

# **Dr. Babasaheb Ambedkar Technological University, Lonere**

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**Dr. Babasaheb Ambedkar Technological University**  
**(Established as a University of Technology in the State of Maharashtra)**  
**(Under Maharashtra Act No. XXIX of 2014)**  
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**Course Structure and Detailed Syllabus**  
**of**  
**B. Tech Programme**  
**for**  
**Electronics and Communication (Sandwich) Engineering**  
**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 Telecommunication Engineering

## 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 Telecommunication Engineering 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 Telecommunication Engineering 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 Telecommunication Engineering 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 Telecommunication Engineering 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
Comm. Engg. Project (CEP)/Field Project (FP)	Courses	--	--	02	--	--	--	-	-	02
Project		--	--	--	--	--	--		04	04
Internship/ OJT		--	---			--	--	12	-	12
Co-curricular Courses (CC)	Liberal Learning Courses	02	02		--	--	--	--	-	04
<b>Total Credits (Major)</b>		<b>20-22</b>	<b>20-22</b>	<b>20-22</b>	<b>20-22</b>	<b>20-22</b>	<b>20-22</b>	<b>20-22</b>	<b>20-22</b>	<b>160-176</b>

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 $\geq 5.50$ & <6.00	Second Class
CGPA $\geq 6.00$ & <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<sub>i</sub>“ is the number of credits allotted to a particular subject, and

„g<sub>i</sub>“ 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,

“c<sub>i</sub>” 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

	Course Code	Course Title	L	T	P	Examination Scheme			Cr	Categorization
						C A	M S E	E S E		
<b>SEM III</b>	25AF1000BS301	Engineering Mathematics-III	3	0	0	20	20	60	3	BSC
	25AF1576PC302	Electronic Devices & Circuits	3	0	0	20	20	60	3	PCC
	25AF1576PC303	Digital Electronics	3	0	0	20	20	60	3	PCC
	25AF1576PC304L	Electronic Devices & Circuits Lab	0	0	2	60		40	1	PCC Lab
	25AF1XXXOEM05	<b>Open Elective Bucket**</b>	2	0	0	20	20	60	2	OE
	25AF1576MD306	<b>MDM Bucket*</b>	2	0	0	20	20	60	2	MD Minor
	25AF1000HM307A/ 25AF1000HM307B	A. Employability and Skill Development B. Innovation and Entrepreneurship	2	0	0	20	20	60	2	Entrepreneurship
	25AF1000VE308A	Life of Chhatrapati Shivaji Maharaj	1	0	0	50			1	VEC
	25AF1576PC309L	Digital Electronics Lab	0	0	2	60		40	1	PCC Lab
	25AF1UHVVE310	Universal Human Values II	3	0	0	20	20	60	3	VEC
	25AF1576CP311	Community Engagement Project (CEP)	0	0	4	60		40	2	CEP/FP
			<b>19</b>	<b>0</b>	<b>8</b>					
		<b>Total</b>							<b>23</b>	

**NOTE: \* Refer to Multidisciplinary Minor Bucket of other departments**

**\*\* Refer to Open Elective Bucket available on University Website**

	Course Code	Course Title	L	T	P	Examination Scheme			Cr	Categorisation
						C A	M S E	E S E		
SEM IV	25AF1576PC401	Signals and Systems	3	0	0	20	20	60	3	PCC
	25AF1576PCL402	Signals and Systems Lab	0	0	2	60		40	1	PCC Lab
	25AF1576PC403	Microprocessors	3	0	0	20	20	60	3	PCC
	25AF1576PCL404	Microprocessors Lab	0	0	2	60		40	1	PCC Lab
	25AF1XXXOEM05	<b>Open Elective Bucket**</b>	3	0	0	20	20	60	3	OE
	25AF1576MD406	<b>MDM Bucket*</b>	2	0	0	20	20	60	2	MD Minor
	25AF1COIVE407	Constitution of India	2	0	0	50			AU	VEC
	25AF1000VE408B	Life of Bharatratna Dr. Babasaheb Ambedkar	1	0	0	50			1	VEC
	25AF1000HM409	Patents and IPR	2	0	0	20	20	60	2	Entrepreneurship
	25AF1000AE410A / 25AF1000AE410B/ 25AF1000AE410C	A. Marathi B. Hindi C. Sanskrit	2	0	0	20	20	60	2	HSSM
	25AF1576VS411	PCB Designing	0	0	4	60		40	2	VSEC
	25AF1576PC412	Network Theory	3	0	0	20	20	60	3	PCC
	25AF1576PCL413	Network Theory Lab	0	0	2	60		40	1	PCC Lab
		<b>21</b>	<b>0</b>	<b>10</b>						
		<b>Total</b>							<b>24</b>	

**NOTE: \* Refer to Multidisciplinary Minor Bucket of other departments**

**\*\* Refer to Open Elective Bucket available on University Website**

## SECOND YEAR SEMESTER III

25AF1000BS301

Engineering Mathematics -III

03 Credits

### Course Objectives:

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

1. Linear differential equations of higher order using analytical methods and numerical methods applicable to Control systems and Network analysis.
2. Transforms such as Fourier transform, Laplace transform and applications to Communication systems and Signal processing.
3. Vector differentiation and integration required in Electro-magnetics 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.

### Unit 1: Laplace Transform 09 Hours

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

### Unit 2: Inverse Laplace Transform 09 Hours

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

### **Unit 3: Fourier Transform 09 Hours**

Definitions – integral transforms ; Fourier integral theorem (without proof) ; Fourier sine and cosine integrals ; Complex form of Fourier integrals ; Fourier sine and cosine transforms ;

Properties of Fourier transforms ; Parseval's identity for Fourier Transforms.

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

Formation of Partial differential equations by eliminating arbitrary constants and functions; Equations solvable by direct integration; Linear equations of first order (Lagrange's linear equations); Method of separation of variables – applications to find solutions of one dimensional heat flow equation ( $\nabla^2 u = 0$ ), and one dimensional wave equation.

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

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

### **Text Books**

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

### **Reference Books**

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

**Course Objectives:**

1. To brief about Semiconductor devices JFET & MOSFET, its characteristics, parameters and applications.
2. To discuss MOSFET DC and AC Configurations and its analysis.
3. To explain various MOSFET Circuits
4. To introduce concepts of feedbacks in amplifiers & oscillators.
5. To impart skills to evaluate the performance of voltage regulator and SMPS Circuits

**Course Outcomes:**

CO1: Compare the characteristics and parameters of JFET towards its applications.

CO2: Compare the characteristics and parameters of MOSFET towards its DC circuits.

CO3: Explain various MOSFET circuits and their applications.

CO4: Explain MOSFET amplifiers with and without feedback & MOSFET oscillators, for given specifications.

CO5: Analyze the performance of linear and switching voltage regulators towards applications in regulated power supplies.

**UNIT – 1 Bipolar Junction Transistor: (06 hrs.)**

**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, Analysis of Single Stage Amplifier, RC coupled Amplifiers, Effects of bypass and coupling capacitors, Frequency response of CE amplifier.

**UNIT – 2 Junction Field Effect Transistor and MOSFET (06 hrs.)**

**JFET:** JFET and its characteristics, Pinch off voltage, Drain saturation current, JFET amplifiers, CS,CD,CG amplifiers, Biasing the FET.

**MOSFET:** Overview of DMOSFET, EMOSFET, n-MOSFET, p-MOSFET and CMOS devices, MOSFET as an Amplifier and Switch, Biasing in MOSFET, Small signal operation and models, Single stage MOS amplifier, MOSFET capacitances.

CMOS Inverter, Comparison of FET with MOSFET and BJT w.r.t. to device and Circuit parameter.

**UNIT III Power amplifiers: (06 hrs.)**

Introduction, classification of power amplifiers -A, B, AB, C and D, transformer coupled class A amplifier, Class B push pull and complementary symmetry amplifier, calculation of efficiency of (transformer coupled class A amplifier, Class B push pull), calculation of power output, power dissipation.

**UNIT IV- Feedback amplifiers & Oscillators (6 hrs.)**

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

**Oscillators:** Principle of Positive feedback, Concept of Stability in electronics circuits, Barkhausen criteria for oscillation, Resonant frequency calculation of (General form of LC oscillator, FET RC Phase Shift oscillator, Wein bridge oscillator, Hartley and Colpitts oscillators).

**UNIT V- Voltage Regulator & Switched Mode Power Supply (SMPS) (6 hrs.)**

**Transistor application:** Discrete transistor voltage Regulation, series voltage regulator, shunt voltage regulator.

**IC Voltage Regulators:** Three terminal voltage regulator, Variable voltage regulator. Introduction to Switch Mode Power supply (SMPS), Block diagram of SMPS, Types of SMPS.

**TEXT/REFERENCE BOOKS:**

1. A. Neamen, Semiconductor Physics and Devices (IRWIN), Times Mirror High Education Group, Chicago)1997.
2. E.S. Yang, Microelectronic Devices, McGraw Hill, Singapore, 1988.
3. Brijesh Iyer, S. L. Nalbalwar, R. Dudhe, "Electronics Devices & Circuits", Synergy Knowledge ware Mumbai, 2017.ISBN:9789383352616
4. B.G. Streetman, Solid State Electronic Devices, Prentice Hall of India, New Delhi,1995.
5. J. Millman and A. Grabel, Microelectronics, McGraw Hill, International,1987.
6. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College Publishing, 1991.
7. R.T. Howe and C.G. Sodini, Microelectronics: An integrated Approach, Prentice Hall International,1997.
8. V.K. Mehta, Rohit Mehta, Principles of Electronics, S. Chand and Company
9. Robert L. Boylestad, Louis Nashelsky, Electronic Devices and Circuit Theory, 11<sup>th</sup> Edition.

25AF1576PC304L

Electronics and Device Circuits Lab

01 Credits

**List of Experiments:**

- 1) P-N junction diode characteristics.
- 2) Zener diode characteristics and Zener as voltage regulator.
- 3) Half -wave rectifier with and without filter.
- 4) Full - wave rectifier with and without filter.
- 5) Input and output characteristics of transistor CB configuration.
- 6) Input and output characteristics of transistor CE configuration.
- 7) FET characteristics.
- 8) H-parameters of CB configuration.
- 9) H-parameters of CE configuration.
- 10) Frequency response of CE amplifier.

- 11) Frequency response of CC amplifier.
- 12) Frequency response of common source FET amplifier.

25AF1576PC303

Digital Electronics

03 Credits

**Course Objectives:**

1. To acquaint the students with the fundamental principles of two-valued logic and Various devices used to implement logical operations on variables.
2. To lay the foundation for further studies in areas such as communication, VHDL, computer.

**Course Outcomes:**

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

- CO1. Use the basic logic gates and various reduction techniques of digital logic circuit in detail.  
CO2. Design combinational and sequential circuits.  
CO3. Design and implement hardware circuit to test performance and application.  
CO4. Understand the architecture and use of VHDL for basic operations and Simulate using simulation software.

**UNIT 1: Combinational Logic Design:**

Standard representations for logic functions, k map representation of logic functions (SOP and POS forms), minimization of logical functions for min-terms and max-terms (upto 4 variables), don't care conditions, Design Examples: Arithmetic Circuits, BCD - to - 7 segment decoder, Code converters. Adders and their use as subtractor, look ahead carry, ALU, Digital Comparator, Parity generators/checkers, Design of Multiplexers and Demultiplexers, Decoders.

**UNIT 2: Sequential Logic Design**

1 Bit Memory Cell, Clocked SR, JK, MS J-K flip flop, D and T flip-flops. Use of preset and clear terminals, Excitation Table for flip flops and Conversion of flip flops. Application of Flip- flops: Registers, Shift registers, Counters (ring counters, twisted ring counters), Sequence Generators, ripple counters, up/down counters, synchronous counters, definitions of lock out, Clock Skew, and Clock jitter.

**UNIT 3: State Machines**

Basic design steps- State diagram, State table, State reduction, State assignment, Mealy and Moore machines representation, Implementation, finite state machine implementation, Sequence detector.

**UNIT 4: Digital Logic Families**

Classification of logic families, Characteristics of digital ICs-Speed of operation, power dissipation, figure of merit, fan in, fan out, current and voltage parameters, noise immunity, operating temperatures and power supply requirements. TTL logic, Operation of TTL NAND gate, active pull up, wired AND, open collector output, unconnected inputs. Tri-

State logic. CMOS logic – CMOS inverter, NAND, NOR gates, unconnected inputs, wired logic, open drain output. Interfacing CMOS and TTL, Comparison table of Characteristics of TTL, CMOS, ECL, RTL, I<sup>2</sup>L and DCTL.

### **UNIT 5: VHDL**

Programmable logic devices: Detail architecture, Study of PROM, PAL, PLA, Designing combinational circuits using PLDs. General Architecture of FPGA and CPLD  
Semiconductor memories: memory organization and operation, expanding memory size, Classification and characteristics of memories, RAM, ROM, EPROM, EEPROM, NVRAM, SRAM, DRAM. Introduction to VHDL: Behavioral – data flow, and algorithmic and structural description, lexical elements, data objects types, attributes, operators; VHDL coding examples, combinational circuit design examples in VHDL and simulation.

### **TEXT/REFERENCE BOOKS:**

1. R.P. Jain, —Modern digital electronics|, 3rd edition, 12th reprint Tata McGraw Hill Publication, 2007.
2. M. Morris Mano, —Digital Logic and Computer Design| 4th edition, Prentice Hall of India, 2013.
3. Anand Kumar, —Fundamentals of digital circuits| 1st edition, Prentice Hall of India, 2001.
4. Pedroni V.A., “Digital Circuit Design with VHDL”, Prentice Hall India, 2nd 2001 Edition.

25AF1576PC309L

Digital Electronics Lab

01 Credits

### **List of Experiments:**

1. Study of Logic gates and their ICs and universal gates.
2. Implement AND, OR, NOT, XOR, XNOR using NAND gates.
3. Implement AND, OR, NOT, XOR, XNOR using NOR gates.
4. Verifying De Morgan’s laws. (Using Logic gates)
5. Implement the given Boolean expressions using minimum number of gates.
6. Design and implement Half adder and Full adder.
7. Design and implement 4:1 multiplexer.
8. Design and implement 1:4 Demultiplexer. Study of IC 74139
9. Design of 3-bit synchronous counter using 7473 and required gates.
10. Study of IC 7490, 7492, 7493 and designing mod-n counters using these.
11. Design and implement a 2-bit by 2-bit multiplier.
12. Design and implement a 2-bit comparator.

**Course Objectives:**

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

**Course Outcomes:**

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

CO1. Have skills and preparedness for aptitude tests.

CO 2. Be equipped with essential communication skills (writing, verbal and non-verbal) CO

3. Master the presentation skill and be ready for facing interviews. CO 4. Build team and lead it for problem solving.

**Unit 1: Soft Skills & Communication basics**

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

**Unit 2: Interpersonal Skills**

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

**Unit 3: Grammar and Comprehension:**

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

**Unit 4: Skills for interviews:**

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

**Unit 5: Problem Solving Techniques**

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

## **TEXT/REFERENCE BOOKS:**

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

25AF1000HM307B

Innovation and Entrepreneurship

02 Credits

### **Course Objectives:**

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

### **Course Outcomes:**

#### **Students will be able to:**

**CO1:** Develop entrepreneurial mind-set and attributes;

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

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

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

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

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

### **Unit 1: Entrepreneurship Fundamentals & Context**

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

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

### **Unit 2: Problem & Customer Identification**

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

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

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

### **Unit 3: Solution design & Prototyping**

Understanding Customer Jobs-to-be-done and crafting innovative solution design to map to customer's needs and create a strong value proposition. Developing Problem-solution fit in an iterative manner. Understanding prototyping and MVP. Developing a feasibility prototype with differentiating value, features and benefits. Initial testing for proof-of-concept and iterate on the prototype.

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

### **Unit 4: Opportunity Assessment and Sizing**

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

Core Teaching Tool: Class and Venture Activity

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

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

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

### **Reference Books**

1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha (2020). Entrepreneurship, McGrawHill, 11th Edition.
2. Ries, E. (2011). The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business.

3. Osterwalder, A., & Pigneur, Y. (2010). Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons
4. Chowdhry Ajay, (2023) Just Aspire: Notes on Technology, Entrepreneurship and the Future.
5. Simon Sinek (2011) Start With Why, Penguin Books limited
6. Brown Tim (2019) Change by Design Revised & Updated: How Design Thinking Transforms Organizations and Inspires Innovation, Harper Business
7. Namita Thapar (2022) The Dolphin and the Shark: Stories on Entrepreneurship, Penguin Books Limited
8. Collins Jim, Porras Jerry, (2004) Built to Last: Successful Habits of Visionary Companies
9. Burlington Bo, (2016) Small Giants: Companies That Choose to Be Great Instead of Big
10. Saras D. Sarasvathy, (2008) Effectuation: Elements of Entrepreneurial Expertise, Elgar Publishing Ltd

### Web Resources

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

25AF1000VE308A

Life of Chhatrapati Shivaji Maharaj

01 Credit

**Course Objectives:** Completing this course the students will:

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

Course Outcomes:

- CO1: Explain Chhatrapati Shivaji Maharaj's military strategies, conquests, and establishment of the Maratha Empire.
- CO2: Evaluate the Chhatrapati's leadership qualities, such as courage, vision, human values and adaptability.
- CO3: Apply the Chhatrapati's principles, such as decentralization and social welfare, to modern engineering challenges.

### Unit 1: Shivaji Maharaj as a Great Conqueror

5 Hrs.

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

- Diplomacy and Alliances

- Naval Power

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

**5 Hrs.**

- Architecture and metallurgy of Raigad Fort

- Use of Light Cavalry

- Intelligence Network

- Asymmetric Warfare

- Logistics and Supply Chains

- Fortifications and Military Architecture

**Unit 3 : Shivaji Maharaj's views on Democracy and Nationalism**

**5**

**Hrs.**

- Shivaji Maharaj's views about Women's rights, their dignity and religious views

- His views on Democracy & Nationalism

**Text Books / References:**

1. Desai, Ranjit. *Shriman Yogi*. Mehta Publishing House. 2018.
2. Kurundkar, Narhar. *Chatrapati Shivaji Maharaj Jeevan Rahasya*. Deshamukh and Company. 2024.
3. Sarkar, Jadunath. *Shivaji and His Times* by Jadunath Sarkar, Classic Book on the Life and History of the Maratha Emperor. Nandy Books. 2024.
4. Keluskar, Krushnaji Arjun. *Chhatrapati Shivaji Maharaj*. Sudhir Prakashan. 2020.
5. Bedekar, Ninad. *Kalatil Vyavsthapan Tatve*. 2015.

**25AF1UHVVE310**

**Universal Human Values II**

**03 Credits**

**Course Objectives:**

1. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

**Course Outcomes:**

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

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

This is only an introductory foundational input. It would be desirable to follow it up by

- a) Faculty-student or mentor-mentee programs throughout their time with the institution
- b) Higher level courses on human values in every aspect of living.

**Module 1 Introduction to Value Education**

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

**Module 2 Harmony in the Human Being**

- Understanding Human being as the Co-existence of the Self and the Body
- Distinguishing between the Needs of the Self and the Body
- The Body as an Instrument of the Self
- Understanding Harmony in the Self
- Harmony of the Self with the Body
- Programme to ensure self-regulation and Health

**Module 3 Harmony in the Family and Society**

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

**Module 4 Harmony in the Nature/Existence** Lecture 19: Understanding Harmony in the Nature

- Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature
- Realizing Existence as Co-existence at All Levels
- The Holistic Perception of Harmony in Existence

### **Module 5 Implications of the Holistic Understanding a Look at Professional Ethics**

- Natural Acceptance of Human Values
- Definitiveness of (Ethical) Human Conduct
- A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order - Competence in Professional Ethics
- Holistic Technologies, Production Systems and Management Models-Typical Case Studies
- Strategies for Transition towards Value-based Life and Profession

### **3. READINGS:**

#### **Text Book and Teachers Manual a. The Textbook**

A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

- b. The Teacher's Manual** Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

#### **Reference Books**

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

## SEMESTER IV

25AF1576PC401

Signals and Systems

03 Credits

### Course Objectives:

1. To understand the mathematical description of continuous and discrete time signals and systems.
2. To classify signals into different categories.
3. To analyse Linear Time Invariant (LTI) systems in time and transform domains.
4. To build basics for understanding of courses such as signal processing, control system and communication.

### Course Outcomes:

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

- CO1: Understand mathematical description and representation of continuous and discrete time signals and systems.
- CO2: Develop input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system.
- CO3: Understand and resolve the signals in frequency domain using Fourier series and Fourier transforms.
- CO4: Understand the limitations of Fourier transform and need for Laplace transform and develop the ability to analyze the system in s-domain.

### UNIT 1: Introduction to Signals and Systems

Introduction and Classification of signals: Definition of signal and systems, Continuous time and discrete time signal, Classification of signals as even, odd, periodic and non-periodic, deterministic and non-deterministic, energy and power, elementary signals used for testing: exponential, sine, impulse, step and its properties, ramp, rectangular, triangular, signum, sinc  
Operations on signals: Amplitude scaling, addition, multiplication, differentiation, integration (Accumulator for DT), time scaling, time shifting and time folding, Sampling Theorem and reconstruction of sampled signal, Concept of aliasing, examples on under sampled and over sampled signals. Systems: Definition, Classification: linear and non-linear, time variant and invariant, causal and non-causal, static and dynamic, stable and unstable, invertible.

### UNIT 2 Time domain representation of LTI System

System modeling: Input-output relation, definition of impulse response, convolution sum, convolution integral, computation of convolution integral using graphical method, Computation of convolution sum. Properties of convolution, properties of the system based on impulse response, step response in terms of impulse response.

### **UNIT 3 Fourier Series**

Fourier series (FS) representation of periodic Continuous Time (CT) signals, Dirichlet condition for existence of Fourier series, FS representation of CT signals using exponential Fourier series, Fourier spectrum representation, properties of Fourier series, Gibbs phenomenon, Discrete Time Fourier Series and its properties.

### **UNIT 4 Fourier Transform**

Fourier Transform (FT) representation of aperiodic CT signals, Dirichlet condition for existence of Fourier transform, evaluation of magnitude and phase response, FT of standard, CT signals, FT of standard periodic CT signals, Introduction to Fourier Transform of DT signals, Properties of CTFT and DTFT, Fourier Transform of periodic signals. Concept of sampling and reconstruction in frequency domain, sampling of band-pass signals.

### **UNIT 5 Laplace and Z-Transform**

Definition of Laplace Transform (LT), Limitations of Fourier transform and need of Laplace transform, ROC and its properties, properties of Laplace transform, Laplace transform evaluation using properties, Inverse Laplace transform based on partial fraction expansion, Application of Laplace transforms to the LTI system analysis. Introduction to Z-transform, and its properties, Inverse Z-transform, different methods of inverse Z-transform, Ztransform for discrete time system LTI analysis.

### **TEXT/REFERENCE BOOKS:**

1. Alan V. Oppenheim. Alan S. Willsky and S. Hamid Nawab, "Signals and Systems", PHI
2. Dr. S. L. Nalbalwar, A.M. Kulkarni and S.P. Sheth, "Signals and Systems", 2nd Edition, Synergy Knowledgeware, 2017
3. Simon Haykins and Barry Van Veen, "Signals and Systems", 2nd Edition, WileyIndia.
4. Shaila Apte, "Signals and Systems-principles and applications", Cambridge University press, 2016.
5. Mrinal Mandal and Amir Asif, Continuous and Discrete Time Signals and Systems, Cambridge University Press, 2007.
6. Peyton Peebles, "Probability, Random Variable, Random Processes", 4th Edition, Tata McGraw Hill.
7. A. NagoorKanni "Signals and Systems", 2nd edition, McGrawHill.
8. NPTEL video lectures on Signals and Systems.
9. Roberts, M.J., "Fundamentals of Signals & Systems", Tata McGraw Hill. 2007.
10. Ziemer, R.E., Tranter, W.H. and Fannin, D.R., "Signals and Systems: Continuous and Discrete", 4th 2001 Ed., Pearson Education.

**List of Experiments:**

1. MATLAB code to generate standard signals
2. MATLAB code to perform basic operations on signals
3. MATLAB code to verify Properties of system
4. MATLAB code to perform convolution
5. MATLAB code to Verify properties of Fourier Transform
6. MATLAB program to find one sided Z-transform of Standard causal signals
7. MATLAB code to find residues and poles of Z-domain signal
8. MATLAB code to find Laplace transform of Standard causal signal
9. MATLAB code for convolution using Fourier transform
10. MATLAB code for convolution using Laplace transform
11. MATLAB code for convolution using Z-transform

**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:**

- 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.
- CO6: Graduates will be able to design real time controllers using microcontroller-based system.
- CO7: Learn importance of microcontroller in designing embedded application.

**Unit 1: Fundamentals of Microprocessor**

Basic 8085 microprocessor architecture and its functional blocks, 8085 microprocessor IC pin outs and signals.

**Unit 2: Programming with 8085**

Assembly Language Programming Basics, Addressing Modes, Instruction set of microprocessor, Instruction timing diagram. Writing, Assembling & Executing Assembly Language Programs.

### **Unit 3: Interrupts**

Interrupt structure of 8085 microprocessor, processing of vectored and non-vectored interrupts, latency time and response time; Handling multiple interrupts.

### **Unit 4: Interfacing Memory Interfacing**

Interfacing with 8255 Programmable Peripheral Interface, 8254 Programmable Interval Timer, 8279 Display controller, Interrupt controller 8259.

**Unit 5:** Introduction of 8086 Microprocessor Detail Architecture of 8086, Addressing Modes, Assembler directives, Co-Processor.

### **TEXT/REFERENCE BOOKS:**

1. Douglas V. Hall, Microprocessors & Interfacing, McGraw Hill International Edition, 1992.
2. Microprocessor-Architecture, programming and application with 8085, gaonkar, penram international.
3. M. A. Mazidi, The 8085 microcontroller & embedded system, using assembly and C, 2<sup>nd</sup> edi, pearsonedu.
4. Jonathan W Valvano, Embedded Microcomputer Systems: Real Time Interfacing, Cengage Learning, Jan2011.
5. David Calcutt, 8051 microcontrollers: Applications based introduction, Elsevier.
6. Udayashankara V., MallikarjunaSwamy, 8051 microcontroller, TMH.
7. K. J. Ayala, 8051 microcontroller, Cenage (Thomson).

25AF1576PCL404

Microprocessors Lab

01 Credit

### **List of Experiments:**

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

25AF1576PC412

Network Theory

03 Credit

### **Course Objectives:**

1. To learn about the basic laws of electric circuits as well as the key fundamentals of the communication channels, namely transmission lines.

2. To understand the need of simplification techniques of complicated circuits To learn about the comprehensive insight into the principle techniques available for characterizing circuits, networks and their implementation in practice.
3. To learn about the use of mathematics, need of different transforms and usefulness of differential equations for analysis of networks.
4. To train the students for handling analog filter design through theory of NA along with practical, this is basic requirement of signal processing field.

### **Course Outcomes:**

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

CO1: Apply knowledge of mathematics to solve numerical based on network simplification and it will be used to analyze the same.

CO2: Design passive filters and attenuators theoretically and practically.

CO3: To apply knowledge for design of active filters as well as digital filters and even extend this to advance adaptive filters.

CO4: Identify issues related to transmission of signals, analyze different RLC networks.

CO5: Find technology recognition for the benefit of the society.

### **Module 1- Network Theorems**

Basic nodal and mesh analysis, linearity, superposition and source transformation, Thevenin's, Norton's and maximum power transfer theorem and useful circuit analysis techniques, network topology, introduction to SPICE in circuit analysis.

### **Module 2 Transient Analysis and Frequency Domain Analysis:**

Transient Analysis: Source free RL and RC circuits, unit step forcing function, source free parallel and series RLC circuit, complete response of the RLC circuit, lossless LC circuit.

Frequency Domain Analysis: The phasor concept, sinusoidal steady state analysis; AC circuit power analysis.

### **Module 3 Laplace transform and its circuit applications**

Laplace transform, initial and final value theorem, circuit analysis in s domain, frequency response.

### **Module 4 Two Port Networks:**

Two Port Networks: Z, Y, h and ABCD parameters, analysis of interconnected (magnetically coupled) two port, three terminal networks.

### **Module 5 State Variable Analysis and RL & RC Network Synthesis:**

State Variable Analysis: State variables and normal-form equations, matrix-based solution of the circuit equations. RL & RC Network Synthesis: Synthesis of one-port networks, transfer function synthesis, basics of filter design.

### **TEXT/REFERENCE BOOKS:**

1. Hayt, Kemmerley and Durbin, "Engineering Circuit Analysis", 8th 2012 Ed., Tata McGraw-Hill
2. DeCarlo, R.A. and Lin, P.M., "Linear Circuit Analysis: Time Domain, Phasor and Laplace Transform Approaches", Oxford University Press.2003.
3. M.E. Van Valkenburg, "Network Analysis", 3rd ed., Pearson2006.
4. M.E. Van Valkenburg, "Network Synthesis," PHI2007.
5. Kuo, F.F., "Network Analysis and Synthesis", 2nd Ed., Wiley India.2008.
6. D Roy Choudary, "Network and Systems" 1st edition, New Age International,1988
7. Boylestead, "Introductory Circuit Analysis", 4th edition, Charles & Merrill,1982.
8. Royal Signal Handbook on Line Communication.
- 9.

25AF1576PC412

Network Theory Lab

03 Credits

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
12. Nodal Analysis
13. DC Transient response

25AF1576VS411

PCB Designing

02 Credits

### Course Objectives:

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

### Course Outcomes:

Students will be able to develop projects using design tools and creating net lists.  
CO1: Students will be able to find faults in the designs.

CO2: Students will be able to understand PCB assembly.

CO3: Students will be able to implement PCB manufacturing techniques.

CO4: Student will be able to build accurate library parts for effective PCB layouts.

### **Unit 1: Printed circuit Board Design:**

Various types of Printed Circuit Boards: Single Sided Boards, Double Sided Plated through Hole Boards, multilayer Boards, and Process of PCB design and product development flow.

**Schematic Design:** Starting a project, Working with schematic design tools, Schematic drawing from circuit, Rules for PCB Design, Standards for PCB Design, Placing, editing, and connecting parts and electrical symbols, Creating a net list, Exporting and importing schematic data, Basic Circuit simulation using EDA tool.

### **Unit 2: PCB Layout Design**

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

### **Unit 3: PCB Manufacturing Techniques**

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

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

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

### **Unit 5: Soldering Techniques:**

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

### **TEXT/REFERENCE BOOKS:**

1. Printed Circuit Board Designer's Reference: Basics, by Christopher T. Robertson
2. Complete PCB Design Using OrCAD Capture and PCB Editor 2nd Edition, Kindle Edition, by Kraig Mitzner (Author), Bob Doe (Author), Alexander Akulin (Author), Anton Suponin (Author), Dirk Müller (Author).

3. PCB Design for Real-World EMI Control By: Bruce R. Archambeault (Author) , James Drewniak (Author) , Bruce R Archambeault (Author) | Publisher: Springer, 2002.

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Marathi/Hindi/Sanskrit

02 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 आणि 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 अंग्रेजी भाषाओं का प्रभाव

## इकाई- २. स्वातंत्र्योत्तर काल में हिंदी भाषा

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

## इकाई- ३. हिंदी भाषा लेखन के नियम और व्याकरण

- वर्णमाला
- शब्द-भेद
- संधि
- वाक्य रचना
- वर्तनी
- उद्देश्य, प्रत्यय और शब्द निर्माण की प्रक्रिया
- मिश्रण किन्हीं का प्रयोग
- पर्यायवाची शब्द
- क्लिष्ट 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 उदय और विकास' - डॉ. हरीशचंद्र वर्मा (लोकभारती प्रकाशन)
- 'हिंदी भाषा का इतिहास' - डॉ. रामकिलश शर्मा (राजकमल प्रकाशन)
- 'भारत में राजभाषा हिंदी' - डॉ. विश्वनाथ प्रसाद (भारतीय राजभाषा परिषद)
- 'हिंदी व्याकरण और रचना' - डॉ. हरीशचंद्र वर्मा (लोकभारती प्रकाशन)
- 'हिंदी लेखन कौशल' - डॉ. रमेश गुप्त (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 करवतील आणि तिच्या विकासशील टप्पे स्पष्टपणे सांगू शकतील.
- शुद्ध व प्रमाणबद्ध लेखन करण्याची क्षमता प्राप्त होतील.
- 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

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Patents and IPR

02 Credits

### 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:

Students will be able to

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

CO2: Utilize patent databases effectively.

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

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

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

### UNIT 1: Patents

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

## **UNIT 2: Patent Rights**

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

## **UNIT 3: Overview of Intellectual Property**

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

## **UNIT 4: New Developments in IPR**

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

## **UNIT 5: Case studies:**

Case studies related to patents and IPR

## **TEXT/REFERENCE BOOKS:**

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

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Constitution of India

02 Credits

## **Mandatory Courses (non-credit)**

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

### **Course Objectives:**

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

### **Course Outcomes:**

At the end of the course the students will

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

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

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

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

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

### Constitution of India – Basic features and fundamental principles

The Constitution of India is the supreme law of India. Parliament of India can not make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the “basic structure” of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of “Constitutionalism” – a modern and progressive concept historically developed by the thinkers of “liberalism” – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The AICTE Model Curriculum for Mandatory Courses & Activities (Non-Credit) for Undergraduate Degree in Engineering & Technology 116 | Page historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of “constitutionalism” in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America. The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India’s legacy of “diversity”. It has been said that Indian constitution reflects ideals of its freedom movement, however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be “static” and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it “as one of the strongest court in the world”. **Course Content :**

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India

11. Emergency Provisions : National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21.

**Suggested Readings:**

1. Brij Kishore Sharma: Introduction to the Indian Constitution, PHI, New Delhi, latest edition.
2. Granville Austin: The Indian Constitution: Cornerstone of a Nation. 1966, Oxford Clarendon Press.
3. Subhash C. Kashyap: Our Constitution: An Introduction to India's Constitution and constitutional Law, NBT, 2018.
4. PM Bakshi: The Constitution of India, Latest Edition, Universal Law Publishing.
5. V.K. Ahuja: Law Relating to Intellectual Property Rights (2007)
6. Suresh T. Viswanathan: The Indian Cyber Laws, Bharat Law House, New Delhi-88
7. P. Narayan: Intellectual Property Law, Eastern Law House, New Delhi
8. Prabudh Ganguli: Gearing up for Patents: The Indian Scenario, Orient Longman.
9. BL Wadehra: Patents, Trademarks, Designs and Geological Indications. Universal Law Publishing - LexisNexis.
10. Intellectual Property Rights: Law and Practice, Module III by ICSI (only relevant sections)
11. Executive programme study material Company Law, Module II, by ICSI (The Institute of Companies Secretaries of India) (Only relevant sections i.e., Study 1, 4 and 36).  
<https://www.icsi.edu/media/webmodules/publications/Company%20Law.pdf>
12. Handbook on e-Governance Project Lifecycle, Department of Electronics & Information Technology, Government of India,  
[https://www.meity.gov.in/writereaddata/files/eGovernance\\_Project\\_Lifecycle\\_Participant\\_Handbook-5Day\\_CourseVI\\_20412.pdf](https://www.meity.gov.in/writereaddata/files/eGovernance_Project_Lifecycle_Participant_Handbook-5Day_CourseVI_20412.pdf)
13. Companies Act, 2013 Key highlights and analysis by PWC.  
<https://www.pwc.in/assets/pdfs/publications/2013/companies-act-2013-keyhighlights-and-analysis.pdf>

**Referred Case Studies:**

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

- Oil & Natural Gas Corporation Vs. Saw Pipes Ltd. 2003 (4) SCALE 92 – 185.

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

**Prescribed Legislations:**

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

**Suggested aid for Students and Pedagogic purpose**

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

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

**25AF1000VE408B      Life of Bharatratna Dr. Babasaheb Ambedkar      01 Credit**

**Course Objectives:**

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

**Course Outcomes:**

- CO1: Explain Dr. Ambedkar's key contributions to the Constitution of India, establishment of human values and social reform
- CO2: Identify and analyze his leadership qualities and strategic thinking
- CO3: Evaluate the impact of his legacy on Maharashtra's culture, politics, and economy

**Unit 1: Introduction**

**5 Hrs.**

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

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

**5 Hrs.**

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

**Unit 3: Legacy and Relevance Today**

**5 Hrs.**

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

**Text Books / Reference:**

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