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(Under Maharashtra Act No. XXIX of 2014)
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Course Structure and Detailed Syllabus

of

B. Tech Programme

for

Electronics and Communication
(Advanced Communication Technology)

for

Second Year Engineering

In line with National Education Policy 2020

(Effective from Academic year 2025-26

for Affiliated Institutes only)

Department of Electronics and Communication (Advanced Communication 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 given below.

  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 and Communication (Advanced Communication 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 and Telecommunication Engineering distributed over semesters III to VIII. Here in the case of "**B. Tech in Electronics and Communication (Advanced Communication 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 Electronics and Telecommunication Engineering with Honours with Multidisciplinary Minor (180-194 credits) enables students of Electronics and Telecommunication Engineering to take up five-six additional courses of 18 to 20 credits in the Electronics and Telecommunication Engineering 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 and Communication (Advanced Communication Technology)with Research with Multidisciplinary Minor (180-194 credits) enables students of Electronics and Telecommunication Engineering to take up a research project of 18 to 20 credits in the Electronics and Telecommunication Engineering 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 and Communication (Advanced Communication 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 and Telecommunication Engineering(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 fulfills 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 2023-24, 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 upto <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 2023-24

5. Description of Grades

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

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

The students may appear for the remedial examination for the subjects he/she failed for the current semester of admission only and his/her performance will be awarded with EE grade only.
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 (upto 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 (III SEMESTER)

Course Category	Course Code	Course Name	Weekly Hours		Examination Scheme				Credit
			L	P	CA	MSE	ESE	Total	
BSC	25AF1000BS301	Engineering Mathematics-III	3	-	20	20	60	100	3
PCC	25AF1928PC302	Electronic Devices & Circuits	3	-	20	20	60	100	3
PCC	25AF1928PC303	Digital Electronics	3	-	20	20	60	100	3
PCC LAB	25AF1928PC304L	Electronic Devices & Circuits Lab	-	2	60	-	40	100	1
OE	25AF1XXXOE305	**Open Elective Bucket****	2	-	20	20	60	100	2
MDM	25AF1928MD306	**MDM Bucket***	2	-	20	20	60	100	2
EEM	25AF1000HM307A	A. Employability and Skill Development	2	-	20	20	60	100	2
	25AF1000HM307B	B. Innovation and Entrepreneurship							
VEC	25AF1000VE308	Life of Chhatrapati Shivaji Maharaj	1	-	50	-		50	1
PCC LAB	25AF1928PC309L	Digital Electronics Lab	-	2	60	-	40	100	1
VEC	25AF1UHVVE310	Universal Human Values - II	3	-	20	20	60	100	3
CEP/FP	25AF1928CP311	Community Engagement Project	-	4	60	-	40	100	2
	Total		**19**	**08**				**1050**	**23**

Course Type and Acronyms used

1. Basic Science Course (BSC)
2. Engineering Science Course (ESC)
3. Program Core Course (PCC)
4. Value Education Course (VEC)
5. Co-curricular Course (CC)
6. Ability Enhancement Course (AEC)
7. Indian Knowledge System (IKS)

L - Lecture,
P / PR - Practical,
CA - Continuous Assessment, TH - Theory,
MSE - Mid Semester Examination,
ESE - End Semester Examination,
CR - Credit

NOTE: * Refer to Multidisciplinary Minor Bucket of other department

****Refer to Open Elective Bucket available in university website**

SECOND YEAR (IV SEMESTER)

Course Categories	Course Code	Course Name	Weekly Hours		Examination Scheme				Credit
			L	P	CA	MSE	ESE	Total	
PCC	25AF1928PC401	Network Analysis	3	-	20	20	60	100	3
PCC Lab	25AF1928PC402L	Network Analysis Lab	-	2	60	-	40	100	1
PCC	25AF1928PC403	Microprocessors	3	-	20	20	60	100	3
PCC Lab	25AF1928PC404L	Microprocessors Lab	-	2	60	-	40	100	1
OE	25AF1XXXOE405	**Open Elective Bucket****	3	-	20	20	60	100	3
MDM	25AF1928MD406	**MDM Bucket***	2	-	20	20	60	100	2
VEC	25AF1COIVE407	Constitution of India	2	-	50	-	-	AU	AU
VEC	25AF1000VE408	Life of Bharatratna Dr. Babasaheb Ambedkar	1	-	50	-	0	50	1
EEM	25AF1000HM409	Patents and IPR	2	-	20	20	60	100	2
HSSM	25AF1000AE410A 25AF1000AE410B 25AF1000AE410C	A. Marathi B. Hindi C. Sanskrit	2	-	20	20	60	100	2
VSEC	25AF1928VS411	PCB Designing	-	4	60	-	40	100	2
PCC	25AF1928PC412	Analog and Digital Communication	3	-	20	20	60	100	3
PCC Lab	25AF1928PC413L	Analog and Digital Communication Lab	-	2	60	-	40	100	1
Total			**21**	**10**				**1150**	**24**

NOTE: * Refer to Multidisciplinary Minor Bucket of other departments

****Refer to Open Elective Bucket available in university website**

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	Continuous Assessment : 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives:

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.

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 analyzing 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, analyze the vector fields and apply to Electromagnetic fields.
CO5	Analyze conformal mappings, transformations and perform contour integration of complex functions in the study of electrostatics and signal processing.

Course Contents:

Unit No 1:	**Laplace Transform**	**[8 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 No 2:	**Inverse Laplace Transform**	**[7 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 No 3:	**Fourier Transform**	**[7 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 No 4:	**Partial Differential Equations and Their Applications**	**[8 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 No 5:	**Functions of Complex Variables**	**[7 Hours]**
Analytic functions; Cauchy- Riemann equations in Cartesian and polar forms; Harmonic functionsinCartesianform;Cauchy‟sintegraltheorem;Cauchy‟sintegralformula;Residues; Cauchy‟s residue theorem (All theorems without proofs).		

Text Books

1.	Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, NewDelhi.
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, NewYork.
2.	A Text Book of Engineering Mathematics by PeterO‟Neil, Thomson Asia Pte Ltd., Singapore.
3.	Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata Mcgraw-Hill Publishing Company Ltd., NewDelhi.
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 , NewYork.

Second Year (Semester –III)
Electronic Devices & Circuits

25AF1928PC302	Electronic Devices &Circuits	PCC	3L- 0T - 0P	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./week	Continuous Assessment : 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Pre-Requisites: Basic Semiconductor theory.

Course Objectives:

1	To acquaint the students with construction, theory and characteristics of various electronic Devices.
2	To emphasis on design of basic electronic circuits.
3	To impart knowledge of working principles of Op-amp & its applications.
4	To study various op-amp parameters and their significance for Op-Amp
5	To emphasize the features and advantages of integrated circuits.

Course Outcomes:

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

CO1	Discuss operation, biasing and applications of BJT, JFET & MOSFET.
CO2	Compare the characteristics and parameters of MOSFET towards its DC circuits.
CO3	Understand the basic concepts related to Op-amp
CO4	Understand the characteristics Op-Amp and identify the internal structure.
CO5	Analyze and identify linear and nonlinear applications of Op-Amp.

Course Contents:

Unit No 1:	Bipolar Junction Transistor	[8 Hours]
BJT: construction, working, characteristics, Transistor as switch, Transistor configurations, Current gain equation, stability factor. **BJT Biasing and basic amplifier configurations:** Need for biasing BJT, Transistor biasing methods, Transistor as amplifier.		
Unit No 2:	**Junction Field Effect Transistor and MOSFET**	**[7 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. FET Amplifier. **MOSFET**- Basics of MOS Transistor operation, Construction of n-channel E-MOSFET, E- MOSFET characteristics & parameters.		
Unit No 3:	**Operational Amplifier**	**[7 Hours]**
Block diagram of Op-Amp, differential amplifier configurations using BJT, constant current source, level shifting, transfer characteristics, frequency response, study of ICuA741, Op-Amp parameters, Inverting and non-inverting amplifiers.		
Unit No 4:	**Linear and Non-linear applications of Op-Amp**	**[8 Hours]**
Linear Applications:Summing, differential amplifier, integrator and differentiator and instrumentation amplifiers.Wein bridge oscillator using IC 741. Converters using OP-AMP :V-F, I-V		

and V-I converter. Non Linear Applications:Theory & Design of Op-amp IC 741 based comparator, Schmitt trigger, astable multivibrator as square and triangular wave generator.		
Unit No 5:	**Active Filters and PLL**	**[7 Hours]**
Active filters and PLL Design guidelines of Active filters: Low pass, high pass, band pass and band stop filters, block diagram of PLL and its function		

Text Books

1.	Boylestad & Nashelsky, Electronics Devices & Circuits, Pearson Education
2.	Millman Halkias, ―Integrated Electronics-Analog and Digital Circuits and Systems‖, Tata McGraw Hill, 2000.
3.	Ramakant A. Gaikwad, "Op Amps and Linear Integrated Circuits", Pearson Education 2000
4.	E.S. Yang, Microelectronic Devices, McGraw Hill, Singapore, 1988.

Reference Books

1.	D. A. Neamen, Semiconductor Physics and Devices (IRWIN), TMH Education Group, Chicago) 1997
2.	Salivahanan and Kanchana Bhaskaran, "Linear Integrated Circuits", Tata McGraw Hill, India 2008.
3.	George Clayton and Steve Winder, "Operational Amplifiers", 5th Edition

Second Year (Semester –III)
Digital Electronics

25AF1928PC303	Digital Electronics	PCC	3L- 0T - 0P	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./week	Continuous Assessment : 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives:

1	To understand the students with the fundamental principles of two-valued logic and Various devices used to implement logical operations on variables.
2	To understand about number system.
3	Demonstrate awareness and fundamental understanding of various Combinational and sequential circuits.
4	Demonstrate awareness and fundamental understanding of various sequential circuits.
5	Demonstrate awareness and fundamental understanding of various digital logic families.

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

CO1	Became familiar with the digital signal, positive and negative logic, Boolean algebra, logic gates, logical variables, the truth table, number systems, codes, and their conversion from to others.
CO2	Learn the minimization techniques to simply the hardware requirements of digital circuits, implement it, design and apply for real time digital systems.
CO3	Understand the working mechanism and design guidelines of different combinational and sequential circuits.
CO4	Understand the working mechanism and design guidelines of different sequential circuits.
CO5	Understand the working mechanism and design guidelines of different digital logic families

Course Contents:

Unit No 1:	**Introduction**	**[7 Hours]**
Logic gates (AND, OR, NOT, XOR, XNOR, NAND, NOR) Switching functions, Boolean algebra – axioms and laws, De-Morgan's theorem, Min term, Max term, , K- Map representation of logic functions (SOP and POS forms), Quine-McCluskey‟s method,Simplification by Boolean theorems, don't care condition and its effect		
Unit No 2:	**Number Systems & Representation**	**[8 Hours]**
Number system and codes: Binary, octal, hexadecimal, and decimal Number systems and their inter conversion, BCD code, gray code, excess–3 code, code conversion, ASCII, EBCDIC codes. Binary addition and subtraction, 1's and 2's complement representation.		
Unit No 3:	**Combinational Circuits**	**[7 Hours]**

The half adder, full adder subtractor circuit, Combinational logic design using 74XX/54XX MSI chip series concerning to MUX, DEMUX, Encoders, Decoders, Comparators,parity generator/checker and BCD to seven segment decoder.		
Unit No 4:	**Sequential Circuits**	**[8 Hours]**
Flip flop and Timing circuit: set-reset latches, D-flipflop, R-S flip-flop, J-K Flip-flop, Master slave Flip flop, edge triggered flip-flop, T flip-flop. Registers & Counters: Synchronous/Asynchronous counter operation, Up/down synchronous counter, shift registers, Mealy and Moore machines.		
Unit No 5:	**Digital Logic Families**	**[7 Hours]**
Integrated circuit, Logic gate characteristics – propagation delay, speed, noise margin, fan-out and power dissipation; Standard TTL and static CMOS gates. ROM and RAM, PLA and PAL.		

Text Books

1.	R.P. Jain, ―Modern digital electronics‖, 3rd edition, 12threprint Tata McGraw Hill Publication,2007.
2	Douglas V. Hall, Microprocessors & Interfacing, McGraw Hill International Edition, 1992.

Reference Books

1.	Mano, Digital logic and Computer design, Pearson Education India, 2016.
2.	Kumar, Fundamentals of Digital Circuits, Prentice Hall India, 2016.
3.	W.H. Gothmann, ―Digital Electronics- An introduction to theory and practice‖, PHI, 2nd edition ,2006.

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

25AF1928PC304L	Electronic Devices & Circuits Lab	0L- 0T - 2P	1 Credits

Teaching Scheme	Examination Scheme
Practical: 2 hrs./week	Continuous Assessment : 60 Marks End Semester Exam: 40 Marks (Duration 03 hrs.)

Minimum 08 to 10 experiments are to be performed based on contents in syllabus

List of Experiments

1	Study of BJT (Reading data sheet, Terminal Identification, packages, testing & Plot BJT characteristics)
2	To perform CE configuration for BJT.
3	Study of FET (Reading data sheet, Terminal Identification, packages, testing & Plot FET characteristics)
4	Study of MOSFET (Reading data sheet, Terminal Identification, packages, testing & Plot MOSFET characteristics)
5	To verify Op-Amp IC 741 as an inverting and non- inverting amplifier with a specific gain value.
6	To demonstrate integrator and differentiator circuit using Op-Amp IC 741.
7	To perform and calculate frequency of oscillations for Wein-Bridge Ocsillator using Op-Amp IC 741
8	To verify Op-Amp IC 741 as a Schmitt trigger and calculate the hysteresis voltage.
9	To verify operation of Astable Multivibrator using Op-Amp IC 741.
10	Study of PLL.
11	To study converters using IC LM331.
12	Study of Square Wave Generator.

Second Year (Semester –III)

Employability and Skill Development

25AF1000HM307A	Employability and Skill Development	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 (Duration 03 hrs.)

Pre-Requisites:

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, students will be able to:

CO1	Improve the soft skills and communication.
CO2	Empower Arithmetic and Mathematical Reasoning and Analytical Reasoning and Quantitative Ability
CO3	Use of grammar.
CO4	Development in interview skills
CO5	Develop problem solving techniques.

Course Contents:

Unit No 1:	**Soft Skills & Communication basics**	**[7 Hours]**
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, Technical writing.		
Unit No 2:	**Interpersonal Skills**	**[6 Hours]**
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 No 3:	**Grammar and Comprehension**	**[5 Hours]**
English sentences and phrases, Technical writing, Paragraph writing, Story writing, Reproduction of a story, Letter writing and e-mail writing.		
Unit No 4:	**Skills for interviews**	**[6 Hours]**
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 No 5:	**Problem Solving Techniques**	**[6 Hours]**
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 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, WileyWren and Martin, "English grammar and Composition", S. Chandpublications.
2.	Philip Carter, "The Complete Book of Intelligence Test", John Willey & SonsLtd.
3.	Eugene Ehrlich, Daniel Murphy, "Schaum‟s Outline of English Grammar", McGraw Hills.

Reference Books

1.	R. S. Aggarwal, "A modern approach to verbal reasoning", S. Chandpublications.
2.	David F. Beer, David A. McMurrey, “A Guide to Writing as an Engineer”, ISBN: 978-1-118-30027-5 4th Edition, 2014, Wiley.
3.	Philip Carter, Ken Russell, "Succeed at IQ test", KoganPage.

Second Year (Semester –III)

Innovation and Entrepreneurship

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

Teaching Scheme	Examination Scheme
Lecture: 2hrs./week	Continuous Assessment : 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Pre-Requisites:

Course Objectives:

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

Course Outcomes:

On completion of the course, 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.

Course Contents:

Unit No 1:	**Entrepreneurship Fundamentals & Context**	**[5 Hours]**

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 No 2:	**Problem & Customer Identification**	**[6 Hours]**

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 No 3:	**Solution design & Prototyping**	**[7 Hours]**

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 No 4:	Opportunity Assessment and Sizing	[5 Hours]
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 No 5:	**Business & Financial Model, Go-to-Market Plan**	**[6 Hours]**
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.		

Text 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

Reference Books

1.	Chowdhry Ajay, (2023) Just Aspire: Notes on Technology, Entrepreneurship and the Future.
2.	Simon Sinek (2011) Start With Why, Penguin Books limited
3.	Brown Tim (2019) Change by Design Revised & Updated: How Design Thinking Transforms Organizations and Inspires Innovation, Harper Business
4	Namita Thapar (2022) The Dolphin and the Shark: Stories on Entrepreneurship, Penguin Books Limited
5	Saras D. Sarasvathy, (2008) Effectuation: Elements of Entrepreneurial Expertise, Elgar Publishing Ltd

Second Year (Semester –IV)

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

Pre-Requisites:

Course Objectives:

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:

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

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.

Course Contents:

Unit No 1:	**Shivaji Maharaj as a Great Conqueror**	**[6 Hours]**
Master Strategist and innovator in Military Tactics - Guerrilla Warfare (Ganimi Kava) - Fortress Strategy - Avoidance of Direct Confrontation. - Diplomacy and Alliances - Naval Power		
Unit No 2:	**Shivaji Maharaj's Management and leadership strategies**	**[6 Hours]**
- Architecture and metallurgy of Raigad Fort - Use of Light Cavalry - Intelligence Network - Asymmetric Warfare - Logistics and Supply Chains - Fortifications and Military Architecture		
Unit No 3:	**Shivaji Maharaj’s views on Democracy and Nationalism**	**[6 Hours]**
- Shivaji Maharaj’s views about Women's rights, their dignity and religious views - His views on Democracy & Nationalism		

Text Books

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.

Reference Books

1.	Keluskar, Krushnaji Arjun. *Chhatrapati Shivaji Maharaj*. Sudhir Prakashan. 2020.
2.	Bedekar, Ninad. *Kalatil Vyavsthapan Tatve*. 2015.

Second Year (Semester - III)
Digital Electronics Lab

25AF1928PC309L	Digital Electronics Lab	0L- 0T - 2P	1 Credits

Teaching Scheme	Examination Scheme
Practical: 2hrs./week	Continuous Assessment : 60 Marks End Semester Exam: 40 Marks (Duration 03 hrs.)

(Minimum 08 to 10 experiments are to be performed based on contents in syllabus)

List of Experiments

1	Study of Logic gates and their ICs and universal gates.
2	Perform experiment on basic and universal logic gates and verify their truth table.
3	Study of Half Adder and Full Adder.
4	Study of Half subtractor and Full subtractor
5	Study of code conversion operation binary to Gray and Gray to binary operation.
6	Study of Multiplexer and Demultiplexer using MSI chips.
7	To study of 8:3 encoder and 3:8 decoder
8	Study and perform experiment to verify the operation of different Flip-Flops SR, JK, D and T Type.
9	Study of 4 bit Asynchronous up/down counter
10	Verification of operation of IC74LS190 as a Modulo – N programmable counter.
11	Study of Shift resisters
12	To Study ALU for performing comparision of 2 to 4 bit binary number
13	Perform BCD to Seven segment Decoder

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 : 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Pre-Requisites:

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.
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:

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

CO1	The students start exploring themselves: get comfortable with each other and with the teacher; they start appreciating the need and relevance for the course.
CO2	The students can see that all physical facility they are required for a limited time in a limited quantity.
CO3	The students can note that the natural acceptance (intention) is always for living in harmony, only competence is lacking! The students can see that respect is right evaluation, and only right evaluation leads to fulfillment in relationship.
CO4	The students can differentiate between the characteristics and activities of different orders and study the mutual fulfillment among them.
CO5	The students can present sustainable solutions to the problems in society and nature.

Course Contents:

Unit No 1:	**Introduction to Value Education**	**[8 Hours]**
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		
Unit No 2:	**Harmony in the Human Being** -	**[7 Hours]**
Understanding Human being as the Co-existence of the Self and the Body - Distinguishing between the Needs of the Self and the Body - The Body as an Instrument of the Self - Understanding Harmony in the Self		

- Harmony of the Self with the Body - Programme to Ensure self-regulation and Health		
Unit No 3:	**Harmony in the Family and Society**	**[8 Hours]**
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		
Unit No 4:	**Harmony in the Nature (Existence)**	**[7 Hours]**
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		
Unit No 5:	**Implications of the Holistic Understanding – a Look at Professional Ethics**	**[7 Hours]**
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		

Text Books

1.	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
2.	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 My Experiments with Truth - by Mohandas Karamchand Gandhi
4.	Small is Beautiful - E. F Schumacher.
5.	Economy of Permanence - J C Kumarappa
6.	Bharat Mein Angreji Raj - PanditSunderlal

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

25AF1844CP311	**Community Engagement Project (CEP)**	**CP**	**0L- 0T - 4P**	**2 Credits**

Teaching Scheme	**Examination Scheme**
Lecture: 4 hrs./week	Continuous Assessment : 60 Marks End Semester Exam: 40 Marks (Duration 03 hrs.)

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:
On completion of the 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 Contents:

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)

Network Analysis

25AF1928PC401	Network Analysis	PCC	3L- 0T - 0P	3Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./week	Continuous Assessment : 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives:

1	To develop skills for analysis of linear circuits with dependent and independent AC/DC excitations
2	To understand concept of resonance in electric circuits and its applications
3	To analyze transient and steady state response for linear circuits
4	To know fundamentals of two port network, passive filters, Attenuators

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

CO1	Analyze linear circuit with use of different network theorems and analysis methods.
CO2	Compute two port network parameters and draw equivalent network.
CO3	Determine transient and steady state response of linear circuits.
CO4	Understand Concepts of graph theory.
CO5	Understand passive filter and attenuator circuits.

Course Contents:

Unit No 1:	**Circuit Analysis and Network Theorems**	**[7 Hours]**
Node and Mesh analysis: Circuit components, assumptions for circuit analysis, Types of Sources and Source transformation, Source transformation, Kirchhoff's laws, Node and Mesh analysis. **Network Theorems**: Superposition theorem, Reciprocity theorem, Thevenin's theorem, Norton's theorem and Maximum power transfer theorem.		
Unit No 2:	**Resonance**	**[7 Hours]**
Series resonance: Series resonance, impedance and phase angle of series resonant circuit, voltage and current in series resonant circuit. Effect of resistance on frequency response curve, bandwidth, selectivity and quality factor. Significance of Quality factor. Parallel resonant: Parallel resonant circuit (Tank circuit), resonant frequency, and variation of Impedance with frequency, reactance curves. Numerical problems based on above.		
Unit No 3:	**Two Port Networks**	**[8 Hours]**
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 No 4:	**Transient Response**	**[7 Hours]**
Review of Laplace Transform Basics: Initial conditions, evaluation and analysis of transient and steady state response of following: RL circuit: RL circuit step voltage response and step current		

response. RC circuit: RC circuit step current response and step voltage response. RLC circuit: RLC circuit step voltage response and step current response.		
Unit No 5:	**Network Topolgy (Graph Theory)**	**[7 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.		

Text Books

1.	"Network Analysis", Valkenburg, PHI Pbs
2.	Circuit theory, Kurikose-PHI Pbs
3.	Franklin Fa-Kun. Kuo, "Network Analysis & Synthesis", John Wiley & Sons

Reference 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.

Second Year (Semester –IV)

Network Analysis Lab

25AF1928PC402L	Network Analysis Lab	0L- 0T - 2P	1 Credits

Teaching Scheme	Examination Scheme
Lecture: 2 hrs./week	Continuous Assessment : 60 Marks End Semester Exam: 40 Marks (Duration 03 hrs.)

List of Experiments

1	Thevenin‟s, Norton‟s and Maximum Power Transfer Theorems.
2	Superposition Theorem and RMS value of complex wave
3	Reciprocity and Millmann‟s Theorems
4	Locus Diagrams of RL and RC Series Circuits
5	Series and Parallel Resonance
6	Z and Y Parameters
7	Transmission and hybrid parameters
8	Measurement of Active Power for Star and Delta connected balanced loads.
9	Measurement of Reactive Power for Star and Delta connected balanced loads
10	Simulation of DC Circuits
11	Mesh Analysis

Second Year (Semester –IV)

Microprocessors

25AF1928PC403	Microprocessors	3L- 0T - 0P	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./week	Continuous Assessment : 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Pre-Requisites:

Course Objectives:

1	Familiarize basic architecture of 8085 microprocessor
2	Program 8085 Microprocessor using Assembly Level Language
3	Handling interrupts in 8085
4	Understand interfacing of 16 bit microprocessor with memory and peripheral chips involving system design
5	Understand the architecture of 8086.

Course Outcomes:

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

CO1	Students get ability to conduct experiments based on interfacing of devices to or interfacing to real world applications.
CO2	Students get ability to interface mechanical system to function in multidisciplinary system like in robotics, Automobiles
CO3	Students can identify and formulate control and monitoring systems using microprocessors.
CO4	Learn use of hardware and software tools.
CO5	Develop interfacing to real world devices and learn 8086.

Course Contents:

Unit No 1:	**Fundamentals of Microprocessor**	**[7 Hours]**
Basic 8085 microprocessor architecture and its functional blocks, 8085 microprocessor IC pin outs and signals.		
Unit No 2:	**Programming with 8085**	**[8 Hours]**
Assembly Language Programming Basics, Addressing Modes, Instruction set of microprocessor, Instruction timing diagram. Writing, Assembling & Executing Assembly Language Programs.		
Unit No 3:	**Interrupts**	**[7 Hours]**
Interrupt structure of 8085 microprocessor, processing of vectored and non-vectored interrupts, latency time and response time; Handling multiple interrupts		
Unit No 4:	**Interfacing Memory Interfacing**	**[7 Hours]**
Interfacing with 8255 Programmable Peripheral Interface, 8254 Programmable Interval Timer, 8279 Display controller, Interrupt controller 8259.		

Unit No 5:	**Introduction of 8086 Microprocessor**	**[8 Hours]**
Introduction of 8086 Microprocessor Detail Architecture of 8086, Addressing Modes, Assembler directives, Co-Processor.		

Text Books

1.	Douglas V. Hall, Microprocessors & Interfacing, McGraw Hill International Edition, 1992.
2.	Microprocessor-Architecture, programming and application with 8085, gaonkar, penram international.

Reference Books

1.	Jonathan W Valvano, Embedded Microcomputer Systems: Real Time Interfacing, Cengage Learning, Jan2011.
2.	David Calcutt, 8051 microcontrollers: Applications based introduction, Elsevier.
3.	Udayashankara V., MallikarjunaSwamy, 8051 microcontroller,TMH.
4.	K. J. Ayala, 8051 microcontroller, Cenage (Thomson).

Second Year (Semester –IV)
Microprocessors lab

25AF1928PC404L	Microprocessors lab	0L- 0T - 2P	1 Credits

Teaching Scheme	Examination Scheme
Lecture: 2 hrs./week	Continuous Assessment : 60 Marks End Semester Exam: 40 Marks (Duration 03 hrs.)

(Minimum 08 to 10 experiments are to be performed based on contents in syllabus)

List of Experiments

1	8-bit Addition, Subtraction, Multiplication and Division
2	16-bit Addition, Subtraction, Multiplication and Division
3	16-bit Multiplication and Division
4	Program to Count 1's and 0's in a Number
5	Largest number in a data array
6	Smallest number in a data array
7	BCD to Hexadecimal and vice-versa
8	BCD to Binary Conversion and vice-versa
9	Move a data block without overlap
10	Counters and Time Delay

Second Year (Semester –IV)
Constitution of India

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

Teaching Scheme	**Examination Scheme**
Lecture: 1 hrs./week	AU

Pre-Requisites:

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:

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

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.

Course Contents:

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 court in the world".

Contents

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_Partici pant_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.

Prescribed Legislations:

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

Suggested aid for Students and Pedagogic purpose

1.	RSTV debates on corporate law, IPR and patent issues
2.	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

Pre-Requisites:

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:

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

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

Course Contents:

Unit No 1:	Introduction	[6 Hours]
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 No 2:	**The Contribution of Dr. Babasaheb Ambedkar**	**[6 Hours]**
- Contribution to the Constitution of India - Vision for Social Justice and Empowerment		
Unit No 3:	**Legacy and Relevance Today**	**[6 Hours]**
- 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 / Reference Books

1.	Ambedkar, B. R. *Annihilation of Caste*. Fingerprint Publishing. 2023.
2.	Keer, Dhananjay. *Dr.Babasaheb Ambedkar Life and Mission*. Popular Prakashan. 1954.
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	EEM	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 (Duration 03 hrs.)

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, nonobviousness, 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:

On completion of the course, 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.

Course Contents:

Unit No 1:	**Patents**	**[7 Hours]**
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 No 2:	**Patent Rights**	**[6 Hours]**
Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.		
Unit No 3:	**Overview of Intellectual Property**	**[5 Hours]**
Introduction of IPR, Need for intellectual property right (IPR), IPR in India – Genesis and Development IPR in abroad.		
Unit No 4:	**New Developments in IPR**	**[5 Hours]**
Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge, Case Studies.		
Unit No 5:	**Case studies**	**[6 Hours]**

Case studies related to patents and IPR

Text 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.

Reference Books

1.	Feroz Ali, The Touchstone Effect – The Impact of Pre-grant Opposition on Patents, LexisNexis, 2009.

Second Year (Semester –IV)

Marathi/Hindi/Sanskrit

25AF1000AE410	Marathi/Hindi/Sanskrit	AEC	2L- 0T - 0P	2 Credits

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
- कर्तरी
- 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. विष्णुपद 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 वाढवतील 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

25AF1928VS411	PCB Designing	VSEC	0L- 0T - 4P	2 Credits

Teaching Scheme	Examination Scheme
Lecture: 4 hrs./week	Continuous Assessment : 60 Marks End Semester Exam: 40 Marks (Duration 03 hrs.)

Pre-Requisites:

Course Objectives:

CO1	To develop skills in starting projects, using design tools, and creating net lists.
CO2	To understand and implement PCB manufacturing techniques.
CO3	To find the faults and understand PCB assembly.
CO4	To understand Soldering Techniques and Quality Control
CO5	Learn to build accurate library parts for effective PCB layouts.

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

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.
CO5	

Course Contents:

Unit No 1:	**Printed circuit Board Design:**	**[8 Hours]**
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 No 2:	**PCB Layout Design**	**[7 Hours]**
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 No 3:	**PCB Manufacturing Techniques**	**[7 Hours]**
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 No 4:	**Study of-Fault Finding methods of PCBs**	**[8 Hours]**
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 No 5:	**Soldering Techniques**	**[7 Hours]**
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 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).

Reference Books

1.	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)

Analog & Digital Communication

25AF1928PC412	Analog & Digital Communication	PCC	3L- 0T - 0P	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./week	Continuous Assessment : 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Pre-Requisites:

Course Objectives:

1	To introduce the concepts of analog communication systems.
2	To equip students with various issues related to analog communication such as modulation, demodulation, transmitters and receivers and noise performance
3	To understand the process of signal transmission through analog communication channels, including the effects of noise, attenuation, and distortion, and methods to mitigate these effects.
4	To understand the building blocks of digital communication system.
5	To prepare mathematical background for communication signal analysis.

Course Outcomes: At the end of course, students should:

CO1	Understand and identify the fundamental concepts and various components of analog Communication systems.
CO2	Understand the concepts of modulation and demodulation techniques.
CO3	Design circuits to generate modulated and demodulated wave.
CO4	Understand the block diagram of digital communication system.
CO5	Analyse the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency

Course Contents:

Unit No 1:	**Introduction to Communication System**	**[7 Hours]**
Block schematic of communication system, Simplex and duplex systems, Modes of communication: Broadcast and point to point communication, Necessity of modulation, Classification of modulation, sampling theorem and pulse analog modulation, multiplexing: TDM, FDM.		
Unit No 2:	**Amplitude Modulation**	**[8 Hours]**
Introduction, Mathematical analysis and expression for AM, Modulation index, Frequency spectrum and bandwidth of AM, Power calculations, Generation of AM using nonlinear property, Low and high level modulation, Balance Modulator. **Types of AM:** DSB-FC, DSB-SC, SSB-SC, ISB and VSB, their generation methods and comparison.		
Unit No 3:	**Angle Modulation**	**[7 Hours]**
Introduction, Mathematical analysis of FM and PM, Modulation index for FM and PM, Frequency spectrum and bandwidth of FM, Narrow band and wide band FM, Direct and indirect methods of FM generation, Pre emphasis and de-emphasis, Comparison of AM, FM and PM. PAM		
Unit No 4:	**Digital Transmission of Analog Signal**	**[8 Hours]**

Introduction to Digital Communication System: Block Diagram and transformations, basic Digital Communication Nomenclature. Digital Versus Analog Performance Criteria, Sampling Process, PCM Generation and Reconstruction, Quantization Noise, Non-uniform Quantization and Companding, PCM with noise: Decoding noise, Error threshold, Delta Modulation, ASK,FSK and PSK.		
Unit No 5:	**Baseband Digital Transmissions**	**[7 Hours]**
Digital Multiplexing: Multiplexers and hierarchies, Data Multiplexers. Data formats and their spectra, synchronization: Bit Synchronization, Scramblers, Frame Synchronization. Intersymbol interference, Equalization		

Text Books

1	Kennedy, "Electronics Communications Systems", McGraw-Hill New Delhi-1997, 4th Edition.
2	Anokh Singh, "Principles of communication engineering"S.Chand
3	Simon Haykin, "Digital Communication Systems", John Wiley & Sons, Fourth Edition.
4	A.B Carlson, P B Crully, J C Rutledge, "Communication Systems", Fourth Edition, McGraw Hill Publication.
5	Ha Nguyen, Ed Shwedyk, "A First Course in Digital Communication", Cambridge University Press.

Reference Books

1	Wayne Tomasi, "Electronic Communication Systems", Pearson Education-2005, 5th Edition.
2	Beasley & Miller, "Modern Electronic Communication", Prentice-Hall India-2006, 8th Edition
3	B P Lathi, Zhi Ding "Modern Analog and Digital Communication System", Oxford University Press, Fourth Edition.
4	Bernard Sklar, Prabitra Kumar Ray, "Digital Communications Fundamentals and Applications" Second Edition, Pearson Education.
5	Taub, Schilling, "Principles of Communication System", Fourth Edition, McGrawHill.
6	P Ramkrishna Rao, Digital Communication, Mc Graw Hill Publication

Second Year (Semester –IV)
Analog & Digital Communication Lab

25AF1928PC413L	Analog & Digital Communication Lab	PCC	L- 0T - 2P	1 Credits

Teaching Scheme	Examination Scheme
Lecture: 2 hrs./week	Continuous Assessment : 60 Marks End Semester Exam: 40 Marks (Duration 03 hrs.)

(Minimum 08 to 10 experiments are to be performed based on contents in syllabus)

List of Experiments

1	Amplitude modulation and demodulation (ii) Spectrum analysis of AM
2	Frequency modulation and demodulation (ii) Spectrum analysis of FM
3	DSB-SC Modulator
4	SSB-SC Modulator
5	Frequency Division Multiplexing & De multiplexing
6	Pulse Amplitude Modulation
7	Pulse Width Modulation & Demodulation
8	Pulse Position Modulation & Demodulation
9	To perform experiment on Time Division Multiplexing
10	To perform experiment on ASK, PSK and FSK.
11	To perform experiment on Pulse Code Modulation & Demodulation