Dr. Babasaheb Ambedkar Technological University
(Established as a University of Technology in the State of Maharashtra)
(Under Maharashtra Act No. XXIX of 2014)
P.O. Lonere, Dist. Raigad, Pin 402 103, Maharashtra
Telephone and Fax. 02140 - 275142
www.dbatu.ac.in

Course Structure and Detailed Syllabus

of

B. Tech Programme

for

Electronics Engineering (VLSI Design and Technology)

from

Second Year Engineering

In line with National Education Policy 2020

(Effective from Academic year 2025-26 for University Affiliated colleges only)

Department of Electronics Engineering
(VLSI Design and Technology)

Credit Framework under Four-Years UG Engineering Programme with Multiple Entry and Multiple Exit options:

- The Four-year Bachelor's Multidisciplinary Engineering Degree Programme allows the students to experience the full range of holistic and multidisciplinary education in addition to a focus on the chosen major and minors as per their choices and the feasibility of exploring learning from different institutions.
- The minimum and maximum credit structure for different levels under the Four-year Bachelor's Multidisciplinary Engineering UG Programme with multiple entry and multiple exit options are as given below:

Credit Framework

Levels	Qualification Title	Credit Requirements		Semester	Year
		Minimum	Maximum		
4.5	One Year UG Certificate in Engg./ Tech.	40	44	2	1
5.0	Two Years UG Diploma in Engg./ Tech.	80	88	4	2
5.5	Three Years Bachelor's Degree in Vocation (B. Voc.) or B. Sc. (Engg./ Tech.)	120	132	6	3
	4-Years Bachelor's degree				

Levels	Qualification Title	Credit Requirements		Semester	Year
		Minimum	Maximum		
6.0	(B.E./ B.Tech. or Equivalent) in Engg./ Tech. with Multidisciplinary Minor	160	176	8	4
6.0	4-Years Bachelor's degree (B.E./ B.Tech. or Equivalent) in Engg./ Tech.- Honors and Multidisciplinary Minor	180	194	8	4
6.0	4-Years Bachelor's degree (B.E./ B.Tech. or Equivalent) in Engg./ Tech.- Honors with Research and Multidisciplinary Minor	180	194	8	4
6.0	4-Years Bachelor's degree (B.E./ B.Tech. or Equivalent) in Engg./ Tech.- Major Engg. Discipline with Double Minors (Multidisciplinary and Specialization Minors)	180	194	8	4

- There are multiple exit options at each level. Student will be given a specific Qualification mentioned in the table depending on the level at which he/she decide to have an exit. Ex. If a student decides to exit after completion of two years (level 5.0) of the program, he will be given a Diploma in Engineering with specific exit condition mentioned in the syllabus of the specific branch. He/she can rejoin the program with the multiple entry option at the level next where he/she chose to exit previously. (Student can join at level 5.5 if successfully completed level 5.0 previously at the time of exit).
- Minimum credit requirements of each level are mentioned in the credit framework table.

- There are 4 distinct options available at level 6.0.
- First one is basic level 6.0 option where minimum 160-maximum 176 credits are mandatory which can be completed as per the Semester-wise Credit distribution structure mentioned in the table.

  Here, the Bachelor's Engineering Degree in chosen Engg./ Tech. Discipline with multidisciplinary minor (min.160-max.176 Credits) i.e. "**B. Tech in Electronics Engineering (VLSI Design and Technology) with Computer Engineering**" (160-176 credits) enables students to take up five-six or required additional courses of 14 credits in the discipline other than Electronics Engineering (VLSI D & T) distributed over semesters III to VIII. Here in the case of "**B. Tech in Electronics Engineering (VLSI Design and Technology) with Computer Engineering**" (160-176 credits) student is supposed to take up 50% or more courses to complete the 50% or more credits (from assigned 14 credits) from **Computer Engineering minor bucket**. The remaining courses to complete the assigned 14 credits can be covered from other discipline's minor buckets.
- Remaining three level 6.0 options are the advanced options where the student is given an opportunity to get extra qualification by earning some extra credits (18-20 extra credits). These three options are given below:
- Level 6.0: The **Bachelor's Engineering Degree with Honours** in chosen Major Engg./ Tech. Discipline i.e. in B. Tech in Electronics Engineering (VLSI Design and Technology) with Honours with Multidisciplinary Minor (180-194 credits) enables students of Electronics Engineering (VLSI Design and Technology) to take up five-six additional courses of 18 to 20 credits in the Electronics Engineering (VLSI Design and Technology) discipline distributed over semesters III to VIII. The decision regarding the mechanism of distribution of these 18-20 credits over semesters III to VIII, which are over and above the min.160-max.176 Credits prescribed for the duration of four years will be taken by Academic Authorities of University. **Student must have CGPA equal to or greater than 7.5 at the end of second semester to go for this option**.
- Level 6.0: The **Bachelor's Engineering Degree with Research** in i.e. in Electronics Engineering (VLSI Design and Technology) with Research with Multidisciplinary Minor (180-194 credits) enables students of Electronics Engineering (VLSI Design and Technology) to take up a research project of 18 to 20 credits in the Electronics Engineering (VLSI Design and Technology) discipline distributed over semesters VII to VIII. **Student must have CGPA equal to or greater than 7.5 at the end of sixth semester to go for this option**.
- Level 6.0: The **Bachelor's Engineering Degree in chosen Engg./ Tech. Discipline with Double Minor** (Multidisciplinary and Specialization Minor, 180-194 credits), i.e. "**B. Tech in Electronics Engineering (VLSI Design and Technology) with *other selected discipline in* Engineering (as MDM) with Specialization Minor in Computer Engineering**" (180-194 credits) enables students to take up five-six additional courses of 14 credits in the discipline other than Electronics Engineering (VLSI Design and Technology) (for completion of multidisciplinary minor) and 18 to 20 extra credits in the **Computer Engineering discipline** distributed over semesters III to VIII. Here, the ***other selected discipline* in Engineering should be different from Specialization Minor i.e. Computer Engineering**. This enables students to take up

five-six or required additional courses of 18 to 20 credits in the **Computer Engineering** discipline distributed over semesters III to VIII, which are over and above the min.160-max.176 Credits. The decision regarding the mechanism of distribution of these 18-20 credits over semesters III to VIII, prescribed for the duration of four years will be taken by Academic Authorities of University. **Student must have CGPA equal to or greater than 7.5 at the end of second semester to go for this option**.

Semester-wise Credit distribution structure for Four Year UG Engineering Program - One Major, One Minor

Semester		I	II	III	IV	V	VI	VII	VIII	Total Credits
Basic Science Course	BSC/ESC	06-08	08-10		--	--	--	--	--	14-18
Engineering Science Course		10-08	06-04		--	--	--	--	--	16-12
Programme Core Course (PCC)	Program Courses	--	02	08-10	08-10	10-12	08-10	04-06	04-06	44-56
Programme Elective Course (PEC)		--	--	--	--	04	08	02	06	20
Multidisciplinary Minor (MD M)	Multidisciplinary Courses		-	02	02	04	02	02	02	14
Open Elective (OE) Other than a particular program		--	--	04	02	02	--	--	--	08
Vocational and Skill Enhancement Course (VSEC)	Skill Courses	02	02	--	02	--	02	--	--	08
Ability Enhancement Course (AEC -01, AEC-02)	Humanities Social Science and Management (HSSM)	02	--	--	02	--	--	--	--	04
Entrepreneurship/Economics/ Management Courses		--		02	02	--	--	--	--	04
Indian Knowledge System (IKS)			02		--	--	--	--	--	02
Value Education Course (VEC)		--	--	02	02	--	--	--	--	04
Research Methodology	Experiential Learning Courses	--	--	--	--	--	--		04	04
Comm. Engg. Project (CEP)/Field Project (FP)		--	--	02	--	--	--	-	-	02
Project		--	--	--	--	--	--		04	04
Internship/ OJT		--	---			--	--	12	-	12
Co-curricular Courses (CC)	Liberal Learning Courses	02	02		--	--	--	--	-	04
Total Credits (Major)		**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**160-176**

Student need to follow the Semester-wise Credit distribution structure for Four Year UG Engineering Program as prescribed in the table given above.

- There are seven vertical categories with specific credits distributed in specific semesters.
- Student can choose a Program Elective Course (PEC) in that specific semester from the given subjects.
- Multidisciplinary course (MDM) and Open Elective (OE) courses can be chosen from the MDM and OE Buckets depending on students' choice. Completion of total credits given in the last column of the table for each vertical is mandatory.
- Students can complete 40% of the courses through online platforms like NPTEL/SWAYAM. The NPTEL SWAYAM course content should be at least 80% similar to the course content in the syllabus.

General Rules and Regulations

1. The normal duration of the course leading to B.Tech degree will be EIGHT semesters.

2. The normal duration of the course leading to M.Tech. degree will be FOUR semesters.

3. Each academic year shall be divided into 2 semesters, each of 20 weeks duration, including evaluation and grade finalization, etc. The Academic Session in each semester shall provide for at least 90 Teaching Days, with at least 40 hours of teaching contact periods in a five to six days session per week. The semester that is typically from Mid-July to November is called the ODD SEMESTER, and the one that is from January to Mid-May is called the EVEN SEMESTER. Academic Session may be scheduled for the Summer Session/Semester as well. For 1st year B. Tech and M. Tech the schedule will be decided as per the admission schedule declared by Government of Maharashtra.

4. The schedule of academic activities for a Semester, including the dates of registration, mid-semester examination, end-semester examination, inter-semester vacation, etc. shall be referred to as the Academic Calendar of the Semester, which shall be prepared by the Dean (Academic), and announced at least TWO weeks before the Closing Date of the previous Semester.

5. The Academic Calendar must be strictly adhered to, and all other activities including cocurricular and/or extra -curricular activities must be scheduled so as not to interfere with the Curricular Activities as stipulated in the Academic Calendar.

Registration:

1. Lower and Upper Limits for Course Credits Registered in a Semester, by a Full- Time Student of a UG/PG Programme:

   A full time student of a particular UG/PG programme shall register for the appropriate number of course credits in each semester/session that is within the minimum and maximum limits specific to that UG/PG programme as stipulated in the specific Regulations pertaining to that UG/PG programme.
2. Mandatory Pre-Registration for higher semesters: In order to facilitate proper planning of the academic activities of a semester, it is essential for the every institute to inform

to Dean (Academics) and COE regarding details of total no. of electives offered (Course-wise) along with the number of students opted for the same. This information should be submitted within two weeks from the date of commencement of the semester as per academic calendar.

3. PhD students can register for any of PG/PhD courses and the corresponding rules of evaluation will apply.
4. Under Graduate students may be permitted to register for a few selected Post Graduate courses, in exceptionally rare circumstances, only if the DUGC/DPGC is convinced of the level of the academic achievement and the potential in a student.

Course Pre-Requisites:

1. In order to register for some courses, it may be required either to have exposure in, or to have completed satisfactorily, or to have prior earned credits in, some specified courses.
2. Students who do not register on the day announced for the purpose may be permitted LATE REGISTRATION up to the notified day in academic calendar on payment of late fee.
3. REGISTRATION IN ABSENTIA will be allowed only in exceptional cases with the approval of the Dean (Academic) / Principal.
4. A student will be permitted to register in the next semester only if he fulfils the following conditions:

   i) Satisfied all the Academic Requirements to continue with the programme of Studies without termination ii) Cleared all Institute, Hostel and Library dues and fines (if any) of the previous semesters;

   iii) Paid all required advance payments of the Institute and hostel for the current semester;

   iv) Not been debarred from registering on any specific ground by the Institute.

Evaluation System:

1. Absolute grading system based on absolute marks as indicated below will be implemented from academic year 2024-25, from I year B. Tech.

Percentage of marks	Letter Grade	Grade Point
91-100	EX	10.0
86-90	AA	9.0
81-85	AB	8.5
76-80	BB	8.0
71-75	BC	7.5

66-70	CC	7.0
61-65	CD	6.5
56-60	DD	6.0
51-55	DE	5.5
40-50	EE	5.0
<40	EF	0.0

2. Class is awarded based on CGPA of all eighth semester of B. Tech Program.

CGPA for pass is minimum 5.0	
CGPA up to <5.50	Pass class
CGPA ≥ 5.50&<6.00	Second Class
CGPA ≥ 6.00&<7.5	First Class
CGPA >7.50	Distinction
[Percentage of Marks =CGPA*10.0]	

3. A total of 100 Marks for each theory course are distributed as follows:

Mid Semester Exam (MSE) Marks	20
Continuous Assessment Marks	20
End Semester Examination(ESE)Marks	60

4. A total of 100 Marks for each practical course are distributed as follows

1.	Continuous Assessment Marks	40
2.	End Semester Examination (ESE)Marks	60

- It is mandatory for every student of B. Tech to score a minimum of 40 marks out of 100, M. Tech to score a minimum of 45 marks out of 100 with a minimum of 20 marks out of 60 marks in End Semester Examination for theory course.
- This will be implemented from the first year of B. Tech starting from Academic Year 2024-25

5. Description of Grades

EX Grade: An "EX" grade stands for outstanding achievement.

EE Grade: The "EE" grade stands for minimum passing grade.

If any of the students remain absent for the regular examination due to genuine reason and the same will be verified and tested by the Dean (Academics) or committee constituted by the University Authority.

FF Grade: The "FF" grade denotes very poor performance, i.e. failure in a course due to poor performance. The students who have been awarded "FF" grade in a course in any semester must repeat the subject in next semester.

6. Evaluation of Performance

a. Semester Grade Point Average (SGPA)

The performance of a student in a semester is indicated by Semester Grade Point Average (SGPA) which is a weighted average of the grade points obtained in all the courses taken by the student in the semester and scaled to a maximum of 10. (SGPI is to be calculated up to two decimal places). A Semester Grade Point Average (SGPA) will be computed for each semester as follows:

$$SGPA = \frac{[\sum_{i=1}^{n} c_i g_i]}{[\sum_{i=1}^{n} c_i]}$$

Where

"n" is the number of subjects for the semester,

"c_i" is the number of credits allotted to a particular subject, and

"g_i" is the grade-points awarded to the student for the subject based on his performance as per the above table.

SGPA will be rounded off to the second place of decimal and recorded as such.

b. Cumulative Grade Point Average (CGPA):

An up to date assessment of the overall performance of a student from the time he entered the Institute is obtained by calculating Cumulative Grade Point Average (CGPA) of a student. The CGPA is weighted average of the grade points obtained in all the courses registered by the student since s/he entered the Institute. CGPA is also calculated at the end of every semester (up to two decimal places). Starting from the first semester at the end of each semester (S), a Cumulative Grade Point Average (CGPA) will be computed as follows:

$$CGPA = \frac{[\sum_{i=1}^{m} c_i g_i]}{[\sum_{i=1}^{m} c_i]}$$

Where,

"m" is the total number of subjects from the first semester onwards up to and including the semester S,

"ci" is the number of credits allotted to a particular subject, and

"gi" is the grade-points awarded to the student for the subject based on his/her performance as per the above table.

CGPA will be rounded off to the second place of decimal and recorded as such.

7. Attendance Requirements:

a. All students must attend every lecture, tutorial and practical classes.

b. To account for approved leave of absence (eg. representing the Institute in sports, games or athletics; placement activities; NCC/NSS activities; etc.) and/or any other such contingencies like medical emergencies, etc., the attendance requirement shall be a minimum of 75% of the classes actually conducted. If the student failed to maintain 75% attendance, he/she will be detained for appearing the successive examination. The Dean (Academics)/ Principal is permitted to give 10% concession for the genuine reasons as such the case may be. In any case the student will not be permitted for appearing the examination if the attendance is less than 65%.

c. The course instructor handling a course must finalize the attendance 3 calendar days before the last day of classes in the current semester and communicate clearly to the students by displaying prominently in the department and also in report writing to the head of the department concerned.

d. The attendance records are to be maintained by the course instructor and he shall show it to the student, if and when required.

8. Transfer of Credits:

The courses credited elsewhere, in Indian or foreign University/Institutions/ Colleges/Swayam Courses by students during their study period at DBATU may count towards the credit requirements for the award of degree. The guidelines for such transfer of credits are as follows:

a. 20 % of the total credit will be considered for respective calculations.

b. Credits transferred will be considered for overall credits requirements of the programme.

c. Credits transfer can be considered only for the course at same level i.e UG, PG etc.

d. A student must provide all details (original or attested authentic copies) such as course contents, number of contact hours, course instructor /project guide and evaluation system for the course for which he is requesting a credits transfer. He shall also provide the approval or acceptance letter from the other side. These details will be evaluated by the concerned Board of Studies before giving approval. The Board of Studies will then decide the number of equivalent credits the student will get for such course(s) in DBATU. The complete details will then be forwarded to Dean for approval.

e. A student has to get minimum passing grades/ marks for such courses for which the credits transfers are to be made.

f. Credits transfers availed by a student shall be properly recorded on academic record(s) of the student.

g. In exceptional cases, the students may opt for higher credits than the prescribed.

SECOND YEAR

SEMESTER III

Semester III												
Sr. No.	**Course Category**	**Course Code**	**Course Title**	**Teaching Scheme**			**Evaluation Scheme**				**Credit**
				L	**T**	**P**	**CA**	**MSE**	**ESE**	**Total**	
1	BSC	25AF1000BS301	Engineering Mathematics-III	3	0	0	20	20	60	100	3
2	PCC	25AF1378PC302	Electronic Devices & Circuits	3	0	0	20	20	60	100	3
3	PCC Lab	25AF1378PC303L	Electronic Devices & Circuits Lab	0	0	2	60	--	40	100	1
4	PCC	25AF1378PC304	Digital System Design & Microprocessor	3	0	0	20	20	60	100	3
5	OE	25AF1XXXOE305	**Open Elective Bucket****	2	0	0	20	20	60	100	2
6	MD Minor	25AF1378MD306	**MDM Bucket***	2	0	0	20	20	60	100	2
7	Entrepreneurship	25AF1000HM307A	A. Employability and Skill Development	2	0	0	20	20	60	100	2
		25AF1000HM307B	B. Innovation and Entrepreneurship								
8	VEC	25AF1000VE308	Life of Chhatrapati Shivaji Maharaj	1	0	0	50	--	--	50	1
9	PCC Lab	25AF1378PC309L	Digital System Design & Microprocessor Lab	0	0	2	60	--	40	100	1
10	VEC	25AF1UHVVE310	Universal Human Values II	3	0	0	20	20	60	100	3
11	CEP/FP	25AF1378FP311	Community Engineering Project (CEP)	0	0	4	60	--	40	100	2
			Total	**19**	**0**	**8**				**1050**	**23**

NOTE: * Refer to Multidisciplinary Minor Bucket of other departments
**** Refer to Open Elective Bucket available on University Website**

SEMESTER IV

Semester IV											
Sr. No.	**Course Category**	**Course Code**	**Course Title**	**Teaching Scheme**			**Evaluation Scheme**				**Credit**
				L	**T**	**P**	**CA**	**MSE**	**ESE**	**Total**	
1	PCC	25AF1378PC401	Analog Circuits	3	0	0	20	20	60	100	3
2	PCC Lab	25AF1378PC402L	Analog Circuits Lab	0	0	2	60	--	40	100	1
3	PCC	25AF1378PC403	Network Theory & Signals and Systems	3	0	0	20	20	60	100	3
4	PCC Lab	25AF1378PC404L	Network Theory & Signals and Systems Lab	0	0	2	60	--	40	100	1
5	OE	25AF1XXXOE405	**Open Elective Bucket****	3	0	0	20	20	60	100	3
6	MD Minor	25AF1378MD406	**MDM Bucket***	2	0	0	20	20	60	100	2
7	VEC	25AF1COIVE407	Constitution of India	2	0	0	50	--	--	AU	AU
8	VEC	25AF1000VE408	Life of Bharatratna Dr.Babasaheb Ambedkar	1	0	0	50	--	--	50	1
9	Entrepreneurship	25AF1000HM409	Patents and IPR	2	0	0	20	20	60	100	2
10	HSSM	25AF1000AE410A	A. Marathi	2	0	0	20	20	60	100	2
		25AF1000AE410B	B. Hindi								
		25AF1000AE410C	C. Sanskrit								
11	VSEC	25AF1378VS411	PCB Designing	0	0	4	60	--	40	100	2
12	PCC	25AF1378PC412	System Design using Verilog	3	0	0	20	20	60	100	3
13	PCC Lab	25AF1378PC413L	System Design using Verilog Lab	0	0	2	60	--	40	100	1
			Total	**21**	**0**	**10**				**1150**	**24**

NOTE: * Refer to Multidisciplinary Minor Bucket of other departments
**** Refer to Open Elective Bucket available on University Website**

Open Electives

In the vertical of Multidisciplinary courses, students need to cover Open Elective Courses (OE) of 08 credits. These 08 credits over semesters III to V, which are included in the basic min.160-max.176 Credits. It is offered in Second and/or Third year. Refer to Semester wise credit distribution table given below. Faculty-wise baskets of OE are prepared by university which are chosen from faculty other than that of the Major Faculty i.e. in this case Major Faculty is Faculty of Engineering.

Other Faculties considered are as follows:

1. Faculty of Management and Commerce
2. Faculty of Law
3. Faculty of Humanities and Arts
4. Faculty of Architecture and Planning
5. Faculty of Health Sciences
6. Faculty of Science

Students need to take up three-four courses of 08 credits over semesters III to V.

Second Year (Semester III)
Engineering Mathematics-III

25AF1000BS301	Engineering Mathematics-III	BSC	3L- 0T - 0P	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./week Tutorial: 0 hr./week	Continuous Assessment: 20Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks

Course Objectives:

After completion of the course, students will have adequate background, conceptual clarity and knowledge of appropriate solution techniques related to:

1. Linear differential equations of higher order using analytical methods and numerical methods applicable to Control systems and Network analysis.
2. Transforms such as Fourier transform, Laplace transform and applications to Communication systems and Signal processing.
3. Vector differentiation and integration required in Electro-magnetic and Wave theory.
4. Complex functions, conformal mappings, contour integration applicable to Electrostatics, Digital filters, Signal and Image processing.
5. Understand conformal mappings, transformations and perform contour integration of complex functions in the study of electrostatics and signal processing

Course Outcomes:

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

CO1: Solve higher order linear differential equation using appropriate techniques for modelling and analysing electrical circuits.

CO2: Solve problems related to Fourier transform, Laplace transform and applications to Communication systems and Signal processing.

CO3: Obtain Interpolating polynomials, numerically differentiate and integrate functions, numerical solutions of differential equations using single step and multi-step iterative methods used in modern scientific computing.

CO4: Perform vector differentiation and integration, analyse the vector fields and apply to Electromagnetic fields.

CO5: Analyse conformal mappings, transformations and perform contour integration of complex functions in the study of electrostatics and signal processing.

Unit 1: Laplace Transform **09 Hours**

Definition – conditions for existence ; Transforms of elementary functions ; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by t^n, scale change property, transforms of functions divided by t, transforms of integral of functions, transforms of derivatives ; Evaluation of integrals by using Laplace transform ; Transforms of some special functions- periodic function, Heaviside-unit step function, Dirac delta function.

Unit 2: Inverse Laplace Transform **09 Hours**

Introductory remarks ; Inverse transforms of some elementary functions ; General methods of finding inverse transforms ; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms ; Applications to find the solutions of linear differential equations and simultaneous linear differential equations with constant coefficients.

Unit 3: Fourier Transform **09 Hours**

Definitions– integral transforms; Fourier integral theorem (without proof); Fourier sine and cosine integrals; Complex form of Fourier integrals; Fourier sine and cosine transforms; Properties of Fourier transforms; Parseval's identity for Fourier Transforms.

Unit 4: Partial Differential Equations and Their Applications **09 Hours**

Formation of Partial differential equations by eliminating arbitrary constants and functions; Equations solvable by direct integration; Linear equations of first order (Lagrange's linear equations); Method of separation of variables – applications to find solutions of one dimensional heat flow equation (), and one-dimensional wave equation.

Unit 5: Functions of Complex Variables **09 Hours**

Analytic functions; Cauchy- Riemann equations in Cartesian and polar forms; Harmonic functions in Cartesian form; Cauchy's integral theorem; Cauchy's integral formula; Residues; Cauchy's residue theorem (All theorems without proofs).

Text Books

1. Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, New Delhi.
2. Higher Engineering Mathematics by H. K. Das and Er. Rajnish Verma, S. Chand & CO. Pvt. Ltd., New Delhi.
3. A course in Engineering Mathematics (Vol III) by Dr. B. B. Singh, Synergy Knowledge ware, Mumbai.
4. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi.

Reference Books

1. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, New York.
2. A Textbook of Engineering Mathematics by Peter O'Neil, Thomson Asia Pte Ltd., Singapore.
3. Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata Mcgraw Hill Publishing Company Ltd., New Delhi.
4. Integral Transforms and their Engineering Applications by Dr. B. B. Singh, Synergy Knowledge ware, Mumbai.
5. Integral Transforms by I. N. Sneddon, Tata McGraw-Hill, New York.

SECOND YEAR (SEMESTER III)
Electronic Devices & Circuits

25AF1378PC302	Electronic Devices & Circuits	PCC	3L- 0T - 0P	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./week Tutorial: 0 hr./week	Continuous Assessment: 20Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks

Course Objectives:

After completion of the course, students will have adequate background, conceptual clarity and knowledge of appropriate solution techniques related to:

1. To introduce static characteristics of ideal two terminal and three terminal devices.
2. To discuss working principle of semiconductor devices such as FET & MOSFET.
3. To explore the applications of amplifier & Oscillator in electronic system design.
4. To explore the use of voltage regulators for power supply design.
5. To explore voltage regulator circuits using standard ICs and comprehend the working of Switch Mode Power Supplies (SMPS)

Course Outcomes:

After completion of this course, students will be able to:

1. Explain Bipolar Junction Transistor (BJT) operation, characteristics, and biasing techniques for amplifier applications.
2. Describe the construction, operation, and characteristics of JFETs and MOSFETs in various configurations
3. Evaluate the performance of different classes of power amplifiers, considering efficiency and distortion
4. Explain the principles of feedback amplifiers and various transistorized oscillator circuits
5. Design voltage regulator circuits using standard ICs and comprehend the working of Switch Mode Power Supplies (SMPS).

Course Contents:

Unit I: Bipolar Junction Transistor (09 Hours)

BJT: construction, working, characteristics of CE, Transistor configurations, current gain equation, stability factor.

BJT Biasing and basic amplifier configurations: Need for biasing BJT, Transistor biasing methods, Transistor as an amplifier, Single Stage Amplifier, RC coupled Amplifiers.

Unit II: Junction Field Effect Transistor and MOSFET (08 Hours)

FET-Introduction to JFET, Types, Construction, Operation, Static Characteristics, Pinch off voltage, FET Volt-Ampere characteristics, FET Configurations (CS/CD/CG) and their Comparison.

MOSFET-Basics of MOS Transistor operation, Construction of n-channel E-MOSFET, E-MOSFET characteristics & parameters.

Comparison of FET with MOSFET and BJT.

Unit III: Power amplifiers **(08 Hours)**

Introduction, classification of power amplifiers-Class A, B, AB, C and D, transformer coupled class A Amplifier, Class B push pull and complementary symmetry amplifier, efficiency, calculation of Power output, power dissipation, cross over distortion, need of heat sink.

Unit IV: Feedback amplifiers & oscillators (transistorized) **(08 Hours)**

Feedback Amplifiers: Principle of Negative feedback in electronic circuits, Voltage series, Voltage shunt, Current series, Current shunt types of Negative feedback, Typical transistor circuit effects of Negative feedback on Input and Output impedance, Voltage and Current gains.

Oscillators: Principle of Positive feedback, Concept of Stability in electronics circuits,

Barkhausen criteria for oscillation, Resonant frequency calculation of (General form of LC oscillator, FET RC Phase Shift oscillator, Wein bridge oscillator, Hartley and Colpitts oscillators).

Unit V: Voltage Regulator **(07 Hours)**

Regulator using 78XX, 79XX, Voltage regulator using IC317, Block schematic of regulator IC 723, regulated power supply using IC 723.

Introduction to Switch Mode Power supply (SMPS), Block diagram of SMPS.

Textbooks:

1. Millman Halkias, Integrated Electronics- Analog and Digital Circuits and Systems‖, Tata McGraw Hill, 2000.
2. Brijesh Iyer, S. L. Nalbalwar, R. Dudhe, “Electronics Devices & Circuits”, Synergy Knowledge ware Mumbai, 2017. ISBN:9789383352616
3. Anil K. Maini and Varsha Agarwal “Electronic Devices and Circuits”, Wiley India

Reference Books:

1. R. L. Boylstad, L. Nashlesky, “Electronic Devices and circuits Theory”, 9thEdition, Prentice Hall of India, 2006.
2. D. A. Neamen, Semiconductor Physics and Devices (IRWIN), Times Mirror High Education Group, Chicago) 1997. 4. David A. Bell, “Electronic Devices and Circuits”,5th Edition, Oxford Press.
3. David A. Bell, “ElectronicDevicesandCircuits”,5th Edition, Oxford press.
4. Phillip E. Allen, Douglas R. Holberg, “CMOS Analog Circuit Design”, Second Edition, Oxford.

Second Year (Semester –III)
Electronic Devices & Circuits Lab

25AF1378PC303L	**Electronic Devices & Circuits Lab**	**PCC Lab**	**0L- 0T - 2P**	**1 Credits**

Teaching Scheme	Examination Scheme
Practical: 02 hrs./week	Continuous Assessment: 60 Marks End Semester Exam: 40 Marks

Electronic Devices & Circuits Lab

(Minimum 8-10 experiments are to be performed based on contents from syllabus)

Sample List of Practical's:

1. Study of Digital multimeter, Function Generator, CRO/DSO, Dual power supply, connecting probes.
2. Study and Experiment on BJT (Reading data sheet, Terminal Identification, packages, testing & Plot BJT characteristics)
3. Study and experiment on FET (Reading data sheet, Terminal Identification, packages, testing & Plot FET characteristics)
4. Study and Experiment on MOSFET (Reading data sheet, Terminal Identification, packages, testing & Plot MOSFET characteristics
5. To study & perform Class A amplifier.
6. To study & perform Voltage series feedback amplifier.
7. To study & Perform RC phase shift oscillator.
8. To study & perform Colpitts, Hartley oscillator.
9. To study regulated DC power supply using discrete components and plot its line and load regulation characteristics.
10. To study the Current Series Feedback amplifier.
11. To study the diode as a clipper and clamper.
12. Mini project.

Second Year (Semester –III)
Digital System Design & Microprocessor

25AF1378PC304	Digital System Design & Microprocessor	PCC	3L- 0T - 0P	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./week Tutorial: 0 hr./week	Continuous Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks

Course Objectives: The aim of this course is to:

1. To introduce fundamental digital concepts including number systems, binary codes, and the principles of Boolean algebra.
2. To teach systematic methods for simplifying Boolean functions using Karnaugh Maps and universal gates.
3. To design and analyze various standard combinational and sequential logic circuits.
4. To understand the architectural details, memory organization, and operating modes of the 8086 microprocessors.
5. To develop proficiency in 8086 assembly language programming, focusing on instruction sets and addressing modes.

Course Outcomes:

After completion of this course, students will be able to:

CO1. Convert between different number systems, represent signed and floating-point numbers, and apply Boolean algebra theorems to simplify expressions.

CO2. Minimize Boolean expressions for three, four, and five variables using K-Maps and implement them using NAND/NOR logic.

CO3. Design and explain the operation of common combinational circuits (e.g., adders, decoders) and sequential elements (e.g., flip-flops, counters, shift registers).

CO4. Describe 8086 architecture, memory segmentation, flag register, and differentiate between its minimum and maximum operating modes.

CO5. Write and analyze 8086 assembly language programs, utilizing various addressing modes and control flow instructions for arithmetic and branching operations.

Course Contents:

Unit 1: [8 hours]

Number systems and codes: Decimal, binary, octal and hexadecimal Number System, Number System conversions, Signed binary numbers: Sign Magnitude Approach, 1's complement Approach, and 2's Complement Approach, Binary codes: Weighted and Non-weighted codes, Alphanumeric codes, Reflective codes, digital logic gates, Boolean algebra, basic theorems & properties, Boolean functions, canonical and standard forms.

UNIT-2: [8 hours]

Gate level minimizations, K-Map – two variable, three variable, four variable and five variables, SOP, POS simplifications, NAND and NOR implementation and other two-level implementation.

UNIT-3: [8 hours]

Combinational circuits for code converters, Binary adders: half adder, full adder,N-bit parallel binary adder, Binary subtractor: half subtractor, full subtractor, N-bit Parallel Binary Subtractor, Binary

Multiplier (2x2), comparator (1 and 2 bit only), decoder, encoder, priority encoder, multiplexers, demultiplexers

UNIT-4: **[8 hours]**

Memory Elements: latches and flipflops, Overview of clock.

Latches: SR latch, Gated SR latch, Gated D latch. Flip-flops: SR flip flop, JK flipflop, D flipflop, and T flipflop. Excitation Table for flip flops, flipflop conversion.

Counters: Asynchronous Counters: ripple, modulo, BCD or decade, and divide by N counter. Ring Counter, Twisted Tail Ring Counter.

Synchronous Counters**:** n-bit synchronous counter, synchronous counter as sequence generator.

Shift Registers.

UNIT-5: **[9 hours]**

Introduction to 8086 Microprocessor: Features, Architecture and Register Organization, Memory Organization & Segmentation, 8086 flag register, Signal description of 8086 common function signals, operating modes, Addressing Modes of 8086, Overview of various types of instruction set.

Textbooks:

1. John Wakerly, “Digital Design: Principles and Practices”, Pearson Education
2. D.V. Hall, “Digital Circuits and Systems”, Tata McGraw Hill, 1989
3. K M Bhurchandi, A K Ray, Advanced microprocessors and Peripherals, McGraw Hill Education India, 2012, 3rd ed.
4. Ramesh S. Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085/8086", Penram International Publishing

Reference Books:

1. R.P. Jain, “Modern digital Electronics”, TataMcGrawHill,4thedition,2009.
2. Morris Mano and Michael Ciletti, “Digital Design”, Pearson Education
3. Stephen Brown and Zvonko Vranesic, “Fundamentals of Digital Logic with VHDL Design”, McGraw-Hill Education

Second Year (Semester –III)
Employability and Skill Development

25AF1000HM307A	**Employability & Skill Development**	**Entrepreneurship**	**2L- 0T - 0P**	**2 Credits**

Teaching Scheme	**Examination Scheme**
Lecture: 2 hrs./week	Continuous Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks

Course Objectives:

1. To develop analytical abilities.
2. To develop communication skills.
3. To introduce the students to skills necessary for getting, keeping and being successful in a profession.
4. To expose the students to leadership and team-building skills.

Course Outcomes:

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

CO1. Have skills and preparedness for aptitude tests.

CO 2. Be equipped with essential communication skills (writing, verbal and non-verbal) CO 3. Master the presentation skill and be ready for facing interviews.

CO 4. Build team and lead it for problem solving.

Unit 1: Soft Skills & Communication basics

Soft skills vs. hard skills, Skills to master, Interdisciplinary relevance, Global and national perspectives on soft skills, Resume, Curriculum vitae, How to develop an impressive resume, Different formats of resume – Chronological, Functional, Hybrid, Job application or cover letter, Professional presentation- planning, preparing and delivering presentation.

Unit 2: Interpersonal Skills

Critical Thinking, Assertiveness, Decision Making, Problem Solving, Negotiation, Building Confidence, Time Management, Personal Presentation, Assertiveness, negotiation, avoiding Stress. Commercial Awareness: Professional etiquettes and manners.

Unit 3: Grammar and Comprehension:

English sentences and phrases, Technical writing, Paragraph writing, Story writing, Reproduction of a story, Letter writing and e-mail writing.

Unit 4: Skills for interviews:

Interviews- types of interviews, preparatory steps for job interviews, interview skill tips, Group discussion- importance of group discussion, types of group discussion, difference between group discussion, panel discussion and debate, tips for successful participation in group discussion, Listening skills: virtues of listening, fundamentals of good listening.

Unit 5: Problem Solving Techniques

Problem solving model: 1. Define the problem, 2. Gather information, 3. Identify various solution, 4. Evaluate alternatives, 5. Take actions, 6. Evaluate the actions. Problem solving skills: 1. Communicate. 2. Brain storming, 3. Learn from mistakes.

TEXT/REFERENCE BOOKS:

1. R. Gajendra Singh Chauhan, Sangeeta Sharma, “Soft Skills- An integrated approach to maximize personality”, ISBN: 987-81-265-5639-7, First Edition 2016, Wiley Wren and Martin, "English grammar and Composition", S. Chand publications.
2. R. S. Aggarwal, "A modern approach to verbal reasoning", S. Chand publications.
3. Philip Carter, "The Complete Book of Intelligence Test", John Willey & Sons Ltd.
4. Philip Carter, Ken Russell, "Succeed at IQ test", Kogan Page.
5. Eugene Ehrlich, Daniel Murphy, "Schaum’s Outline of English Grammar", McGraw Hills.
6. David F. Beer, David A. McMurrey, “A Guide to Writing as an Engineer”, ISBN: 978-1-118-30027-5 4th Edition, 2014, Wiley.

Second Year (Semester –III)
Innovation and Entrepreneurship

25AF1000HM307B	**Innovation and Entrepreneurship**	**Entrepreneurship**	**2L- 0T - 0P**	**2 Credits**

Teaching Scheme	**Examination Scheme**
Lecture: 2 hrs./week	Continuous Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks

Course Objectives:

1. To build inspiration, aspiration, knowledge, skills, networks, practical experience, and confidence to Start-up a new Venture.

Course Outcomes:

Students will be able to:

CO1: Develop entrepreneurial mind-set and attributes;

CO2: Apply process of problem-opportunity identification and feasibility assessment through developing a macro perspective of the real market, industries, domains and customers

CO3: Analyse Customer and Market segmentation, estimate Market size.

CO4: Initiate Solution design, Prototype for Proof of Concept. Understand MVP development and validation techniques to determine Product-Market fit.

CO5: Craft initial Business and Revenue models, financial planning and pricing strategy for profitability and financial feasibility of a venture.

CO6: Understand and apply story telling skills in presenting a persuasive and defensible Venture Pitch.

Unit 1: Entrepreneurship Fundamentals & Context

Meaning and concept, attributes and mindset of entrepreneurial and intrapreneurial leadership, role models in each and their role in economic development. Gamified role play based exploration aligned to one's short term career aspiration and ambition. An understanding of how to build entrepreneurial mindset, skillsets, attributes and networks while on campus.

Core Teaching Tool: Simulation, Game, Industry Case Studies (Personalized for students – 16 industries to choose from), Venture Activity

Unit 2: Problem & Customer Identification

Understanding and analysing the macro Problem and Industry perspective, technological, socio-economic and urbanization trends and their implication on new opportunities. Identifying passion, identifying and defining problem using Design thinking principles.

Analysing problem and validating with the potential customer. Iterating problem-customer fit. Understanding customer segmentation, creating and validating customer personas. Competition and Industry trends mapping and assessing initial opportunity.

Core Teaching Tool: Several types of activities including: Class, game, Gen AI, „Get out of the Building" and Venture Activity.

Unit 3: Solution design & Prototyping

Understanding Customer Jobs-to-be-done and crafting innovative solution design to map to customer's needs and create a strong value proposition. Developing Problem-solution fit in an iterative manner. Understanding prototyping and MVP. Developing a feasibility prototype

with differentiating value, features and benefits. Initial testing for proof-of-concept and iterate on the prototype.

Core Teaching Tool: Venture Activity, nocode Innovation tools, Class activity

Unit 4: Opportunity Assessment and Sizing

Assess relative market position via competition analysis, sizing the market and assess scope and potential scale of the opportunity.

Core Teaching Tool: Class and Venture Activity

Unit 5: Business & Financial Model, Go-to-Market Plan

Introduction to Business model and types, Lean approach, 9 block lean canvas model, riskiest assumptions to Business models. Importance of Build - Measure – Lean approach Business planning: components of Business plan- Sales plan, People plan and financial plan, Financial Planning: Types of costs, preparing a financial plan for profitability using financial template, understanding basics of Unit economics and analysing financial performance. Introduction to Marketing and Sales, Selecting the Right Channel, creating digital presence, building customer acquisition strategy. Choosing a form of business organization specific to your venture, identifying sources of funds: Debt & Equity, Map the Start-up Lifecycle to Funding Options.

Core Teaching Tool: Founder Case Studies – Sama and Securely Share; Class activity and discussions; Venture Activities.

Reference Books

1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha (2020). Entrepreneurship, McGrawHill, 11th Edition.
2. Ries, E. (2011). The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business.
3. Osterwalder, A., & Pigneur, Y. (2010). Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons
4. Chowdhry Ajay, (2023) Just Aspire: Notes on Technology, Entrepreneurship and the Future.
5. Simon Sinek (2011) Start With Why, Penguin Books limited
6. Brown Tim (2019) Change by Design Revised & Updated: How Design Thinking Transforms Organizations and Inspires Innovation, Harper Business
7. Namita Thapar (2022) The Dolphin and the Shark: Stories on Entrepreneurship, Penguin Books Limited
8. Collins Jim, Porras Jerry, (2004) Built to Last: Successful Habits of Visionary Companies
9. Burlington Bo, (2016) Small Giants: Companies That Choose to Be Great Instead of Big
10. Saras D. Sarasvathy, (2008) Effectuation: Elements of Entrepreneurial Expertise, Elgar Publishing Ltd

Web Resources

Learning resource- IgniteX Course Wadhwani platform (Includes 200+ components of custom created modular content + 500+ components of the most relevant curated content)

Second Year (Semester –III)
Life of Chhatrapati Shivaji Maharaj

25AF1000VE308	**Life of Chhatrapati Shivaji Maharaj**	**VEC**	**1L- 0T - 0P**	**1 Credits**

Teaching Scheme	**Examination Scheme**
Lecture: 1 hrs./week	Continuous Assessment: 50Marks

Course Objectives: Completing this course the students will:

1. Analyze Chhatrapati Shivaji Maharaj's leadership qualities, strategic thinking, and management skills.
2. Develop critical thinking and problem-solving skills through case studies and discussions.
3. Recognize the relevance of the Chhatrapati's principles and values in modern times.

Course Outcomes:

CO1: Explain Chhatrapati Shivaji Maharaj's military strategies, conquests, and establishment of the Maratha Empire.

CO2: Evaluate the Chhatrapati's leadership qualities, such as courage, vision, human values and adaptability.

CO3: Apply the Chhatrapati's principles, such as decentralization and social welfare, to modern engineering challenges.

Unit 1: Shivaji Maharaj as a Great Conqueror **5 Hrs.**

- Master Strategist and innovator in Military Tactics
- Guerrilla Warfare (Ganimi Kava)
- Fortress Strategy
- Avoidance of Direct Confrontation
- Diplomacy and Alliances
- Naval Power

Unit 2: Shivaji Maharaj's Management and leadership strategies **5 Hrs.**

- Architecture and metallurgy of Raigad Fort
- Use of Light Cavalry
- Intelligence Network
- Asymmetric Warfare
- Logistics and Supply Chains
- Fortifications and Military Architecture

Unit 3 : Shivaji Maharaj’s views on Democracy and Nationalism **5 Hrs.**

- Shivaji Maharaj’s views about Women's rights, their dignity and religious views
- His views on Democracy & Nationalism

Text Books / References:

1. Desai, Ranjit. *Shriman Yogi.* Mehta Publishing House. 2018.

2. Kurundkar, Narhar. *Chatrapati Shivaji Maharaj Jeevan Rahasya*. Deshamukh and Company. 2024.
3. Sarkar, Jadunath. Shivaji and His Times by Jadunath Sarkar, Classic Book on the Life and History of the Maratha Emperor. Nandy Books. 2024.
4. Keluskar, Krushnaji Arjun. *Chhatrapati Shivaji Maharaj*. Sudhir Prakashan. 2020.
5. Bedekar, Ninad. *Kalatil Vyavsthapan Tatve*. 2015.

Second Year (Semester –III)
Digital System Design & Microprocessor lab

25AF1378PC309L	**Digital System Design & Microprocessor Lab**	**PCC**	**0L- 0T - 2P**	**1 Credits**

Teaching Scheme	**Examination Scheme**
Practical: 02 hrs./week	Continuous Assessment: 60 Marks End Semester Exam: 40 Marks

Digital System Design & Microprocessor Lab

(Minimum 8-10 experiments are to be performed based on contents from syllabus)
Sample List of Practical's:

Verify the functionality of the following:

1. Logic gate (AND, OR, NOT, NAND, NOR, XOR, XNOR)
2. Flip flops (SR, D, JK, T)
3. Adders and Subtractor
4. Decoders
5. Multiplexer/Demultiplexer
6. Counters
7. Shift Registers
8. Simple Microprocessor based program

Second Year (Semester –III)
Universal Human Values II

25AF1UHVVE310	Universal Human Values II	VEC	3L- 0T - 0P	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./week	Continuous Assessment: 20Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks

Course Objectives:

1. To help the students appreciate the essential complementarily 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 behaviour and mutually enriching interaction with Nature.

Course Outcomes:

By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

This is only an introductory foundational input. It would be desirable to follow it up by
a) Faculty-student or mentor-mentee programs throughout their time with the institution
b) Higher level courses on human values in every aspect of living.

Module 1 Introduction to Value Education

-Understanding Value Education
- Self-exploration as the Process for Value Education
- Continuous Happiness and Prosperity the Basic Human Aspirations
- Right Understanding, Relationship and Physical Facility
- Happiness and Prosperity Current Scenario
- Method to Fulfill the Basic Human Aspirations

Module 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

Module 3 Harmony in the Family and Society

- Harmony in the Family the Basic Unit of Human Interaction
- Values in Human-to-Human Relationship
- 'Trust' the Foundational Value in Relationship
- 'Respect' as the Right Evaluation
- Understanding Harmony in the Society
- Vision for the Universal Human Order

Module 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

Module 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

3. READINGS:

Textbook and Teachers Manual

a. 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

b. The Teacher's Manual Teachers‟ Manual for 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 978-93-87034-53-2

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

Second Year (Semester –III)
Community Engineering Project (CEP)

25AF1378FP311	**Community Engineering Project (CEP)**	**CEP/FP**	**0L- 0T - 4P**	**2 Credits**

Teaching Scheme	**Examination Scheme**
Practical: 04 hrs./week	Continuous Assessment: 60 Marks End Semester Exam: 40 Marks

Course Objectives:

1. Opportunities to engage with their local community, fostering empathy, teamwork, and problem solving skills while contributing positively to their surroundings.
2. An understanding of the challenges faced by the local community and the role of engineering in addressing those challenges.
3. The ability to apply technical knowledge and skills to design solutions or interventions that create a positive impact on the community.
4. The skills to evaluate and critically analyze the outcomes of their engagement activities, deriving actionable insights for sustainable impact.

Course Outcomes:

After completing this course, students will be able to:

CO1: Identify and Analyze community needs and challenges by engaging with stakeholders and evaluating real-world problems.

CO2: Design and Implement practical, creative, and context-specific solutions using engineering principles to address community issues.

CO3: Reflect and Evaluate the effectiveness of their interventions and articulate lessons learned through reports and presentations.

Course Guidelines

A community engagement project is intended to instill social responsibility and to connect students with local communities to address real-life challenges and promote sustainable development. Students are expected to contribute to the community by sharing their learning outcomes and solve/propose solutions to societal/community problems. The motto of the community engagement project is ‘Campus to Community’. Students are expected to identify socially relevant problems/projects under the guidance of teacher and solve or propose solutions. These projects foster collaboration, empathy, and social responsibility.

Projects may include, but not limited to, diverse areas such as health, where students can organize free check-up camps or mental health awareness drives; livelihood, through skill-sharing or micro entrepreneurship support; and education, via digital literacy workshops, mobile libraries, or career guidance camps. Environmentally impactful projects include rainwater harvesting awareness and solar lighting in villages. Moreover, projects like documenting local history or organizing cultural exchange events help preserve and celebrate community identity. Such initiatives not only benefit society but also provide participants with practical experience, leadership skills, and a deeper understanding of civic duties. Through these engagements, communities become active partners in development, creating a more inclusive and resilient society.

A. Project Scope:

The CEP should focus on addressing a specific community or societal issue. Projects may fall under the following themes:

1. Education and Awareness: Conduct workshops or awareness drives on topics like digital literacy, environmental sustainability, mental health, or career planning for local stakeholders.
2. Technology for Social Good: Develop a simple prototype or solution that addresses a real-world problem (e.g., a water saving device, simple mobile apps, or tools for community use).
3. Environmental Sustainability: Organize clean-up drives, tree plantations, recycling campaigns, or energy conservation initiatives.
4. Health and Wellness: Promote health through awareness programs on hygiene, nutrition, and exercise.
5. Skill Development: Teach basic computer or technical skills to students, staff, or the community.

B. Step-by-Step Execution Plan:

1. Planning Phase:
    a. Team Formation: Form a team of 3-4 students with a balance of skills and interests. The group should be cohesive, sharing and caring, contribute to the task assigned.
    b. Project Selection: Choose a project theme and define a clear objective that aligns with community needs.
    c. Proposal Submission: Submit a one-page project proposal outlining:
        - Title of the project.
        - Objective and expected outcome.
        - Plan of execution (timeline and activities).
        - Required resources (if any).
        - Get approval from the designated faculty mentor.
2. Execution Phase:
    a. Phase 1 Activities
        - Conduct initial outreach and engage with the community or target participants.
        - Implement planned activities with close teamwork and documentation.
    b. Phase 2 Activities
        - Continue engagement and collect feedback from the participants.
        - Begin summarizing the outcomes of the project.
3. Reporting Phase:
    a. Documentation: Create a detailed report containing:
        - Title, objective, and scope of the project.
        - Activities conducted and timeline.

- Outcomes and community feedback.
- Photos/videos of the activities (if permitted).
- Challenges faced and how they were addressed.

b. Presentation:

- Each team will present their project to a panel of faculty members or peers, showcasing their efforts and outcomes.
- Duration of presentation: 5-7 minutes per team.

C. Evaluation Criteria:

Projects will be evaluated based on:

1. Relevance: How well the project aligns with community needs.
2. Impact: The tangible and intangible benefits delivered to the community.
3. Innovation: Creativity in the approach or solution provided.
4. Teamwork: Collaboration and effective delegation within the group.
5. Documentation & Presentation: Clarity, depth, and overall delivery of the report and presentation.

D. Guidelines for Conduct:

1. Behavior: Students should display professionalism, punctuality, and respect.
2. Safety: Follow all safety protocols during on-campus or fieldwork activities.
3. Feedback: Collect feedback from participants to measure the success and identify areas for improvement.

E. Best Practices:

1. Maintain a positive attitude and open communication with the community.
2. Respect cultural norms and values of the participants.
3. Adapt your plan based on real-time needs or challenges.
4. Faculty mentors has to be assigned to each group to guide them throughout the project.
5. The task carried out need to be maintained in field work diary by each group.

Reference Books:

1. Dostilio, L. D., et al. The Community Engagement Professional's Guidebook: A Companion to The Community Engagement Professional in Higher Education. Stylus Publishing, 2017.
2. Waterman, A. Service-Learning: A Guide to Planning, Implementing, and Assessing Student Projects. Routledge, 1997.
3. Beckman, M., and Long, J. F. Community-Based Research: Teaching for Community Impact. Stylus Publishing, 2016.
4. IDEO.org. Design Thinking for Social Innovation. IDEO Press, 2015.
5. Sherrod, L. R., Torney-Purta, J., and Flanagan, C. A. (Eds.). Handbook of Research on Civic Engagement in Youth. Wiley, 2010.

For Planning and Conducting Projects:

1. UNESCO: Education for Sustainable Development: https://www.unesco.org
2. EPICS (Engineering Projects in Community Service): https://engineering.purdue.edu/EPICS
3. Ashoka: Innovators for the Public: https://www.dfcworld.com
4. Design for Change: https://www.dfcworld.com

5. Community Tool Box (University of Kansas): https://ctb.ku.edu
6. UN SDG (Sustainable Development Goals) Knowledge Platform: https://sdgs.un.org/
7. Campus Compact: https://www.compact.org/

Second Year (Semester IV)
Analog Circuits

25AF1378PC401	Analog Circuits	PCC	3L- 0T - 0P	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./week Tutorial: 0 hr./week	Continuous Assessment: 20Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks

Course Objectives:

1 To demonstrate the different stages in Op-Amp and its working principle.
2 To explore various op-amp parameters and their significance.
3 To discuss the frequency response, transient response and frequency compensation techniques for Op-Amp.
4 To illustrate various linear and nonlinear applications of Op-Amp.
5 To explain the functionalities of PLL and its use in various applications in communication and control systems.

Course Outcomes: After completion of the course, students will be able to:

CO1 Understand the working of OP-AMP and parameters of IC 741.
CO2 Apply the knowledge of IC 741 for designing simple linear applications.
CO3 Design square wave generator and active filters using OP-AMP.
CO4 Understand the working of IC 555 and its use for waveform generation.
CO5 Explain the concept of PLL & its application.

Course Contents:

Unit 1: OP-AMP Basics **[09 Hours]**

Block diagram of OP-AMP, Differential Amplifier configurations, current mirror circuit, level shifting, transfer- characteristics, frequency response, study of IC 741, OP-AMP parameters, offset nulling and their importance. Voltage series and voltage shunt feedback amplifier and its effect on Ri, Ro, bandwidth and voltage gain.

Unit 2: Linear Applications of OP-AMP **[08 Hours]**

Inverting and non-inverting amplifier, voltage follower, Summing, averaging, scaling amplifier, Differentiator, Integrator, Instrumentation amplifiers, voltage to current converter, frequency to voltage and voltage to frequency converter.

Unit 3: Non-linear Applications of OP-AMP & Active Filters **[09 Hours]**

Comparator, window detector, Schmitt trigger, astable, monostable and bistable multivibrator, triangular wave generator, clippers and clampers.

Active filters: LPF, HPF, BPF, Band Stop Filters, 1^{st} and 2^{nd} order Butterworth filters using op-amp.

UNIT 4: Timers **[08 Hours]**

Timers: Block schematic of IC555, Pin configuration of IC555, application of timer 555 as astable, monostable and bistable multivibrators, frequency divider, sawtooth generator, free running ramp generator.

Unit 5: Phase Locked Loop **[07 Hours]**

Operation of phase lock loop system, transfer characteristics, lock range and capture range, study of PLL IC-LM 565 and its applications as FM detector and frequency translator, VCO.

TEXTBOOKS: -

1. Ramakant A. Gaikwad, Op Amps and Linear Integrated Circuits‖, Pearson Education 2000.
2. Salivahanan and Kanchana Bhaskaran, Linear Integrated Circuits‖, Tata McGraw Hill, India 2008.
3. Bali, Linear Integrated Circuits, McGraw Hill 2008.

REFERENCE BOOKS: -

1. George Clayton and Steve Winder, Operational Amplifiers, 5th Edition Newnes.
2. Sergio Franco, Design with Operational Amplifiers and Analog Integrated Circuits‖, Tata McGraw Hill.
3. Gray, Hurst, Lewise, Meyer, Analysis & Design of Analog Integrated Circuits, Wiley Publications on Education.
4. Matt Weisfeld, the Object-Oriented Thought Process, Pearson.
5. Cox Brad, Object –Oriented Programming: An Evolutionary Approach, Addison –Wesley.

Second Year (Semester IV)
Analog Circuits Lab

25AF1378PC402L	Analog Circuits Lab	PCC Lab	0L- 0T - 2P	1 Credits

Teaching Scheme	Examination Scheme
Practical: 02 hrs./week	Continuous Assessment: 60 Marks End Semester Exam: 40 Marks

Analog Circuits Lab

(Minimum 8-10 experiments are to be performed based on contents from syllabus)
Sample List of Practical's:

1. To Measure Op-Amp parameters and compare with the specifications (Input bias current, input offset current and input offset voltage, Slew rate, CMRR).
2. To design inverting amplifier using IC 741.
3. To design non-inverting amplifier using IC 741.
4. To study and perform integrator for given frequency fa.
5. To study and perform three Op-Amp instrumentation amplifiers for typical application.
6. To design Differentiator circuit using IC-741.
7. To design Integrator circuit using IC-741.
8. To study and perform Schmitt trigger and plot transfer characteristics.
9. To study and perform square & triangular wave generator using op-amp.
10. To verify and understand practically virtual ground and virtual short concept in inverting and non-inverting configuration.
11. Plot DC transfer characteristics of emitter coupled differential amplifier.
12. Study effect of emitter resistance and constant current source on figure of merit. (CMRR) of emitter coupled differential amplifier.
13. To study and perform V-I converter.
14. Study and perform practical based on astable multi vibrator using IC555 for the given specifications.
15. Study and perform practical based on monostable multivibrator using IC555 for the given specifications.
16. Mini-project.

Second Year (Semester-IV)
Network Theory & Signals and Systems

25AF1378PC403	Network Theory & Signals and Systems	PCC	3L- 0T - 0P	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./week Tutorial: 0 hr./week	Continuous Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks

Course Objectives: The aim of this course is:

1. To develop skills for analysis of linear circuits using nodal analysis, mesh analysis and network theorems.
2. To illustrate the concept of graph theory used for networks analysis.
3. To demonstrate a comprehensive understanding of various parameters used to characterize two-port networks.
4. To emphasise on the fundamental characteristics of signals and systems.
5. To explore the need of Laplace transform and develop the ability to analyze the systems in s-domain.

Course Outcomes: After completion of the course, students will be able to:

CO1 Analyze electrical circuits using Mesh Analysis, Node analysis and network theorems.
CO2 Determine network currents and voltages using Graph Theory approach.
CO3 Apply the concept of Two-Port network theory for electrical network analysis
CO4 Understand the classification of signals and systems.
CO5 Analyze Linear Time Invariant (LTI) systems in Laplace Domain.

UNIT-1: **[09 Hours]**

Node and Mesh analysis: Circuit components, Types of Sources, Source transformation, Kirchhoff's laws, Node and Mesh analysis.

Network Theorems: Superposition theorem, Thevenin's theorem, Norton's theorem and Maximum power transfer theorem

Unit-2 Graph theory and network equations: **[08 Hours]**

Graph of a network, Trees, Co-trees and loops, Incidence matrix, Tie set and Cut set of a network, Analysis of a network using Tie set and Cut set matrix, Network equilibrium equations (without magnetic coupling), Duality.

UNIT-3: Two Port Networks: **[07 Hours]**

Two port Network: Open circuit impedance parameters (Z), Short circuit admittance parameters (Y), Transmission parameters (ABCD), Hybrid parameters (H), and reciprocity and symmetry conditions. **Interconnection of two port networks**: Parallel, Series and Cascade connection of two port networks, T and π representation, Terminated 2 port networks.

UNIT-4: **[08 Hours]**

Signals and systems as seen in everyday life, and in various branches of engineering and science. Classification of Signals in continuous time: continuous and discrete time signals, continuous and discrete amplitude signals, deterministic and random signals, periodic and non-periodic signals, Energy and power signals. Elementary Signals: Unit impulse, step, ramp, exponential, Classification of systems in continuous time.

UNIT-5: **[08 Hours]**

Laplace Transform: Laplace Transform, Region of convergence, Inverse Laplace transforms Application of Laplace transform for determination of solution of differential equation and systems realization up to second order, analysis of RC, RL and RLC networks. Frequency response of LTI system.

TEXT BOOKS:

1. Valkenburg, “Network Analysis”, PHI Pbs.
2. D. Roy Choudhary, “Networks and Systems” New Age International Publishers.
3. Dr. S. L. Nalbalwar, A.M. Kulkarni and S.P. Sheth, “Signals and Systems”, 2nd Edition, Synergy Knowledgeware, 2017

REFERENCES BOOKS:

1. Kelkar, Pandit, “Linear Network Theory”, Pratibha Publication.
2. “Network Analysis And Synthesis”, Wadhwa, New Age Pbs
3. “Introduction to Network Synthesis”, Valkenburg, PHI Pbs.
4. Sudhakar, A. Shyammohan, “Circuits and Network”, Third Edition, 2006, Tata McGraw Hill.
5. R. Anand, Signals and Systems, Khanna Publishing House, 2019.
6. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall, 1983.
7. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998.
8. Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia) Private Limited, c1998.
9. Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems", John Wiley and Sons, 1995.

Second Year (Semester IV)
Network Theory & Signals and Systems Lab

25AF1378PC404L	**Network Theory & Signals and Systems Lab**	**PCC Lab**	**0L- 0T - 2P**	**1 Credits**

Teaching Scheme	**Examination Scheme**
Practical: 02 hrs./week	Continuous Assessment: 60 Marks End Semester Exam: 40 Marks

Network Theory & Signals and Systems Lab

(Minimum 8-10 experiments are to be performed based on contents from syllabus)

Sample List of Practical's:

1. Thevenin's Theorems
2. Norton's Theorems
3. Maximum Power Transfer Theorems
4. Superposition Theorem
5. Z Parameters
6. Y Parameters
7. Transmission and hybrid parameters
8. Simulation of DC Circuits
9. Mesh Analysis
10. Nodal Analysis
11. Generation of standard test signals
12. Practical based on Laplace transform
13. Mini Project.

Second Year (Semester –IV)
Constitution of India

25AF1COIVE407	Constitution of India	VEC	2L- 0T - 0P	Audit

Teaching Scheme	Examination Scheme
Lecture: 2 hrs./week	Continuous Assessment: 50 Marks

Mandatory Courses (non-credit)

Universal declaration of Human Rights and Provisions of India, Constitution and Law, National Human Rights Commission and State Human Rights Commission.

Course Objectives:

1. To acquaint the students with legacies of constitutional development in India and help them to understand the most diversified legal document of India and philosophy behind it.
2. To make students aware of the theoretical and functional aspects of the Indian Parliamentary System.
3. To channelize students‟ thinking towards basic understanding of the legal concepts and its implications for engineers.
4. To acquaint students with latest intellectual property rights and innovation environment with related regulatory framework.
5. To make students learn about role of engineering in business organizations and e-governance.

Course Outcomes:

At the end of the course the students will

CO1: Identify and explore the basic features and modalities about Indian constitution.

CO2: Differentiate and relate the functioning of Indian parliamentary system at the center and state level.

CO3: Differentiate different aspects of Indian Legal System and its related bodies.

CO4: Discover and apply different laws and regulations related to engineering practices.

CO5: Correlate role of engineers with different organizations and governance models.

Constitution of India – Basic features and fundamental principles

The Constitution of India is the supreme law of India. Parliament of India can not make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the “basic structure” of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of “Constitutionalism” – a modern and progressive concept historically developed by the thinkers of “liberalism” – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The AICTE Model Curriculum for Mandatory Courses & Activities (Non-Credit) for Undergraduate Degree in Engineering & Technology 116 | Page historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of “constitutionalism” in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America. The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India’s legacy of

"diversity". It has been said that Indian constitution reflects ideals of its freedom movement, however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be "static" and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it "as one of the strongest courts in the world".

Course Content:

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions : National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21.

Suggested Readings:

1. Brij Kishore Sharma: Introduction to the Indian Constitution, PHI, New Delhi, latest edition.
2. Granville Austin: The Indian Constitution: Cornerstone of a Nation. 1966, Oxford Clarendon Press.
3. Subhash C. Kashyap: Our Constitution: An Introduction to India's Constitution and constitutional Law, NBT, 2018.
4. PM Bakshi: The Constitution of India, Latest Edition, Universal Law Publishing.
5. V.K. Ahuja: Law Relating to Intellectual Property Rights (2007)
6. Suresh T. Viswanathan: The Indian Cyber Laws, Bharat Law House, New Delhi-88
7. P. Narayan: Intellectual Property Law, Eastern Law House, New Delhi
8. Prabudh Ganguli: Gearing up for Patents: The Indian Scenario, Orient Longman.
9. BL Wadehra: Patents, Trademarks, Designs and Geological Indications.Universal Law Publishing - LexisNexis.
10. Intellectual Property Rights: Law and Practice, Module III by ICSI (only relevant sections)
11. Executive programme study material Company Law, Module II, by ICSI (The Institute of Companies Secretaries of India) (Only relevant sections i.e., Study 1, 4 and 36). https://www.icsi.edu/media/webmodules/publications/Company%20Law.pdf
12. Handbook on e-Governance Project Lifecycle, Department of Electronics & Information Technology, Government of India,

https://www.meity.gov.in/writereaddata/files/eGovernance_Project_Lifecycle_Participant_Handbook-5Day_CourseV1_20412.pdf
13. Companies Act, 2013 Key highlights and analysis by PWC. https://www.pwc.in/assets/pdfs/publications/2013/companies-act-2013-keyhighlights-and-analysis.pdf

Referred Case Studies:

- Keshavanand Bharati V. State of Kerala, AIR 1973 SC 1461.
- Maneka Gandhi V. Union of India AIR, 1978 SC 597.
- S.R. Bammai V. Union of India, AIR 1994 SC 1918.
- Kuldip Nayyar V. Union of India, AIR 2006 SC312.
- A.D.M. Jabalpur V. ShivkantShakla, AIR 1976 SC1207.
- Remshwar Prasad V. Union of India, AIR 2006 SC980.
- Keshav Singh in re, AIR 1965 SC 745.
- Union of India V. Talsiram, AIR 1985 SC 1416.
- Atiabari Tea Estate Co.V. State of Assam, AIR 1961SC232.
- SBP & Co. Vs. Patel Engg. Ltd. 2005 (8) SCC 618.
- Krishna Bhagya Jala Nigam Ltd. Vs. G. Arischandra Reddy (2007) 2 SCC 720.
- Oil & Natural Gas Corporation Vs. Saw Pipes Ltd. 2003 (4) SCALE 92 – 185.

**(Other relevant case studies can be consulted by the teacher as per the topic).

Prescribed Legislations:

1. Information Technology Act, 2000 with latest amendments.
2. RTI Act 2005 with latest amendments.
3. Information Technology Rules, 2000
4. Cyber Regulation Appellate Tribunal Rules, 2000

Suggested aid for Students and Pedagogic purpose

- RSTV debates on corporate law, IPR and patent issues
- NPTEL lectures on IPR and patent rights

Episodes of 10 -part mini TV series "Samvidhan: The Making of Constitution of India" by RSTV.

Second Year (Semester –IV)
Life of Bharatratna Dr. Babasaheb Ambedkar

25AF1000VE408	**Life of Bharatratna Dr. Babasaheb Ambedkar**	**VEC**	**1L- 0T - 0P**	**1 Credits**

Teaching Scheme	**Examination Scheme**
Lecture: 1 hrs./week	Continuous Assessment: 50 Marks

Course Objectives:

1. Analyze Dr. Ambedkar's role in shaping India's constitution and social justice movements
2. Recognize the relevance of his principles in contemporary engineering and societal contexts
3. Develop critical thinking and problem-solving skills through case studies and discussions

Course Outcomes:

CO1: Explain Dr. Ambedkar's key contributions to the Constitution of India, establishment of human values and social reform

CO2: Identify and analyze his leadership qualities and strategic thinking

CO3: Evaluate the impact of his legacy on Maharashtra's culture, politics, and economy

Unit 1: Introduction **5 Hrs.**

-Introduction to the Socio-political Context of Dr. Babasaheb Ambedkar's Era
- British Colonialism
- Indian National Movement
- Caste Hierarchy
- Untouchability
- Social Reform Movements
- Role in the Indian freedom struggle

Unit 2: The Contribution of Dr. Babasaheb Ambedkar **5 Hrs.**

- Contribution to the Constitution of India
- Vision for Social Justice and Empowerment

Unit 3: Legacy and Relevance Today **5 Hrs.**

- Dr. Ambedkar and Marxism: An Exploration of his Thoughts on Marxism
- Common Ground with Marxism
- Focus on Class Struggle
- Caste vs Caste
- Primacy of Caste in Indian Society
- Economic Ideas and Policies

Text Books / Reference:

1. Keer, Dhananjay. *Dr.Babasaheb Ambedkar Life and Mission*. Popular Prakashan. 1954.
2. Ambedkar, B. R. *Annihilation of Caste*. Fingerprint Publishing. 2023.
3. Ambedkar, B. R. *Buddha or Karl Marx*. Infinite Words. 2024.
4. Ambedkar, B. R. *The Problem of Rupee: It's Origin and it's Solution*. Sudhir Prakashan. 2021.

Second Year (Semester –IV)
Patents and IPR

25AF1000HM409	Patents and IPR	Entrepreneurship	2L- 0T - 0P	2 Credits

Teaching Scheme	Examination Scheme
Lecture: 2 hrs./week Tutorial: 0 hr./week	Continuous Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks

Course objectives

1. To explore the historical development and significance of patents in fostering innovation.
2. To familiarize students with the legal frameworks governing patents.
3. To Identify and evaluate the criteria for patentability, including novelty, non-obviousness, and industrial applicability.
4. To understand the role of prior art in the patent examination process.
5. To understand the challenges and opportunities associated with filing patents globally.

Course outcomes:

Students will be able to

CO1: Demonstrate proficiency in patent categorization and practical patent procedures.

CO2: Utilize patent databases effectively.

CO3: Grasp the significance of IPR and its historical context.

CO4: Stay updated on the latest IPR developments, especially in biological systems and computer software.

CO5: Apply acquired knowledge and problem-solving skills to real-world cases related to patents and IPR.

UNIT 1: Patents

Designs, Trade and Copyright, Classification of patents in India, Categories of Patent, Special Patents, Patent document, granting of patent, Rights of a patent, Patent Searching, Patent Drafting, filing of a patent, different layers of the international patent system, Utility models.

UNIT 2: Patent Rights

Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT 3: Overview of Intellectual Property

Introduction of IPR, Need for intellectual property right (IPR), IPR in India – Genesis and Development IPR in abroad.

UNIT 4: New Developments in IPR

Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge, Case Studies.

UNIT 5: Case studies:

Case studies related to patents and IPR

TEXT/REFERENCE BOOKS:

1. Feroz Ali, The Law of Patents, LexisNexis
2. Ronald D. Slusky, Invention Analysis and Claiming – A Patent Lawyer‟s Guide, Second Edition, American Bar Association, 2012.
3. Feroz Ali, The Touchstone Effect – The Impact of Pre-grant Opposition on Patents, LexisNexis, 2009.

Second Year (Semester –IV)
A. Marathi
B. Hindi
C. Sanskrit

25AF1000AE410A **25AF1000AE410B** **25AF1000AE410C**	**A. Marathi** **B. Hindi** **C. Sanskrit**	**HSSM**	**2L- 0T - 0P**	**2 Credits**

Teaching Scheme	**Examination Scheme**
Lecture: 2 hrs./week Tutorial: 0 hr./week	Continuous Assessment: 20Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks

Syllabus for above Subject as per University Guidelines

उपयोजित मराठी/ व्यावहारिक मराठी अभ्यासक्रम

Course Code	Course Title	Teaching Scheme			Examination Scheme					
		L	T	P	Continuous Assessment (1)	Continuous Assessment (2)	Mid Term Test	End Semester Exam	Total	Credits
2311372AE204 24UD1000AE410A	उपयोजित मराठी/ व्यावहारिक मराठी	2	0	0	10	10	20	60	100	2

Course Objectives:

- मराठी भाषेचा ऐतिहासिक प्रवास, तिच्या निर्मितीतील संस्कृत, प्राकृत आणि अपभ्रंश भाषांचा प्रभाव समजून घेणे.
- मराठी लेखनाचे नियम, व्याकरण व शुद्धलेखन यांची अचूकता आत्मसात करणे.
- सर्जनशील आणि औपचारिक लेखन कौशल्ये विकसित करणे.
- भाषांतर तत्त्वे, प्रक्रिया आणि सांस्कृतिक संदर्भ यांचा विचार करून मराठीतून इंग्रजी आणि इंग्रजीतून मराठी भाषांतर करण्याचे कौशल्य प्राप्त करणे.

Course Outcomes:

- विद्यार्थी मराठी भाषेच्या ऐतिहासिक प्रवासाची समज वाढवतील आणि तिच्या विकासातील टप्पे स्पष्टपणे सांगू शकतील.
- शुद्ध व प्रमाणबद्ध लेखन करण्याची क्षमता प्राप्त होईल.
- विविध प्रकारच्या लेखन शैली आत्मसात करून सृजनशील, विश्लेषणात्मक आणि औपचारिक लेखन करू शकतील.
- अचूक, स्पष्ट आणि भाषिक-सांस्कृतिक दृष्टिकोनातून योग्य भाषांतर करू शकतील.
- व्यावसायिक आणि साहित्यिक भाषांतरात प्रावीण्य मिळवू शकतील.

घटक- १. मराठीचा उगम आणि विकास

- मराठीचा उगम आणि विकास
- मराठी भाषेवर संत परंपरेचा प्रभाव- ज्ञानेश्वर, तुकाराम, नामदेव आणि एकनाथ यांच्या रचनांचा अभ्यास.
- मराठीत बखरी लेखन व इतिहासदर्शन.
- आधुनिक मराठी आणि सुधारणा चळवळी- टिळक, फुले, आणि आगरकर यांचे योगदान.

घटक- २. स्वातंत्र्यानंतरची मराठी भाषा

- महाराष्ट्र राज्य निर्मिती व मराठीचा अधिकृत दर्जा.
- डिजिटल युगातील मराठी भाषा : ब्लॉग, सोशल मीडिया आणि ई-साहित्य.
- मराठी भाषा संरक्षणासाठी उपाययोजना.
- शिक्षणव्यवस्थेतील मराठीचा वापर.
- जागतिक स्तरावर मराठी भाषेचा प्रभाव.

घटक-३. मराठी लेखनाचे नियम आणि व्याकरण

- संधि
- वाक्यप्रकार (विधानार्थी वाक्य, प्रश्नार्थी वाक्य, आज्ञार्थी वाक्य इ.)
- विरामचिन्हे आणि त्यांचे उपयोग
- शुद्धलेखन
- समानार्थी शब्द (पर्यायवाची शब्द), विरुद्धार्थी शब्द

घटक-४. लेखन कौशल्य

- लेखन कौशल्याचा परिचय- लेखन कौशल्याचे महत्त्व आणि आवश्यकता
- पत्रलेखन
- निबंध लेखन
- वृत्तलेखन (वृत्तपत्रीय लेखन)
- इतिवृत्त लेखन
- सारांश लेखन

- घटक- ५. भाषांतर (मराठीतून इंग्रजी अणि इंग्रजीतून मराठी)

- भाषांतराचा मूलभूत परिचय- भाषांतराची व्याख्या आणि स्वरूप, महत्त्व आणि उपयोग, भाषांतराचे प्रकार इ.
- पारिभाषिक शब्दावली

- मराठीतून इंग्रजी आणि इंग्रजीतून मराठी भाषांतर.

संदर्भ साहित्य

1. प्रशासनिक लेखन, भाषा संचालनालय , महाराष्ट्र शासन, मुंबई १९६६
2. सुगम मराठी व्याकरण व लेखन - मो.रा. वाळंबे
3. "अनुवाद सिद्धांत आणि प्रयोग" – डॉ. भालचंद्र नेमाडे (लोकवाङ्मय गृह प्रकाशन)
4. मराठी भाषा आणि साहित्याचा इतिहास – वि.का. राजवाडे प्रकाशक : राजवाडे संशोधन मंडळ, धुळे
5. भाषांतर : सिद्धांत आणि प्रयोग – डॉ. अशोक केळकर प्रकाशक : लोकवाङ्मय गृह, मुंबई

सामान्य हिंदी / व्यावहारिक हिंदी पाठ्यक्रम

पाठ्यक्रम उद्देश्य (Course Objectives):

- हिंदी भाषा के उद्भव, विकास और ऐतिहासिक प्रवृत्तियों को समझाना।
- हिंदी व्याकरण और लेखन कौशल में दक्षता प्रदान करना।
- प्रशासन, शिक्षा और संचार में हिंदी के व्यावहारिक उपयोग को स्पष्ट करना।
- अनुवाद कौशल विकसित करना, जिससे तकनीकी एवं व्यावसायिक संचार सुगम हो।

अपेक्षित परिणाम (Course Outcomes):

- विद्यार्थी हिंदी भाषा के ऐतिहासिक और आधुनिक विकास को समझेंगे।
- हिंदी व्याकरण और लेखन के नियमों में दक्षता प्राप्त करेंगे।
- व्यावसायिक, प्रशासनिक और तकनीकी लेखन में हिंदी का प्रयोग कर सकेंगे।
- अनुवाद के सिद्धांतों को सीखकर अंग्रेजी और हिंदी के बीच प्रभावी अनुवाद कर सकेंगे।

इकाई – १. हिंदी भाषा का उद्भव और स्रोत

- हिंदी भाषा की उत्पत्ति और स्वरूप
- संस्कृत, प्राकृत और अपभ्रंश से हिंदी का विकास
- हिंदी की प्रमुख बोलियाँ (ब्रज, अवधी, खड़ी बोली, भोजपुरी, राजस्थानी आदि)
- हिंदी पर फारसी, अरबी और अंग्रेज़ी भाषाओं का प्रभाव

इकाई- २. स्वातंत्र्योत्तर काल में हिंदी भाषा

- प्रशासन, शिक्षा और संचार माध्यमों में हिंदी की भूमिका
- राजभाषा के रूप में हिंदी – संवैधानिक स्थिति और व्यावहारिक उपयोग
- हिंदी का वैश्विक विस्तार और डिजिटल माध्यमों में हिंदी की उपस्थिति
- प्रशासन और संचार माध्यमों में हिंदी

इकाई- ३. हिंदी भाषा लेखन के नियम और व्याकरण

- वर्णमाला
- शब्द-भेद
- संधि
- वाक्य रचना
- वर्तनी
- उपसर्ग, प्रत्यय और शब्द निर्माण की प्रक्रिया
- विराम चिन्हों का प्रयोग
- पर्यायवाची शब्द
- विलोम शब्द

इकाई- ४. लेखन कौशल

- पत्र लेखन
- प्रतिवेदन (रिपोर्ट) लेखन
- विज्ञप्ति, नोटिस और परिपत्र लेखन

- निबंध लेखन
- सार लेखन

इकाई- ५. अनुवाद (अंग्रेजी से हिंदी और हिंदी से अंग्रेजी)

- अनुवाद : सिद्धांत और परंपरा
- अनुवाद : क्षेत्र, प्रकार
- पारिभाषिक शब्दावली
- अंग्रेजी से हिंदी और हिंदी से अंग्रेजी अनुवाद

संदर्भ ग्रंथ:

- "हिंदी भाषा का उद्भव और विकास" – डॉ. हरीशचंद्र वर्मा (लोकभारती प्रकाशन)
- "हिंदी भाषा का इतिहास" – डॉ. रामविलास शर्मा (राजकमल प्रकाशन)
- "भारत में राजभाषा हिंदी" – डॉ. विश्वनाथ प्रसाद (भारतीय राजभाषा परिषद)
- "हिंदी व्याकरण और रचना" – डॉ. हरीशचंद्र वर्मा (लोकभारती प्रकाशन)
- "हिंदी लेखन कौशल" – डॉ. रमेश गुप्ता (साहित्य भवन)
- "अनुवाद विज्ञान और सिद्धांत" – डॉ. ओमप्रकाश (राजकमल प्रकाशन)

संस्कृत अभ्यासक्रम

Course Objectives:

- संस्कृत भाषेचा ऐतिहासिक प्रवास
- संस्कृत लेखनाचे नियम, व्याकरण आत्मसात करणे.
- दैनंदिन संवादासाठी लागणारे काही शब्द यांचा अभ्यास करणे.

Course Outcomes:

- विद्यार्थी संस्कृत भाषेच्या ऐतिहासिक प्रवासाची समज करू शकतील आणि तिच्या विकासातील टप्पे स्पष्टपणे सांगू शकतील.
- शुद्ध व प्रमाणबद्ध लेखन करण्याची क्षमता प्राप्त होईल.
- विविध प्रकारच्या लेखन शैली आत्मसात करून लेखन करू शकतील.
- अचूक, स्पष्ट आणि भाषिक-सांस्कृतिक दृष्टीकोनातून योग्य भाषांतर करू शकतील.

1. Introduction to Sanskrit
- Importance and history of Sanskrit
- Sanskrit alphabets (Varnamala)
- Swaras (Vowels)
- Vyanjanas (Consonants)
- Pronunciation and script (Devanagari)

2. Basic Grammar
- Nouns, pronouns, Grammatical numbers, Grammatical genders, Grammatical person

- Verbs, Tenses, Sandhi (Combination of letters)
- Karaka (Case system) – Nominative, Accusative, Instrumental, etc.
- Vibhakti (Declensions of nouns and pronouns)
- Linga (Gender: Masculine, Feminine, Neuter)
- Vakya Rachana (Sentence construction)

3. Simple Vocabulary and Sentence Formation
- Basic words and their meanings (nature, family, animals, objects, etc.)
- Greetings and basic conversational phrases
- Formation of simple sentences

4. Selected Sanskrit Shlokas and Subhashitas
- Recitation and meaning of simple verses from Bhagavad Gita, Hitopadesha, or Panchatantra
- Common proverbs (Subhashitas)

5. Reading and Writing Practice
- Reading simple Sanskrit texts
- Writing small paragraphs in Sanskrit

Second Year (Semester –IV)
PCB Designing

25AF1378VS411	PCB Designing	VSEC	0L- 0T - 4P	2 Credits

Teaching Scheme	Examination Scheme
Practical: 04 hrs./week	Continuous Assessment: 60 Marks End Semester Exam: 40 Marks

Course Objectives:

1. To develop skills in starting projects, using design tools, and creating net lists.
2. To understand and implement PCB manufacturing techniques.
3. To find the faults and understand PCB assembly.
4. To understand Soldering Techniques and Quality Control
5. Learn to build accurate library parts for effective PCB layouts.

Course Outcomes:

Students will be able to develop projects using design tools and creating net lists.
CO1: Students will be able to find faults in the designs.
CO2: Students will be able to understand PCB assembly.
CO3: Students will be able to implement PCB manufacturing techniques.
CO4: Student will be able to build accurate library parts for effective PCB layouts.

Unit 1: Printed circuit Board Design:

Various types of Printed Circuit Boards: Single Sided Boards, Double Sided Plated through Hole Boards, multilayer Boards, and Process of PCB design and product development flow. **Schematic Design:** Starting a project, Working with schematic design tools, Schematic drawing from circuit, Rules for PCB Design, Standards for PCB Design, Placing, editing, and connecting parts and electrical symbols, Creating a net list, Exporting and importing schematic data, Basic Circuit simulation using EDA tool.

Unit 2: PCB Layout Design

Study of technical terms in layout design, Board outline Design, components placement, Details of layers, Routing methods, Copper Pour, Adding reference texts, Build library parts (footprints, schematic symbols), Manufacturing Output files generation.

Unit 3: PCB Manufacturing Techniques

Film Master Generation method: Study of photographic Film, Properties of material used in Manufacturing of PCBs. Cleaning Method of base materials. PCB Manufacturing Methods: Method of Screen Printing for pattern transfer. Method of Wet film and Dry film for single- and Double-Sided Board Manufacturing. Plating, etching, punching, drilling, milling and routing.

Unit 4: **Study of-Fault Finding methods of PCBs**

Repairing techniques, De-soldering techniques, PCB Assembly Techniques: Components Preparation Method, Lead identification of components. Component mounting techniques, Lead Forming methods. Leaded through hole assembly and Surface Mount Assembly. Mixed Assembly Techniques of through hole and SMDs. Manual Assembly method, Semiautomatic and automatic Assembly method.

Unit 5: Soldering Techniques:

Materials used in Soldering Process. Types of soldering techniques. Soldering Methods – Manual and Mass soldering Techniques. Tools for soldering and de-soldering. Study of soldering defect and rectification. Testing for quality control. Introduction to SMD soldering methods, placing methods of SMDs, study of material for SMD soldering. Rework and Repairing methods.

TEXT/REFERENCE BOOKS:

1. Printed Circuit Board Designer's Reference: Basics, by Christopher T. Robertson
2. Complete PCB Design Using OrCAD Capture and PCB Editor 2nd Edition, Kindle Edition, by Kraig Mitzner (Author), Bob Doe (Author), Alexander Akulin (Author), Anton Suponin (Author), Dirk Müller (Author).
3. PCB Design for Real-World EMI Control By: Bruce R. Archambeault (Author), James Drewniak (Author), Bruce R Archambeault (Author) | Publisher: Springer, 2002.

Second Year (Semester –IV)
System Design using Verilog

25AF1378PC412	System Design using Verilog	PCC	2L- 0T - 0P	2 Credits

Teaching Scheme	Examination Scheme
Lecture: 0 hrs./week Tutorial: 1 hr./week	Continuous Assessment: 20 Marks Mid Sem Exam: 20 Marks End Semester Exam: 60 Marks

Course Objectives: The aim of this course is:

1. To know the basic language features of Verilog HDL and the role of HDL in digital logic design.
2. To know the behavioural modelling of combinational and simple sequential circuits.
3. To know the behavioural modelling of algorithmic state machines.
4. To know the synthesis of combinational and sequential descriptions.
5. To know the architectural features of programmable logic devices.

Course Outcomes:

After completion of this course, students will be able to:

1. Demonstrate knowledge on HDL design flow, digital circuits design, switch de-bouncing, metastability, memory devices applications
2. Design and develop the combinational and sequential circuits using behavioural modelling
3. Solving algorithmic state machines using hardware description language
4. Analyse the process of synthesizing the combinational and sequential descriptions
5. Memorizing the advantages of programmable logic devices and their description in Verilog.

Course Contents:

Unit 1: **[8 hours]**

Introduction to Logic Design with Verilog: Structural models of combination logic, logic simulation, design verification, test methodology, propagation delay, truth table models of combinational and sequential logic with Verilog modules, ports, gate types, gate delays, dataflow modelling, continuous assignments delays, expressions, operators, operands, operator.

UNIT-2: **[8 hours]**

Logic Design with Behavioral Models of Combinational And Sequential Logic: Behavioral modeling, data types for behavioral modeling, behavioral models of combinational logic, propagation delay and continuous assignments, lathes and level sensitive circuits in Verilog, cyclic behavioral models of flip flops and latches, cyclic behavior and edge detection, a comparison of styles for behavioral modeling.

UNIT-3: **[8 hours]**

Behavioral models of multiplexers, encoders and decoders data flow model of a LFSR machines with multicycle operations, algorithmic state machine charts for behavioral modeling, asmd charts, behavioral models of counters, shift registers and register files, switch debounce, metastability, synchronizers for asynchronous signals.

UNIT-4: **[8 hour]**

Introduction to synthesis: synthesis of combinational logic, synthesis of sequential logic with latches, synthesis of three state devices and bus interfaces, synthesis of sequential logic with flip flops, synthesis of explicit state machines registered logic. Synchronous Counters: n-bit synchronous counter, synchronous counter as sequence generator.

UNIT-5: [8 hours]

Programmable logic devices, storage devices, programmable logic array programmable array logic, programmability of PLDs CPLDs.

Textbooks / Reference:

1. Michael D Ciletti - Advanced Digital Design with the VERILOG HDL, 2ND Edition, PHI, 2009.
2. Samir Palnitkar - Verilog HDL, 2nd edition, Pearson Education, 2003.
3. Stephen Brown and Zvonko Vranesic - Fundamentals of Digital Logic with Verilog, 2nd Edition, TMH, 2008.
4. Z Navabi - Verilog Digital System Design, 2nd Edition, McGraw Hill, 2005.

Second Year (Semester –IV)
System Design using Verilog lab

25AF1378PC413L	System Design using Verilog lab	PCC	0L- 0T - 2P	2 Credits

Teaching Scheme	Examination Scheme
Practical: 02 hrs./week	Continuous Assessment: 60 Marks End Semester Exam: 40 Marks

Practical Based on the above syllabus of System Design using Verilog.