Course and Examination Scheme
Of NEP 2020 Curriculum

Bachelor of Technology in
Electronics & Telecommunication Engineering
(Faculty of Science and Technology)

GONDWANA UNIVERSITY, Gadchiroli
MIDC Road Complex, Gadchiroli
PIN-442 605, (M.S.)

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Key Features of Curriculum

1. Multiple exit options after every year.
2. Provision for Open Electives (OE), Vocational and Skill Enhancement Courses (VSEC), Ability Enhancement Courses (AEC), Indian Knowledge System (IKS), Value Education Courses (VEC), Co-Curricular Courses (CC) in addition to program core courses.
3. Mandatory internship of one semester.
4. Credits for Value education courses, Ability Enhancement Courses, Co-Curricular Curricular Activities.
5. Interdisciplinary and multidisciplinary education through minors and open electives.
6. Skill based courses.
7. Provision for learning in online mode through Swayam /NPTEL etc. courses
8. Opportunity for learner to choose courses of their interest in all disciplines.
9. Provision of Skill Based Courses and internship/Field project/mini projects for exit options at each level.
10. Flexibility for all types of learners i.e. Good, Normal and Exit

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Credit Distribution for each year and Exit Option

NCrF Level	Year/ Semester	Exit Option	Credits	Additional Credits for exit students	Total Credits
4.5	Semester I & II	One Year U.G. Certificate in Engg./Tech.	44	04	48
5.0	Semester III & IV	Two Year U.G. Diploma in Engg./Tech.	88	08	96
5.5	Semester V &VI	Three Years Bachelor's Degree in Vocation (B. Voc.) Or B.Sc. (Engg./Tech.)	132	08	140
6.0	Semester VII &VIII	B. Tech. Major with Multidisciplinary Minor	174	--	174

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Course Category-wise Credit Distribution

Course Category	As per NEPGR	University Credits	CC	As per NEPGR	University Credits
BSC/ESC	30	30	BSC	14-18	17
			ESC	16-12	13
Program Courses	64-76	74	PCC	44-56	54
			PEC	20	20
Multidisciplinary Courses	22	22	MDM	14	14
			OE	8	8
Skill Courses	8	8	VSEC	8	8
Humanities, Social Science & Management (HSSM)	14	14	AEC	4	4
			EM	4	4
			IKS	2	2
			VEC	4	4
Experiential Courses	22	22	RM	4	4
			CEP	2	2
			PR	4	4
			IN/OJT	12	12
Liberal Learning Courses	4	4	CC	4	4
Total Credits	**164 - 176**	**174**		**164-176**	**174**

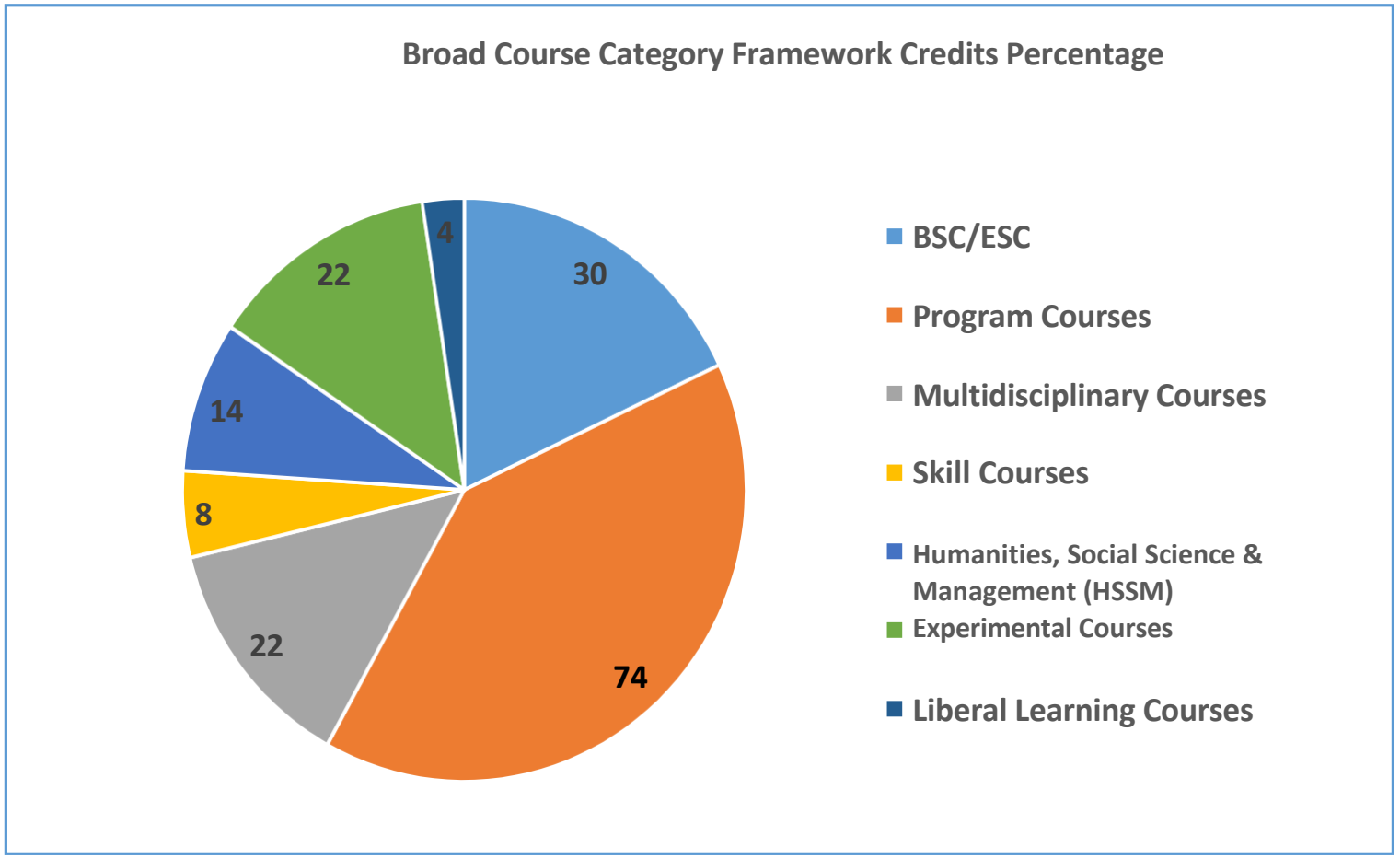
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Semester-wise Credit Distribution:

Sr. No.	SEM	I	II	III	IV	V	VI	VII	VIII	Total Credits	NEP Requirement
1	Basic Science Course (BSC)	8	9							17	14-18
2	Engineering Science Course (ESC)	6	7							13	16-12
3	Program Core Course (PCC)	2		10	10	13	9		10	54	44-56
4	Program Elective Course (PEC)					4	8	6	2	20	20
5	Multidisciplinary Minor Course (MDM)			2	2	3	3	2	2	14	14
6	Open /School Elective Course (OE)			4	2	2				8	8
7	Vocational & Skill Enhancement Course (VSEC)	2	2		2		2			8	8
8	Ability Enhancement Course (AEC)	2			2					4	4
9	Entrepreneurship/ Management Courses (EMC)			2	2					4	4
10	Indian Knowledge System (IKS)		2							2	2
11	Value Education Course (VEC)			2	2					4	4
12	Research Methodology (RM)								4	4	4
13	Community Engagement Activity/Field Project (CEP)			2						2	2
14	Project (PR)								4	4	4
15	Internship (IN)							12		12	12
16	Co-Curricular Course (CC)	2	2							4	4
	Total Credits	**22**	**22**	**22**	**22**	**22**	**22**	**20**	**22**	**174**	**164-176**

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General Instructions:

1. **Regarding Multi-Disciplinary Minor (MDM) track and subject:**

   i. The MDM subjects included in the NEP curriculum are to encourage students to gain knowledge and skills in areas beyond their core discipline and to promote flexibility, breadth of learning and innovation.

   ii. Minor subject title will appear in the **degree certificate** (**B.Tech. in Electronics & Telecommunication Engineering with Minor in Data Science**).

   iii. In the third semester, students must select one track from the MDM basket (Page No. 25 and 26) provided in this document, that is outside the scope of their parent discipline. For example, a Computer Science and Engineering student may choose a track offered by departments like Instrumentation Engineering, Electronics & Telecommunication, or Mechanical Engineering etc., but not permitted to opt for a track provided by the Computer Science and Engineering department itself.

   iv. Once a track is selected, it cannot be changed throughout the duration of the course.

   v. The offering of any MDM course Track shall be subject to a minimum enrollment of fifteen (15) students.

2. **Regarding Open Electives**

   i. Students must choose one subject from open elective basket for the respective Semester.

   ii. Students from any Program/discipline are allowed to opt for any one subject offered in the open elective basket.

   iii. The offering of any open elective course shall be subject to a minimum enrollment of fifteen (15) students.

3. **The courses to be completed through "online" mode, offered through SWAYAM/ NPTEL portal or equivalent platform which provides Evaluation mechanism with the permission of Departmental Faculty Board (DFB) of their college. In this case –**

   i. Students can register and complete these online courses during semester in which they are offered, however, the student must successfully complete and pass the course, and submit the score card/certificate before declaration of result of respective semester in which the course is being offered.

   ii. In case, if a student registers for a course in online mode but fails in the course, the student will have to register for the examination conducted by the University/institute in respective semester as per curriculum. In this case, the student will have to appear for the examinations of the course, and successfully complete the course.

4. In Seventh semester, the students have to complete mandatory internship of one semester in the company/organization approved by the DFB.

5. In addition to program specific courses, the students have to complete vocational skill courses, internship, field projects connected to major degree.

6. **Exit Option:** The exit option at the end of each year will be available to students after even semester, i.e. 2nd semester, 4thsemester & 6th semester and will be awarded from AY 2024-25 for UG Certificate, AY 2025-26 for UG Diploma, AY 2026-27 for B. Voc./B. Sc. Engineering degree. Students opting for exit at any level will have to earn additional four/eight credits before exit in skill based vocational courses and internship/apprenticeship/mini-project to make them eligible to get UG certificate/UG Diploma or B.Voc./B. Sc. (Engg./Tech) degree as per eligibility.

7. **Regarding Practical Examination:** To pass the practical course, a student must appear for the university practical examination. Absence from this examination will result in failure, irrespective of the marks obtained in the college assessment.

Multiple exits: Following options are available for multiple exists:

Option	NCrF Level	Qualification Title	Additional credit requirement	Bridge courses
Exit-1	4.5	One-year UG certificate in Engineering/Technology	4	Exit off line courses offered by department **OR** 2 Month Internship **OR** Two online skill courses (ITI level) from NSQF/ESSC/ANY Other agency which provides certification. **OR** Technical Project
Exit-2	5.0	Two-year UG Diploma in Engineering/Technology	8	Exit offline courses offered by department **OR** 2 Month Internship **OR** Two online skill courses (diploma level) from NSQF/ESSC/ANY Other agency which provides certification. **OR** Technical Project
Exit-3	5.5	Three-year Bachelor Degree in Vocation (B.Voc) or B.Sc. (Engineering/Technology)	8	Exit offline courses offered by department **OR** 2 Month Internship **OR** Two online skill courses (diploma level) from NSQF/ESSC/ANY Other agency which provides certification. **OR** Technical Project.

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SEMESTER–III																		
Course Category	**Board of Studies**	**Course Code**	**Name of the Course**	**Teaching Scheme**				**Examination Scheme**										**Credit**
				Hours per week				**Theory Marks**						**Practical Marks**				
				L	**T**	**P**	**T**	**Duration in hrs.**	**MSE (CA)**	**IE (CA)**	**ESE (UA)**	**Total**	**Min (CA+UA)**	**CA**	**UA**	**Total**	**Min (CA+UA)**	
MDM	Electronics & Telecommunication	STMDMETC301	Multi-disciplinary Minor-I	2	--	--	2	2	5	5	40	50	20	--	--	--	--	2
OE	Science and Humanities	STOESHC302B	Open Elective- I	4	--	--	4	3	10	10	80	100	40	--	--	--	--	4
HSSM (VEC)	Science and Humanities	STVECSHC303	Introduction to Constitution of India	2	--	--	2	--	30	20	--	50	20	--	--	--	--	2
PCC	Electronics & Telecommunication	STPCCETC304	Electronic Devices and Circuits	3	--	--	3	3	10	10	80	100	40	--	--	--	--	3
PCC	Electronics & Telecommunication	STPCCETC305	Linear Integrated Circuits	3	--	--	3	3	10	10	80	100	40	--	--	--	--	3
HSSM (EMC)	Electronics & Telecommunication	STEMCETC306	Innovation, Creativity and Entrepreneurship	2	--	--	2	2	5	5	40	50	20	--	--	--	--	2
PCC	Electronics & Telecommunication	STPCCETC307	Electronic Devices and Circuits Lab	--	--	2	2	--	--	--	--	--	--	25	25	50	25	1
PCC	Electronics & Telecommunication	STPCCETC308	Linear Integrated Circuits Lab	--	--	2	2	--	--	--	--	--	--	25	25	50	25	1
PCC	Electronics & Telecommunication	STPCCETC309	Programming Skills - I	--	1	2	3	--	--	--	--	--	--	25	25	50	25	2
CEP	Electronics & Telecommunication	STCEPETC310	Mini Project/ Field Project	--	--	4	4	--	--	--	--	--	--	50	--	50	25	2
Total				**16**	**1**	**10**	**27**	**--**	**70**	**60**	**320**	**450**	**--**	**125**	**75**	**200**	**--**	**22**
Marks Grand Total				**650**														

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SEMESTER–III		
LIST OF OPEN ELECTIVES – I COURSE		
Sr.	**Course Code**	**Name of the course**
A	STOESHC302A	Mathematical Transform and Statistical Methods
B	STOESHC302B	Transform Methods in Engineering Mathematics
C	STOESHC302C	Probability and Statistics
D	STOEINS302	Signals and Systems
E	STOECEC302	Building Constructions and Materials
F	STOEELE302	Modelling and Design of EV

Note: The offering of any open elective course shall be subject to a minimum enrollment of fifteen (15) students.

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SEMESTER–IV																		
Course Category	Board of Studies	Course Code	Name of the Course	Teaching Scheme				Examination Scheme										Credit
				Hours per week				Theory Marks						Practical Marks				
				L	T	P	T	Duration in hrs.	MSE (CA)	IE (CA)	ESE (UA)	Total	Min (CA+UA)	CA	UA	Total	Min (CA+UA)	
MDM	Electronics & Telecommunication	STMDMETC401	Multi-disciplinary Minor-II	2	--	--	2	2	5	5	40	50	20	--	--	--	--	2
OE	Electronics & Telecommunication	STOEETC402B	Open Elective- II	2	--	--	2	2	5	5	40	50	20	--	--	--	--	2
PCC	Electronics & Telecommunication	STPCCETC403	Analog & Digital Communication	3	--	--	3	3	10	10	80	100	40	--	--	--	--	3
PCC	Electronics & Telecommunication	STPCCETC404	Industrial Electronics	3	--	--	3	3	10	10	80	100	40	--	--	--	--	3
PCC	Electronics & Telecommunication	STPCCETC405	Automatic Control Systems	3	--	--	3	3	10	10	80	100	40	--	--	--	--	3
HSSM (EMC)	Electronics & Telecommunication	STEMCETC406	Human Resource Management	2	--	--	2	--	30	20	--	50	20	--	--	--	--	2
PCC	Electronics & Telecommunication	STPCCETC407	Analog & Digital Communication Lab	--	--	2	2	--	--	--	--	--	--	25	25	50	25	1
VSEC	Electronics & Telecommunication	STVSECETC408	Programming Skills -II	--	1	2	3	--	--	--	--	--	--	25	25	50	25	2
HSSM (AEC)	Electronics & Telecommunication	STAECETC409	Language Skills	--	1	2	3	--	--	--	--	--	--	50	--	50	25	2
HSSM (VEC)	Electronics & Telecommunication	STVECETC410	Human Values and Ethics	--	1	2	3	--	--	--	--	--	--	50	--	50	25	2
Total				**15**	**3**	**8**	**26**	**--**	**70**	**60**	**320**	**450**	**--**	**150**	**50**	**200**	**--**	**22**
Marks Grand Total				**650**														

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SEMESTER–IV		
LIST OF OPEN ELECTIVES - II COURSE		
Sr.	**Course Code**	**Name of the course**
A	STOEMEC402	Industrial Management
B	STOEETC402	Digital System Design
C	STOECSE402	Design Thinking
D	STOEINS402	Optoelectronic Instrumentation
E	STOECEC402	Building Automation
F	STOEELE402	EV Design Analysis and Control

Note: The offering of any open elective course shall be subject to a minimum enrollment of fifteen (15) students.

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EXIT CRITERIA FOR U. G. DIPLOMA (AFTER SECOND YEAR)																			
Course Category	Board of Studies	Course Code	Name of the Course	Teaching Scheme				Examination Scheme											Credit
				Hours per week				Theory Marks						Practical Marks					
				L	T	P	T	Duration in hrs.	MSE (CA)	IE (CA)	ESE (UA)	Total	Min (CA+UA)	CA	UA	Total	Min (CA+UA)	
Exit offline courses offered by department (Any One)																			
EX2	Electronics & Telecommunication	STEXETC421	Mechatronics and Internet of Things	--	2	12	14	--	--	--	--	--	--	200	--	200	100	8	
OR																			
EX2	Electronics & Telecommunication	STEXETC422	Introduction to Embedded System Design	--	2	12	14	--	--	--	--	--	--	200	--	200	100	8	
OR																			
EX2	Electronics & Telecommunication	STEXETC423	Learn the Art and Science of PCB Design with Eagle	--	2	12	14	--	--	--	--	--	--	200	--	200	100	8	
OR																			
EX2	Electronics & Telecommunication	STEXETC431	Internship / Technical Project											200[@]	--	200	100	8	
OR																			
EX2	Electronics & Telecommunication	STEXETC441	Two online skill courses (diploma level) from NSQF/ESSC/ANY Other agency which provides certification.											200[@]	--	200	100	8	

@ Evaluation based on seminar, internship report, technical project report, skill courses certification.

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SEMESTER–V																		
Course Category	**Board of Studies**	**Course Code**	**Name of the Course**	**Teaching Scheme**				**Examination Scheme**										**Credit**
				Hours per week				**Theory Marks**						**Practical Marks**				
				L	**T**	**P**	**T**	**Duration in hrs.**	**MSE (CA)**	**IE (CA)**	**ESE (UA)**	**Total**	**Min (CA+UA)**	**CA**	**UA**	**Total**	**Min (CA+UA)**	
MDM	Electronics & Telecommunication	STMDMETC501	Multi-disciplinary Minor-III	3	--	--	3	3	10	10	80	100	40	--	--	--	--	3
OE	Electronics & Telecommunication	STOEETC502B	Open Elective- III	2	--	--	2	2	5	5	40	50	20	--	--	--	--	2
PCC	Electronics & Telecommunication	STPCCETC503	Microprocessor & Microcontroller	3	1	--	4	3	10	10	80	100	40	--	--	--	--	4
PCC	Electronics & Telecommunication	STPCCETC504	Computer Networks	3	1	--	4	3	10	10	80	100	40	--	--	--	--	4
PCC	Electronics & Telecommunication	STPCCETC505	Electromagnetic Engineering	3	1	--	4	3	10	10	80	100	40	--	--	--	--	4
PEC	Electronics & Telecommunication	STPECETC506A/B/C	Program Elective - I	3	--	--	3	3	10	10	80	100	40	--	--	--	--	3
PCC	Electronics & Telecommunication	STPCCETC507	Microprocessor & Microcontroller Lab	--	--	2	2	--	--	--	--	--	--	25	25	50	25	1
PEC	Electronics & Telecommunication	STPECETC508A/B/C	Program Elective – I Lab.	--	--	2	2	--	--	--	--	--	--	25	25	50	25	1
Total				**17**	**3**	**4**	**24**	**--**	**55**	**55**	**440**	**550**	**--**	**50**	**50**	**100**	**--**	**22**
Marks Grand Total				**650**														

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SEMESTER–V						
LIST OF OPEN ELECTIVES - III COURSE			**LIST OF PROGRAM ELECTIVES - I**		**LIST OF PROGRAM ELECTIVES – I LAB**	
Sr.	**Course Code**	**Name of the course**	**Course Code**	**Name of the course**	**Course Code**	**Name of the course**
A	STOEMEC502	Operations Research Techniques	**STPECETC506A**	**Electronic Measurement & Instrumentation**	**STPECETC508A**	**Electronic Measurement & Instrumentation Lab**
B	**STOEETC502**	**Automotive Electronics**	**STPECETC506B**	**CMOS Design**	**STPECETC508B**	**CMOS Design Lab**
C	STOECSE502	Software Project Management	**STPECETC506C**	**RF Integrated Circuits**	**STPECETC508C**	**RF Integrated Circuits Lab**
D	STOEINS502	Unit Operation and Power Plant Instrumentation				
E	STOECEC502	Remote Sensing and GIS				
F	STOEELE502	Introduction to Smart Grid				

Note:

1. Note: The offering of any open elective or Program elective course shall be subject to a minimum enrollment of fifteen (15) students.
2. If a student opts for Program Elective – I (Serial No. A), they will be eligible only for the corresponding Program Elective – I Lab (Serial No. A); the same applies for serial no. B

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SEMESTER–VI																		
Course Category	Board of Studies	Course Code	Name of the Course	Teaching Scheme				Examination Scheme										Credit
				Hours per week				Theory Marks						Practical Marks				
				L	T	P	T	Duration in hrs.	MSE (CA)	IE (CA)	ESE (UA)	Total	Min (CA+UA)	CA	UA	Total	Min (CA+UA)	
MDM	Electronics & Telecommunication	STMDMETC601	Multi-disciplinary Minor-IV	3	--	--	3	3	10	10	80	100	40	--	--	--	--	3
PCC	Electronics & Telecommunication	STPCCETC602	Digital Signal Processing	3	--	--	3	3	10	10	80	100	40	--	--	--	--	3
PCC	Electronics & Telecommunication	STPCCETC603	VLSI Design	2	--	--	2	2	5	5	40	50	20	--	--	--	--	2
PCC	Electronics & Telecommunication	STPCCETC604	Embedded Systems & RTOS	3	--	--	3	3	10	10	80	100	40	--	--	--	--	3
PEC	Electronics & Telecommunication	STPECETC605A/B/C	Program Elective - II	3	--	--	3	3	10	10	80	100	40	--	--	--	--	3
PEC	Electronics & Telecommunication	STPECETC606A/B/C	Program Elective – III	3	--	--	3	3	10	10	80	100	40	--	--	--	--	3
PCC	Electronics & Telecommunication	STPCCETC607	Digital Signal Processing Lab	--	--	2	2	--	--	--	--	--	--	25	25	50	25	1
PEC	Electronics & Telecommunication	STPECETC608A/B/C	Program Elective – II Lab.	--	--	2	2	--	--	--	--	--	--	25	25	50	25	1
PEC	Electronics & Telecommunication	STPECETC609A/B/C	Program Elective – III Lab.	--	--	2	2	--	--	--	--	--	--	25	25	50	25	1
VSEC	Electronics & Telecommunication	STVSECETC610	Soft Skills	--	1	2	3	--	--	--	--	--	--	50	--	50	25	2
Total				**17**	**1**	**8**	**26**	**--**	**55**	**55**	**440**	**550**	**--**	**125**	**75**	**200**	**--**	**22**
Marks Grand Total				**750**														

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SEMESTER–VI			
LIST OF PROGRAM ELECTIVES - II		**LIST OF PROGRAM ELECTIVES – II LAB**	
Course Code	**Name of the course**	**Course Code**	**Name of the course**
STPECETC605A	**Telecommunication Switching & Networks**	**STPECETCC608A**	**Telecommunication Switching & Networks Lab**
STPECETC605B	**Transmission Lines**	**STPECETCC608B**	**Transmission Lines Lab**
STPECETC605C	**Mechatronics**	**STPECETCC608C**	**Mechatronics Lab**

LIST OF PROGRAM ELECTIVES - III		**LIST OF PROGRAM ELECTIVES – III LAB**	
Course Code	**Name of the course**	**Course Code**	**Name of the course**
STPECETC606A	**Biomedical Electronics**	**STPECETC609A**	**Biomedical Electronics Lab**
STPECETC606B	**Industrial Automation**	**STPECETC609B**	**Industrial Automation Lab**
STPECETC606C	**Fiber Optic Communication**	**STPECETC609C**	**Fiber Optic Communication Lab**

Note:

1. Note: The offering of any Program elective course shall be subject to a minimum enrollment of fifteen (15) students.
2. If a student opts for Program Elective – II or III (Serial No. A), they will be eligible only for the corresponding Program Elective – II or III Lab (Serial No. A); the same applies for serial no. B

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EXIT CRITERIA FOR BACHELOR DEGREE IN VOCATION (AFTER THIRD YEAR)																			
Course Category	Board of Studies	Course Code	Name of the Course	Teaching Scheme				Examination Scheme											Credit
				Hours per week				Theory Marks						Practical Marks					
				L	T	P	T	Duration in hrs.	MSE (CA)	IE (CA)	ESE (UA)	Total	Min (CA+UA)	CA	UA	Total	Min (CA+UA)	
Exit offline courses offered by department (Any One)																			
EX3	Electronics & Telecommunication	STEXETC621	PC Hardware & Computer Networking	--	2	12	14	--	--	--	--	--	--	200	--	200	100	8	
OR																			
EX3	Electronics & Telecommunication	STEXETC622	Data Communication and Networking	--	2	12	14	--	--	--	--	--	--	200	--	200	100	8	
OR																			
EX3	Electronics & Telecommunication	STEXETC623	Electronic Servicing & Maintenance	--	2	12	14	--	--	--	--	--	--	200	--	200	100	8	
OR																			
EX3	Electronics & Telecommunication	STEXETC631	Internship / Technical Project											200@	--	200	100	8	
OR																			
EX3	Electronics & Telecommunication	STEXETC641	Two online skill courses (diploma level) from NSQF / ESSC / ANY Other agency which provides certification.											200@	--	200	100	8	

@ Evaluation based on seminar, internship report, technical project report, skill courses certification.

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SEMESTER–VII																			
Course Category	Board of Studies	Course Code	Name of the Course	Teaching Scheme				Examination Scheme											Credit
				Hours per week				Theory Marks						Practical Marks					
				L	T	P	T	Duration in hrs.	MSE (CA)	IE (CA)	ESE (UA)	Total	Min (CA+UA)	CA	UA	Total	Min (CA+UA)	
MDM	Electronics & Telecommunication	STMDMETC701	Multi-disciplinary Minor-V	*2	--	--	2	--	--	50	--	50	20	--	--	--	--	2
PEC	Electronics & Telecommunication	STPECETC702	Program Elective - IV	*3	--	--	3	--	--	100	--	100	40	--	--	--	--	3
PEC	Electronics & Telecommunication	STPECETC703	Program Elective - V	*3	--	--	3	--	--	100	--	100	40	--	--	--	--	3
IN	Electronics & Telecommunication	STINETC704	Internship / On Job Training	--	--	24	24	--	--	--	--	--	--	100	200	300	150	12
Total				**8**	**--**	**24**	**32**	**--**	**--**	**250**	**--**	**250**	**--**	**100**	**200**	**300**	**--**	**20**
Marks Grand Total				**550**															

Note:

Program Elective-IV and V is12-week online certificate courses conducted by NPTEL / SWAYAM / MOOC / OTHERS in the area approved by DFB
Internship Guide Teaching load: 4 hrs/week

***Courses to be mentored and assessed by faculty members**

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SEMESTER–VIII																		
Course Category	Board of Studies	Course Code	Name of the Course	Teaching Scheme				Examination Scheme										Credit
				Hours per week				Theory Marks						Practical Marks				
				L	T	P	T	Duration in hrs.	MSE (CA)	IE (CA)	ESE (UA)	Total	Min (CA+UA)	CA	UA	Total	Min (CA+UA)	
MDM	Electronics & Telecommunication	STMDMETC801	Multi-disciplinary Minor-VI	2	--	--	2	2	5	5	40	50	20	--	--	--	--	2
PCC	Electronics & Telecommunication	STPCCETC802	AI & NN	3	1	--	4	3	10	10	80	100	40	---	---	---	---	4
PCC	Electronics & Telecommunication	STPCCETC803	Wireless & Mobile Communication	3	1	--	4	3	10	10	80	100	40	---	---	---	---	4
PEC	Electronics & Telecommunication	STPECETC804A/B/C	Program Elective - VI	2	--	--	2	2	5	5	40	50	20	---	---	---	---	2
RM	Electronics & Telecommunication	STRMETC805	Research Methodology and IPR	3	1	---	4	3	10	10	80	100	40	---	---	---	---	4
PCC	Electronics & Telecommunication	STPCCETC806	AI & NN Lab.	---	---	2	2	---	---	---	---	---	---	25	25	50	25	1
PCC	Electronics & Telecommunication	STPCCETCC807	Wireless & Mobile Communication Lab	---	---	2	2	---	---	---	---	---	---	25	25	50	25	1
PR	Electronics & Telecommunication	STPRETC808	Major Project	---	---	8	8	---	---	---	---	---	---	75	75	150	75	4
Total				**13**	**3**	**12**	**28**	**--**	**40**	**40**	**320**	**400**	**--**	**125**	**125**	**250**	**--**	**22**
Marks Grand Total				**650**														

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Semester - VIII	
LIST OF PROGRAM ELECTIVES - VI	
Course Code	**Name of the course**
STPECETC804A	**Digital Image & Video Processing**
STPECETC804B	**Radar and Microwave Engineering**
STPECETC804C	**Multimedia Communication & Systems**

Note: The offering of any Program elective course shall be subject to a minimum enrollment of fifteen (15) students.

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LIST OF OPEN ELECTIVE COURSE (BASKET OF OPEN ELECTIVE)			
	OPEN ELECTIVE-I	**OPEN ELECTIVE -II**	**OPEN ELECTIVE -III**
A	STOESHC302A Mathematical Transform and Statistical Methods	STOEMEC402 Industrial Management	STOEMEC502 Operations Research Techniques
B	STOESHC302 Transform Methods in Engineering Mathematics	STOEETC402 Digital System Design	STOEETC502 Automotive Electronics
C	STOECSE302 Probability and Statistics	STOECSE402 Design Thinking	STOECSE502 Software Project Management
D	STOEINS302 Signals and Systems	STOEINS402 Chemical and Analytical Instrumentation	STOEINS502 Power Plant Instrumentation
E	STOECEC302 Building Constructions and Materials	STOECEC402 Building Automation	STOECEC502 Remote Sensing and GIS
F	STOEELE302 Modelling and Design of EV	STOEELE402 EV Design Analysis and Control	STOEELE502 Introduction to Smart Grid

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LIST OF PROGRAM ELECTIVES						
Name of course	**Program Elective - I**	**Program Elective - II**	**Program Elective - III**	**Program Elective - IV**	**Program Elective - V**	**Program Elective - VI**
Code	**STPECETC506**	**STPECETC605**	**STPECETC606**	**STPECMEC702**	**STPECMEC703**	**STPECETC804**
A	Electronic Measurement & Instrumentation	Telecommunication Switching & Networks	Biomedical Electronics	NPTEL / SWAYAM / MOOC / OTHERS	NPTEL / SWAYAM / MOOC / OTHERS	Digital Image & Video Processing
B	CMOS Design	Transmission Lines	Industrial Automation	NPTEL / SWAYAM / MOOC / OTHERS	NPTEL / SWAYAM / MOOC / OTHERS	Radar and Microwave Engineering
C	RF Integrated Circuits	Mechatronics	Fiber Optic Communication	NPTEL / SWAYAM / MOOC / OTHERS	NPTEL / SWAYAM / MOOC / OTHERS	Multimedia Communication & Systems

SWAYAM/NPTEL etc. portal Courses should be approved by DFB and **at least of 12 weeks** including tutorials.

LIST OF PROGRAM ELECTIVES LABS			
Name of course	**Program Elective – I Lab**	**Program Elective – II Lab**	**Program Elective – III Lab**
Code	**STPECETC508**	**STPECETCC608**	**STPECETC609**
A	Electronic Measurement & Instrumentation Lab	Telecommunication Switching & Networks Lab	Biomedical Electronics Lab
B	CMOS Design Lab	Transmission Lines Lab	Industrial Automation Lab
C	RF Integrated Circuits Lab	Mechatronics Lab	Fiber Optic Communication Lab

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LIST OF MULTIDICIPLINARY MINOR COURSE TRACK (MDM BASKET)

Sr. No.	Offering Department	Name of Minor Course (Track)	Students from Department Who can register
1	Civil Engineering (CEC)	Environmental Engineering	All branches except Civil Engineering
2	Computer Science & Engineering (CSE)	Data Science and Machine Learning	All branches except Computer Science & Engineering
3	Electrical Engineering (ELE)	Power System Engineering	All branches except Electrical Engineering
4	Electronics and Telecommunication Engg. (ETC)	IoT and Drone Technology	All branches except Electronics and Telecommunication Engineering
5	Instrumentation Engineering (INS)	Industrial Automation	All branches except Instrumentation Engineering
6	Mechanical Engineering (MEC)	Industry IoT and Smart Manufacturing	All branches except Mechanical Engineering

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LIST OF MULTI DICIPLINARY MINOR COURSES (MDM BASKET)

Name of Minor Course	Civil Engineering	Computer Science and Engineering	Electrical Engineering	Electronics & Telecommunication Engineering	Instrumentation Engineering	Mechanical Engineering
	TRACK-I Environmental Engineering	**TRACK-I** Data Science and Machine Learning	**TRACK-I** Power System Engineering	**TRACK-I IoT and Drone Technology**	**TRACK-I Industrial Automation**	**TRACK-I Industry IoT and Smart Manufacturing**
Multi-disciplinary Minor-I	STMDMCEC301 Basics of Environmental Engineering	STMDMCSE301 Introduction to Data Science	STMDMELE301 DC Machines and Transformer	STMDMETC301 IoT Sensors and Actuators	STMDMINS301 Industrial Measurements	STMDMMEC301 Additive Manufacturing
Multi-disciplinary Minor -II	STMDMCEC401 Drinking Water Quality and Water Pollution	STMDMCSE401 Mathematics for Data Science	STMDMELE401 AC Machines	STMDMETC401 Basics of Drone Technology	STMDMINS401 Control System Components	STMDMMEC401 Mechatronics Systems
Multi-disciplinary Minor -III	STMDMCEC501 Air Pollution	STMDMCSE501 Programming for Data Science	STMDMELE501 Electrical Drives	STMDMETC501 IoT Architecture and Protocol	STMDMINS501 Control System Engineering	STMDMMEC501 PLC and Automation
Multi-disciplinary Minor -IV	STMDMCEC601 Soil, Sound and Solid Waste Pollution	STMDMCSE601 Machine Learning	STMDMELE601 Power System Protection	STMDMETC601 Interfacing Programming of IoT and Drone	STMDMINS601 Process Automation	STMDMMEC601 Industrial Robotics
Multi-disciplinary Minor -V	STMDMCEC701 NPTEL / SWAYAM / MOOC 8 Week online course related to track	STMDCSEC701 NPTEL / SWAYAM / MOOC 8 Week online course related to track	STMDMELE701 NPTEL / SWAYAM / MOOC 8 Week online course related to track	STMDMETC701 NPTEL / SWAYAM / MOOC 8 Week online course related to track	STMDMINS701 NPTEL / SWAYAM / MOOC 8 Week online course related to track	STMDMMEC701 NPTEL / SWAYAM / MOOC 8 Week online course related to track
Multi-disciplinary Minor -VI	STMDMCEC801 Advance Air Pollution and Solid waste Management	STMDMCSE801 Data Science in Practice	STMDMELE801 Digital Signal Processing	STMDMETC801 IoT and Drones Application	STMDMINS801 Process Control	STMDMMEC801 IoT in Automotive Engineering

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III Semester B. Tech. Electronics & Telecommunication Engineering (NEP 2020)

Course Code: STOESHC302B

Title of Course: **Transform Methods in Engineering Mathematics**

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	MSE	IE	ESE	Total
4	--	--	4	4	3	10	10	80	100

Course outcomes:

After completing the course, the students will be able to;

CO1 Understand and perform algebraic and geometric operations using Complex Number.
CO2 Solve engineering problems using Laplace Transform.
CO3 Solve engineering problems using Z Transform
CO4 Solve engineering problems using Fourier Transform
CO5 Solve engineering problems using Probability and Statistics.

Unit	Content	Hours
I	**Complex Number:** Analytic function, Cauchy-Riemann Condition, Harmonic function, Polar form of a Cauchy-Riemann equation, Milne's Thomson method, complex integration, Cauchy's Integral theorem R, Integral formula, Cauchy's residue theorem, Contour Integration around unit circle, integration around a semicircular contour, Transformation and Mapping.	9
II	**Laplace Transform:** Definition, Properties, Evaluation of integral by Laplace Transform, inverse Laplace Transform, properties of Laplace Transform, convolution theorem (Statement only), Laplace Transform of Periodic Function, Unit Step function and Unit Impulse Function, Application of Laplace Transform to solve ordinary Differential Equation, Simultaneous Differential equation, Integral Equation & Integro-Differential Equation.	9
III	**Z Transform:** Definitions, Convergence of Z transform and properties, Inverse of Z transform by Partial Fraction Method, Residue Method, Inverse integral method and Power series Expansion, Convolution of two sequences, Solution of difference equation with constant coefficient by Z-Transform.	9
IV	**Fourier Series and Fourier Transform:** Periodic function and their Fourier Expansion, Even and odd functions, Change of interval, Half Range Expansions. Fourier Transform: Definition and properties of Fourier Transform, Fourier Integral Theorem, Relation with Laplace Transform, Application of Fourier Transform to solve Integral Equation.	9

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V	**Probability and Statistics:** Random Variable, Discrete and continuous R. Variable, probability function and distribution, joint function, conditional distribution, Mathematical Expectation, Variance and Standard Deviation, Moment generating function, Characteristics function, binomial function, poisson, Normal, Exponential, uniform and Weibull distribution, autocorrelation, Stationary Random process.	9

Text Books:

1. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication
2. Text book of Applied Mathematics Volume I and II by T. N. Wartikar and P. N. Wartikar
3. Advance Engineering Mathematics by H. K. Dass, S. Chand and Company Pvt. Ltd.

Reference Book:

1. Advance Engineering Mathematics by Erwin Kreyszig, John Wiley and Sons Inc.
2. Probability and Statistics by Murray R. Spiegel, Schaum's Outline series

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III Semester B. Tech. Electronics & Telecommunication Engineering (NEP 2020)

Course Code: STVECSHC303

Title of Course: **Introduction to Constitution of India**

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	MSE	IE	ESE	Total
2	--	--	2	2	--	30	20	--	50

Course outcomes:

After completing the course, the students will be able to;

CO1 Explain the value of the fundamental rights and duties for becoming a responsible citizen of India.

CO2 Analyze the functioning of the three wings of the government i.e., legislative, executive and judiciary.

CO3 Discuss the decentralization of power between the central, state and local self-government.

CO4 Describe the functioning of urban and rural administration in India.

Unit	Content	Hours
I	**Constitution: Meaning and Importance** Introduction to the Constitution of India, history, social, political, economic, and spiritual influences in the development of the constitution, Nature and special features: Equality and social justice- various kinds of freedoms-social control, Citizenship, Preamble, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy (Article 41 to 47)	8
II	**The Central Government of India** The levels of government, Indian Federation, Center-state relationship: Legislative, Administrative and Financial, Roles and positions of President, PM, Council of union ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha.	8
III	**The State Government** Roles and positions of Governor, CM, and Council of ministers of states: Legislative, and Executive Control, Secretariat and Directorates: organization, structure, and functions, District Administration and the role of District Collector: Legislative, and Executive Control. The Supreme Court and High Court: Powers and Functions.	7
IV	**Urban and Rural Administration** Role and importance of District's administrative head, the role of Mayor and elected representative, Role and functioning of the Municipal Corporation and Municipalities, Zila Panchayat, Gram Panchayat, Block level governance, democracy at the grass root level, The Election Commission of India: Introduction to the role and functioning of the Election Commission of India, Overview of the electoral procedure.	7

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Reference Books:

1. Introduction to the Constitution of India by Durga Das Basu, Prentice Hall of India Pvt. Ltd., New Delhi
2. Indian Constitution by Subash Kashyap, National Book Trust
3. Constitution of India by Dr. P. K. Agrawal and Dr. K. N. Chaturvedi, Prabhat Prakashan 2017
4. Constitution of India by V. N. Shukla, Eastern Book Company

III Semester B. Tech. Electronics & Telecommunication Engineering (NEP 2020)

Course Code: STPCCETC304

Title of Course: **Electronic Devices and Circuits**

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	MSE	IE	ESE	Total
3	--	--	3	3	3	10	10	80	100

Course outcomes:

After completing the course, the students will be able to;

CO1 Understand the principles of semiconductor Physics

CO2 Design half wave and full wave rectifiers with filters.

CO3 Characterize the current flow of a bipolar transistor in CE configurations

CO4 Design and develop simple amplifier circuits using BJT biasing.

CO5 Design and develop simple amplifier circuits using BJT biasing.

Unit	Content	Hours
I	**PN Junction Diode:** Formation of p-n junction, biasing the diode, current equation and V-I characteristics of diode, static and dynamic resistance, transition and diffusion capacitance of diode, Analysis of Half Wave Rectifier (HWR), Full Wave Rectifier (FWR), introduction to filters C, L, LC and CLC filters. Clipper, clamper circuits, Zener diode and its application as voltage regulator.	8
II	**Bipolar Junction Transistors and Field Effect Transistor:** Operation of transistor, CB, CE and CC configurations with characteristics and parameters, transistor as a switch, low frequency hybrid and pi model of transistor, high frequency pi model of transistor, FET, MOSFET and UJT structure, operation and V-I characteristics.	8
III	**Biasing of BJT and FET:** Introduction, d.c and a.c load line, stability factor, methods of transistor biasing, thermal runaway, bias compensation, methods of FET biasing, transistor amplifier, single stage transistor amplifier, cascade transistor amplifier and cascade transistor amplifier.	8
IV	**Power amplifier and feedback amplifier**: various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues, feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc.	8
V	**Oscillators and Multivibrators:** Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitts, Clapp etc.). Multivibrators (Astable, Monostable and Bistable multivibrator) and UJT as relaxation oscillator.	8

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Text/Reference Books:

1. Integrated Electronics, Milliman and Halkias, Tata McGraw Hill, New Delhi.
2. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition.
3. Electronic Devices and Circuits-David A Bell Oxford University Press Fifth Edition
4. Electronic Circuit Analysis and Design, Donald A Neamen, Tata McGraw Hill, 3rd Edition, 2003.
5. Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, Second Edition.

III Semester B. Tech. Electronics & Telecommunication Engineering (NEP 2020)

Course Code: STPCCETC305

Title of Course: **Linear Integrated Circuits**

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	MSE	IE	ESE	Total
3	--	--	3	3	3	10	10	80	100

Course outcomes:

After completing the course, the students will be able to;

CO1 Understand the fundamentals of operational amplifiers.

CO2 Apply op-amps in linear and non-linear circuit configurations.

CO3 Analyze frequency response and stability of op-amp circuits.

CO4 Design analog systems using IC 741, IC 555, and voltage regulators

CO5 Evaluate and troubleshoot linear integrated circuit applications

Unit	Content	Hours
I	**Introduction to Integrated Circuits and Operational Amplifiers:** Definition and classification of ICs: Analog, Digital, and Mixed ICs, Advantages and applications of ICs, Types of IC packages. Basic block diagram and internal stages of Op-Amp. Ideal Op-Amp: Inverting and Non-inverting configurations, Open-loop and closed-loop configurations. Ideal Op-Amp characteristics: Common-mode rejection ratio (CMRR), input impedance, output impedance, slew rate, offset voltage, and bias currents. Practical Op-Amp characteristics: Frequency response and bandwidth, offset voltage, drift, and compensation techniques.	8
II	**Linear Applications of Op-Amps:** Inverting, Non-inverting Amplifiers, Voltage follower (buffer) circuits. Difference Amplifier, Instrumentation Amplifier, Summing Amplifier, Voltage Follower, Integrator and Differentiator Circuits, Practical considerations and limitations.	8
III	**Non-linear Applications of Op-Amps:** Comparators, Zero Crossing detectors, Schmitt Trigger: Hysteresis, advantages, and applications. Waveform generator, peak detector, clipper, clamper. Precision Rectifiers: half-wave and full-wave rectifiers. Phase-Locked Loop (PLL), Applications of PLLs.	8
IV	**Active Filters and Oscillators:** Active Filters using op-amps: Low-pass, High-pass, Band-pass, and Band-stop filters: Design, frequency response, and applications Second-Order Filters: Butterworth, Chebyshev, and Bessel filters, Applications Oscillators: Basic concept of oscillators and Barkhausen criterion. Wein-Bridge oscillator, Phase-shift oscillator using op-amps.	8
V	**Voltage Regulators, Timers, and Special ICs:** Linear Voltage Regulators: Fixed and Adjustable types (78xx, LM317, etc.) Timer IC555 and its applications as Astable, Mono stable multi vibrator, etc.	8

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	Specialized ICs: Phase-Locked Loop (PLL) ICs, Voltage-controlled Oscillators (VCOs), Analog-to-digital and digital-to-analog converters (ADC/DAC).	

Textbooks:

1. D. Roy Choudhury and Shail Jain, “Linear Integrated Circuits”, New Age International.
2. Ramakant A. Gayakwad, “Op-Amps and Linear Integrated Circuits”, Pearson Education
3. Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, McGraw-Hill

Reference Books:

1. Coughlin and Driscoll, “Operational Amplifiers and Linear Integrated Circuits”, Pearson Education (Prentice-Hall)
2. Sedra and Smith, “Microelectronic Circuits”, Oxford University Press
3. Paul R. Gray and Robert G. Meyer, “Analysis and Design of Analog Integrated Circuits”

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III Semester B. Tech. Electronics & Telecommunication Engineering (NEP 2020)

Course Code: STEMCETC306

Title of Course: **Innovation, Creativity and Entrepreneurship**

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	MSE	IE	ESE	Total
2	--	--	2	2	2	5	5	40	50

Course outcomes:

After completing the course, the students will be able to;

CO1 Enhanced creative thinking and problem-solving skills to generate innovative ideas and solutions

CO2 Understand the concept of innovation and its components for the organization.

CO3 Develop a practical framework for the implementation of a systematic innovation strategy

CO4 Identify the role of Creativity and innovation in Entrepreneurial start-ups

Unit	Content	Hours
I	**Foundations of Creativity and Innovation:** Creative thinking process, developing a creative mindset, and overcoming creative blocks. Types of Innovation: Incremental, Disruptive, and Radical, The Innovation Process: From idea to execution. Managing risk and uncertainty in innovation, measuring innovation success.	7
II	**Design Thinking and Prototyping:** Introduction to Design Thinking: Principles and Process. Empathy and Understanding User Needs. Ideation, Concept Development, and Selection. Prototyping, Testing, and Iteration.	7
III	**Entrepreneurship:** Introduction, Concept, Characteristics, Entrepreneurial mindset. Evolution and Growth of Entrepreneurship in India. Role and Functions of Entrepreneur. Types of Entrepreneurs. Theories: Economic, Psychological, Sociological, Anthropological, Opportunity-Based, and Resource-Based entrepreneurship	8
IV	**Innovate and Iterate: The Power of Lean Startups:** Overview of the Lean Startup Methodology and its Principles. Understanding the concepts like Split Testing, Pivot, Business-Measure-Learn (BML) and Minimum Viable Product (MVP). Designing market scenarios to test hypotheses. Analyzing results and making data-driven decisions. Innovating for Social Causes. New Product development and testing. Growth Strategies for Innovative Businesses. Managing Innovation and Building an Innovative Culture.	8

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Text Books:

1. Entrepreneurial Development, S.S.Khanka S.Chand& Co. Ltd. Ram Nagar New Delhi.
2. Entrepreneurship, Hisrich R D and Peters M P, Tata McGraw-Hill.
3. Management of Entrepreneurship. By, N.V.R. Naidu, I.K. International Pvt Ltd.
4. Entrepreneurial Development, S.Anil Kumar, New Age International.
5. Dynamics of Entrepreneurial, Vasant Desai
6. Desai, Vasant (2003). Small-Scale Industries and Entrepreneurship. Himalaya Publishing House, Delhi.

Reference Books:

1. Entrepreneurship and innovation Rabindra N. Kanungo, Sage Publications, New Delhi.
2. Kaulgud, Aruna (2003). Entrepreneurship Management. Vikas Publishing House,Delhi.
3. Taneja, S., & Gupta, S. L. Entrepreneurship Development-New Venture creation. New Delhi: Galgotia Publishing House.

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III Semester B. Tech. Electronics & Telecommunication Engineering (NEP 2020)

Course Code: STPCCETC307

Title of Course: **Electronic Devices and Circuits Lab**

Teaching Scheme					Examination Scheme (Practical)			
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	CA	UA	Total
--	--	2	2	1	--	25	25	50

Course outcomes:

After completing the course, the students will be able to;

CO1 Plot the V-I characteristics of PN junction diode and determine cut in voltage.
CO2 Construct the circuit for Half Wave Rectifier using PN junction Diode
CO3 Plot input and output characteristics of common emitter configuration of a transistor.
CO4 Build the circuit for BJT two stage RC coupled common emitter (CE) amplifier.
CO5 Design and implement sinusoidal and non-sinusoidal oscillator circuit.

Lab Activities: A minimum of eight practical's should be performed from the topics listed below.

List of practicals:

1. Analysing V-I characteristics of p-n junction diode
2. Design of half wave, full wave, Bridge wave rectifier
3. Analysing V-I characteristics of Zener diode
4. Design of voltage regulator using Zener diode.
5. Implement clipper circuit using diode.
6. To obtain input and output characteristics of CE configuration BJT.
7. To obtain input and output characteristics of CB configuration BJT.
8. To obtain input and output characteristics of CC configuration BJT.
9. To obtain Drain and Transfer characteristics of FET
10. Analysing the frequency response of single stage CE amplifier.
11. Analysing the frequency response of two stage CE amplifier.
12. Design and implement UJT relaxation oscillator.
13. Measure the output frequency of RC and LC oscillator.

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III Semester B. Tech. Electronics & Telecommunication Engineering (NEP 2020)

Course Code: STPCCETC308

Title of Course: **Linear Integrated Circuits Lab**

Teaching Scheme					Examination Scheme (Practical)			
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	CA	UA	Total
--	--	2	2	1	--	25	25	50

Course outcomes:

After completing the course, the students will be able to;

CO1 Identify and explain the operation of basic op-amp configurations including inverting, non-inverting, summing, and difference amplifiers.

CO2 Analyze and interpret the behavior of linear and non-linear op-amp circuits such as Integrators, differentiators, comparators, Schmitt triggers, and precision rectifiers.

CO3 Design and construct active filter and oscillator circuits for signal conditioning and waveform generation.

CO4 Implement and evaluate waveform generation circuits using IC555 timers in Astable and Monostable modes.

CO5 Develop and test a Digital-to-Analog Converter (DAC) using an R-2R ladder network and op-amp to demonstrate digital-to-analog interfacing.

Lab Activities: A minimum of eight practical's should be performed from the topics listed below.

List of practical's:

1. Inverting and Non-Inverting Amplifiers.
2. Voltage follower (Buffer Amplifier) and Summing Amplifier Circuits.
3. Subtractor / Difference Amplifier.
4. Integrator and Differentiator Circuits.
5. Schmitt Trigger Using Op-Amp.
6. Precision Rectifiers (Super diode)
7. Active Filters (Low Pass, High Pass, Band Pass and Band Stop Filters).
8. Wien Bridge Oscillator.
9. Astable Multivibrator using IC555 Timer.
10. Digital to Analog Converter (DAC) Using R-2R Ladder and Op-Amp.
11. Comparator using op-amp.
12. Monostable Multivibrator using IC555 Timer.
13. PWM Generation using IC555 Timer.
14. Fixed Voltage Regulators (Using 7805, 7812, 7905)
15. Variable Voltage Regulator (Using LM317)
16. Square/Triangle Wave Generator using op-amp.

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III Semester B. Tech. Electronics & Telecommunication Engineering (NEP 2020)

Course Code: STPCCETC309

Title of Course: **Programming Skills-I (Object Oriented Programming using C++)**

Teaching Scheme					Examination Scheme (Practical)			
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	CA	UA	Total
--	1	2	3	2	--	25	25	50

Course outcomes:

After completing the course, the students will be able to;

CO1 Understand OOP concepts and their advantages over procedural programming.

CO2 Implement classes, objects, and functions in C++.

CO3 Handle file operations and exceptions in C++.

CO4 Perform operator overloading and use function templates.

Unit	Content
I	**Unit 1: Introduction to Object-Oriented Programming & Basics of C++:** Introduction to Programming Paradigms: Procedural vs Object-Oriented Programming (OOP), Principles of OOP: Encapsulation, Abstraction, Inheritance, Polymorphism, Basics of C++: Structure of a C++ Program, Data Types, Variables, Constants, Operators & Expressions: Arithmetic, Relational, Logical, Bitwise, Assignment, Conditional, Control Structures: if-else, switch-case, loops (for, while, do-while), break & continue.
II	**Unit 2: Functions, Classes & Objects**: **Functions in C++:** Call by Value & Reference, Inline Functions, Function Overloading, Classes & Objects: Defining a Class, Creating Objects, Access Specifiers (public, private, protected), Constructors & Destructors: Default, Parameterized & Copy Constructor, Destructor Concept, Static Members & Methods in a Class, Friend Functions & Friend Classes
III	**Unit 3: Inheritance, Polymorphism & Operator Overloading**: **Inheritance:** Types (Single, Multilevel, Multiple, Hierarchical, Hybrid), Virtual Base Classes, Function Overriding & Virtual Functions for Runtime Polymorphism, Abstract Classes & Pure Virtual Functions, Operator Overloading: Overloading Unary & Binary Operators, Type Conversion: Basic-to-Class, Class-to-Basic, Class-to-Class
IV	**Unit 4: File Handling, Templates & Exception Handling: File Handling in C++:** File Streams, Opening & Closing Files, Read/Write Operations, Templates in C++: Function Templates, Class Templates, Template Specialization, Exception Handling: Try, Catch, Throw, Handling Multiple Exceptions, STL (Standard Template Library): Introduction to Vectors, Lists, Maps

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Lab Activities: A minimum of eight practicals should be performed from the topics listed above.

Text/Reference Book:

1. Stroustrup, B. (2013). *The C++* Programming Language (4th ed.). Addison-Wesley.
2. Balagurusamy, E. (2018). Object-Oriented Programming with *C++* (8th ed.). McGraw-Hill Education.
3. Lafore, R. (2018). Object-Oriented Programming in C++ (4th ed.). Pearson Education.
4. Kanetkar, Y. (2021). Let Us *C++* (3rd ed.). BPB Publications.
5. Lippman, S. B., Lajoie, J., & Moo, B. E. (2012). *C++ Primer* (5th ed.). Addison-Wesley.

III Semester B. Tech. Electronics & Telecommunication Engineering (NEP 2020)

Course Code: STCEPETC310

Title of Course: **Mini Project / Field Project**

Teaching Scheme					Examination Scheme (Practical)			
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	CA	UA	Total
--	--	4	4	2	--	50	--	50

Course outcomes:

After completing the course, the students will be able to;

CO1 Identify industry /Centre for training/ possible mini project on Electronics & Telecommunication engineering system through survey / participate in community activities

CO2 Recognized the area expected to undergo training/carry out literature survey for selected mini project

CO3 Analyze literature and develop/fabricate mini project using mechanical design procedure

CO4 Prepare and present industrial training /case study/mini project/ community activities report based on work experience

Students are expected to fulfill any one of the following (A or B or C or D)

(A) Students are expected to undergo the training (before commencement of semester or during the semester as per schedule) at CIIIT centers in the Institute/ Industry/Organization for minimum two weeks duration.

(B) Students are expected to carry a mini project (Training centers of CIIIT, Departmental laboratories/workshop in the Institute or recognized training Institutes/centers) under the guidance of concerned resource person.

(C) Students are expected to participate in any National or International technical event/ competition organized by reputed institutes or organizations to demonstrate the developed innovative machine or product.

(D) Students are expected to participate in community activities like village technology awareness camp, rain water harvesting awareness, plastic waste to product campaign, energy conservation awareness drive and green campus movement drive etc.

Student should submit training report with certificate from concerned industry/organization

And deliver presentation based on the training/ project undertaken.

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Contents of Industrial Training Report:

1. Details of Industry/Organization (Name of Industry, address, ownership, organization structure etc.)
2. Descriptions about Layout, Departments/Sections, Operations and Processes used in the plant

Contents of Mini Project /Community activity Report:

1. Details of laboratory/Training Centre/Community activity
2. Description about Layout, Departments/Sections/activity,
3. Brief description of the equipment's / software's handled, if any
4. Brief description about hands on project undertaken
5. Steps followed to fabricate mechanism / model/ activity solution
6. Display and submission of physical/virtual prototype/model

Evaluation Guidelines for A, B, C and D are as follows:

a. Industrial Training / Project Report - 25 Marks (Maximum).
b. Presentation - 15 Marks (Maximum).
c. Viva – Voce - 10 Marks (Maximum).

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IV Semester B. Tech. Electronics & Telecommunication Engineering (NEP 2020)

Course Code: STOEETC402B

Title of Course: **Digital System Design (Open Elective – II)**

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	MSE	IE	ESE	Total
2	--	--	2	2	2	5	5	40	50

After completing the course, the students will be able to;

CO1 Utilize/Apply the knowledge of digital circuits to design basic combinational and sequential blocks and hierarchical implementation of digital systems.

CO2 Make use of dataflow, structural and behavioral modeling styles of Verilog HDL for simulating the combinational/sequential circuits and systems.

CO3 Use of EDA tools and FPGA development platform for digital system design, verification, testing and implementation.

CO4 Identify the relevant material for the Electronic Applications.

Unit	Content	Hours
I	Digital System Design Flow, Introduction to FPGA Development Board, Introduction to HDL, Basic Language Elements, Syntax and Semantics of HDL.	8
II	Gate level, Dataflow and Behavioral Modeling for circuits like Multiplexer, De-multiplexer, Encoder-Decoder, Flip-Flop, Counter.	7
III	Design and Analysis of Standard Combinational Blocks, Modeling for Arithmetic Circuits - Adders, Subtractor, Multiplier, Divider, ALU and Comparator.	8
IV	Design and analysis of Standard Sequential blocks, Finite State Machine Design, Timing analysis Synthesis of HDL code on FPGA platforms.	7

Text Books:

1. Verilog HDL: A Guide to Digital Design and Synthesis; Samir Palnitkar, Prentice Hall PTR; 2nd Edition
2. Fundamentals of Digital Logic with Verilog; Stephen Brown and ZvonkoVranesic; McGraw Hill, 2nd Edition

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Reference books:

1. Verilog Digital Systems Design; Zainalabedin Navabi; McGraw-Hill, 2nd Edition
2. A Verilog HDL Primer: J Bhaskar; Star Galaxy Publishing; 2nd Edition

IV Semester B. Tech. Electronics & Telecommunication Engineering (NEP 2020)

Course Code: STPCCETC403

Title of Course: **Analog & Digital Communication**

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	MSE	IE	ESE	Total
3	--	--	3	3	3	10	10	80	100

After completing the course, the students will be able to;

CO1 Demonstrate the necessity of modulation and identify the various components of analog and Digital communication Systems.

CO2 Illustrate the different modulation and demodulation schemes in analog communication systems.

CO3 Analyse the performance of various pulse modulation scheme.

CO4 Illustrate the basic building blocks of digital communication system, formatting of digital signal, signal information theory and analyse information transmission over communication channel.

CO5 Analyze performance of different digital modulation techniques.

Unit	Content	Hours
I	**AM Transmitters and Receivers:** Modulation, need of modulation, AM Modulation (Mathematical expression and related numerical), modulation index, power relation in AM wave, AM modulation and demodulation methods, Principles of DSB-FC, DSBSC, SSB-SC modulation and their comparison, high level and low-level AM transmitter, TRF and Super heterodyne receiver. Need and types of AGC, Receiver Characteristics: Selectivity, Sensitivity & Fidelity.	9
II	**FM Transmitters and Receivers:** FM Modulation, Circuit & Analysis for direct FM generation using FET. Narrow Band and Wide Band FM, their comparison, Pre-emphasis and De-emphasis.FM Receiver block diagram including Limiter. FM Discriminator: Introduction to Single Slope and Balanced slope detector, Foster Seeley and Ratio detectors. Comparison of performance of AM & FM systems.	9
III	**Pulse Modulation and Multiple Access System:** Sampling Theorem in time domain, Nyquist criteria, ISI, Types of sampling- ideal, natural, flat top, Aliasing & Aperture effect. Analog modulation techniques: PAM, PWM & PPM. FDMA, TDMA and CDMA Multiple Access System.	9
IV	**Introduction to Digital Communication System:** Functional Blocks of Digital Communication System, Digital representation of Analog signal, PCM Generation and Reconstruction: Quantization (basic working), Differential pulse code modulation, Delta Modulation, Adaptive Delta Modulation. Information Theory: Shannon-Hartley theorem, Measure of Information, Entropy and Information Rate.	9

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V	**Digital Modulation:** Need of digital modulation, BPSK, DPSK QPSK, OQPSK, M-ary PSK, ASK, QAM, BFSK, M-ary BFSK, minimum shift keying (MSK) Transmitter and Receiver.	9

Text/Reference Books:

1. Electronic Communication System, George Kennedy, Tata Mc-Graw Hill Co., New Delhi (Fifth Ed).
2. Principles of Communication Systems, Taub and Schilling D.L, Mc-Graw Hill Co., New Delhi (Second Ed.).
3. Digital & Analog Communication Systems, Shanmugam K.S, John Wiley & Sons, NewYork, 1996.
4. Modern Digital and Communication Systems, Lathi B. P, Holt Rinchart and Winston Inc.,New York, 1993
5. Digital Communication, Simon Haykin, John Wiley and Sons,Pvt. Ltd., Singapore.
6. Digital Communication, Proakis J. K, Mc-Graw Hill Book Co., London (Second Edition).

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IV Semester B. Tech. Electronics & Telecommunication Engineering (NEP 2020)

Course Code: STPCCETC404

Title of Course: **Industrial Electronics**

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	MSE	IE	ESE	Total
3	--	--	3	3	3	10	10	80	100

After completing the course, the students will be able to;

CO1 Identify power semiconductor devices used in Power Electronics circuit.

CO2 Understand the characteristics of SCR

CO3 Design triggering circuit for SCR.

CO4 Analyze half wave and full wave-controlled rectifier.

CO5 Select the appropriate power electronic components of physical system.

Unit	Content	Hours
I	**Power Semiconductor Devices:** Classification of Thyristor family devices, Construction, working principle, V-I characteristics and applications of SCR, LASCR, DIAC, TRIAC, SCS, PUT, SUS, SBS, GTO, static and dynamic equalising circuit of SCR.	9
II	**Triggering methods of SCR:** Concept of turn ON mechanism for given SCR: High voltage, thermal triggering, dv/dt triggering, gate triggering, Gate trigger circuits: Thyristor Triggering Circuits: Resistance Triggering Circuit, Resistor-Capacitor (RC) Triggering Circuit, half wave and full wave triggering Circuit, UJT (Uni junction Transistor) Triggering Circuit, Pulse Transformer Triggering Circuit, Turn OFF	10
III	**Commutation methods of SCR:** Commutation methods: Natural and Forced Commutation, Types: Class A, Class B, Class C, Class D, Class E, Class F. Construction and working principle	7
IV	**Phase controlled rectifiers:** Phase control parameters: Firing angle, and conduction angle, Single phase half wave-controlled rectifier: circuit diagram, working and waveforms with R and RL load, effect of freewheeling diode with RL load, Single phase centre tapped full wave-controlled rectifier and Bridge rectifier: circuit diagram, working and waveforms with R and RL load, effect of freewheeling diode with RL load, three phase rectifier: need, circuit diagram, working and waveforms with R load.	10
V	**Power Converters:** Introduction, classification, Block diagram and working of Inverters, choppers, Cyclo converter, Block diagram and concept of Online and Offline UPS, SMPS: concept, Block diagram and applications.	9

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Text/Reference Books:

1. Power Electronics by M.D. Singh, K. B. Khanchandani, Tata Mc,Graw Hill.
2. Power Electronics by P. S. Bimbhra, Khanna Publisher, New Delhi.
3. Power Electronics Circuits Devices and Applications by Rashid, Muhammad H, Pearson Education India, New Delhi
4. Power Electronics, Converters, Mohan N., T. M. Undeland and W. P. Robbins

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IV Semester B. Tech. Electronics & Telecommunication Engineering (NEP 2020)

Course Code: STPCCETC405

Title of Course: **Automatic Control System**

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	MSE	IE	ESE	Total
3	--	--	3	3	3	10	10	80	100

After completing the course, the students will be able to;

CO1 Understand open and closed-loop systems.

CO2 Analyze system dynamics in time and frequency domains.

CO3 Assess stability using Routh, Nyquist, and root locus methods.

CO4 Use state-space for modeling and analysis.

CO5 Design controllers using state space and compensators.

Unit	Content	Hours
I	**Introduction to Control Systems & its modeling:** Introduction to control systems: Introduction, classification of control systems. Mathematical models of physical systems: Modelling of mechanical system elements, electrical systems, Analogous systems, Transfer function, Single input single output systems, Procedure for deriving transfer functions. Block diagram reduction Techniques, Signal flow graph.	9
II	**Time domain analysis:** Time domain analysis: transient response and steady state response, standard test inputs for time domain analysis, order and type of a system, transient analysis of first and second order systems, time domain specifications of second order under damped system from its step response, Steady state error and static error constants.	9
III	**Stability analysis:** Characteristic equation of a system, concept of pole and zero, response of various pole locations in s-plane, concept of stability absolute stability, relative stability, stability of system from pole locations, Routh Hurwitz stability criterion, Root locus: definition, magnitude and angle conditions, construction of root locus, concept of dominant poles, effect of addition of pole and zero on root locus. Application of root locus for the stability analysis.	9
IV	**Frequency domain analysis:** Frequency response and frequency domain specifications, correlation between time domain and frequency domain specifications, polar plot, Nyquist stability criterion and construction of Nyquist plot, Bode plot, determination of frequency domain specifications and stability analysis using Nyquist plot and Bode plot.	9

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V	**Controllers and State space representation:** Concept of Controller, Basic ON-OFF Controller, Concept of Dead Zone, Introduction to P, I, D, PI, PD and PID controller. State space advantages and representation, Transfer function.	9

Textbooks:

1. I. J. Nagrath and M. Gopal, “Control System Engineering”, New Age International Publishers, 5th Edition.
2. K. Ogata, “Modern Control Engineering”, Prentice Hall India Learning Private Limited; 5th Edition.

Reference Books:

1. Benjamin C. Kuo, “Automatic control systems”, Prentice Hall of India, 7th Edition.
2. M. Gopal, “Control System – Principles and Design”, Tata McGraw Hill, 4th Edition.
3. Schaum’s Outline Series, “Feedback and Control Systems” Tata McGraw-Hill.
4. John J. D’Azzo and Constantine H. Houpis, “Linear Control System Analysis and Design”, Tata McGraw-Hill, Inc.
5. Richard C. Dorf and Robert H. Bishop, “Modern Control Systems”, Addison – Wesley.

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IV Semester B. Tech. Electronics & Telecommunication Engineering (NEP 2020)

Course Code: STEMCETC406

Title of Course: Human Resource Management

Teaching Scheme					Examination Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	MSE	IE	ESE	Total
2	--	--	2	2	--	30	20	--	50

After completing the course, the students will be able to;

CO1 Explain the importance of human resource (HR) management for an organization and also distinguish between personnel and HR management.

CO2 Develop a job analysis and produce a job description & job specification.

CO3 Construct selection process and justify the applicability of various techniques of training

CO4 Outline the performance appraisal process and explain the utility of various modern and traditional methods of performance appraisal

Unit	Content	Hours
I	Introduction: Nature, scope, objectives, importance and functions of Human Resource Management (HRM), Difference between Personnel Management and Human Resource Management, Roles and Qualities of HR Manager, Introduction to strategic HRM.	8
II	Job analysis and job design: Meaning, uses, process and methods of collecting data for job analysis, job description, job specifications &role analysis, Concept of job design: Factors affecting job design, techniques of job design.	8
III	Human Resources Planning (HRP): Need, importance &objectives of HRP, factors affecting HRP, Recruitment and Selection - meaning, sources and process, Induction and placement, Objectives and importance of training, training process, training need identification, types and techniques of training and development	7
IV	Performance appraisal and career planning &development: Concept, objectives, importance, methods, self-appraisal, Potential appraisals compensation management - concept and components, Job evaluation, components of salary, incentives, bonus, employee stock ownership plan (ESOP), fringe benefits	7

Text Books:

1. Human Resource Management – Text and Cases, Dr. S S. Khanka, S. Chand Publication
2. Human Resource and Personnel Management – Text and cases, K. Aswathappa, McGraw- Hill Publishing co. ltd.
3. Essentials of Human Resource Management & Industrial Relations, P. Subba Rao, Himalaya Publication
4. Human Resource Management, Seema Sanghi, Vikas Publishing.

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IV Semester B. Tech. Electronics & Telecommunication Engineering (NEP 2020)

Course Code: STPCCETC407

Title of Course: **Analog & Digital Communication Lab**

Teaching Scheme					Examination Scheme (Practical)			
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	CA	UA	Total
--	--	2	2	1	--	25	25	50

Course outcomes:

After completing the course, the students will be able to;

CO1 Observe the AM Modulated and demodulated signal on DSO/CRO.

CO2 Calculate modulation index 'm' from the observed AM waveform.

CO3 To build FM modulation and demodulation circuit and observe output waveform.

CO4 Observe and verify PCM modulated and demodulated signal.

CO5 Generation of delta modulation and demodulation signal.

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Lab Activities: A minimum of eight practicals should be performed as per the syllabus and Instructor guidance.

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IV Semester B. Tech. Electronics & Telecommunication Engineering (NEP 2020)

Course Code: STVSECETC408

Title of Course: **Programming Skills-II (Python Programming)**

Teaching Scheme					Examination Scheme (Practical)			
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	CA	UA	Total
--	1	2	3	2	--	25	25	50

Course outcomes:

After completing the course, the students will be able to;

CO1 Understand the fundamentals of Python, including syntax, data types, and control structures.

CO2 Implement functions, data structures, and object-oriented programming concepts in Python.

CO3 Apply file handling and exception handling techniques for robust program execution.

CO4 Analyze data using Python libraries like NumPy, Pandas, and Matplotlib.

CO5 Develop real-world applications using database connectivity and web scraping techniques.

Lab Activities: A minimum of eight practical's should be Performed from the topics listed below.

Unit	Content
I	**Unit 1: Introduction to Python:** Basics of Python: History, Features, Installation, IDEs, Python Syntax, Variables, Data Types, Operators: Arithmetic, Relational, Logical, Bitwise, Assignment, Identity & Membership, Control Structures: if-else, loops (for, while), Functions: Definition, Parameters, Return Values, Recursion
II	**Unit 2: Data Structures and Functions in Python:** Lists: Operations, Slicing, List Comprehensions, Tuples and Sets: Properties, Methods, Dictionaries: Keys, Values, Methods, String Handling: Methods, Formatting, Encoding, Functions: Built-in Functions, Lambda Functions, Modules & Packages
III	**Unit 3: Object-Oriented Programming & File Handling:** Introduction to OOP: Classes, Objects, Methods, Constructors & Destructors, Inheritance, Polymorphism, File Handling: Reading & Writing Text and Binary Files, Exception Handling: try, except, finally, Raising Exceptions
IV	**Unit 4: Advanced Python and Applications:** Introduction to NumPy& Pandas for Data Analysis, Introduction to Matplotlib for Data Visualization, Regular Expressions in Python, Database Connectivity with SQLite/MySQL, Introduction to Web Scraping using Beautiful Soup.

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Text/Reference Book:

1. Mark Lutz, Learning Python, 5th ed., O'Reilly Media, 2013.
2. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, 2nd ed., O'Reilly Media, 2015.
3. Guido van Rossum, Fred L. Drake Jr., Python 3 Reference Manual, Python Software Foundation, 2009.
4. Wes McKinney, Python for Data Analysis, 2nd ed., O'Reilly Media, 2017.
5. Zed A. Shaw, Learn Python the Hard Way, 3rd ed., Addison-Wesley, 2014.
6. David Beazley, Python Cookbook, 3rd ed., O'Reilly Media, 2013.

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IV Semester B. Tech. Electronics & Telecommunication Engineering (NEP 2020)

Course Code: STAECETC409

Title of Course: **Language Skills**

Teaching Scheme					Examination Scheme (Practical)			
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	CA	UA	Total
--	1	2	3	2	--	50	--	50

Course outcomes:

After completing the course, the students will be able to;

CO1 Develop essential reading, writing, speaking, and listening skills in a selected foreign language.

CO2 Introduce basic grammar, sentence construction, and frequently used vocabulary.

CO3 Enable students to engage in simple conversations and write basic texts.

CO4 Enhance intercultural communication by providing an understanding of cultural contexts.

Unit	Content
I	**Introduction to Language and Culture** Introduction to the selected language (alphabets, phonetics, scripts, tones), Basic greetings and courtesy phrases, Self-introduction, numbers, days of the week, months, seasons, telling time, Cultural aspects: etiquette, gestures, formal/informal use, social norms, Brief history and global relevance of the chosen language.
II	**Vocabulary and Grammar Fundamentals** Sentence structure and word order in the selected language, Introduction to parts of speech: nouns, pronouns, articles, verbs, adjectives, Present tense for daily conversations, Thematic vocabulary: family, food, transport, weather, colors, hobbies, Grammar exercises and vocabulary-building activities.
III	**Everyday Communication and Situational Practice** Forming simple questions and answers, Common expressions used in day-to-day scenarios, Role plays: asking directions, shopping, ordering food, travel-related interactions, Speaking and pronunciation drills, Listening to basic native audio/video dialogues.
IV	**Functional Skills and Language Proficiency Tools** Reading comprehension of basic texts (signboards, menus, forms, short paragraphs), Writing practice: simple paragraphs, messages, filling forms, composing emails. Listening and speaking activities in workplace and academic contexts. Overview of international certifications: DELF A1 (French), JLPT N5 (Japanese), Goethe A1 (German), DELE A1 (Spanish), Tips for online/offline exam preparation and further learning resources.

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Lab activities;
Based on the above, students are required to appear for internal written examinations or quizzes, oral examinations or role plays. Additionally, they must submit at least one assignment for each unit. The assessment and evaluation will be carried out as follows.
Written exams or quizzes (20 marks)
Oral exams or role-plays (20 marks)
Assignments or projects (10 marks)

Reference Books:

1. Basic French Language Skills for Everyday Life, Alison, [Online]. Available: https://alison.com/course/basic-french-language-skills-for-everyday-life
2. DELF/DALF - French Language Proficiency Tests, France Éducation International, [Online]. Available: https://www.france-education-international.fr/en/delf-dalf
3. Japanese Language - N5 Course, Japan Foundation and Minato, [Online]. Available: https://minato-jf.jp/
4. Japanese-Language Proficiency Test (JLPT) Official Website, Japan Foundation and Japan Educational Exchanges and Services, [Online]. Available: https://www.jlpt.jp/e/
5. Goethe-Zertifikat A1: Start Deutsch 1, Goethe-Institut, [Online]. Available: https://www.goethe.de/en/spr/kup/prf/prf/sd1.html
6. Learn German – Introduction to German A1, Deutsche Welle (DW), [Online]. Available: https://learngerman.dw.com/en/overview
7. Learn Spanish: Basic Spanish Vocabulary, edX (University of California, Davis), [Online]. Available: https://www.edx.org/course/spanish-vocabulary
8. German - I, National Programme on Technology Enhanced Learning (NPTEL), IIT Madras[Online]. Available: https://onlinecourses.nptel.ac.in/noc21_hs30/preview
9. Introduction to Japanese Language and Culture, SWAYAM – IIT Kanpur, [Online]. https://onlinecourses.nptel.ac.in/noc19_hs52/preview
10. Foreign Languages Courses, FutureLearn, [Online]. Available: https://www.futurelearn.com/subjects/language-courses

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IV Semester B. Tech. Electronics & Telecommunication Engineering (NEP 2020)

Course Code: STVECETC410

Title of Course: **Human Values and Ethics**

Teaching Scheme					Examination Scheme (Practical)			
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	CA	UA	Total
--	1	2	3	2	--	50	--	50

Course outcomes:

After completing the course, the students will be able to;

CO1 Demonstrate an understanding of basic human values and their role in shaping ethical behavior and personal well-being.

CO2 Demonstrate the ability to apply ethical principles and interpersonal skills such as empathy, trust, and respect to analyze and resolve real-life dilemmas in personal and social contexts through case studies and role plays.

CO3 Demonstrate the ability to evaluate and address real-life professional dilemmas using ethical frameworks through the analysis of case studies and participation in role plays.

CO4 Exhibit a sense of environmental responsibility and understand the importance of sustainable living for global peace and harmony.

Unit	Content	Hours
I	**Introduction to Human Values** **Tutorial:** Concept of values, value education, and need for value-based life. **Practical:** Group discussion on value conflicts; Case study on ethical dilemmas	
II	**Harmony in the Self, Family and Society:** **Tutorial:** Understanding self, needs, and happiness; Relationship and trust in the family and Humanistic society. **Practical:** Role-play on trust and respect in relationships; Reflective journal writing. Group debate on social ethics and justice; Local community interaction or survey.	
III	**Ethics in Professional Life:** **Tutorial:** Integrity, work ethics, professional responsibility. **Practical:** Case study analysis of ethical issues in professional environments.	
IV	**Environmental Ethics and Global Peace:** **Tutorial:** Environmental responsibility, sustainable development, peace and harmony. **Practical:** Field activity on local environmental issues; Poster presentation or awareness campaign	

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Reference Books:

1. R.R. Gaur, R. Sangal & G.P. Bagaria, A Foundation Course in Human Values and Professional Ethics, Excel Books, 2010.
2. Govindarajan M., Natarajan S., Senthil Kumar V. S., Professional Ethics and Human Values, PHI.
3. Bhatia, R. (2011), Values and Ethics in Business and Profession, PHI.

Online Reference:

1. https://www.uhv.org.in/uhve
2. https://fdp-si.aicte-india.org/UHVII.php

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Two-year UG Diploma in Engineering/Technology

Exit Course after Second Year of B.Tech. Electronics & Telecommunication Engineering

Course Code: STEXETC421

Title of Course: **Mechatronics and Internet of Things**

Teaching Scheme					Examination Scheme (Practical)			
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	CA	UA	Total
--	2	12	14	8	--	200	--	200

Course Description: This course introduces basic concepts of Mechatronics and Internet of Things (IoT). Students will learn about mechanical and electronic components, sensors, microcontrollers, and how they are used in smart systems like industrial automation.

Course outcomes:

After completing the course, the students will be able to;

CO1 Identify key electronic, mechanical components and explain their working.
CO2 Interface basic sensors and actuators with microcontrollers.
CO3 Develop basic Arduino codes to control and monitor devices.
CO4 Connect sensors to cloud/mobile apps using IoT concepts.
CO5 Build a mini project using Mechatronics + IoT integration.

Unit	Content	Hours
I	Basics of Mechatronics, Introduction to Mechatronics, Definition, importance, and real-life applications (washing machine, ATM, car automation). Mechanical Components: Gears, cams, levers, linkages, pulleys Sensors and Actuators Sensors: LDR (light), IR sensor, Ultrasonic (distance), Temperature sensor (LM35/DHT11). Actuators: DC motor, Servo motor, Relay, Buzzer, Solenoid. Control Systems: Open-loop vs closed-loop systems with simple examples like fan with thermostat or automatic streetlight. Feedback Concept: Basic idea of sensor feedback and system correction.	8
II	Microcontrollers: Introduction, Definition, Difference between microprocessor and microcontroller, Arduino Uno Board, Pin diagram, power supply, digital vs analog pins, coding software (Arduino IDE). Basic Arduino Programming: Blink LED, Push button switch, Delay and loop functions Interfacing Sensors and Actuators IR sensor to detect obstacle: LDR to measure light, Relay to control a fan/bulb, Servo to rotate door or camera, Troubleshooting Basics, Common wiring and coding errors and how to fix them.	8
III	Introduction to IoT: Definition, daily applications: Smart home, smart irrigation, health monitoring. IoT Architecture, Basic concept: Wi-Fi Enabled Microcontrollers Node MCU / ESP8266 basics. How it differs from Arduino. IoT Platforms: Introduction of open-source cloud platform like Blynk App: To control devices via smartphone and Thing-Speak: For sending sensor data to cloud.	8
IV	Integration of Mechatronics with IoT	8

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	Sensors and actuators used with microcontroller + Wi-Fi to build smart systems. Real-Time Monitoring and Control Controlling devices through mobile apps using Internet connectivity. Hands-On Examples Smart Home System: Light and fan control from mobile Automatic Irrigation System: Soil sensor + pump control IoT Fire Alert: Temperature sensor + buzzer + cloud alert Safety and Precautions: Safe voltage levels, wiring precautions, handling Wi-Fi modules properly. Fault Finding in IoT Systems: Detecting connectivity issues, serial monitor debugging, using LEDs for status.	
V	Lab Work and Project Sensor Interfacing Experiments Connect LDR, IR sensor, and temperature sensor with Arduino. Use buzzer or LED as output indicator. Device Control Experiments DC Motor forward/reverse Servo Motor controlled by sensor Relay to turn on a fan or light IoT Integration Send data to mobile using Blynk Control fan from cloud dashboard Show temperature on graph using Thing Speak Mini Project Ideas Smart Dustbin (IR sensor + servo) Fire Alert System (DHT + buzzer + cloud) Room Automation (Relay + mobile control) Weather Station (Display sensor data on mobile) Project Report and Presentation Document project objectives, components used, working explanation, and testing results.	8

Text Books:

1. Bradley D.A., Burd N.C., Dawson D., Loader A.J., Mechatronics: Electronics in Products and Processes, Routledge.
2. Sami S.H and Kisheen Rao G The Internet of Mechanical Things: The IoT Framework for Mechanical Engineers, CRC Press.

Reference Books:

1. John Billingsley, Essentials of Mechatronics, Wiley.
2. David H., Gonzalo S., Patrick G., Rob B. and Jerome H., IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, Pearson Education.
3. Nitin G and Sharad S, Internet of Things: Robotic and Drone Technology, CRC Press.
4. Newton C. Braga, Mechatronics for The Evil Genius, McGrawHill.
5. Bell C., Beginning Sensor Networks with Arduino and Raspberry Pi, Apress.

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Exit Course after Second Year of B.Tech. Electronics & Telecommunication Engineering

Course Code: STEXETC422

Title of Course: **Introduction To Embedded System Design**

Teaching Scheme					Examination Scheme (Practical)			
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	CA	UA	Total
--	2	12	14	8	--	200	--	200

Course Description: This course provides in-depth knowledge of modern consumer electronics manufacturing technologies and advanced processes used in today's industrial environment. Embedded system design involves creating specialized computer systems that perform specific tasks, often in real-time, within resource constrained environments. These systems integrate hardware and software components to meet performance, power, reliability, and security requirements. Applications span consumer electronics, industrial automation, automotive, medical devices, and more. Effective design requires a deep understanding of microcontrollers, programming languages, and development tools, as well as consideration of factors like power consumption, reliability, and security. Through lab learning and practical case studies, students will develop the competencies necessary to apply advanced consumer electronics manufacturing methods in solving real-world engineering problems.

Course Objectives:

After completing the course, the students will be able to;

1 To design and manufacture embedded system products
2 To design embedded systems using a building block approach
3 To know embedded systems using a microcontroller MSP430
4 To learn effective embedded programming techniques in C
5 Build a mini project.

Course outcomes:

After completing the course, the students will be able to;

CO1 Acquire knowledge about devices and buses used in embedded networking
CO2 Develop programming skills in embedded systems for various applications.
CO3 Acquire knowledge about MSP430 Microcontroller
CO4 Acquire knowledge about MSP430 Timer Module and its Modes of Operation
CO5 Acquire knowledge about communication protocols.

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Unit	Content	Hours
I	Introduction to Embedded Systems and Computer Systems Terminology. Modular approach to Embedded System Design using Six-Box model: Input devices, output devices, embedded computer, communication block, host and storage elements and power supply.	8
II	Microcontroller Based Embedded System Design. Salient Features of Modern Microcontrollers. Elements of Microcontroller Ecosystem and their significance.	8
III	Introduction to MSP430 Microcontroller. Salient Features of MSP430 Microcontroller. Elements of MSP430 Microcontroller Ecosystem and their significance.	8
IV	Fundamentals of Physical Interfacing. Connecting Input Devices: Switches, Keyboard and Output devices: LEDs, Seven Segment Displays (SSD). Introduction to Embedded C. Interfacing LEDs and Switches with MSP430 using Digital Input and Output.	8
V	**Lab Work and Project:** **Lab Activities:** To develop the mini project, lab activities should be completed in accordance with the above curriculum and instructor suggestions. **Useful Link:** 1. Introduction to Embedded System Design - Course (nptel.ac.in) **Project Report and Presentation:** Document project objectives, components used, process parameters, working explanation, and inspecting results.	8

Textbooks:

1. Designing Embedded Hardware, John Catsoulis. 2nd edition. Shroff Publishers and Distributors. ISBN-10: 9788184042597
2. Embedded System Design: A Unified Hardware / Software Introduction. Tony Givargis and Frank Vahid. Wiley. ISBN-10: 812650837X

Reference Books:

1. MSP430 Microcontroller Basics. John H. Davies. Elsevier. ISBN-10: 9789380501857.
2. Programming Embedded Systems in C and C++. Micheal Barr. Shroff Publishers and Distributors. ISBN-10: 817366076X
3. Embedded System Design: A Unified Hardware / Software Introduction. Tony Givargis and Frank Vahid. Wiley. ISBN-10: 812650837X

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Exit Course after Second Year of B.Tech. Electronics & Telecommunication Engineering

Course Code: STEXETC423

Title of Course: **PCB Design With EAGLE**

Teaching Scheme					Examination Scheme (Practical)			
Lecture	Tutorial	Practical	Periods/week	Credits	Duration in Hours	CA	UA	Total
--	2	12	14	8	--	200	--	200

Course Description: This course introduces basic concepts of PCB Design. This course covers the basics of designing printed circuit boards (PCBs) using Autodesk Eagle. It includes creating schematics, designing board layouts, and preparing files for manufacturing.

Key topics include:

1. Setting up projects and libraries
2. Creating schematics and board layouts
3. Routing and optimizing PCB traces
4. Adding components and creating custom parts
5. Verifying design rules and generating manufacturing files.

By mastering Eagle's tools and features, designers can create efficient, reliable, and manufacturable PCBs for a wide range of applications.

Course Objectives:

After completing the course, the students will be able to;

1	To Learn Circuit design and PCB Design with the most powerful and most widely used tool Eagle
2	To be able to create single- and double-sided PCB Designs
3	To understand use of Eagle for PCB Design
4	To understand Gerber file and export Gerber file for production
5	To Start designing the boards

Course outcomes:

After completing the course, the students will be able to;

CO1	To design PCB with the most powerful and most widely used tool Eagle.
CO2	To design single- and double-sided PCB Designs.
CO3	To understand use of Eagle for PCB Design.
CO4	To understand Gerber file and export Gerber file for production.
CO5	To Start designing the boards.

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Unit	Content	Hours
I	Basics of Printed Circuit Board, Downloading Eagle, Software installation and creating the project.	8
II	An Overview of Circuit Boards and EAGLE Design, Overview of Circuit Design with EAGLE. Designing a Simple Circuit: An Inverting Amplifier, The Inverting Amplifier Schematic, Board Layout, Routing, CAM Processor Layout and Design Rules	8
III	Single Sided PCB Design, Single Sided PCB Design Hands on. Creating PCB Project, Copper Pour.	8
IV	Double Sided PCB Design. SMT Components, Create Custom Library Component in Eagle	8
V	**Lab Work and Project** **Lab Activities:** To develop the mini project, lab activities should be completed in accordance with the above curriculum and instructor suggestions. **Use Link:** 1. Learn the Art and Science of PCB Design with Eagle | Udemy **Project Report and Presentation** Document project objectives, components used, materials selections, working explanation, and testing results.	8

Textbooks:

1. Make Your Own PCBs with EAGLE: From Schematic Designs to Finished Boards 2nd Edition by Simon Monk (Author), Duncan Amos (Author).
2. Designing Circuit Boards with EAGLE: Make High-Quality PCBs at Low Cost by Matthew Scarpino, Released March 2014, Publisher(s): Pearson, ISBN: 9780133820027

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