transfer and drain characteristics.
8. Study of BJT as switch and amplifier
9. Study of BJT as amplifier and find the gain of amplifier and plot its frequency response.
10. To calculate the total harmonic distortion in transistor amplifier

Books:

1. J. Millman and C. C. Halkias, Integrated Electronics: Tata McGraw Hill (2001).
2. David A. Bell, 5th Edition 2015, Electronic Devices and Circuits, Oxford University Press.
3. B. L. Theraja, Basic Electronics (Solid State): S. Chand & Company, 2000.
4. R. S. Sedha, A Textbook of Applied Electronics:, S. Chand Publications.
5. Bhargava and Gupta, Basic Electronics and linear circuits, TMH.
6. D.L. Schilling and C. Belove, Electronic Circuits: Discrete and Integrated, TMH.
7. A. S. Sedra, K.C. Smith, A.N. Chandorkar, Learning Microelectronic circuits:, 2014

Semester – 1; Paper – 2: Digital Electronics

Course outcome:

At the end of this course students will demonstrate the ability to

1. Understand number systems conversions and apply the principles of Boolean algebra to manipulate, minimize and design logic circuits using logic gates.
2. Demonstrate knowledge of various combinational logic circuits like code converters, multiplexers, adders.
3. Demonstrate knowledge of sequential logic circuits elements like latches, flip-flops and use them in the design and analysis of counters, registers.
4. Demonstrate knowledge of design and analysis of complex combinational and simple finite state machine and similar circuits.

Unit 1: Number System and Gates

Binary Arithmetic, Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Logic Gates, combinational Logic Optimization Techniques.

Unit 2: Combinational Circuits

Comparators, Multiplexers, Demultiplexer, Encoder, Decoder, Arithmetic Circuit Design, ALU.

Unit 3: Sequential Circuits

Latches, Flip flop – S-R, JK, D, T and Master-Slave JK FF, counters, Shift registers.

Unit 4: K Map and its applications

K-Maps, application of k-maps in building combinational circuits. Finite state machines & their implementation.

Practical – 1 Student will have to perform at least 6 practical with TTL or CMOS logic ICs.

1. Study of logic gates.
2. Verification of NAND and NOR as universal gates.
3. Verification of De Morgan's theorem.
4. Study of comparator
5. Study of multiplexer and demultiplexer
6. Study of ALU
7. Study of SRFF, Clocked SRFF, DFF.
8. Study of JKFF and JKMSFF.
9. Study of binary up-down counter.
10. Study of shift register.
11. Use of K-Map to design and verify combinational logic circuit. (On Software)
12. Use of K-Map to design various counters using various flipflops. (On Software)

Books:

1. A. Anand Kumar, Fundamentals of digital circuits, Prentice-Hall of India
2. R.P. Jain, Modern digital Electronics, Tata McGraw Hill
3. Malvino, Digital Electronic Principles, PHI, 3rd Edition.
4. Venugopal, Digital Circuits and systems, Tata McGraw Hill.
5. R. J. Tocci, N. S. Widmer, Digital Systems: Principles & Applications
6. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia
7. R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill

Semester – 1: VSC

Basic Electronic Components and Instruments (BVS1P01)

Course outcome:

At the end of this course students will have ability to

1. Identify various passive and active components
2. Make series and parallel combinations of components.
3. Design various types of simple linear power supply.
4. Demonstrate knowledge and use of various instrument used in electronics lab.

Syllabus

1. Components Identification: Resistor, Capacitor, Inductor, Transformer, Switches, Semiconductors, IC types and Packages.
2. Serial and parallel connection of Resistor, capacitor, and inductor.
3. Working with LED. Design of Zener regulated power supply. 3 terminal fixed and variable power supply. Voltmeter, ammeter.
4. Study and application of CRO, Function Generator, Multimeter.

Books:

1. Charles Platt, Make: Electronics, O'Reilly Publications
2. Paul Scherz, Practical Electronics for Invertors, McGraw-Hills Publications
3. J. M. Hughes, Practical Electronics, O'Reilly Publications
4. B. L. Theraja, Basic Electronics (Solid State): S. Chand & Company

B.Sc. SEMESTER – I

BVE1T01: ENVIRONMENTAL SCIENCE

COURSE OUTCOMES:

At the end of the course, students shall be able to:

- Explain the basics of Environmental Science and Atmospheric Science along-with the components of Environment
- Explicate the importance of Environmental Education.
- Elucidate the fundamentals of atmospheric science including formation, depletion and effects of ozone layer and acid rain on environment.
- Describe the various physical and chemical characteristics and properties of Water and Soil
- Understand the Ecology and its allied branches
- Comprehend about Population and Community Ecology
- Study the changes in Population by understanding the concept of Population ecology

Unit-I: Basics of Environmental Science (7.5 Hrs)

A. Introduction of Environmental Science: Definition, Types, Classification, Characteristics, Components and principles of environment. Scope and need for environmental science, Multidisciplinary nature of environmental science, Environmental ethics.
B. Environmental Education: Goals, Objectives and principles of environmental education, formal and non-formal environmental education, environmental programme, importance of environmental education, environmental awareness.
C. Components of Environment: Atmosphere (Structure and composition),hydrosphere – distribution of water, hydrological cycle, global water balance, lithosphere – Internal structure of Earth, types of rocks, Biosphere- Boundaries of biosphere.

Unit-II: Basics of Atmospheric Science (7.5 Hrs)

A. Atmospheric Chemistry: Structure of atmosphere based on temperature, photochemical reaction in the atmosphere, temperature inversion and lapse rate, smog formation, types of smog (sulphur and photochemical smog), adverse effect of smog on human being, aerosol.
B. Green House Effect: Greenhouse gases, relative contribution and effects of greenhouse effect, control of greenhouse gases. Ozone depletion: chemistry of ozone depletion, Dobson Unit, ozone depleting substances (ODS), ozone hole, consequences of ozone depletion, mitigation measures and international protocols.
C. Acid Rain: Chemistry of Acid Rain, effect of acid rain on ecosystem, control measures. Precipitation – Forms of precipitation (rain, drizzle, snow, sleet, and hail), types of precipitation (conventional, orographic, and cyclonic).

Unit-III: Basics of Ecology (7.5 Hrs)

A. Ecology: Definition, subdivision and modern branches of ecology, ecology spectrum, scope of ecology. Application and significance of ecology to human beings.
B. Abiotic Factors: Temperature: effect of temperature on plants and animals, Adaptation to meet extreme temperature. Light: Zonation in marine habitat, effects of light on plants and animals, Microclimate and fire, Shelford law of tolerance, Leibigs law of minimum.
C. Biotic Factor: Inter specific relationship Positive: Mutualism (symbiosis), commensalism, proto- cooperation Negative: Parasitism, predation, competition, Antibiosis, Neutralism.

Unit-IV: Ecosystems and food chain (7.5 Hrs)

A. Ecosystem: Definition, structure and function of ecosystem, types of ecosystem: Terrestrial (forest, grassland, desert, cropland), Aquatic (Marine and freshwater)
B. Food chain: Definition & types: Grazing food chain, detritus food chain, and parasitic food chain, food web in forest and grassland ecosystem. Ecological pyramids (number biomass and energy), energy flow in ecosystem (Y- shaped). Energy flow and the law of thermodynamics.
C. Biogeochemical Cycles: Definition, classification, gaseous cycle (oxygen, carbon and nitrogen) Sedimentary cycle (phosphorus and sulphur).

Reference Books:

1. Text Book of Environment: K M Agrawal, P.K. Sikdar, and S.C. Deb, Mc'Millan Publication, Mumbai.
2. Man and Environment: M.C. Dash and P.C. Mishra, Mc'Millan Publication, Mumbai.
3. Environmental Science: S.C. Santra, New Central Book Pvt.Ltd, Kolkatta.
4. Environmental Problems and Solution: D.K. Asthana, S.Chand Publication, New Delhi.
5. Environmental Chemistry: S.S. Dara, S.Chand Publication ,New Delhi.
6. Environmental Chemistry: A.K. Dey, New Age International Publishers,2001.
7. A Textbook of Environmental Studies: Dr S.Satyanarayan, Dr S.Zade, Dr S Sitre and Dr P.U. Meshram, Allied Publishers, New Delhi.
8. Environmental Biology: Biswarup Mukherjee, Tata McGraw-Hill Publishing Company Ltd, New Delhi,1996.
9. Animal Ecology and Distribution of Animals: Veer Bala Rastogi , Rastogi Publication, Meerut (U.P).
10. Ecology and Environment: P.D.Sharma, Rastogi Publication ,Meerut (U.P).
11. Fundamentals of Environmental Biology: S. Arora, Kalyani Publishers.
12. Environmental Biology: P.K.G. Nair, Himalaya Publication.
13. Environmental Biology: K.C. Agrawal, Agro Botanical Publisher ,Bikaner,1994

Indian Knowledge System (IKS)

SEM1: VEDIC MATHEMATICS (BIK1T01)

Course Outcomes: This course will enable the students to

1. Improve speed and accuracy in numerical calculations
2. Acquire IQ skills and high-end technical knowledge
3. gain test taking skills & creativity of calculations

UNITS	TOPICS	HOURS
Unit 1	(i)Addition - Subtraction - Combined operations - Beejank (ii) Multiplication methods: Urdhwatiryagbhayam, Nikhilam, Ekanyunen, Ekadhiken, Antyayordashakepi. (iii) Vinculum - Operations. (iv) Awareness of 1 to 5 Vedic sutras as per Shankaracharya Bharthikrishan Teerthji Swamiji's book.	**8**
Unit 2	(i) Division methods : Nikhilam, Paravartya Yojayet, Dhwajank(ii) GCD and LCM (iii) Expression of GCD in terms of two numbers.	**8**
Unit 3	(i) Divisibility tests, Osculation & Reverse osculation. (ii) Division Algorithm, Quotient & Remainder. (iii) Duplex method.	**7**
Unit 4	i) Squares & Square-roots for 6 digit number. (ii) Cubes & Cube-roots for 6 digit number, Contribution of Indian Mathematicians in Arithmetic.	**7**
	TOTAL	**30 HRS**

Reference Books:

1. Tirthaji B.K. (1965) Vedic Mathematics, MotilalBanarsidass
2. Bidder G.P. (1856) On Mental Calculation. Minutes of Proceedings, Institution ofCivil Engineers (1855-56), 15, 251-280
3. Scripture E.W. (1891) American Journal of Psychology. Vol. IV 1-59
4. Mitchell F.D. (1907) American Journal of Psychology. Vol. XVIII 61-143
5. Aitken A.C. (1954) The Art of Mental Calculation: With Demonstrations. Transactions of the Society of Engineers. 45, 295-309
6. Dow A. (1991) A Unified Approach to Developing Intuition in Mathematics, Scientific Research on the Transcendental Meditation and TM-Sidhi Program Vol 5,3386-3398
7. Williams K.R. (1984) Discover Vedic Mathematics. Vedic Mathematics Research Group
8. Nicholas, Williams, Pickles (1984) Vertically and Crosswise. Inspiration Books

Semester – 2; Paper – 1: Network Analysis

Course outcome:

At the end of this course students will demonstrate the ability to

1. Understand basics electrical circuits with nodal and mesh analysis.
2. Apply network theorems for the analysis of electrical circuits.
3. Apply Laplace Transform for steady state and transient analysis.

Unit 1: Node and Mesh Analysis:

Types of sources, source transformation and duality, KVL, KCL, Node and mesh analysis,

Unit 2: Network Theorems

Superposition, reciprocity, Thevenin's, Norton's, Maximum power Transfer theorem, compensation and Tallegen's theorem (Proof not required)

Unit 3: Behaviors of L, C and R circuit

Time Domain and frequency domain analysis of LR, CR, Series and Parallel LCR circuit. Introduction to filters.

Unit 4: Laplace transform and its application to circuits

Review of Laplace Transform, Partial fractions, singularity functions, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, evaluation of initial conditions. Transformed network with initial conditions, waveform synthesis, and analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms.

Practical – 1 Student will have to perform at least 6 practical

1. Study of current source and voltage source.
2. Verification KVL and KCL
3. Verification Superposition position.
4. Verification of Thevenin's Theorem
5. Verification of Norton's Theorem
6. Verification of Maximum power transfer Theorem
7. Verification of reciprocity theorem.
8. Time domain and frequency domain analysis of LR circuit (on simulation software).
9. Time domain and frequency domain analysis of CR circuit (on simulation software).
10. Time domain and frequency domain analysis of series LCR circuit (on simulation software).
11. Time domain and frequency domain analysis of Parallel LCR circuit (on simulation software).

Books:

1. M. E. Van Valkenburg, Network Analysis, Prentice Hall, 2006.

2. D. Roy Choudhury, Networks and Systems, New Age International Publications, 1998.
3. Mahmood Nahvi, Joseph A. Edminister, Theory and Problems of Electric Circuits, Schaum Series
4. Mahadevan and Chitra, Electrical Circuit Analysis, PHI
5. John Bird, Electrical Circuit Theory and Technology, Newnes Publications.
6. Network analysis by G. K. Mittal
7. James W. Nilsson & Susan A Riedel, Electric Circuits, Prentice Halls.
8. Sudhakar, A., Shyammohan, S. P.; Circuits and Network; Tata McGraw-Hill New Delhi, 1994
9. C. K. Alexander and M. N. O. Sadiku, Electric Circuits, McGraw Hill Education, 2004.
10. K. V. V. Murthy and M. S. Kamath, Basic Circuit Analysis, Jaico Publishers, 1999.

Semester – 2; Paper – 2: Programming in C

Course Outcome:

At the end of this course students will demonstrate the ability to

1. To formulate simple algorithms and translate the algorithms to programs (in C language), test and execute the programs and correct syntax and logical errors.
2. To implement conditional branching, iteration, and recursion, to decompose a problem into functions and synthesize a complete program using divide and conquer approach.
3. To use arrays to solve various matrix operation, searching, sorting and Pointers, Structures for the formulation of algorithm and Programs.

Unit 1: Programming Language

Introduction to C language: Keywords, Constant, Variable, Data types, Operators, Types of Statements, Pre-processor Directives, Decision Control Statement-if, if-else, Nested if-else statement, Switch case, Loops and Writing and evaluation of conditionals and consequent branching.

Unit 2: Arrays and Basic Algorithms Arrays

1-D, 2-D, Character arrays and Strings. Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

Unit 3: Functions and Recursion

User defined and Library Functions, Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference. Recursion: As a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Quick sort or Merge sort.

Unit 4: Pointers and Structures

Structures, defining structures, Array of Structures, Introduction to pointers, Defining pointers, Pointer arithmetic, pointer operators, Use of Pointers.

Practical – 2 Student will have to perform at least 6 practical.

1. Multiplication, square, cube table or any other table.
2. Bubble, Insertion, and selection Sorting algorithm
3. Finding roots of quadratic equation
4. Finding out the impedance table and frequency response table of RL or RC or LCR circuit.
5. Find out the table of phase angle of LR or CR or LCR circuit for different frequencies.
6. 1D and 2D array
7. Use of functions, parameter passing in function, call by value, call by reference.
8. Finding factorial, Fibonacci series.
9. Quick sort or merge sort.
10. Application of pointer.

Books

1. Let us C Y Kanetkar
2. Mastering C: K. R. Venugopal and S. R. Prasad, Tata McGraw Hill
3. C in depth Shrivastava BPB publication
4. Programming in ANSI C Balgurusamy Tata McGraw Hill
5. Programming with C Byron Gottfried Schaums outline series TMH

Semester – 2; VSC – 2:

Arduino and applications (BVS2P03)

Course Outcome:

At the end of this course students will demonstrate the ability to

1. Understand the architecture of a Arduino boards & comparison
2. Understand the operation and interfacing with peripheral devices.
3. Implement various applications

Syllabus :

1. Introductction to arduino, Pin configuratuion and architecture, Device and platform features, concept of digital and analog ports, familiarizing with Arduino interfacing boards, introduction to embedded C and arduino platform

2. Review of Basic concepts and Arduino I/O Functions : Arduino Data types, Variables and constants, Operators, Control Statements, Arrays, Functions Pins configured as INPUT and OUTPUT, PinMode() Function, digital write(), analogRead() Function, Arduino Interrupts

3. Arduino Sensors: Humidity sensor, temperature sensor, Water level sensor, PIR sensor, Ultrasonic sensor, Connecting switches,

4. Arduino Communication and Interfacing: parallel and serial communication, Display devices, rf module, wifi module, bluetooth module, GSM/GPRS interfacing

Books:

1. Arduino made simple by Ashwin pajankar
2. Arduino-based Embedded Systems by Rajesh singh, Anita Gehlot, Bhupendra Singh and Sushabhan Choudhary
3. https://www.arduino.cc/en/Tutorial/HomePage

SEM 2 : CONSTITUION OF INDIA (BVE2T02)

Syllabus

UNIT – I:

- Historical Background to the Framing of the Indian Constitution: General Idea about the Constituent Assembly of India.

UNIT – II

- Preamble – Nature and key concepts/Constitutional values, Socialism, Secularism, Democracy, Justice, Liberty, Equality and Fraternity

- Salient Features of the Constitution of India

UNIT – III

- General study about the kinds, nature and importance of; Fundamental Rights, Directive Principles of State Policy and Fundamental Duties.

UNIT –IV

Introduction of the Constitutional Institutions and Authorities;

- Central Legislature and Executive (Parliament of India, President of India and Council of Ministers)
- State Legislature and Executive (State legislative Assemblies, Governors and Council of Ministers)
- Higher Judiciary (Supreme Court of India and High Courts)

Indian Knowledge System (IKS)

SEM2: INDIAN ASTRONOMY (BIK2T02)

Course Outcomes: This course will enable the students to understand that

1. It is possible to create a map of the intellectual growth of a culture usingastronomy as a probe.
2. The growth of Indian astronomy occurs in distinct stages analogous to phasetransitions of the evolution of cultures
3. Indian Astronomy therefore provides an excellent window to the pastdramatic transitions.

UNITS	TOPICS	HOURS
Unit 1	Astronomy in Prehistoric Era, Astronomy in Vedic Era, Vedang Jyotish, Astronomical References In Religious Scriptures, Astronomies of the West	**8**
Unit 2	Arya Bhatta, Panch Siddhantika of Varahamihira, Surya Siddhanta Varahamihira to Bhaskar Acharya-II, Siddhant Shiromani of Bhaskar Acharya-II, Bhaskar Acharya-II to Jai Singh, Jai Singh and his Observatories.	**8**
Unit 3	After Jai Singh, Interaction with the Astronomies of the World, Modern Era Astronomy , Our Universe, Cosmology	**7**
Unit 4	Panchang Horoscope and Astrology , Siddhantas, Karnas and Koshtakas, Observational Instruments of Indian Astronomy	**7**
	TOTAL	**30 HRS**

Reference Books:

1. The Story Of Astronomy In India, Chander Mohan, Pothi.com
2. Indian Astronomy: An Introduction. Front Cover · S. Balachandra Rao.Universities Press, 2000
3. Astronomy in India: A Historical Perspective, Thanu Padmanabhan,Springer Science & Business Media
4. Hindu Astronomy, W. Brennand, Alpha Editions
5. Origin and Growth of Astronomy in India, https://www.tifr.res.in/~archaeo/FOP/FOP%20pdf%20of%20ppt/Vahia%20Origin% 20of%20Astronomy.pdf