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With CGPA 3.52

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जा.क./शिवाजी.वि/अं.म./460 दिनांकः- ०६/११/२०२६

प्रति,

मा. संचालक / प्राचार्य,
सर्व संलग्नित अभियांत्रीकी महाविद्यालये,
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विषयः- B.Tech. Part II अभ्यासकमातील किरकोळ दुरुस्तीबाबत.
संदर्भः- एसयु/बीओएस/सायन्स-टेक/३१५ दि.१६/०५/२०२५

महोदय,

उपरोक्त संदर्भिय विषयास अनुसररुन आपणास आदेशान्वये कळविण्यात येते की, विद्यापीठ अधिकार मंडळाने B.Tech. Part II Electronics and Computer Science अभ्यासकमाच्या सुधारीत आराखडयास मान्यता देण्यात आली आहे.

सोबत सुधारीत आराखडा व अभ्यासकमाची प्रत जोडली आहे. तसेच विद्यापीठाच्या https://www.unishivaji.ac.in (NEP-2020@suk/ Online syllabus) या संकेस्थळावर ठेवण्यात आला आहे. सदर दुरुस्ती ही शैक्षणिक वर्ष २०२६-२७ पासून लागू राहील.

सदर अभ्यासकम सर्व संबधित विद्यार्थी व शिक्षकांच्या निदर्शनास आणून द्यावेत ही विनंती.

कळावे.

आपला विश्वासू,

उपकुलसचिव
अभ्यास मंडळे विभाग

सोबत - अभ्यासकमाची प्रत,
प्रत :- माहितीसाठी व पुढील योग्यत्या कार्यवाहीसाठी

मा. संचालक, परीक्षा व मुल्यमापन मंडळ	प्र. अधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा
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पीजी प्रवेश विभागास	पीजी सेमिनार विभागास
संगणक केंद्र / आयटी सेल	पात्रता विभागास

Shivaji University
Kolhapur

Revised Syllabus
as per
National Education Policy 2020

S. Y. B. Tech.
Electronics and Computer Science

To be Implemented from

Academic Year 2026-27



First Year Exit: Teaching Methodology, Assessment and Evaluation

[I] As per R. R. B. Tech. 12.1 Rule: Award of Degree

If a student passes all the courses of first year and earns the requisite number of credits, the student will become entitled to Undergraduate Certificate (One year or two semesters) in the programme of his/her major subject. If he/she wants to exit, can exit the programme with UG Certificate. However, for the award of one year UG Certificate in Major with 44 credits, an additional 8 credits are required to earn.

[II] First Year Exit Course:

Methodology 1:

1. The students should complete two online certification courses (NPTEL) related to their programme, each of 3 credits. In addition to this, they will also need to complete 2 credits worth of two Virtual Lab work related to online certification courses. These additional 8 credits earn by students shall be based upon skill based vocational courses or internship/Apprenticeship.
2. The NPTEL courses are likely to be available online and can be completed at the student's own pace. The content will be specific to the student's field of study or programme. The skill based vocational courses shall be analogous to the Baskets/Areas provided by the concerned BoS.
3. The student must complete two virtual lab work that adds 2 credits to simulate practical or experimental learning experiences in a controlled virtual environment.

4. **Examination scheme:** The marks gained from the two NPTEL Courses (3 credits each) are converted to a total of 100 marks. The report for the two Virtual Lab work of 2 credits will be evaluated for 25 marks. The report should include a detailed write-up and analysis of the virtual lab experiments conducted, encompassing the methodology, results, and conclusions.
5. There may be uncertainty in availability of the NPTEL courses offered by concerned BoS as there is continuous updatation of the NPTEL courses. The students can choose equivalent NPTEL course of the required duration with prior permission from the concerned institute. The concerned institute should communicate to Concerned BoS for their permission. For NPTEL course registration, the students are required to visit to website https://swayam.gov.in and create their account. Log in the account and join the required course and follow the instructions to compete the course. Similarly, for Virual Lab, the students are required to visit to website https://www.vlab.co.in and create their account. Log in the account and join the required lab and follow the instructions to compete the course (need to perform all listed experiments under that Lab). To fulfill the requirement of 06 credits, students can go for two courses each of 12 weeks.

Methodology 2:

1. The students should complete two online certification courses (NPTEL) related to their programme, each carrying 2 credits. In addition to this, they will also need to complete 4 credits worth of two physical internship/Apprenticeship (each of 40 hrs) work from relevant

industry. These additional 8 credits earned by the students shall be based upon skill based vocational courses or internship/Apprenticeship.

2. The NPTEL courses are likely to be available online and can be completed at the student's own pace. The content will be specific to the student's field of study/programme. The skill-based vocational courses shall be analogous with the list provided by the concerned BoS.
3. The student should complete two physical internship/Apprenticeship (each of 40 hrs) work from relevant industrial practices that adds 4 credits to simulate practical or experimental learning experiences in a controlled virtual environment.
4. **Examination scheme:** The marks gained from the two NPTEL Courses (2 credits each) are converted to a total of 100 marks. The report for the performed two physical internship/Apprenticeship (each of 40 hrs) work from relevant industrial practices of 4 credits will be evaluated for 25 marks. The report should include a detailed write-up and analysis of two physical internship/Apprenticeship (each of 40 hrs) work along with certificate of internship/Apprenticeship from relevant industrial practices conducted, encompassing the methodology, results, and conclusions.
5. There may be uncertainty in availability of the NPTEL courses offered by concerned BoS as there is continuous updatation of the NPTEL courses. The students can choose equivalent NPTEL course of the required duration with prior permission from the concerned institute.

The concerned institute should communicate to Concerned BoS for their permission. For NPTEL course registration, the students are required to visit to website https://swayam.gov.in and create their account. Log in the account and join the required course and follow the instructions to compete the course.

Direct Second Year Entry: Teaching Methodology, Assessment and Evaluation

[I] For the students admitted directly into the second year of a programme (at the entry level) from a different programme, earning of an additional 2 credits is mandatory.

[II] As per R. R. B. Tech. 13.3 Rule, For direct second year admitted students (at entry level) to concern programme, the earning of additional 2 credits is mandatory. It is required to conduct examination and evaluation for same at institute level at the time of third semester ESE examination. The evaluation report must be submitted to The Director, Board of Examination and Evaluation, Shivaji University, Kolhapur.

[III] Examination scheme:

Students admitted directly into the second year of a programme from another programme are required to complete a 2-credit entry-level course as per the prescribed curriculum. This course should be completed at their own pace to ensure alignment with the programme foundational requirements. End Semester Examination (ESE) of 100 marks will be conducted at the institute level. It is mandatory to organize the examination and evaluate the performance of such students at the institute level during the third semester ESE. The evaluation report must be submitted to The Director, Board of Examination and Evaluation, Shivaji University, Kolhapur.

Guidelines for Open Elective Courses: Teaching Methodology, Assessment and Evaluation

Open Elective (OE) courses other than faculty of Science and Technology through Massive Open Online Courses (MOOCs) allowing students to engage with a broad spectrum of ideas and knowledge areas. The OE courses are likely to be available online and can be completed at the student's own pace within a set timeframe. For OE course, students are required to visit to the website https://swayam.gov.in for registration and create an account. Afterward, students should Login the account and join the course assigned by the course coordinator and follow the instructions to compete the course through self-learning mode. Additionally, the respective institution should download the relevant study materials to ensure students have access to them as needed. Minimum 25 students can register for one OE course in the concerned institute. There will be one course coordinator for one OE course. Students need to cover OE Courses of 08 credits. These 08 credits over semesters III to V. OE courses are chosen from faculty other than Faculty of Science and Technology. It is offered in Second and Third year as per Semester wise credit distribution table. Students need to take up the courses of 08 credits over semesters III to V.

1. **For Semester-III,** OE theory course of 3 credits consists of Mid Term Test (MT) of 10 Marks, Continuous Assessment (CA) of 30 Marks and End Semester Examination (ESE) of 60 Marks.
2. **For Semester-III,** OE practical lab course of 1 credit consists of Continuous Assessment (CA) of 25 Marks

and End Semester Examination-Practical Oral Examination (ESE-POE) of 25 Marks. Course Coordinator assigned by Institute should complete the selected course practical through expert of that course. The lab exercises and demonstrations prepared by concern expert must be aligned with the specific OE course that the students have chosen.

3. **For Semester-IV,** OE theory course of 2 credits consists of Mid Term Test (MT) of 10 Marks, Continuous Assessment (CA) of 30 Marks and End Semester Examination (ESE) of 60 Marks.
4. The Mid Term Test (MT) of 10 Marks based on selected OE Course will be conducted by Concerned Departmental Course Coordinator. The course expert of concerned faculty should set question paper of MSE and evaluate the same.
5. Online submitted assignments by students using SWAYAM platform for concerned OE course will be used for Continuous Assessment (CA) of 30 Marks by Concerned Departmental Course Coordinator appointed for particular course by Principal of the Institute. Assignments may be of varied in nature for OE course.
6. The ESE of OE courses will be conducted by the University. The setting of question papers for both MT and ESE, as well as the evaluation of the concerned OE course, should be carried out by the course expert from the Board of Studies (BoS) of the respective faculty

in accordance with the provisions under Panel of Paper Setters, Examiners, and Moderators – Clauses 41(f) and 48(3)(a).

Note: One OE course may be floated by the institute for 60 intake.

Open Electives Courses Offered to the students under Faculty of Science and Technology

In line with New Education Policy 2020

(Effective from Academic year 2025-26)

Open Electives

The students need to cover Open Elective Courses (OE) of 08 credits. These 08 credits over semesters III to V.

Semester wise credit distribution table for OE is given below

Sr. No.	Semester	Open Elective	Teaching scheme			Credits
			L	T	P	
01	III	OE-01	3	-	-	3
	III	OE-01 Lab	-	-	2	1
	IV	OE-02	2	-	-	2
02	V	OE-03	2	-	-	2
	Total		**7**	**-**	**2**	**8**

Semester wise baskets of OE from faculty other than Faculty of Science and Technology, Viz. Faculty of Commerce and Management, Faculty of Humanities and Faculty of Interdisciplinary Studies is given below

List of Open Elective Courses might be taken by students under Faculty of Science and Technology

Semester – III

Note: Choose any one course from the below basket of other than faculty in such way that the course with same name should not comes under or taught by major programme or the MDM.

Sr. No.	Name of the Course	Category	Duration (Weeks)	Credit Points	Institute Offering Course	Name of Professor/ Resource person	Link
01	Principles of Economics	Economics	12	03	IIT Madras	Prof. Sabuj Kumar Mandal	https://onlinecourses.nptel.ac.in/noc25_ec15/preview
02	German - I	Humanities and Social Science	12	03	IIT Madras	Prof. Milind Brahme	https://onlinecourses.nptel.ac.in/noc25_hs121/preview
03	Science, Technology and Society	Humanities and Social Science	12	03	IIT Guwahati	Prof. Sambit Mallick	https://onlinecourses.nptel.ac.in/noc25_hs189/preview
04	Environment and Development	Humanities and Social Science	12	03	IIT Guwahati	Prof. Ngamjahao Kipgen	https://onlinecourses.nptel.ac.in/noc25_hs195/preview
05	Logistics & Supply Chain Management	Humanities and Social Science	12	03	IIT Kharagpur	Prof. Vikas Thakur	https://onlinecourses.nptel.ac.in/noc25_hs205/preview
06	Introduction to Film Studies	Humanities and Social Sciences English studies	12	03	IIT Madras	Prof. Aysha Viswamohan	https://onlinecourses.nptel.ac.in/noc25_hs138/preview
07	Entrepreneurship	Management	12	03	IIT Madras	Prof. C Bhaktavatsala Rao	https://onlinecourses.nptel.ac.in/noc25_mg81/preview
08	Managerial Skills for Interpersonal Dynamics	Management	12	03	IIT Roorkee	Prof. Santosh Rangnekar	https://onlinecourses.nptel.ac.in/noc25_mg91/preview
09	Automation in Production Systems and Management	Management	12	03	IIT Kharagpur	Prof. Pradip Kumar Ray	https://onlinecourses.nptel.ac.in/noc25_mg135/preview
10	Numerical Methods for Engineers	Multidisciplinary	12	03	IIT Madras	Prof. Niket Kaisare	https://onlinecourses.nptel.ac.in/noc25_ge59/preview

Semester – IV

Note: Choose any one course from the below basket of other than faculty in such way that the course with same name should not comes under or taught by major programme or the MDM.

Sr. No.	Name of Course	Category	Duration (Weeks)	Credit Points	Institute Offering Course	Name of Professor/ Resource person	Link
01	Indian Business History	Humanities And Social Sciences	08	02	IIT Guwahati	Prof. Vipul Dutta	https://onlinecourses.nptel.ac.in/noc25_hs32/preview
02	Probability and Stochastic for Finance	Economic Sciences	08	02	IIT Kanpur	Prof. Joydeep Dutta	https://onlinecourses.nptel.ac.in/noc25_ma58/preview
03	Enhancing Soft Skills and Personality	Humanities and Social Sciences	08	02	IIT Kanpur	Prof. T. Ravichandran	https://onlinecourses.nptel.ac.in/noc25_hs87/preview
04	Mastering Speaking and Presentations: A case Based Approach	Humanities and Social Sciences	08	02	IIT Kharagpur	Prof. Seema Singh	https://onlinecourses.nptel.ac.in/noc25_hs96/preview
05	The Science of Happiness and Wellbeing	Humanities and Social Sciences	08	02	IIT Kharagpur	Prof. Priyadarshi Patnaik Prof. Manas K Mandal	https://onlinecourses.nptel.ac.in/noc25_hs103/preview
06	Philosophical Foundations Of Social Research	Humanities And Social Sciences	08	02	IIT Guwahati	Prof. Sambit Mallick	https://onlinecourses.nptel.ac.in/noc25_hs63/preview
07	Emotional Intelligence	Humanities and Social Science	08	02	IIT Kharagpur	Prof. Rabindra Kumar Pradhan	https://onlinecourses.nptel.ac.in/noc25_hs16/preview
08	Employment Communication: A Lab based course	Humanities and Social Science	08	02	IIT Kharagpur	Prof. Seema Singh	https://onlinecourses.nptel.ac.in/noc25_hs17/preview
09	Soft Skill Development	Humanities and Social Science	08	02	IIT Kharagpur	Prof. Priyadarshi Patnaik Prof. V. N. Giri Prof. D. Suar	https://onlinecourses.nptel.ac.in/noc25_hs72/preview
10	Social Behavior and the Brain: An Introduction to Social Neuroscience	Humanities and Social Science, Psychology, Neuroscience, Cognitive Science	08	02	IIT Kanpur	Prof. Ark Verma	https://onlinecourses.nptel.ac.in/noc25_hs101/preview
11	Economic Growth And Development	Humanities and Social Sciences	08	02	IIT Guwahati	Prof. Rajshree Bedamatta	https://onlinecourses.nptel.ac.in/noc25_hs11/preview

12	Effective Writing	Humanities and Social Sciences	08	02	IIT Roorkee	Prof. Binod Mishra	https://onlinecourses.nptel.ac.in/noc25_hs14/preview
13	Centre-State Relations in India	Law	08	02	IIT Kharagpur	Prof. Uday Shankar	https://onlinecourses.nptel.ac.in/noc25_lw04/preview
14	Foundation Course in Managerial Economics	Management	08	02	IIT Kharagpur	Prof. Barnali Nag	https://onlinecourses.nptel.ac.in/noc25_mg25/preview
15	International Marketing	Management	08	02	IIT Kharagpur	Prof. Biswarup Ghosh	https://onlinecourses.nptel.ac.in/noc25_mg32/preview
16	Introduction to System Dynamics Modeling	Management	08	02	IIT Bombay	Prof. Jayendran Venkateswaran	https://onlinecourses.nptel.ac.in/noc25_mg37/preview
17	Management of New Products and Services	Management	08	02	IIT Kharagpur	Prof. KBL Srivastava	https://onlinecourses.nptel.ac.in/noc25_mg44/preview
18	Business Forecasting	Management	08	02	IIT Bombay	Prof. Pankaj Dutta	https://onlinecourses.nptel.ac.in/noc25_mg66/preview
19	Yoga and Positive Psychology for Managing Career and Life	Management	08	02	IIT Bombay	Prof. Ashish Pandey	https://onlinecourses.nptel.ac.in/noc25_mg75/preview
20	Roadmap for patent creation	Multidisciplinary	08	02	IIT Kharagpur	Prof. Gouri Gargate	https://onlinecourses.nptel.ac.in/noc25_ge30/preview

Semester – V

Note: Choose any one course from the below basket of other than faculty in such way that the course with same name should not comes under or taught by major programme or the MDM.

Sr. No.	Name of Course	Category	Duration (Weeks)	Credit Points	Institute Offering Course	Name of Professor/ Resource person	Link
01	Enhancing Study Skills	Multidisciplinary	08	02	Indira Gandhi National Open University, New Delhi	Dr. P. Lakshmi; Dr. G. Mythili	https://onlinecourses.swayam2.ac.in/nou25_ge69/preview
02	Community Engagement and Social Responsibility	Multidisciplinary	10	02	Dayalbagh Educational Institute, Agra, Uttar Pradesh	Prof. Akshay Kumar Satsangi	https://onlinecourses.swayam2.ac.in/ugc25_ge10/preview
03	Economic Environment and Business Strategy	Economics	8	02	IIT Kanpur	Prof. Sukumar Vellakkal	https://onlinecourses.nptel.ac.in/noc25_ec16/preview
04	Corporate Social Responsibility	Management	8	02	IIT Kharagpur	Prof. Aradhna Malik	https://onlinecourses.nptel.ac.in/noc25_mg139/preview
05	Soft Skill Development	Humanities and Social Science	8	02	IIT Kharagpur	Prof. Priyadarshi Patnaik, Prof. V. N. Giri, Prof. D. Suar	https://onlinecourses.nptel.ac.in/noc25_hs142/preview
06	Developing Soft Skills and Personality	Humanities and Social Science	8	02	IIT Kanpur	Prof. T Ravichandran	https://onlinecourses.nptel.ac.in/noc25_hs174/preview
07	Introduction to Advanced Cognitive Processes	Humanities and Social Science	8	02	IIT Kanpur	Prof. Ark Verma	https://onlinecourses.nptel.ac.in/noc25_hs177/preview
08	Entrepreneurship and IP Strategy	Humanities and Social Science	8	02	IIT Kharagpur	Prof. Gouri Gargate	https://onlinecourses.nptel.ac.in/noc25_hs213/preview
09	Artificial Intelligence, Law and Justice	Law	8	02	NALSAR University of Law	Prof. Krishna Ravi Srinivas	https://onlinecourses.nptel.ac.in/noc25_lw12/preview
10	Innovation, Business Models and Entrepreneurship	Management	8	02	IIT Roorkee	Prof. Rajat Agrawal Prof. Vinay Sharma	https://onlinecourses.nptel.ac.in/noc25_mg95/preview
11	Organization Development and Change in 21st Century	Management	8	02	IIT Bombay	Prof. Ashish Pandey	https://onlinecourses.nptel.ac.in/noc25_mg103/preview

List of S. Y. B. Tech. Open Elective Courses Offered by Various Engineering Programmes under Faculty of Science and Technology for the students of the programmes under faculty other than Science and Technology, Viz. Faculty of Commerce and Management, Faculty of Humanities and Faculty of Interdisciplinary Studies of Shivaji University, Kolhapur

Sr. No.	Name of the Programme Offering Open Electives	Semester	Open Elective Course Title	Teaching scheme			Credits
				L	T	P	
01	Mechanical Engineering	III	OE-01:Marketing Management	3	-	-	3
		III	OE-01 Lab: Marketing Management Practical	-	-	2	1
		IV	OE-02: Entrepreneurship Development	2	-	-	2
02	Computer Science and Engineering	III	OE-01: Advanced Computer Graphics	3	-	-	3
		III	OE-01 Lab: Advanced Computer Graphics Lab	-	-	2	1
		IV	OE-02: Computer Organization & Architecture	2	-	-	2
03	Electronics and Computer Science	III	OE-01: Sensor & Applications	3	-	-	3
		III	OE-01 Lab: Sensor & Applications Lab	-	-	2	1
		IV	*OE-02: Block Chain Technology*	*2*	-	-	*2*
04	Computer Science and Engineering (AIML)	III	*OE-01: Programming Fundamentals using C++* *OR* *OE-01: Web Technologies*	3	-	-	3
		III	OE-01 Lab: Programming Fundamentals using C++ Lab	-	-	2	1
		IV	OE-02: *Advanced Computer Network* *OR* OE-02: *Software Development using Agile*	2	-	-	2
05	Civil Engineering	III	OE-01: Building Construction and Planning	3	-	-	3
		III	OE-01 Lab: Building Construction and Planning Lab	-	-	2	1
		IV	OE-02: Municipal Solid Waste Management	2	-	-	2

06	Electronics and Telecommunication Engineering	III	OE-01: Introduction To IoT	3	-	-	3
		III	OE-01 Lab: Introduction To IoT Lab	-	-	2	1
		IV	OE-02: Control System Engineering	2	-	-	2
07	Computer Science and Engineering (Data Science)	III	OE-01: Programming for Everyone	3	-	-	3
		III	OE-01 Lab: Programming for Everyone lab	-	-	2	1
		IV	OE-02: E-Commerce & Digital Marketing	2	-	-	2
08	Electrical Engineering	III	OE-01: Energy Storage Systems	3	-	-	3
		III	OE-01 Lab: Energy Storage Systems Lab	-	-	2	1
		IV	OE-02: Electrical Maintenance and Energy Audit	2	-	-	2
09	Artificial Intelligence & Data Science	III	OE-01: Computer Networks	3	-	-	3
		III	OE-01 Lab: Open Elective -01 Lab	-	-	2	1
		IV	OE-02: Ethics in AI & DS	2	-	-	2
10	Electrical and Computer Engineering	III	OE-01: Electrical Machine	3	-	-	3
		III	OE-01 Lab: Electrical Machines-I Lab	-	-	2	1
		IV	OE-02: Electrical Design Estimation and Costing	2	-	-	2
11	Mechanical Mechatronics Engineering (Additive Manufacturing)	III	OE-01: Auto CAD	3	-	-	3
		III	OE-01 Lab: Auto CAD Lab	-	-	2	1
		IV	OE-02: Design and Technology	2	-	-	2
12	Electronics and Communication Engineering (Bio-Medical Engineering)	III	OE-01: Solid and e-Waste Management	3	-	-	3
		III	OE-01 Lab: Solid and e-Waste Management Lab	-	-	2	1
		IV	OE-02: Hospital Safety and Management	2	-	-	2

Guidelines for Multidisciplinary Minor (MDM) Programmes

As per the directives of the Government of Maharashtra, engineering colleges are encouraged to update their curricula in alignment with the guidelines of the National Education Policy (NEP) 2020. As part of this transformative initiative, the 'Minor Programme' has been introduced to promote multidisciplinary learning at the undergraduate level. These programmes are structured to provide students with interdisciplinary knowledge, enhancing their core academic disciplines and preparing them to meet the evolving demands of the global job market.

Minor programmes across various disciplines have been introduced to provide students with the opportunity to explore fields beyond their core B. Tech curriculum. These programmes enable students from specific branches to broaden their knowledge and skill sets. For example, a student pursuing Mechanical Engineering can opt for a Minor in Computer Science and Engineering, thereby acquiring interdisciplinary expertise that enhances both academic depth and professional flexibility. However, students enrolled in the Computer Science and Engineering (CSE) programme are restricted from choosing MDM's in Artificial Intelligence and Data Science, CSE (Data Science), and CSE (Artificial Intelligence and Machine Learning) in order to prevent overlap between the core curriculum of CSE and the content of these minors, ensuring that students gain diverse and non-redundant knowledge through their minor specializations. **(Refer Table: MDM Courses)**

Common guidelines to students:

1. The Multidisciplinary Minor (MDM) must be compulsorily chosen from engineering discipline different from the student's Major engineering programme. Students should take MDM from the list of MDM Offered by Other Departments/Branches/ programmes only. Ex: A Student of Mechanical Engineering should take MDM from other departments/branches/Programmes except MDM offered by Mechanical Engineering Dept. **(Refer Table: MDM Courses)**
2. The entry point for any compulsory MDM programme is the 3rd semester. The required credits for MDM courses must be acquired from the 3rd semester of second year to the final year of UG Programme.
3. A student is required to continue with the selected Minor programme consistently throughout all six semesters.
4. No changes to the selected Minor programme will be permitted under any circumstances.
5. A student may choose only one Minor programme (track), from the list of MDM courses offered by the institute.
6. The allotment of the MDM course will be based on the marks obtained by the student in the first year for Sem-I and Sem-II combinely.
7. The compulsory MDM programme will admit a maximum of 75 students into its minor course, with selection strictly based on first-year academic merit. Preference order for allocating MDM minor will follow the hierarchy: Candidates with no backlogs first, then those with one backlog, followed by those with two backlogs, and so on.

8. All students must complete the Google form provided by the Institute, indicating their preferences to MDM programme within the specified deadline. Students should ensure that they enter their accurate first year marks in the form along with the attachment of marksheets of Sem-I and Sem-II to avoid any discrepancies.

(Refer Table: MDM Courses)

List of S. Y. B. Tech. MDM Courses Offered by the Various Programmes under the Faculty of Science and Technology at Shivaji University, Kolhapur

Sr. No.	Name of the Programme (Major) Offering MDM	Name of the corresponding Minor Programme to be offered	Semester	Name of the MDM Course offered by the Major Programme	Teaching scheme			Credits
					L	T	P	
01	Mechanical Engineering	1. Computer Science and Engineering 2. Electronics and Computer Science 3. Computer Science and Engineering (AIML) 4. Civil Engineering 5. Electronics and Telecommunication Engineering 6. Computer Science and Engineering (Data Science) 7. Electrical Engineering 8. Artificial Intelligence & Data Science 9. Electrical and Computer Engineering 10. Electronics and Communication Engineering (Bio-Medical Engineering)	III	MDM 01: Thermodynamics	2	-	-	2
			IV	MDM 02: Theory of Machines	2	-	-	2
02	Computer Science and Engineering	1. Mechanical Engineering 2. Civil Engineering 3. Electronics and Telecommunication Engineering 4. Electrical Engineering 5. Mechanical and Mechatronics Engineering (Additive Manufacturing) 6. Electronics and Communication Engineering (Bio-Medical Engineering)	III	MDM 01: Data Structures using C	2	-	-	2
			IV	MDM 02: Object Oriented Programming	2	-	-	2

03	Electronics and Computer Science	1. Mechanical Engineering 2. Civil Engineering 3. Electrical Engineering 4. Mechanical and Mechatronics Engineering (Additive Manufacturing)	III	MDM 01: Logic Design	2	-	-	2
			IV	MDM 02: Electronics Measurements	2	-	-	2
04	Computer Science and Engineering (AIML)	1. Mechanical Engineering 2. Civil Engineering 3. Electronics and Telecommunication Engineering 4. Electrical Engineering 5. Mechanical and Mechatronics Engineering (Additive Manufacturing) 6. Electronics and Communication Engineering (Bio-Medical Engineering)	III	MDM 01: Object Oriented Programming	2	-	-	2
			IV	MDM 02: Introduction to AI	2	-	-	2
05	Civil Engineering	1. Mechanical Engineering 2. Computer Science and Engineering 3. Electronics and Computer Science 4. Computer Science and Engineering (AIML) 5. Electronics and Telecommunication Engineering 6. Computer Science and Engineering (Data Science) 7. Electrical Engineering 8. Artificial Intelligence & Data Science 9. Electrical and Computer Engineering 10. Mechanical and Mechatronics Engineering (Additive Manufacturing) 11. Electronics and Communication Engineering (Bio-Medical Engineering)	III	MDM 01: Building Construction	2	-	-	2
			IV	MDM 02: Waste Management	2	-	-	2

06	Electronics and Telecommunication Engineering	1. Mechanical Engineering 2. Computer Science and Engineering 3. Computer Science and Engineering (AIML) 4. Civil Engineering 5. Computer Science and Engineering (Data Science) 6. Electrical Engineering 7. Artificial Intelligence & Data Science 8. Electrical and Computer Engineering 9. Mechanical and Mechatronics Engineering (Additive Manufacturing)	III	MDM 01: Electronics System	2	-	-	2
			IV	MDM 02: Electronics Measurements	2	-	-	2
07	Computer Science and Engineering (Data Science)	1. Mechanical Engineering 2. Civil Engineering 3. Electronics and Telecommunication Engineering 4. Electrical Engineering 5. Mechanical and Mechatronics Engineering (Additive Manufacturing) 6. Electronics and Communication Engineering (Bio-Medical Engineering)	III	MDM 01: C Programming	2	-	-	2
			IV	MDM 02: Python Programming	2	-	-	2

08	Electrical Engineering	1. Mechanical Engineering 2. Computer Science and Engineering 3. Electronics and Computer Science 4. Computer Science and Engineering (AIML) 5. Civil Engineering 6. Electronics and Telecommunication Engineering 7. Computer Science and Engineering (Data Science) 8. Artificial Intelligence & Data Science 9. Mechanical and Mechatronics Engineering (Additive Manufacturing) 10. Electronics and Communication Engineering (Bio-Medical Engineering)	III	MDM 01: Introduction to Electrical and Electronics Circuits	2	-	-	2
			IV	MDM 02: Electrical Power System	2	-	-	2
09	Artificial Intelligence & Data Science	1. Mechanical Engineering 2. Civil Engineering 3. Electronics and Telecommunication Engineering 4. Electrical Engineering 5. Mechanical and Mechatronics Engineering (Additive Manufacturing) 6. Electronics and Communication Engineering (Bio-Medical Engineering)	III	MDM 01: Fundamentals of AI	2	-	-	2
			IV	MDM 02: Python for Data Science	2	-	-	2
10	Electrical and Computer Engineering	1. Mechanical Engineering 2. Civil Engineering 3. Electronics and Telecommunication Engineering 4. Mechanical and Mechatronics Engineering (Additive Manufacturing) 5. Electronics and Communication Engineering (Bio-Medical Engineering)	III	MDM 01: Renewable Energy Sources	2	-	-	2
			IV	MDM 02: Python Programming	2	-	-	2

11	Mechanical and Mechatronics Engineering (Additive Manufacturing)	1. Computer Science and Engineering 2. Electronics and Computer Science 3. Computer Science and Engineering (AIML) 4. Civil Engineering 5. Electronics and Telecommunication Engineering 6. Computer Science and Engineering (Data Science) 7. Electrical Engineering 8. Artificial Intelligence & Data Science 9. Electrical and Computer Engineering 10. Electronics and Communication Engineering (Bio-Medical Engineering)	III	MDM 01: Computer Aided Design (CAD)	2	-	-	2
			IV	MDM 02: Product Design & Development	2	-	-	2
12	Electronics and Communication Engineering (Bio-Medical Engineering)	1. Mechanical Engineering 2. Computer Science and Engineering 3. Computer Science and Engineering (AIML) 4. Civil Engineering 5. Computer Science and Engineering (Data Science) 6. Electrical Engineering 7. Artificial Intelligence & Data Science 8. Electrical and Computer Engineering 9. Mechanical and Mechatronics Engineering (Additive Manufacturing)	III	MDM 01: Data Analytics for Healthcare System	2	-	-	2
			IV	MDM 02: Environmental Management in Healthcare	2	-	-	2

Second Year Exit: Teaching Methodology, Assessment and Evaluation

[I] As per R. R. B. Tech. 12.2 Rule: Award of Degree

If a student passes all the courses of first year, second year and earns the requisite number of credits, the student will become entitled to Undergraduate Diploma (Two years or four semesters) in the programme of his/her major subject. If he/she wants to exit, can exit the programme with UG Diploma certificate. However, for the award of two years UG Diploma Certificate in Major with 88 credits, an additional 8 credits from Exit Courses are required to earn.

[II] Second Year Exit Course:

Methodology 1:

1. The students should complete two online certification courses (NPTEL) related to their programme, each of 3 credits. In addition to this, they will also need to complete 2 credits worth of two Virtual Lab work related to online certification courses. These additional 8 credits earn by students shall be based upon skill based vocational courses or internship/Apprenticeship.
2. The NPTEL courses are likely to be available online and can be completed at the student's own pace. The content will be specific to the student's field of study or programme. The skill based vocational courses shall be analogous to the Baskets/Areas provided by the concerned BoS.

3. The student must complete two virtual lab work that adds 2 credits to simulate practical or experimental learning experiences in a controlled virtual environment.
4. **Examination scheme:** The marks gained from the two NPTEL Courses (3 credits each) are converted to a total of 100 marks. The report for the two Virtual Lab work of 2 credits will be evaluated for 25 marks. The report should include a detailed write-up and analysis of the virtual lab experiments conducted, encompassing the methodology, results, and conclusions.
5. There may be uncertainty in availability of the NPTEL courses offered by concerned BoS as there is continuous updatation of the NPTEL courses. The students can choose equivalent NPTEL course of the required duration with prior permission from the concerned institute. The concerned institute should communicate to Concerned BoS for their permission. For NPTEL course registration, the students are required to visit to website https://swayam.gov.in and create their account. Log in the account and join the required course and follow the instructions to compete the course. Similarly, for Virual Lab, the students are required to visit to website https://www.vlab.co.in and create their account. Log in the account and join the required lab and follow the instructions to compete the course (need to perform all listed experiments under that Lab). To fulfill the requirement of 06 credits, students can go for two courses each of 12 weeks.

Methodology 2:

1. The students should complete two online certification courses (NPTEL) related to their programme, each carrying 2 credits. In addition to this, they will also need to complete 4 credits worth of two physical internship/Apprenticeship (each of 40 hrs) work from relevant industry. These additional 8 credits earned by the students shall be based upon skill based vocational courses or internship/Apprenticeship.
2. The NPTEL courses are likely to be available online and can be completed at the student's own pace. The content will be specific to the student's field of study/programme. The skill-based vocational courses shall be analogous with the list provided by the concerned BoS.
3. The student should complete two physical internship/Apprenticeship (each of 40 hrs) work from relevant industrial practices that adds 4 credits to simulate practical or experimental learning experiences in a controlled virtual environment.
4. **Examination scheme:** The marks gained from the two NPTEL Courses (2 credits each) are converted to a total of 100 marks. The report for the performed two physical internship/Apprenticeship (each of 40 hrs) work from relevant industrial practices of 4 credits will be evaluated for 25 marks. The report should include a detailed write-up and analysis of two physical internship/Apprenticeship (each of 40 hrs) work along with certificate of internship/Apprenticeship from

relevant industrial practices conducted, encompassing the methodology, results, and conclusions.

5. There may be uncertainty in availability of the NPTEL courses offered by concerned BoS as there is continuous updatation of the NPTEL courses. The students can choose equivalent NPTEL course of the required duration with prior permission from the concerned institute. The concerned institute should communicate to Concerned BoS for their permission. For NPTEL course registration, the students are required to visit to website https://swayam.gov.in and create their account. Log in the account and join the required course and follow the instructions to compete the course.

शिवाजी विद्यापीठ, कोल्हापूर
SHIVAJI UNIVERSITY, KOLHAPUR

Exit Course for Computer Science and Engineering After 1st Year

- As part of the NEP 2020 Revised Syllabus, for the First Year B. Tech Exit, students must earn a total of 8 additional credits. This includes 6 credits from online SWAYAM NPTEL courses and 2 credits from Virtual Lab performance.
- Students must complete two SWAYAM NPTEL courses (12-week duration) from the provided list and successfully perform two Virtual Labs from the specified list.
- Each SWAYAM NPTEL course carries 3 credits, while each Virtual Lab is worth 1 credit.

Sr. No.	Name of NPTEL Course
1	An Introduction to Programming Through C++
2	Computer Networks and Internet Protocol
3	Discrete Mathematics
4	Problem Solving Through Programming In C
5	Programming In Modern C++
6	The Joy of Computing Using Python

Sr. No.	Name of Virtual Lab
1	Computer Programming Lab
2	Data Structures Lab
3	Problem Solving Lab
4	Python Programming Lab

Examination Scheme

- Swayam NPTEL Course Certificate Should be submitted to Department — 6 Credits
- Lab Experiments Report must be prepared and submitted to department — 2 Credits

Earning of additional 2 mandatory credits for direct second year admitted students to

Electronics and Computer Science branch

Sr. No.	Semester	Subject	Credit
1	III	Basics of Electronics Engineering	2

Basics of Electronics Engineering

Lectures :--
Credit : 2
Practical : --

Evaluation Scheme
MT : --
CA :--
ESE :

Course Outcomes:		
COs	**At the end of successful completion of the course, the student will be able to**	**Blooms Taxonomy**
CO1	Understand passive semiconductor devices applications	Understand
CO2	Understand active semiconductor devices applications	Understand
CO3	Analyze different biasing circuits and low frequency response of an amplifier	Analyze
CO4	Gain knowledge about fundamentals of Operational amplifiers and various applications	Remember
CO5	Apply fundamental techniques of digital design	Apply

Unit No	**Content**	**Hours**
Unit 1	**Semiconductor Diode**	
	Intrinsic & extrinsic semiconductors, Construction of PN Junction diode working and V-I characteristics of diode. Special purpose diodes characteristics, construction and advantages, disadvantages and applications o Zener diode LED	**5 Hrs.**
Unit 2	**Rectifiers & Filters**	
	Need of rectifiers, definition, types of rectifiers- half wave rectifiers, full wave rectifiers (bridge and center tapped), circuit operation, input and outpu waveforms for voltage & current, comparison of three rectifiers. Need of filters and definition, types of filters-shunt capacitor, series inductor, ∏ filter, circui operation, input and output waveforms, limitations and advantages.	**5 Hrs.**

Unit 3	**Transistor**	
	Bipolar junction transistor- symbol, types and working principle of NPN and PNP transistors, Transistor configuration-CB,CE & CC, Input & outpu characteristic, biasing of transistor of transistors- fixed bias, voltage divide bias, emitter bias, DC load line and thermal runaway	**5 Hrs.**
Unit 4	**Amplifiers**	
	Concept of amplification, small signal amplifier using BJT, single stage CE amplifier, working and frequency response, multistage amplifier- need and types of amplifier coupling- RC coupling, transformer coupling, direc coupling, merits and demerits of each and applications.	**5 Hrs.**
Unit 5	**Operational Amplifier (IC-741)**	
	Introduction to op-amp, block diagram of op-amp, ideal and practica specifications of op-amp, Applications of op-amp as inverting amplifier, non inverting amplifier, integrator, differentiator and comparator.	**4 Hrs.**
Unit 6	**Digital Electronics**	
	Logic gates and Boolean algebra, combinational logic circuits- adde subtractor and its types, Multiplexer and de-multiplexer, Number system and its types- binary, octal, decimal, hexadecimal, conversions in numbe system	**4 Hrs.**

Text Books

1 A Text Book of Applied Electronics by R. S. Sedha
2 Basic Electronics Engineering by Vijay Baru
3 Digital Principles & Applications by Albert Malvino
4 Principle of Electronics by V.K. Mehata

Reference Books

1 Fundamental of Digital Circuits by A. Anand Kumar (PHI-Publication).
2 Fundamental of Electronics Engineering by R. Prasad (CENGAGE- Learning).
3 Electronics Circuits And Systems by Owen Bishop.
4 Integrated Electronics Analog And Digital & System by Jacob Millman. Christos C. Halkias.
5 Electronics Devices and Circuit theory by Robert Boylestad, Louis Mashlsky (Peerson Publication).

SCHEME OF INSTRUCTION & SYLLABI

Name of Programme: Electronics and Computer Science

Scheme of Instructions: Second Year B. Tech. in Electronics and Computer Science

Semester – III

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Course Credits	EXAM SCHEME			
									Internal Evaluation (IE)		ESE	TOTAL
									MT	CA		
1	PCC	ECS0231	Control & Instrumentation	3	–	–	3	3	10	30	60	100
2	PCC	ECS0232	Analog Circuits	3	–	–	3	3	10	30	60	100
3	PCC	ECS0233	Data Structure & Algorithm	3	–	–	3	3	10	30	60	100
4	MDM	ECS0234	Multi-disciplinary Minor–01	2	–	–	2	2	10	30	60	100
5	OE	ECS0235	Open Elective -01	3	–	–	3	3	10	30	60	100
6	OE	ECS0236	Open Elective -01 Lab	–	–	2	2	1	–	25	25	50
7	PCC	ECS0237	Analog Circuits Lab	–	–	2	2	1	–	25	50	75
8	PCC	ECS0238	C++ Lab	1	–	2	3	2	–	25	50	75
9	HSSM	ECS0239	Universal Human Values	2	–	–	2	2	–	50	–	50
10	HSSM	ECS02310	Soft Skill Development	2	–	–	2	2	–	25	25	50
			Total	**19**	**--**	**6**	**25**	**22**	**50**	**300**	**450**	**800**

L-Lecture T-Tutorial P-Practical

IE-Internal Evaluation MT-Midterm Test CA-Continuous Assessment ESE-End Semester Examination (For Laboratory End Semester performance)

Course Category	Basic Science Courses (BSC)	Engineering Science Courses (ESC)	Programme Core Course (PCC)	Programme Elective Course (PEC)	Open Elective other than particular Programme (OE/MDM)	Vocational and Skill Enhancement Course(VSEC)	Humanities Social Science and Management (HSSM)	Experiential Learning (EL)	Co-curricular and Extracurricular Activities (CCA)
Last Sem. Cumulative Sum	**16**	**16**	**--**	**--**	**--**	**06**	**04**	**--**	**02**
Semester Credits	--	**--**	**12**	**--**	**06**	**--**	**04**	**--**	**--**
Cumulative Sum	**16**	**16**	**12**	**--**	**06**	**06**	**08**	**--**	**02**

PROGRESSIVE TOTAL CREDITS: 44 + 22 = 66

SCHEME OF INSTRUCTION & SYLLABI

Name of Programme: Electronics and Computer Science

Scheme of Instructions: Second Year B. Tech.in Electronics and Computer Science

Semester– IV

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Course Credits	EXAM SCHEME			
									Internal Evaluation (IE)		ESE	TOTAL
									MT	CA		
1	PCC	ECS0241	Digital System & VLSI	3	1	–	4	4	10	30	60	100
2	PCC	ECS0242	Computer Network	3	–	–	3	3	10	30	60	100
3	PCC	ECS0243	Operating System	3	–	–	3	3	10	30	60	100
4	MDM	ECS0244	Multi-disciplinary Minor–02	2	–	–	2	2	10	30	60	100
5	OE	ECS0245	Open Elective -02	2	–	–	2	2	10	30	60	100
6	PCC	ECS0247	Computer Network Lab	–	–	2	2	1	–	25	50	75
7	VEC	ECS0248	Humanity Science	–	–	2	2	1	–	50	25	75
8	HSSM	ECS0249	Employability Enhancement Skill	2	–	–	2	2	–	50	–	50
9	HSSM	ECS02410	Professional Ethics	2	–	–	2	2	–	25	–	25
10	VEC	ECS02411	Electronics Workshop 1	–	–	2	2	1	–	25	25	50
11	VEC	ECS02412	Simulation Lab	–	–	2	2	1	–	25	–	25
12	BSC	ECS02413	Environmental Science	2	–	–	2	Audit	10	30	60	100
			Total	**19**	**01**	**08**	**28**	**22**	**60**	**380**	**460**	**800+100** (Audit)

L-Lecture T-Tutorial P-Practical

IE-Internal Evaluation MT-Midterm Test CA-Continuous Assessment ESE-End Semester Examination (For Laboratory End Semester performance)

Course Category	Basic Science Courses (BSC)	Engineering Science Courses (ESC)	Programme Core Course (PCC)	Programme Elective Course (PEC)	Open Elective Other than Particular Programme (OE/MDM)	Vocational and Skill Enhancement Course (VSEC)	Humanities Social Science and Management (HSSM)	Experiential Learning (EL)	Co-curricular and Extracurricular Activities (CCA)
Last Sem. Cumulative Sum	**16**	**16**	**12**	--	**06**	**06**	**08**	--	**02**
Semester Credits	**–**	**–**	**11**	**–**	**04**	**–**	**07**	**–**	**–**
Cumulative Sum	**16**	**16**	**23**	**–**	**10**	**06**	**15**	**–**	**02**

PROGRESSIVE TOTAL CREDITS: 66 + 22 = 88

Control & Instrumentation

Lectures	**:**	**3 Hrs. / Week**	**Evaluation Scheme**
Credit	**:**	**3**	**MT :** 10 Marks
Tutorial	**:**	**NA**	**CA :** 30 Marks
			ESE : 60 Marks
			Duration of ESE: 02 Hrs

Course Objectives: The objective of the course is to

1. To develop the ability to model control systems and determine their time response and frequency response.
2. To develop the ability to analyze stability of control systems.
3. To develop the ability to understand instruments and data acquisition systems.

Course Outcomes:

COs	At the end of successful completion of the course, the student will be able to	Blooms Taxonomy
CO1	Determine the transfer functions for the given control systems.	Understand
CO2	Analyze the response and stability of control systems based on the time domain specifications.	Apply
CO3	Analyze the response and stability of control systems based on the frequency domain specifications.	Apply
CO4	Understand and explain the working principle of sensors and transducers.	Understand
CO5	Explain all components of data acquisition systems.	Remember
CO6	Describe instrument communication standards.	Remember

Unit No	Content	Hours
Unit 1	**Introduction to Control Systems and Mathematical Models**	
	1.1 Introduction to control systems: The control system, servomechanisms, digital control. 1.2 Mathematical models: Transfer functions, block diagram algebra, block diagram reduction, signal flow graphs.	**07 Hrs.**
Unit 2	**Time response analysis and stability analysis in time domain**	
	2.1 Time response analysis: standard test signals, time response of first and second order systems, steady state errors and error constants. 2.2 Stability in time domain: The concept of stability, necessary conditions for stability, Hurwitz stability criterion, Routh stability criterion, relative stability analysis. 2.3 Stability analysis using root locus technique.	**07 Hrs.**
Unit 3	**Stability Analysis in frequency domain and Introduction to advances in control systems**	
	3.1 Introduction to frequency response analysis, correlation between time and frequency domain. 3.2 Stability analysis using Bode plots. 3.3 Nyquist stability criterion and stability analysis using Nyquist plot. 3.4 Introduction to advances in control systems: adaptive control, fuzzy logic control and neural networks. Introduction to distributed control systems.	**07 Hrs.**
Unit 4	**Sensors and Transducers**	
	4.1 Introduction to sensors and transducers. Various types of sensors. Various types of transducers and their principle of operation. Selection criteria of transducers. 4.2 Displacement and pressure transducers: potentiometers, pressure gauges, Linear variable differential transducer (LVDT), strain gauges. 4.3 Temperature transducers: working principle, ranges and applications of resistance temperature detectors (RTD), thermocouple and thermistor temperature transducers.	**08 Hrs.**
Unit 5	**Signal conditioning DAS, Data logger and SCADA**	
	5.1 Introduction to instrumentation systems, data acquisition system (DAS), use of DAS in Intelligent instrumentation system. Design of pressure and temperature measuremer system using DAS. Data logger, its types and applications. SCADA communicatior architecture, types, applications, open SCADA protocols. Cloud based SCADA systems. Introduction to fibre optic instrumentation.	**07 Hrs.**
Unit 6	**Telemetry and Instrument communication standards**	
	6.1 Introduction to telemetry, landline telemetry, radio telemetry and types of multiplexing. 6.2 Instrument interfacing, Current loop, RS232/485, Field bus, Modbus, GPIB, USB Protocol, and HART communication Protocol.	**06 Hrs.**

References:

Reference Books	
1	K. Ogata, “Modern Control Engineering”, PHI, New Delhi
2	Norman S. Nise, “Control System Engineering”, John Wiley and Sons.
3	B. C. Kuo, “Automatic Control Systems”, PHI, New Delhi
4	C. S. Rangan, G. R. Sharma and V. S. Mani, „Instrumentation Devices and Systems“, Tata McGraw-Hill Publishing Company Ltd.
5	Helfrick & Cooper, “Modern Electronic Instrumentation & Measuring Techniques” – PHI

Text Books:

Text Books	
1	I. J. Nagrath, M. Gopal, “Control System Engineering”, 5th edition, New Age International Publishers 2. B. S. Manke, “Linear Control Systems”, Khanna Publishers, New Delhi.
2	D. Patranabis, “Principle of Industrial Instrumentation”, Tata McGraw Hill.
3	A.K. Sawhney, “Electrical & Electronic Measurement & Instrumentation” – DRS. India
4	H.S.Kalsi, “Electronic Instrumentation”-TMH, 2nd Edition

Note: For Control & Instrumentation Course, Graph Papers are required for End Semester Examination of Shivaji University, Kolhapur.

Analog Circuit

Lectures	**:**	**3 Hrs.. / Week**	**Evaluation Scheme**	
Credit	**:**	**3**	**MT**	**:** 10 Marks
Practical	**:--**		**CA**	**:** 30Marks
			ESE	**:** 60 Marks
			Duration of ESE	: 02 Hrs

Course Objectives: The objective of the course is to
01 Provide an introduction and basic understanding of Semiconductor Devices viz. diodes and BJT, JFET. 2 Provide basic analog electronic circuit design techniques using diodes and bipolar junction transistors and to develop analytical skills. 3 Develop student ability to apply basic engineering sciences to understand the operation& analysis of electronic circuits using diodes and bipolar junction transistors. 4 Design electronic circuits to meet the desired specifications.

Course Outcomes:

COs	**At the end of successful completion of the course, the student will be able to**	**Blooms Taxonomy**
CO1	Analyze and design electronic circuits such as rectifiers & unregulated power supply.	Analyze
CO2	Analyze and design electronic circuits such as regulated power supply.	Analyze
CO3	Analyze & Design of BJT & FET Biasing.	Analyze
CO4	Explain the hybrid model of transistor and analyze the transistor amplifier (CE, CB, CC) using h-parameters	Apply
CO5	Analysis of CE Amplifier for low frequency & High frequency response for sinusoidal & square wave input.	Analyze
CO6	Analyze & Design LPF, HPF, Clipper, Clampers, Multipliers	Analyze

Unit No	Content	Hours
Unit 1	**Wave Shaping Circuits:**	
	Low pass & high pass RC circuits (analysis for square, step, ramp, exponential input), High pass RC circuit as a differentiator, Low pass RC circuit as integrator. Clipping circuits: diode clippers, transistor clippers, Transfer characteristics, clamping circuits: Classification, clamping operations, Clamping circuit theorem, practical clamping circuits, and voltage multipliers.	**08 Hrs.**
Unit 2	**Unregulated Power Supplies:**	
	Rectifiers: Half wave, full wave: center tap and bridge type, analysis for differen parameters: PIV, TUF, efficiency, ripple factor, regulation, form factor etc. Filters: Need of filters, Types: capacitor, inductor, LC, CLC, and Analysis for ripple factor. Design of unregulated power supply with filter using full wave rectifier.	**08Hrs.**
Unit 3	**Voltage Regulators:**	
	Need of voltage regulator, Stabilization factors, Analysis & Design of Shunt regulator (using Zener diode & BJT), emitter follower regulator, series pass voltage regulator (using BJT), Pre- regulator & Overload protection circuit.	**08Hrs.**
Unit 4	**BJT & FET Biasing:**	
	Introduction to BJT, Need of Biasing, generalized stability factor derivation, Biasing o CE configuration-Fixed Bias, Collector to Base Bias & Voltage Divider Bias (Analysis & Design of the same with & without Re). Introduction to JFET, Biasing of CS configuration- Fixed Bias, Self Bias (Analysis & Design of the same). MOSFET EMOSFET & DMOSFET (Working & Characteristics)	**08 Hrs.**
Unit 5	**Voltage Amplifiers:**	
	H-Parameters, Hybrid model for transistor (CE, CB& CC configuration), amplifier equations for Voltage Gain, Current gain, Input resistance & Output resistance taking Rg of source into account. (Numerical are expected)	**08 Hrs.**
Unit 6	**Frequency Response of Single Stage RC Coupled Amplifier:**	
	Low frequency response: Effect of emitter bypass capacitor (CE) & Coupling capacito (CC), Amplifier response to square wave, percentage Sag calculation, (Numerical are expected) High frequency response: Hybrid π model, Derivation for CE short circuit & resistive current gain, β cutoff, α cutoff frequency, amplifier high freq. response to square wave, gain band width product, (Numerical are expected). Design of single stage RC coupled amplifier.	**08 Hrs.**

References:

Reference Books	
1	Electronic devices & circuits, David A. Bell, Oxford University
2	Electronic devices & circuits", Salivahanan, N Sureshkumar, Tata McGraw Hill Publication
3	Electronic devices & circuit theory, Robert L. Boylsted, Louis Nashelsky, Pearson Education

Text Books:

Text Books	
1	Electronic devices & circuits, Allen Motter shed Prentice- Hall India
2	Electronic devices & circuits, J. Millman & C. Halkias, Tata McGraw Hill Publication
3	A Monograph on Electronics Design Principles N.C. Goyal & R.K. Khetan-Khanna Publishers
4	Pulse digital and switching circuits Millman Taub, Tata MC Graw hill 2nd edition

Data Structures and Algorithms

Lectures	**: 3 Hrs.. / Week**	**Evaluation Scheme**	
Credit	**: 3**	**MT :**	10 Marks
Practical	**: --**	**CA :**	30 Marks
		ESE :	60 Marks
		Duration of ESE**:**	02 Hrs

Course Objectives: The objective of the course is to
1. To understand and demonstrate basic data structures (such as Arrays, linked list, stack, queue, binary tree, graph). 2. To implement various operations on data structures. 3. To study different sorting and searching techniques. 4. To choose efficient data structures and apply them to solve real world problems

Course Outcomes:

COs	**At the end of successful completion of the course, the student will be able to**	**Blooms Taxonomy**
CO1	Implement various linear data structures	Apply
CO2	Implement various nonlinear data structures.	Apply
CO3	Select appropriate sorting and searching techniques for a given problem and use it	Analyze
CO4	Develop solutions for real world problems by selecting appropriate data structure and algorithms.	Apply
CO5	Analyze the complexity of the given algorithms.	Analyze
CO6	Analyze & Design LPF, HPF, Clipper, Clampers, Multipliers	Analyze

Unit No	Content	Hours
Unit 1	**Introduction to Data Structures:**	
	Introduction to Data Structures, Types of Data Structures – Linear and Nonlinear Operations on Data Structures, Concept of array, Static arrays vs Dynamic Arrays structures. Introduction to Analysis of Algorithms, characteristics of algorithms, Time and Space complexities, Asymptotic notations.	**07 Hrs.**
Unit 2	**Stack and Queues:**	
	Introduction, Basic Stack Operations, Representation of a Stack using Array Applications of Stack – Well form-ness of Parenthesis, Infix to Postfix Conversion and Postfix Evaluation. Queue, Operations on Queue. Representation of a Queue using array, Circular Queue, concept of priority Queue.	**06Hrs.**
Unit 3	**Linked List**	
	Introduction, Representation of Linked List, Linked List v/s Array, Types of Linked List - Singly Linked List (SLL), Operations on Singly Linked List: Insertion, Deletion, reversal of SLL, Print SLL. Implementation of Stack and Queue using Singly Linked List. Applications of doubly Linked List and Circular Linked List	**08Hrs.**
Unit 4	**Trees**	
	Introduction, Tree Terminologies, Binary Tree, Types of Binary Tree, Representation of Binary Trees, Binary Tree Traversals, Binary Search Tree Operations on Binary Search Tree, Applications of Binary Tree – Expression Tree, Huffman Encoding.	**07Hrs.**
Unit 5	**Graphs**	
	Introduction, Graph Terminologies, Representation of graph (Adjacency matrix and adjacency list), Graph Traversals – Depth First Search (DFS) and Breadth First Search (BFS), Application – Topological Sorting	**06 Hrs.**
Unit 6	**Introduction to Sorting and Searching:**	
	Introduction to Searching: Linear search, Binary search, Sorting: Internal VS. External Sorting, Sorting Techniques: Bubble, Insertion, selection, Quick Sort, Merge Sort, Comparison of sorting Techniques based on their complexity. Hashing Techniques, Different Hash functions, Collision & Collision resolution techniques: Linear and Quadratic probing, Double hashing.	**08 Hrs.**

References:

Reference Books	
1	Data Structure Using C, Balagurusamy
2	Data Structures using C and C++, Rajesh K Shukla, Wiley – India
3	ALGORITHMS Design and Analysis, Bhasin, OXFORD.
4	Data Structures Using C, ISRD Group, Second Edition, Tata McGraw-Hill.
5	Computer Algorithms by Ellis Horowitz and Sartaj Sahni, Universities Press.
6	Data Structures, Adapted by: GAV PAI, Schaum‟s Outline

Text Books:

Text Books	
1	
2	Introduction to Data Structure and its Applications Jean-Paul Tremblay, P. G.Sorenson
3	Data Structures using C, Reema Thareja, Oxford
4	C and Data structures, Prof. P.S.Deshpande, Prof. O.G.Kakde, Dreamtech Press.
5	Data Structures: A Pseudocode Approach with C, Richard F. Gilberg& Behrouz A. Forouzan, Second Edition, CENGAGE Learning

Multi-disciplinary Minor–01

Logic Design

Theory : 2 Hrs./Week

Credit : 2

Evaluation Scheme

MT : 10 Marks

CA : 30 Marks

ESE : 60 Marks

Duration of ESE : 02 Hrs

Course Objectives: The objective of the course is to
1. Understand and apply number systems and coding techniques 2. Develop proficiency in Boolean algebra and logic gate operations 3. Apply minimization techniques for digital circuit optimization 4. Design and analyze combinational and sequential digital circuits

Course Outcomes:

COs	**At the end of successful completion of the course, the student will be able to**	**Blooms Taxonomy**
CO1	Be able to manipulate numeric information in different forms	Understand
CO2	Be able to manipulate simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.	Apply
CO3	Be able to design and analyze small combinational circuits and to use standard combinational functions to build larger more complex circuits.	Analyze
CO4	Be able to design and analyze small sequential circuits and to use standard sequential functions to build larger more complex circuits	Analyze

Unit No.	Content	Hours
Unit 1	**Number System:**	
	Number Systems, Base Conversion Methods, Complements of Numbers, Codes- Binary Codes, Binary Coded Decimal Code and its Properties, Unit Distance Codes, Error Detecting and Correcting Codes	**03 Hrs.**
Unit 2	**Boolean Algebra:**	
	Digital Logic Gates (AND, NAND, OR, NOR, EX-OR, EX-NOR), Properties of XOR Gates, Universe.	**05 Hrs.**
Unit 3	**Minimization Techniques:**	
	Introduction, The minimization with theorems, The Karnaugh Map Method, Three, Four and Five variable K- Maps, Prime and Essential Implications, Don"t Care Map Entries, Using the Maps for Simplifying, Quine-McCluskey Method, Multilevel NAND/NOR realizations.	**05 Hrs.**
Unit 4	**Combinational Circuits 1:**	
	Design Procedure – Half Adder, Full Adder, Half Subtractor, Full Subtractor, Parallel Binary Adder, Parallel binary subtractor, Binary Multiplie Multiplexers/De Multiplexers, decoder, Encoder, Code Converters, Magnitude Comparator.	**05 Hrs.**
Unit 5	**Combinational Circuits 2:**	
	classification of sequential circuits, The binary cell, The S-R-Latch Flip-Flop The D-Latch Flip-Flop, The "Clocked T" Flip-Flop, The " Clocked J-K" Flip-Flop, Design of a Clocked Flip-Flop, Timing and Triggering Consideration	**05 Hrs.**
Unit 6	**Sequential Circuits:**	**05 Hrs.**
	Introduction, Basic Architectural Distinctions between Combinational and Sequential circuits, Latches, Flip-Flops, SR,JK,D,T and Master slave, characteristic Tables and equations, Conversion from one type of Flip-Flop to another, Counters - Design of Single Mode Counter, Ripple Counter, Ring Counter, Shift Register, Ring counter using Shift Register	

Textbooks			
Sr. No.	Title	Author	Edition/Publication
01	Digital Design	Morris Mano	PHI, 3rd Edition
02	Switching Theory and Logic Design	A. Anand Kumar	PHI, 2nd Edition
03	Switching and Finite Automata Theory	Zvi Kohavi & Niraj K. Jha,	3rd Edition, Cambridge.

Reference Books			
Sr. No.	Title	Author	Edition/Publication
01	Introduction to Switching Theory and Logic Design	Fredriac J. Hill, Gerald R. Peterson	3rd Ed,John Wiley & Sons Inc.
02	Digital Fundamentals – A Systems Approach	Thomas L. Floyd, Pearson	2013
03	Switching Theory and Logic Design	Bhanu Bhaskara	Tata McGraw Hill Publication, 2012
04	Fundamentals of Logic Design	Charles H. Roth, Cengage LEanring	5th, Edition, 2004
05	Digital Logic Applications and Design	John M. Yarbrough	Thomson Publications, 2006

Open Elective 1: Sensor & Applications

Lectures	**:**	**3 Hrs. / Week**	**Evaluation Scheme**
Credit	**:**	**3**	**MT :** 10 Marks
Practical	**:**	**--**	**CA :** 30 Marks
			ESE : 60 Marks
			Duration of ESE **:** 02 Hrs

Course Objectives: The objective of the course is to

1. Explain the operation/working principle of different sensors.
2. Compare various sensors and select appropriate sensor for a particular application.
3. To impart interdisciplinary knowledge regarding sensors and actuators.
4. Explain the advanced sensor fabrication techniques like MEMS.
5. Explain industrial applications of sensors and transducers.

Course Outcomes:

COs	At the end of successful completion of the course, the student will be able to	Blooms Taxonomy
CO1	Classify sensors/transducers and describe important performance measures, terminology of sensors/instrumentation systems.	Understand
CO2	Compare various temperature sensors, design signal conditioning circuits for temperature sensors and describe working principles of chemical sensors.	Understand
CO3	Compare various flow and level sensing techniques and select appropriate technique for a specific application.	Understand
CO4	Describe working principles of motion, light and radiation detectors.	Understand
CO5	Describe construction and working principle of MEMS and SMART sensors.	Understand
CO6	Select appropriate Switches and final control elements for a specific application	Understand

Section-I

Unit No.	Contents	Hrs..
1	**Fundamentals of Sensors & Transducer**	07
	Definitions sensors & transducer, Classification of sensors and transducers, Performance and Terminology: Accuracy, precision, resolution, threshold, sensitivity, linearity, hysteresis, drift, range, span, speed of response, measuring lag, fidelity, dynamic error. Advantages, disadvantages & applications of sensors and transducers, Block diagram and description of Instrumentation system. Instrument calibration-definition, benefits of calibration, Measurement Standards-International System of Units (SI), Calibration Chain and Traceability, Calibration procedure.	
2	**Temperature & Chemical sensors**	07
	Temperature: RTD, thermistors, thermocouples, noncontact temperature measurement- pyrometers. Semiconductor temperature sensing (LM75), Signal conditioning circuit for RTD and Thermocouple, Interfacing technique of Temperature sensors with microcontroller. Acoustics sensors for sound level measurement, Humidity Sensors. Chemical sensors: classes of chemical sensors, Characteristics of chemical sensors,	
	biochemical sensors, electronics noses.	
3	**Flow and Level Sensing**	07
	Flow: Bernoulli Equation, Differential head type flow meters (Orifice, Venturi tube and Flow Nozzle), Pitot static tube, Variable area type flow meter – Rotameter, vortex shedding, Electromagnetic, ultrasonic flow meters, hot wire anemometers. Level: Float, DP Cell, Ultrasonic, Capacitance probe type, Hydrostatic pressure and nuclear level detection techniques.	
Section-II		
4	**Weight, Motion, Light & Radiation Detectors**	07
	Weight- Load Cell and strain gauges, strain gauge signal conditioning. Displacement- LVDT, Ultrasonic, capacitive detectors, Proximity sensors (inductive, optical and capacitive) Velocity-Absolute and incremental encoders. Acceleration– Accelerometer characteristics, capacitive accelerometers, Piezoelectric Accelerometer, Piezo-resistive accelerometer, thermal accelerometer. Light & Radiation detectors: Photo diodes, photo transistor, CCD, CMOS image sensors, gas flame detectors, Radiation detectors	
5	**MEMS & Smart sensors**	07
	Magnetic field sensors – Hall effect and magneto-resistive elements (MRE), magneto-transistors, piezoelectric (PZT) sensors and actuators. Microelectromechanical systems (MEMS) – Bulk micromachining, micro-machined absolute pressure sensor, Surface Micromachining-Hot wire anemometer micro-miniature temperature sensor, surface micromachined accelerometer and SMART sensors.	

6	**Actuators and Final Control Elements**	07
	Pneumatic and hydraulic actuators- Directional control valves, Pressure control valves, Cylinders, Process control valves - Electrical actuators- Mechanical switches, Solid state switches, Solenoids, DC motors, AC motors and Stepper motors.	
	Total	**42**

Text Books:

1. W. Bolton; — Mechatronics, Electronic Control Systems in Mechanical and Electrical Engineering‖; Pearson Education; 3rd Edition
2. William C. Dunn, —Introduction to Instrumentation, Sensors, and Process Control‖, Artech House Sensors Library.

Reference Books:

1. Curtis Johnson; — Process Control Instrumentation Technology ‖; Prentice Hall of India Pvt. Ltd.;7th Edition
2. Ernest O. Doebelin; —Measurement System Application and Design ‖; Mc-Graw Hill; 5th Edition
3. David G. Alciatore, Michael B Histand; — Introduction to Mechatronics and Measurement System ‖; Tata McGraw Hill
4. C.S. Rangan, G.R. Sarma, V.S.V. Mani; — Instrumentation Devices and Systems ‖; Tata McGraw Hill; 2nd Edition.

Open Elective Lab

Lectures : --

Credit : 1

Practical : 2 Hrs. / Week

Evaluation Scheme

MT: –

CA: 25 Marks

ESE : 25 Marks

Course Objectives: The objective of the course is to

1. Explain the operation/working principle of different sensors.
2. Compare various sensors and select appropriate sensor for a particular application.
3. To impart interdisciplinary knowledge regarding sensors and actuators.
4. Explain the advanced sensor fabrication techniques like MEMS.
5. Explain industrial applications of sensors and transducers.

Course Outcomes:

COs	At the end of successful completion of the course, the student will be able to	Blooms Taxonomy
CO1	Classify sensors/transducers and describe important performance measures, terminology of sensors/instrumentation systems.	Understand
CO2	Compare various temperature sensors, design signal conditioning circuits for temperature sensors and describe working principles of chemical sensors.	Understand
CO3	Compare various flow and level sensing techniques and select appropriate technique for a specific application.	Understand
CO4	Describe working principles of motion, light and radiation detectors.	Understand
CO5	Describe construction and working principle of MEMS and SMART sensors.	Understand
CO6	Select appropriate Switches and final control elements for a specific application	Understand

List of Experiments (Minimum 8 experiments)

1. Study different types of static and dynamic characteristics of an instrument.
2. Study the term calibration.
3. Measure the temperature using RTD.
4. Measure the temperature using Thermocouple.
5. To measure the flow using Rotameter.
6. To study of electromagnetic flow meter.
7. To measure the displacement by using LVDT.
8. To measure the speed of rotor using contact and non-contact type devices.
9. To study micro electromechanical system.
10. To study pneumatic and hydraulic actuators.
11. To study electrical actuators.

Analog Circuit Lab

Lectures	**:**	**--**	**Evaluation Scheme**	
Credit	**:**	**1**	**MT :**	--
Practical	**:**	**2 Hrs. / Week**	**CA :**	25 Marks
			ESE:	50 Marks

Course Objectives: The objective of the course is to

01 Provide an introduction and basic understanding of Semiconductor Devices viz. diodes and BJT, JFET.
2 Provide basic analog electronic circuit design techniques using diodes and bipolar junction transistors and to develop analytical skills.
3 Develop student ability to apply basic engineering sciences to understand the operation& analysis of electronic circuits using diodes and bipolar junction transistors.
4 Design electronic circuits to meet the desired specifications.

Course Outcomes:

COs	**At the end of successful completion of the course, the student will be able to**	**Blooms Taxonomy**
CO1	Analyze and design electronic circuits such as rectifiers & unregulated power supply	Analyze
CO2	Analyze and design electronic circuits such as regulated power supply.	Analyze
CO3	Analyze & Design of BJT & FET Biasing.	Analyze
CO4	Explain the hybrid model of transistor and analyze the transistor amplifier (CE, CB, CC) using h-parameters	Apply
CO5	Analysis of CE Amplifier for low frequency & High frequency response for sinusoidal & square wave input.	Analyze
CO6	Analyze & Design LPF, HPF, Clipper, Clampers, Multipliers	Analyze

List of Experiments (Minimum 08 experiment + 01 Simulation + 01 Mini Project compulsory):

1. Design and study of Low pass filter a. Frequency response (sinusoidal) b. integrator (Square wave input)
2. Design and study of High pass filter a. Frequency response (sinusoidal) b. Differentiator (Square wave input)
3. Study of different types of clipper circuits.
4. Study of different types of clamping circuits.
5. Design and analysis of full wave rectifier with capacitive filter.
6. Design and analysis of full wave rectifier with inductive filter.
7. Design and analysis of Zener shunt regulator
8. Design and analysis of transistorized shunt regulator
9. Design and analysis of emitter follower regulator
10. Design and analysis of series pass voltage regulator
11. Determination of H-parameter for CE configuration using input and output characteristics.
12 Simulation of FWR using C-filter
13 Simulation of Single stage RC-Coupled Amplifier
14 Mini Project (PCB Design) a. Design of FWR (Different output voltages for different groups) with C filter. b. Design of Single Stage RC Coupled Amplifier (Different voltage Gain for different groups).

C++ Lab

Lectures	**: 1 Hr / Week**	**Evaluation Scheme**	
Credit	**: 2**	**MT :**	**–**
Practical	**: 2 Hrs. / Week**	**CA:**	25 Marks
		ESE :	50 Marks

Course Objectives: The objective of the course is to
1 To understand features of object-oriented programming and design C++ classes 2 To understand how to overload functions and operators in C++. 3 To learn how to implement copy constructors and class member functions. 4 To learn how inheritance and virtual functions implement dynamic binding with polymorphism. 5 To learn how design inheritance for code reuse in C++. 6 To learn how to design and implement generic classes with C++ templates and exception handling

Course Outcomes:

COs		
CO1	Student will be able to understand the basic concepts of procedure-oriented programming language.	Understand
CO2	Student will be able to use the class, objects, function and operator overloading concepts	Understand, Remember
CO3	Student will be able to understand and implement the concept of inheritance, template and exception handling applications	Understand, Remember
CO4	Student will be able to design & apply the skills for solving the engineering problems	Apply

Unit		**CONTENTS**	**Hours**
1		Introduction To Object Oriented Programming	2
	1.1	Difference between procedure-oriented programming and object-oriented programming	
	1.2	basic concepts and features of object-oriented programming	
	1.3	structures and classes, declaration of class, member functions	
	1.4	defining the object of class	
	1.5	accessing member of class, array of class objects.	
2		Overloading	2
	2.1	Function overloading	
	2.2	assignment operator overloading	
	2.3	binary operator overloading	

	2.4	unary operator overloading	
3		Constructors And Destructors	2
	3.1	Constructors- copy constructor	
	3.2	default constructors, destructors	
	3.3	inline member function	
	3.4	friend function, dynamic memory allocation.	
Section-II			
4		Polymorphism	2
	4.1	Polymorphism, early binding	
	4.2	polymorphism with pointers, virtual functions	
	4.3	late binding, pure virtual functions,	
	4.4	abstract base classes, constructor under inheritance	
	4.5	destructor under inheritance, virtual destructors, virtual base classes	
5		Inheritance	2
	5.1	Introduction, Single Inheritance	
	5.2	Types Of Base Classes- Direct, Indirect	
		Array Of Class Object and Single Inheritance, Multiple Inheritances.	
6		Template And Exception Handling	2
	6.1	Function template	
	6.2	class template	
	6.3	exception handling	
		Total	**12**

Text Books:

1 Programming with C++ D Ravichandran, II edition, Tata Mc Grow Hill
2 Object oriented Programming with C++, E Balagurusamy, Mc Grow Hill

Reference Books:

1 The C++ Programming Language, Brian W. Kernighan, Dennis M. Ritchi, IInd edition, Prentice Hall of India.

List of Experiments (Minimum 10 + mini project):

1. Develop a Program for implementation of array
a) One-dimensional array
b) multi-dimensional array
2. Develop a Program for implementation of classes and Objects.
3. Develop a Program for implementation of types of constructor.
a. Default constructor
b. Parameterized constructor
c. Copy constructor
4. Develop a Program for implementation of polymorphism
5. Develop a Program for implementation of Friend Functions in Class
6. Develop a Program for implementation of types of inheritance
a. Single level Inheritance
b. Multi-level Inheritance
c. Multiple Inheritance
d. Hybrid Inheritance
e. Hierarchical inheritance
7. Develop an Object-oriented Program to Insert the Number in an Array
8. Develop an Object-oriented program to Delete the Number in an Array
9. Develop an Object-oriented program on Bubble Sort
10. Develop an Object-oriented program to Perform Linear or binary search
11. Develop an Object-oriented program to Insert and delete a Node in Link List
12. Develop an Object-oriented program to implement stack using linked list.
13. Mini project

Universal Human Values

Lectures	**:**	2 Hrs./Week	**Evaluation Scheme**	
			MT	**: --**
Credit	**:**	2	**CA**	**:** 50 Marks
			ESE	**:** --

Course Pre-Requisite	Basic Communication Skills, Basic Ethical Awareness		
Course Objective	1.	To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.	
	2.	To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.,	
	3.	To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.	
Course Outcomes	After competition of this course Students will be able to		Blooms Taxonomy
	CO1	Understand value education's role in holistic development, balancing right understanding, relationships, and physical needs.	Understand
	CO2	Recognize the coexistence of self and body and develop strategies for self-regulation and health.	Understand
	CO3	Analyze foundational values like trust and respect to foster justice and harmony in relationships.	Analyze
	CO4	Explore the interconnectedness of nature's orders and realize coexistence and harmony at all levels.	Understand
	CO5	Apply human values and ethical principles to professional and personal life for value-based living.	Apply

Unit No.	Content	Hours
Unit 1	**Introduction to Value Education**	
	Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as th Process for Value Education, Continuous Happiness and Prosperity – the Basi Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations	**06 Hrs.**
Unit 2	**Harmony in the Human Being**	
	Understanding Human being as the Co-existence of the Self and the Body distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health	**06 Hrs.**
Unit 3	**Harmony in the Family and Society**	
	Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order	**06 Hrs.**
Unit 4	**Harmony in the Nature/Existence**	
	Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence.	**06 Hrs.**
Unit 5	**Implications of the Holistic Understanding – a Look at Professional Ethics**	
	Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession	**06 Hrs.**

Textbooks			
Sr. No.	Title	Author	Edition/Publication
01	The Textbook A Foundation Course in Human Values and Professional Ethics,	R R Gaur, R Asthana, G P Bagaria,	2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034- 47-1
02	The Teacher‟s Manual for Foundation Course in Human Values and Professional Ethics,	R R Gaur, R Asthana, G .	

Reference Books			
Sr. No.	Title	Author	Edition/Publication
01	Human Values,	A.N. Tripathi,	New Age Intl. Publishers, New Delhi, 2004.
02	Engineering Ethics (including Human Values),	M Govindrajran, S Natrajan & V.S. Senthil Kumar,	Eastern Economy Edition, Prentice Hall of India Ltd.

Soft Skills Development

Theory : 2 Hrs./Week

Credit : 2

Evaluation Scheme

MT : --

CA : 25 Marks

ESE : 25 Marks

Course Pre-Requisite	Communication Skills.		
Course Objective	1.	To make the engineering students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice.	
	2.	To develop and nurture the soft skills of the students through individual and group activities.	
	3.	To expose students to right attitudinal and behavioral aspects and to build the same through activities	
	4.	To encourage the all-round development of students by focusing on soft skills.	
Course Outcomes	After competition of this course Students will be able to		Blooms Taxonomy
	CO1	Demonstrate effective verbal and non-verbal communication skill	Understand
	CO2	Apply self-assessment tools and behavioral techniques for personal development	Apply
	CO3	Exhibit leadership qualities and contribute effectively in team environments	Understand
	CO4	Develop professional writing skills for various workplace communications	Understand
	CO5	Manage stress and time effectively using practical strategies	Remember
	CO6	Demonstrate professionalism through ethical behavior and appropriate workplace etiquette	Apply

Unit No.	Content	Hours
Unit 1	**Understanding Communication Skills**	
	Verbal Communication - Effective Communication - Active listening – Articulation Paraphrasing – Feedback ➢ Non- Verbal Communication - Body Language of self and others	**05 Hrs.**
Unit 2	**Behavioral Skills /Self Development:**	
	SWOT Analysis, Confidence improvement, values, positive attitude, positive thinking and self-esteem.	**05 Hrs.**
Unit 3	**Leadership and Team Building**	
	➢ Culture and Leadership- Salient Features of Corporate Culture, Leadership Styles, Leadership Trends ➢ Team Building- Team Development Stages, Types of Teams, Attributes of a successful team – Barriers involved	**06 Hrs.**
Unit 4	**Developing Writing skills**	
	➢ E-mail writing, report writing, resumes writing, practice.	**04 Hrs.**
Unit 5	**Stress and Time Management**	
	➢ Stress in Today ,,s Time- Identify the Stress Source, Signs of Stress, Ways to Cope with Stress. ➢ Healthier Ways to Combat Stress, Steps to be taken in the Organizations: Open communication, Time Management, working towards Your Goals, Smart Work, Prioritize your Tasks	**06 Hrs.**
Unit 6	**Professional Skill**	
	➢ Ethics, Etiquette and Mannerism-All types of Etiquette (at Meetings, Etiquette at Dining. Involuntary Awkward Actions, Public Relations Office (PRO) Etiquettes) ➢ Technology Etiquette: Phone Etiquette, Email Etiquette, Social Media Etiquette, Video Conferencing Etiquette, Interview Etiquette. ➢ Dressing Etiquettes: for Interview, offices and social functions. ➢ Ethical Values: Importance of Work Ethics, Problems in the Absence of Work Ethics.	**06 Hrs.**

Textbooks			
Sr. No.	Title	Author	Edition/Publication
01	Developing Communication Skills	Krishna Mohan and Meera Banerji	MacMillan India Ltd. Delhi
02	An Integrated Approach to Maximize Personality	Gajendra Singh Chauhan, Sangeeta Sharma	WILEY INDIA, ISBN:13:9788126556397

Reference Books			
Sr. No.	Title	Author	Edition/Publication
01	An Approach to Communication Skills‖	Indrajit Bhattachary0061	Dhanpat Rai, 2008
02	English for Business Communication	Simon Sweeney	Cambridge University Press, ISBN 13:978-0521754507.

Digital System & VLSI

Lectures	**:**	3 Hrs./Week	**Evaluation Scheme**	
Tutorial	**:**	1 Hr./Week	**MT**	**:** 10 Marks
Credit	**:**	4	**CA**	**:** 30 Marks
			ESE	**:** 60 Marks

Course Pre-Requisite	Basics of matrices, complex algebra, derivative and its properties.		
Course Objective	1	Understand principles and operations of combinational & sequential logic circuits.	
	2	Design & implement digital circuits (combinational & sequential) using VHDL	
	3	Explain students the fundamental concepts of Hardware Description Language and design flow of digital system design.	
Course Outcomes	After competition of this course Students will be able to		Blooms Taxonomy
	CO1	Apply Boolean laws/K-Map-method, to reduce a given Boolean function	Apply
	CO2	Design & realize combinational logic circuits using logic gates.	Analyze
	CO3	Demonstrate the operation of flip-flops, counters, shift registers Synchronous sequential machine using Moore and Mealy machine	Understand
	CO4	Design combinational and sequential logic circuits using various description techniques in VHDL	Analyze

Unit No.	Content	Hours
Unit 1	**Basics of digital systems:**	
	Generation of Switching Equations from Truth Table, Canonical forms, K- map (Karnaugh map) 2,3,4 and 5 variables, K map with Don‟t care terms - Quine Mc Cluskey minimization technique, Quine Mc-Cluskey using Don‟t Care Terms Binary codes, Code Conversion.	**07 Hrs.**
Unit 2	**Introduction to VHDL:**	
	Level of abstraction. Need of HDL, VLSI Design flow, Features and capabilities of VHDL, Elements of VHDL (Entity Architecture, Library, Package, and Configuration), Modeling styles in VHDL, Identifiers, operators, Data objects, data types, literals, Delay Models, Concurrent and sequential statement.	**07 Hrs.**
Unit 3	**Combinational logic Design:**	
	Adder, Subtractor, Code converters (binary to gray & gray to binary, BCD to Excess 3 and vice versa, BCD to 7 segment display), Multiplexer and Demultiplexer , Encoder, Priority encoder, Decoder, Comparator, ALU, Barrel shifter. VHDL coding for combinational circuits.	**07 Hrs.**
Unit 4	**Sequential logic Design:**	
	1-Bit Memory Cell, Latches (SR, JK, D and T), Clocked latches (SR, JK, D and T) flips flop (SR, JK, T and D). Use of preset and clear, Excitation Table for flip flops and Conversion of flip flops, Timing parameters of FF, Shift registers (SISO, SIPO PIPO, and PISO). VHDL coding for Sequential circuits.	**07 Hrs.**
Unit 5	**Counters and Finite State Machines:**	
	Counter – ripple counters, synchronous counters, Up/down counters, Ring counters Johnson Counter, MOD-N counter, FSM, Moore/Mealy machines, state diagram state table, state assignment and state reduction, Sequence detector. VHDL coding for Counters and FSM.	**07 Hrs.**
Unit 6	**Semiconductor Memories and Programmable Logic Devices**	
	Memory devices: ROM, PROM, EPROM, EEPROM, RAM, SRAM, DRAM, NVRAM, Programmable logic devices: PAL, PLA, CPLD and FPGA. Logic implementation using Programmable Devices (ROM, PLA)	**07 Hrs.**

Textbooks			
Sr. No.	Title	Author	Edition/Publication
01	Fundamentals of Digital Circuit	A. Anand Kumar	4th Edition PHI
02	Fundamentals of Digital Logic with VHDL Design	Stephen Brown & Zvonko Vranesic	Tata Mc-Graw Hill publication

Reference Books			
Sr. No.	Title	Author	Edition/Publication
01	Digital Design Principles and Applications	Wakerly	Pearson Education
02	Digital Design	M. Morris Mano	3rd Edition Pearson Education
03	Principles of Digital System Design Using VHDL	Roth John	Cengage Learning
04	Modern Digital Electronics	R. P. Jain	3rd Edition, 12th reprint, Tata Mc-Graw Hill publication 2007

Computer Network

Lectures : 3 Hrs./Week

Credit : 3

Evaluation Scheme

MT : 10 Marks

CA : 30 Marks

ESE : 60 Marks

Course Pre-Requisite	Digital Communication		
Course Objective	1.	To provide students with an overview of the concepts and fundamentals of data communication and computer networks	
	2.	Review the state of art in open research area such as LAN, MAN, WLAN & applications Computer Networking	
	3.	Acquire the required skill to design simple computer networks.	
	4.	Describe various functions and protocols at each layer of OSI and TCP/IP reference models	
Course Outcomes	After competition of this course Students will be able to		Blooms Taxonomy
	CO1	State the evolution of Computer network, classifies different types of Computer Networks.	Remember
	CO2	Designs, implements, and analyzes simple computer networks.	Analyze
	CO3	Identify, formulate, and solve network engineering problems.	Understand
	CO4	Illustrate different OSI and TCP/IP protocols.	Remember

Unit No.	Content	Hours
Unit 1	**INTRODUCTION TO COMPUTER NETWORK**	
	History and development of computer network, network application, network software and hardware components, reference models: layer details of OSI, TCP/IP models., Network topology, Transmission media and types, Network Devices: Network Connectors, Hubs, Switches, Routers, Bridges.	**06 Hrs.**
Unit 2	**DATA LINK LAYER**	
	Design issues, sliding window protocols. HDLC – types of stations, modes of operation & frame formats, Random access Protocols, IEEE 802.3 frame formats.	**06 Hrs.**
Unit 3	**NETWORK LAYER**	
	Design issues, Routing algorithms – shortest path, distance vector routing, link state routing. Routing protocols - RIP, OSPF, IP Addressing, Sub netting/super netting, IPv4, IPv6 header format and basic address mode, DHCP, Congestion control, traffic shaping algorithms	**08 Hrs.**
Unit 4	**TRANSPORT LAYER**	
	Transport layer-Process to process delivery, UDP, TCP, TCP services, TCP Segment, TCP Timers, Flow control, congestion control and Quality of Service.	**08 Hrs.**
Unit 5	**APPLICATION LAYER**	
	DNS, HTTP, SMTP, Telnet, FTP	**08 Hrs.**
Unit 6	**MULTIMEDIA IN INTERNET**	
	Streaming stored audio/video, Real-time interactive audio/video, Realtime transport protocol (RTP), Real-time transport control protocol (RTCP), Voice over IP (VoIP)	**06 Hrs.**

Textbooks			
Sr. No.	Title	Author	Edition/Publication
01	Data Communication and Networking	Forouzan	IIndedition, TataMc-Graw Hill
02	Computer Networks	Tanenbaum	IVth Edition, pearson Education

Reference Books			
Sr. No.	Title	Author	Edition/Publication
01	Introduction to Data communications and Networking	Wayne Tomasi	Pearson Education
02	TCP/IP Protocol Suite	Forouzan	3rd Edition Tata Mc-Graw Hill publication

Operating System

Lectures : 3 Hrs./Week

Credit : 3

Evaluation Scheme

MT : 10 Marks

CA : 30 Marks

ESE : 60 Marks

Course Pre-Requisite	Computer Organization and Architecture, Data Structures and Algorithms		
Course Objective	1.	To introduce Operating systems, types and its use	
	2.	To introduce process, threads and their management,	
	3.	To introduce process and Thread scheduling, inter-process synchronization and communication	
	4.	To introduce memory management	
Course Outcomes	After competition of this course Students will be able to		Blooms Taxonomy
	CO1	State the evolution of Computer network, classifies different types of Computer Networks.	Remember
	CO2	Designs, implements, and analyzes simple computer networks.	Analyze
	CO3	Identify, formulate, and solve network engineering problems.	Understand
	CO4	Illustrate different OSI and TCP/IP protocols.	Remember

Unit No.	Content	Hours
Unit 1	**Introduction to Operating Systems**	
	Introduction to Operating Systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Types of Operating Systems* Distributed system; Special-purpose systems; Operating System Services; User Operating System interface; System calls; Types of system calls; System programs; Operating System structure; Virtual machines; System boot.	**08 Hrs.**
Unit 2	**Process Management**	
	Process concept; Process scheduling; Operations on processes; Inter-proces communication. Multi-Threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concep Scheduling Criteria, Scheduling Algorithms, Multiple processor scheduling, Real time scheduling.	**08 Hrs.**
Unit 3	**Inter-process Synchronization**	
	Inter-process Synchronization: Background, Classical problems of synchronization, Critical Region, The critical section problem, Synchronization Hardware Monitors, Semaphores.	**06 Hrs.**
Unit 4	**Deadlocks**	
	Deadlocks: System modes, Deadlock characterization, Methods for handling deadlocks Deadlock prevention, Deadlock avoidance, Deadlock detection Recovery from deadlock, combined approach to dead lock.	**06 Hrs.**
Unit 5	**Memory management And Virtual Memory:**	
	Logical Versus Physical Address space, Swapping Contiguous Allocation, Virtual Memory: Background, Demand paging, Page replacement, Page replacement algorithms, Allocation of frames, Thrashing (Only concept). VIRTUAL MEMORY- Background, Demand paging, Page replacement, Page replacement algorithms, Allocation of frames, Thrashing (Only concept), Demand segmentation.	**09 Hrs.**

Unit 6	**IO Systems**	
	Overview, I/O Hardware, Application I/O Interface, Kernel IO Subsystem, Transforming I/O Request to Hardware Operations, Streams	**05 Hrs.**

Textbooks			
Sr. No.	Title	Author	Edition/Publication
01	Operating System Principles	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne	8th edition Wiley India, 2009
02	Operating System concepts	Silberschatz Galvin (John Wiley.	5th Edition

Reference Books			
Sr. No.	Title	Author	Edition/Publication
01	Operating systems: concepts and design	Milan Milenkovic (TMGH)	Second Edition
02	Modern Operating Systems	Andrew S	Tanenbaum (Pearson Education International)

Multi-disciplinary Minor–02

Electronics Measurements

Theory : 2 Hrs./Week

Credit : 2

Evaluation Scheme

MT : 10 Marks

CA : 30 Marks

ESE : 60 Marks

Course Pre-Requisite	Basic Electricals, Instrumentation		
Course Objectives	1	Understand the fundamental components and performance characteristics of measurement systems	
	2	Develop the ability to use and interpret standard measuring instruments	
	3	Gain knowledge of signal analyzers and signal generators	
	4	Explore the construction and applications of oscilloscopes	
	5	Understand the types and functions of transducers for physical parameter measurement	
	6	Introduce advanced measurement techniques and computer-controlled test systems	
Course Outcomes	**After competition of this course Students will be able to**		
	CO 1	The student will analyze the different types measuring instruments	Analyze
	CO 2	Prepare theoretically and practically laboratory experiments.	Understand
	CO 3	Carry out laboratory experiments on instruments, DC and AC bridges.	Apply
	CO 4	Present experiment results in a written report.	Remember
	CO 5	Understand the fundamentals of measuring instruments and apply the above conceptual things to real-world electrical and electronics problems applications.	Understand

Unit No.	Content	Hours
Unit 1	**Block Schematic of Measuring Systems**	
	Performance Characteristics, Static Characteristics, Accuracy, Precision Resolution, Types of Errors, Gaussian Error, Root Sum Squares Formulae Dynamic Characteristics- Repeatability, Reproducibility, Fidelity, Lag; Measuring Instruments: DC Voltmeters, D-Arsenal Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeter, Meter Protection Extension of Range, True Rms Responding Voltmeters, Specification of Instruments	**04Hrs.**
Unit 2	**Signal analyzers and Signal generators:**	
	Signal analyzers: AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne Wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance –Voltage Meter Oscillators Signal generators: AF, HF Signal Generators, Sweep Frequency Generators, Arbitrary Waveform Generator, Video Signal Generators and Specification	**04 Hrs.**
Unit 3	**Oscilloscopes:**	
	CRT, Block Schematic Of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay Lines, Applications: Measurement of Time, Period and Frequency Specifications Special purpose oscilloscopes: Dual trace, Dual beam CROs, sampling oscilloscope, storage oscilloscope, digital storage oscilloscope	**06 Hrs.**
Unit 4	**Transducers:**	
	Classification, Strain Gauges, Bounded, Un-Bounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchronous, Special Resistance thermometers, Digital Temperature Sensing System, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers	**04 Hrs.**

	Bridges and Physical parameters:	
Unit 5	Wheat Stone Bridge, Kelvin Bridge, Maxwell‟s Bridge. MEASUREMENT OF PHYSICAL PARAMETERS: Flow measurement, displacement meters, liquid level measurement, measurement of humidity and moisture, velocity, force pressure – high pressure, vacuum level, temperature- measurements, data acquisition system	**04 Hrs.**
Unit 6	**Advanced Measurements and Computer Controlled test systems.**	**06 Hrs.**
	Scanning Probe Microscope-Atomic Force Microscope-Magnetic Force Microscope-Scanning Tunneling Microscope-Testing an Audio Amplifier-Testing a Radio Receiver-Instruments used in Computer Controlled Instrumentation Microprocessor based System and Measurement-Case Studies in Instrumentation Electronic Weighing System-Digital Transducer.	

Textbooks			
Sr. No.	Title	Author	Edition/Publication
01	Electronic Instrumentation	H. S. Kalsi	2nd Edition, Tata McGraw Hill, 2004
02	Modern Electronic Instrumentation and Measurement Techniques	Techniques A. D. Helfrick and W.D. Cooper	5th Edition, PHI, 2002.

Reference Books			
Sr. No.	Title	Author	Edition/Publication
01	Transducers and display systems	B. S. Sonde	
02	Electronic measurements and Instrumentation	B. M. Oliver and J.M. Cage	TMH, 2009
03	Electrical and Electronic measurements	Shawney	Khanna Publications
04	Introduction to Instrumentation and measurements	Robert Northrop	

Open Elective–02

Block Chain Technology

Theory : **2** Hrs./Week

Credit : 2

Evaluation Scheme

MT : 10 Marks

CA : 30 Marks

ESE : 60 Marks

Course Pre- Requisite	Programming Knowledge, Computer Science Fundamentals.		
Course Objective	1.	To introduce Blockchain Technology	
	2.	To learn the distributed decentralized system.	
	3.	To learn hashing in cryptography, Ethereum and consensus	
	4.	To learn bitcoin and its process also the blockchain technology in allied technologies	
Course Outcomes	After competition of this course Students will be able to		Blooms Taxonomy
	CO1	Understand the basic concepts and architecture of Blockchain Technology	Understand
	CO2	Demonstrate distributed decentralized system, its applications and regulations	Analyze
	CO3	Demonstrate the application of hashing in cryptography	Analyze
	CO4	Demonstrate the verification process through Ethereum and consensus in blockchain technology.	Analyze
	CO5	Illustrate the concepts of Bitcoin and its process in blockchain technology.	Remember
	CO6	Understand and illustrate Block-chain with allied technologies such as cloud computing, AI, IoT, Robotics	Understand

Unit No.	Contents	Hrs..
1	**Basics of Blockchain**	05
	Introduction, History and Concept of Blockchain, Definition of Blockchain, Fundamentals of Blockchain, Characteristics of Blockchain, Consensus in Trust-Building Exercise, Public, Private, and Hybrid Blockchains, Architecture of Blockchain, Transactions, Chaining Blocks,	
2	**Distributed Decentralized System**	05
	Introduction, Distributed Ledger Technologies (DLT), Distributed Decentralized Applications and Databases, Value Proposition of Blockchain Technology, Decentralized Enterprise, Decentralization, Disintermediation, Decentralized Enterprise Regulation.	
3	**Cryptography and Hash Functions**	05
	Cryptography, Cryptography Primitives, Symmetric Cryptography, Introduction of Hash, Asymmetric Cryptography Hashing, Message Authentication Code, Secure Hash Algorithms (SHA-1), Secure Hash Algorithm Version 3, Distributed Hash Tables, Hashing and Data Structures, Hashing in Blockchain Mining.	
Section-II		
4	**Blockchain Components & Consensus**	05
	Introduction of Ethereum, History, Ethereum Virtual Machine, Working of Ethereum, Ethereum Clients, Ethereum Key Pairs, Ethereum Addresses, Ethereum Wallets, Ethereum Transactions, Ethereum Languages, Ethereum Development Tools Introduction, Consensus Introduction, Consensus Approach, Consensus Algorithms, Byzantine Agreement Methods	
5	**Bitcoins**	04
	Introduction, Working of Bitcoin, Merkle Trees, Bitcoin Block Structure, Bitcoin Address, Bitcoin Transactions, Bitcoin Network, Bitcoin Wallets, Bitcoin Payments, Bitcoin Clients, Bitcoin Supply	
6	**Blockchain and Allied Technologies**	04
	Blockchain and Cloud Computing, Characteristics of Blockchain Cloud, Blockchain and Artificial Intelligence, Blockchain and IoT, Blockchain and Machine Learning, Blockchain and Robotic Process Automation	
	Total	**28**

Text Books:

1. Kumar Saurabh and Ashutosh Saxena., —Blockchain Technology: Concepts and Applications‖, Wliey Publications
2. Yathish R, Tejaswini N, ‖Blockchain for Beginners‖, Publisher: Shroff/X-Team 2019 Edition
3. Don Tapscott, author of Wikinomics, Alex Tapscott, — Blockchain Revolution: How the technology behind bitcoin and other cryptocurrencies is changing the world‖, Penguin Publishing Group

Reference Books:

1. Narayanan, Bonneau, Felten, Miller and Goldfeder, —Bitcoin and Cryptocurrency Technologies – A Comprehensive Introduction‖, Princeton University Press.
2. Josh Thompson, ‗Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming ,,, Create Space Independent Publishing Platform, 2017.
3. Imran Bashir, —Mastering Blockchain: Distributed ledger technology, decentralization, and smart contracts explained‖, Packet Publishing.
4. Merunas Grincalaitis, —Mastering Ethereum: Implement Advanced Blockchain Applications Using Ethereum-supported Tools, Services, and Protocols‖, Packt Publishing

Computer Network Lab

Lectures	**:** NA	**Evaluation Scheme**	
Practical	: 02 Hrs. / Week	**MT**	**:** --
Credit	**:** 1	**CA**	**:** 25 Marks
		ESE	**:** 50 Marks

Course Pre-Requisite	Digital Communication		
Course Objective	1.	To provide students with an overview of the concepts and fundamentals of data communication and computer networks	
	2.	Review the state of art in open research area such as LAN, MAN, WLAN & applications Computer Networking	
	3.	Acquire the required skill to design simple computer networks.	
	4.	Describe various functions and protocols at each layer of OSI and TCP/IP reference models	
Course Outcomes	After competition of this course Students will be able to		Blooms Taxonomy
	CO1	State the evolution of Computer network, classifies different types of Computer Networks.	Remember
	CO2	Designs, implements, and analyzes simple computer networks.	Analyze
	CO3	Identify, formulate, and solve network engineering problems.	Understand
	CO4	Illustrate different OSI and TCP/IP protocols.	Remember

List of Experiments: (Minimum 8 Experiments should be Performed

1. Study of LAN, MAN and WAN and Demonstrate Sharing of file using LAN Network.

• List out component and devices required for a std. LAN, WAN

2. Study, design and configuration of IEEE 802.3 Ethernet and IEEE 802.11Wireless • LANs (Referring RFCs)

3. Understand and demonstrate the working of network Devices (Network Connectors, Hubs, Switches, Routers, Bridges) using Cisco Packet Tracer.

4. Study of following connectivity test tools with all its options– Ping, nslookup, netsh and pathping

5. ifconfig, arp, route, traceroute

6. nmap, netstat, finger

7. Implementing Framing methods

8. Programs to understand IP addressing, classful & classless addressing

9. Implementation of sliding window protocol.

10. Implement shortest path routing algorithm.

11. Programs for connection oriented (TCP) client-server using socket programming

12. Programs for connection less (UDP) client-server using socket programming

13. Study of network protocol analyzer (Ethereal or Wire-Shark) and analyze the following protocols using any of network analyzer tool UDP, TCP, DNS, HTTP, FTP, DNS, RTP

Humanity Science

Lectures	**:**	**--**	**Evaluation Scheme**
Practical	:	2 Hrs../Week	**MT : --**
Credit	**:**	1	**CA : 50 Marks**
			ESE : 25 Marks

Course Pre-Requisite	Basic Education		
Course Objective	1.	To develop right understanding through self-exploration as the foundation for value education	
	2.	To understand the fundamental human aspirations of happiness and prosperity	
	3.	To foster harmony between the self and the body	
	4.	To promote values in human relationships for harmony in the family and society	
	5.	To create awareness of harmony in society, nature, and existence	
	6.	To build competence in ethical and value-based professional conduct	
Course Outcomes	After competition of this course Students will be able to		Blooms Taxonomy
	CO1	Explain the concept of value education and its significance in personal and professional life.	Understand
	CO2	Analyze the relationship between fundamental human aspirations and the pursuit of happiness and prosperity.	Analyze
	CO3	Evaluate methods to achieve harmony between self and body for holistic well-being.	Analyze
	CO4	Demonstrate ethical values and principles in interpersonal relationships and social interactions.	Understand
	CO5	Assess the role of individuals in maintaining harmony with society, the universal order, and nature.	Analyze
	CO6	Formulate strategies for ethical decision-making and responsible professional conduct during the transition from student to professional life.	Analyze

Unit 1	**Introduction to Value** Education**: (5 Hrs.)** Right understanding, relationship, and physical facility (holistic development and the role of education), understanding value education, self-exploration as the process for value education.
Unit 2	**Fundamental Human Aspirations: (5 Hrs.)** Continuous happiness and prosperity – the basic human aspirations, happiness and prosperity – current scenario, method to fulfil the basic human aspirations.
Unit 3	**Harmony between Self and Body: (5 Hrs.)** Understanding human being as the co-existence of the self and the body Distinguishing between the needs of the self and the body, the body as an instrument of the self, understanding harmony in the self, harmony of the self with the body, programme to ensure self-regulation and health.
Unit 4	**Values in Human Interaction: (5 Hrs.)** Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship.
Unit 5	**Society, Universal Order, and Nature: (4 Hrs.)** Understanding Harmony in the Society, Vision for the Universal Human Order, Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels. (**Self-Study**: The Holistic Perception of Harmony in Existence.)
Unit 6	**Ethical Conduct and Professional Transition: (4 Hrs.)** Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models-Typical Case Studies, (**Self Study**: Strategies for Transition towards Value-based Life and Profession)

Text Books	
1.	R. R. Gaur, R. Asthana, G. P. Bagaria, "The Textbook A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034- 47-1 (Unit: 1,2,3,4,5,6)
2.	R. R. Gaur, R. Asthana, G. P. Bagaria, "The Teacher"s Manual Teachers: Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2.(Unit: 1,2,3,4,5,6)

Reference Books

01) D R Kiran , "Professional ethics and human values", McGraw Hill Education (India) Private Limited P-24, 2nd edition, 2014, Green Park Extension, New Delhi 110 016

02) V. Jayakumar, "Professional ethics and Human values in Engineering"

03) Rudolf Steiner, "Human Values in Education (The Foundations of Waldorf Education, 20)", Anthroposophic Press, Year: 2004, ISBN: 0880105445,9780880105446

04) R.S. Naagarazan, "A Textbook on Professional Ethics and Human Values", New Age International Pvt Ltd Publishers, Year: 2007 ISBN: 8122419380,9788122419382,9788122423013

Employability Enhancement Skills

Lectures	**:**	2 Hr/Week	**Evaluation Scheme**
Practical	:	--	**MT : --**
Credit	**:**	2	**CA : 50 Marks**
			ESE :--

Course Pre-Requisite	Communication Skills / English Language Proficiency, Soft Skills		
Course Objective	1.	To introduce the concept and significance of employability skills for career readiness.	
	2.	To instill constitutional values and responsible citizenship among learners.	
	3.	To develop key 21st-century professional skills such as communication, time management, and self-motivation.	
	4.	To promote awareness and sensitivity towards diversity, inclusion, and gender equity in the workplace.	
	5	To provide basic financial and legal literacy for safe and responsible financial behavior.	
	6	To equip learners with essential digital skills for safe and effective use of technology and the internet.	
Course Outcomes	After competition of this course Students will be able to		Blooms Taxonomy
	CO1	Describe the importance of employability skills in achieving personal and professional success.	Understand
	CO2	Demonstrate understanding of constitutional values and responsibilities as a citizen, and adopt environmentally sustainable practices.	Understand
	CO3	Apply 21st-century skills such as time management, problem-solving, and a continuous learning mindset in real-life scenarios.	Apply
	CO4	Exhibit respectful and inclusive behavior towards people of all genders and persons with disabilities	Apply

		(PwDs), and respond appropriately to workplace harassment.	
	CO5	Use basic financial tools and understand income, savings, budgeting, and legal rights to ensure personal financial security.	Understand
	CO6	Operate digital devices and use the internet, social media, and communication tools in a safe, secure, and effective manner.	Remember

Unit No.	Content	Hours
Unit 1	**Introduction to Employability Skills**	
	Discuss the importance of Employability Skills in meeting the job requirements	**02 Hrs.**
Unit 2	**Constitutional values - Citizenship**	
	Explain constitutional values, civic rights, duties, citizenship, responsibility towards society etc. that are required to be followed to become a responsible citizen. Show how to practice different environmentally sustainable practices	**02 Hrs.**
Unit 3	**Becoming a Professional in the 21st Century**	
	Discuss 21st century skills. 5. Display positive attitude, self -motivation, problem solving, time management skills and continuous learning mindset in different situations.	**02 Hrs.**
Unit 4	**Diversity & Inclusion**	
	Show how to conduct oneself appropriately with all genders and PwD. Discuss the significance of reporting sexual harassment issues in time	**02 Hrs.**
Unit 5	**Financial and Legal Literacy**	
	Discuss the significance of using financial products and services safely and securely. Explain the importance of managing expenses, income, and savings. Explain the significance of approaching the concerned authorities in time for any exploitation as per legal rights and laws	**04 Hrs.**
Unit 6	**Essential Digital Skills**	**04 Hrs.**
	Show how to operate digital devices and use the associated applications and features, safely and securely	

	Discuss the significance of using internet for browsing, accessing social media platforms, safely and securely	

Reference Books		
Sr. No.	Title	Author
01	Emotional Intelligence: Why It Can Matter More Than IQ	Daniel Goleman
02	Professionalism: Skills for Workplace Success	Lydia E. Anderson and Sandra B. Bolt
03	Diversity at Work: The Practice of Inclusion	Bernardo Ferdman
04	Financial Literacy: How to Manage Your Money and Achieve Financial Success	Melissa Sprouse Browne
05	Becoming a 21st Century Professional	Dennis R. Dunkin and David Boud

Text Books		
Sr. No.	Title	Author
01	Skills for Success: Personal Development and Employability	Stella Cottrell
02	The Employability Skills Handbook	Karen Holmes
03	Our Constitution: An Introduction to India‟s Constitution and Citizenship	Subhash C. Kashyap
04	The 7 Habits of Highly Effective People	Stephen R. Covey
	Financial Literacy for Managers: Finance and Accounting Basics for Nonfinancial Managers	Richard A. Lambert
	Digital Literacy: Tools and Methodologies for Information Society	Laurent Elder and Heloise Emdon

Professional Ethics

Lectures : 2 Hrs./Week

Credit : 2

Evaluation Scheme

MT : --

CA : 25 Marks

ESE : --

Course Pre-Requisite	Value Education / Human Values, Communication Skills		
Course Objective	1.	To connect the learners to their potential - understand moral, professional and personal values.	
	2.	To introduce the learners to professional ethics and to enable them towards decision making skills	
	3.	To draw the learners‟ attention towards business ethics	
	4.	To strengthen and enhance professional ethics through psychological approach	
	5.	To cultivate a spirit of working in diverse world by understanding workplace ethics	
	6.	To instill a sense of professional ethics which help them develop a safe comfortable and prosperous and sustainable society	
Course Outcomes	After competition of this course Students will be able to		Blooms Taxonomy
	CO1	Equip themselves with an understanding of moral, professional and personal values	Remember
	CO2	Understand the need of ethics in shaping their profession The learners will hone their decision-making skills.	Understand
	CO3	Refine their business ethics based on psychological and philosophical perspective.	Understand
	CO4	Have an edge over the ethical systems in workplace.	Remember
	CO5	Assess the need for a balance between ecology, engineering and economy	Understand
	CO6	Equip themselves with a better understanding of themselves and the society they live in and the responsibilities they shoulder in creating a sustainable world.	Understand

Unit No.	Content	Hours
Unit 1	**Introduction: Individual and Professional Ethics**	
	Introduction to Professional Ethics, Morals, Values and Ethics – Personal and Professional- Sensé of Engineering Ethics – Code of Ethics by NSPE - Making decisions with ethical dimensions – definition – roadmap to ethical decision making – common standards – internal obstacles – bias – empathy	**06 Hrs.**
Unit 2	**Business Ethics**	
	Philosophical approaches to Business Ethics – ethical reasoning – ethical issues in business - Social Responsibility of Business conflict of interest – cultural relativism - Ethical leadership - Resisting un-ethical authority and domination - Global Business Ethics	**07 Hrs.**
Unit 3	**Psychological Approaches**	
	Ethical Theories - Psychological and Philosohpical approaches - Myths about Morality - conflict of interest in psychological perspective - Courage-Integrity – ethical dilemma – Emotional Intelligence	**06 Hrs.**
Unit 4	**Workplace Ethics**	
	Ethics in changing domains of Research – academic integrity – intellectual honesty - Role of Engineers and Managers - Ethical issues in Diverse workplace – competition – free will - Confidentiality – employee rights – Intellectual property rights – discrimination	**07 Hrs.**
Unit 5	**Safety, Responsibilities and Rights**	
	Ecology, Engineering, Economy - Risk benefit analysis and reducing risk SDGs – Corporate social responsibility and Corporate Sustainability - CSR in India - Sustainability Case Studies	**06Hrs.**

Textbooks			
Sr. No.	Title	Author	Edition/Publication
01	Professional Ethics,	Subramanian.R.	Oxford Publication, 2013.
02	Professional Ethics and Human Values.	Nagarasan. R.S.	New Age International Publications, 2006
03	Ethics in Engineering,4th edition,	Mike W Martin and Roland Schinzinger,	Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi,2014

Electronics Workshop 1

Practical	**:**	2 Hrs./Week	**Evaluation Scheme**	
			MT	**:** --
Credit	**:**	1	**CA**	**:** 25 Marks
			ESE	**:** 25 Marks

Course Pre-Requisite	Basic Electronics Engineering.		
Course Objectives	1	To enable students to identify and interpret specifications of electronic components	
	2	To train students in reading and drawing electronic circuit diagrams using standard symbols	
	3	To impart hands-on experience in the use of electronic testing instruments and tools	
	4	To develop skills in component testing, soldering techniques, and interconnection methods	
	5	To introduce PCB design and fabrication with functional circuit implementation	
	6	To expose students to basic circuit applications and introductory robotics	
Course Outcomes	CO 1.	Identify different electronic components	Remember
	CO 2.	Draw a circuit using standard IEEE symbols of components.	Remember
	CO 3.	To use different equipment‟s like CRO function generator and multimeter	Understand
	CO 4.	Test the components and identify the working condition and values of the components using multimeter	Apply
	CO 5.	Set up small circuits using Diodes and transistor and able to observe the outputs using CRO, make a circuit on PCB and do soldering	Apply
	CO 6.	Familiarization of Electronic Systems.	Understand

LIST OF EXPERIMENTS

1. Familiarization and Identification of electronic component with specification
2. Drawing of electronic circuit diagrams using BIS/IEEE symbols and introduction to EDA
3. Familiarization and application of testing instruments and commonly use tools
4. Testing of electronic components
5. Inter connection methods and soldering practice
6. Printed circuit board
7. Setup a voltage power supply in PCB
8. LED blinking circuit using a stable multivibrator with transistor BC 107
9. Sine wave generation using IC 741 OP-AMP
10. Square wave generation using IC 555 timer
11. Introduction to Robotics.

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Simulation Lab

Practicals	**:**	2 Hrs./Week	**Evaluation Scheme**	
			MT	**:** --
Credit	**:**	1	**CA**	**:** 25 Marks
			ESE	**:** --

Course Pre-Requisite	Basic Electronics Engineering.		Blooms Taxonomy
Course Outcomes	CO 1.	Develop the ability to generate, analyze, and manipulate various types of signals and sequences, both periodic and aperiodic.	Apply
	CO 2.	Gain practical understanding of linearity, time invariance, stability, and realizability properties in continuous and discrete systems.	Understand
	CO 3.	Apply Fourier Transform and Pole-Zero analysis for interpreting signals and systems in frequency and time domains.	Apply
	CO 4.	Learn to compute convolution and correlation, essential for signal detection, system response, and communication applications.	Remember
	CO 5.	Verify the sampling theorem and understand the requirements for accurate signal digitization and reconstruction.	Understand

List of experiments:

1. Basic Operations on Matrices.
2. Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
3. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power
4. Finding the Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal.
5. Convolution between Signals and sequences
6. Auto Correlation and Cross Correlation between Signals and Sequences
7. Verification of linearity properties of a given continuous /discrete system.
8. Verification of time invariance properties of a given continuous discrete system.
9. Computation of Unit sample, Unit step and Sinusoidal responses of the given LTI system and verifying its physical realizability and stability properties.
10. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum
11. Locating the Zeros and Poles and plotting the Pole-Zero maps in S-plane and Z- Plane for the given transfer function.
12. Sampling Theorem Verification.

Year and Semester	Second Year B. Tech - Semester IV (Common to all branches of Engineering)				
Course Category	Basic Science Courses (BSC)				
Title of Course	**Environmental Science**			Contact Hrs./Week	Credits
Teaching Scheme	L	T	P		
	02	--	--	02	Audit
Examination Scheme	MT	CA	ESE	Total	
	10	30	60	100	

Course Objectives: The objectives of the course is to

1. Understand the scope & multidisciplinary nature of Environmental Studies.
2. Get acquainted with the problems associated with natural resources and their conservation.
3. Familiarize the environmental & social problems with global concern.
4. Recognize the importance of Biodiversity with respect to Western Ghats.

Course Outcomes:

COs	At the end of successful completion of the course, the student will be able to	Blooms Taxonomy
CO1	Understand the importance of Environmental Studies and recognize significance of ecosystem.	Understand
CO2	Classify the values of natural resources with associated problems for sustainable lifestyles.	Understand
CO3	Describe the social and global environmental issues	Understand
CO4	Make aware of Pollution issues with its mitigation measures.	Understand
CO5	Familiarize the basics of Biodiversity and concerned issues in the context of Western Ghats.	Understand
CO6	Acquaint with the role of environmental laws and regulations in conservation efforts.	Remember

SYLLABUS

Unit No	Content	Hours
Unit 1	**Nature of Environmental Studies and Importance of ecosystems.**	
	• Definition, scope and importance. • Multidisciplinary nature of environmental studies • Need for public awareness. **Ecosystem** • Concept of an ecosystem. • Structure and function of an ecosystem. • Producers, consumers and decomposers. • Food chains, food webs and ecological pyramids • Introduction, types, characteristics features, structure and function of the following ecosystem a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem, d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) • Degradation of the ecosystems and it‟s impacts.	**06 Hrs.**
Unit 2	**Natural Resources and Associated Problems.**	
	• Forest resources: Use and over-exploitation, deforestation, dams and their effects on forests and tribal people. • Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. • Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources. • Food resources: World food problem, changes caused by agriculture, effect of modern agriculture, fertilizer-pesticide problems. • Energy resources: Growing energy needs, renewable and non- renewable energy resources, use of alternate energy sources. Solar energy, Biomass energy. • Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.	**06 Hrs.**

	• Role of individuals in conservation of natural resources. Equitable use of resources for sustainable lifestyles.	
Unit 03	**Social Issues and the Environment** • Human population growth and impact on environment. • Environmental ethics: Role of Indian religious traditions and culture in conservation of the environment. • Environmental movements- Chipko Movement, Appiko Movement, Silent Valley Movement. • Resettlement and rehabilitation of people; its problems and concerns. • Water conservation, rain water harvesting. Disaster management: floods, earthquake, cyclone, tsunami and landslides, Case studies.	**04 Hrs.**
Unit 04	**Environmental Pollution** • Definition: Causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Global warming, acid rain, ozone layer depletion. • Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Solid waste management, control & rules, Role of an individual in prevention of pollution	**04 Hrs.**
Unit 05	**Biodiversity and its conservation:** • Introduction- Definition: genetic, species and ecosystem diversity. • Bio-geographical classification of India. • Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. • India as a mega- diversity nation. • Western Ghat as a biodiversity region. Hot-spots of biodiversity. • Threats to biodiversity: habitat loss, poaching of wildlife, man- wildlife conflicts, • Conservation of biodiversity: In-situ and Ex- situ conservation of biodiversity.	**04 Hrs.**

Unit 06	**Environmental Protection-Policies and practices**. • Environment Protection Act. • Air (Prevention and Control of Pollution) Act. • Water (Prevention and control of Pollution) Act • Wildlife Protection Act • Forest Conservation Act • National and International Conventions and agreements on environment	**04 Hrs.**

Field work: (Field work is equal to 4 lectures)

Note - The CA is carried out through the Field work and Report writing.

- Visit to a local area to document environmental assets river/ forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.

References:

Reference Books	
1	Raut P.D., Environmental Studies, Shivaji University Press, 2021
2	Gleick, H.,1993, Water in crisis, Pacific Institute for studies in Dev., Environment & Security. Stockholm Env. Institute. Oxford Univ. Press 473p
3	Hawkins R.e., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
4	Heywood, V.H. & Watson, R.T.1995, Global Biodiversity Assessment, Cambridge Univ. Press 1140p.
5	Jadhav, H. & Bhosale, V.M.1995, Environmental Protection and Laws, Himalaya Pub. House, Delhi 284p.
6	McKinney, M.L. & School. R.M.1196, Environmental Science Systems & Solutions, Web enhanced edition, 639p
7	Mhaskar A.K., Master Hazardous, Techno-Science Publications (TB)

Equivalence of Subjects between CBCS and NEP for

S.Y. B. Tech (Sem-III & IV)

Name of Programme: Electronics & Computer Science

Class: S. Y. B. Tech Semester- III

Sr. No	Name of Subjects in existing CBCS 2018 onwards pattern (Add all subjects)	Name of Subjects in NEP pattern	Reason	Remark
1	Engineering Mathematics – III	--		Not Equivalent
2	Electronic Devices	--		Not Equivalent
3	Digital Electronics	--		Not Equivalent
4	Data Structures and Algorithms	Data Structure & Algorithm	All contents are relevant	
5	Database Management System	--		Not Equivalent
6	Programming in C	--		Not Equivalent

Class: S. Y. B. Tech Semester- IV

Sr. No	Name of Subjects in existing CBCS 2018 onwards pattern (Add all subjects)	Name of Subjects in NEP pattern	Reason	Remark
1	Electronic Circuits	--		Not Equivalent
2	Controls and Instrumentation	--		Not Equivalent
3	Computer Network	Computer Network	All contents are relevant	
4	Microprocessors and Microcontrollers	--		Not Equivalent
5	Discrete Structure & Automata Theory	--		Not Equivalent
6	Programming in C++	--		Not Equivalent
7	Environment Studies	--		

शिवाजी विद्यापीठ, कोल्हापूर
SHIVAJI UNIVERSITY, KOLHAPUR

Exit Course for Electronics and Computer Science After 2nd Year

- As part of the NEP 2020 Revised Syllabus, for the First Year B. Tech Exit, students must earn a total of 8 additional credits. This includes 6 credits from online SWAYAM NPTEL courses and 2 credits from Virtual Lab performance.
- Students must complete two SWAYAM NPTEL courses (12-week duration) from the provided list and successfully perform two Virtual Labs from the specified list.
- Each SWAYAM NPTEL course carries 3 credits, while each Virtual Lab is worth 1 credit.

Sr. No.	Name of NPTEL Course
1	Discrete Mathematics
2	Introduction To Internet Of Things
3	Real Time Operating System
4	Industrial Automation and Control
5	Power Management Integrated Circuits
6	A brief introduction of Micro - Sensors

Sr. No.	Name of Virtual Lab
1	Control Engineering Lab
2	PLC Lab
3	Computer Organization and Architecture Lab
4	Python Programming Lab

Examination Scheme

- Swayam NPTEL Course Certificate Should be submitted to Department — 6 Credits
- Lab Experiments Report must be prepared and submitted to department — 2 Credits