

**Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,  
CHHATRAPATI SAMBHAJINAGAR.**



**CIRCULAR NO.SU/ Engg./NEP-2020/117/2024**

It is hereby inform to all concerned that, the syllabus prepared by the Board of Studies and recommended by the Dean, Faculty of Science & Technology, **Academic Council at its meeting held on 05 June 2024 has accepted the Scheme of Examination and Revised First Year B.E syllabus "Group A" – Mechanical Engineering; Civil Engineering and "Group B"– Computer Science and Engineering; AI & ML; Electrical and Electronics Engineering as per Norms of National Education Policy – 2020 under the Faculty of Science & Technology run to the Affiliated Colleges, Dr.Babasaheb Ambedkar Marathwada University** as appended herewith.

This is effective from the Academic Year 2024-25 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,  
Chhatrapati Sambhajinagar  
-431 004.  
REF.NO. SU/ENGG/2024/ 853-61  
Date:- 15.06.2024.

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**Deputy Registrar,  
Academic Section.**

**Copy forwarded with compliments to :-**

- 1] **The Principal of all concerned Colleges,**  
Dr. Babasaheb Ambedkar Marathwada University,
- 2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

**Copy to :-**

- 1] The Director, Board of Examinations & Evaluation, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajinagar.
- 2] The Section Officer,[Engg.Unit] Examination Branch, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajinagar.
- 3] The Programmer [Computer Unit-1] Examinations, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
- 4] The Programmer [Computer Unit-2] Examinations, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajinagar.
- 5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajinagar.
- 6] The Public Relation Officer, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
- 7] The Record Keeper, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

**Dr. Babasaheb Ambedkar Marathwada University**

**Chhatrapati Sambhajnagar- 431001**



**Four Year UG Engineering Programme**

**First Year Course  
Structure and Curriculum**

**(Revised)**

**( AS PER NEP-2020)**

**Group A**

**(Mechanical Engineering and Civil Engineering)**

**Effective from 2024-25**

*DR. B.S. Sonawane*

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Page 1 of 66

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### **National Education Policy (NEP) Based Programme Structure:**

The National Education Policy 2020, lays emphasis on of making the education more holistic and effective by integration of general (academic) and vocational education while ensuring the vertical and horizontal mobility of students and learners between academic and vocational streams. NEP strives to transform India into a vibrant knowledge society to become a global knowledge superpower.

The National Credit Framework (NCrF) is an inclusive umbrella Framework to seamlessly integrate the credits earned through school education, higher education and vocational and skill education. For creditisation and integration of all learning, the National Credit Framework (NCrF) shall encompass the qualification frameworks for higher education, vocational and skill education and school education, namely National Higher Education Qualification Framework (NHEQF), National Skills Qualification Framework (NSQF) and National School Education Qualification Framework (NSEQF) also popularly known as National Curricular Framework (NCF) respectively. The implementation of NCrF will help in realizing the vision and intent of NEP by removing distinction, ensuring flexibility and mobility and establishing academic equivalence between general and vocational education. The National Credit Framework (NCrF) provides for broad based, multi-disciplinary, holistic education, allowing imaginative and need based curricular structures and enabling creative combinations of subjects and disciplines. The Framework has been built on the strength of existing regulations, guidelines and qualification frameworks of UGC, AICTE, NCVET, NCERT, CBSE and NIOS so that the options for Multiple Entry-Multiple Exit (ME-ME) are accessible and applicable across the higher education, school education and vocational education.

#### **Multiple Entry Multiple Exit Criteria:**

For Multiple Entry Multiple Exit (MEME), at the end of one year study, an equivalent degree can be awarded. The NCrF credit levels for school education are up to level 4, while for higher education from Level 4.5 to level 8 (Under-Graduate Levels 4.5, 5.0, 5.5 and 6.0, Post Graduate Levels 6.0, 6.5 and 7.0, and PhD Level 8) and for vocational education and training at level 4.5 to level 8.

**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 in 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:

Table 1: Program Level, Credit, Exit-Equivalence

Levels	Qualification Title	Credit Requirements	Semester	Year
4.5	One Year UG Certificate in Engg./ Tech.	44	2	1
5.0	Two Years UG Diploma in Engg./ Tech.	88	4	2
5.5	Three Years Bachelor's Degree in Vocation (B. Voc.) or B. Sc. (Engg./ Tech.)	132	6	3
6.0	4-Years Bachelor's degree (B.E./B.Tech. or Equivalent) in Engg./ Tech. with Multidisciplinary Minor	176	8	4
6.0	4-Years Bachelor's degree (B.E./ B.Tech. or Equivalent) in Engg./Tech.- Honors and Multidisciplinary Minor	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	194	8	4
6.0	4-Years Bachelor's degree (B.E./ B.Tech. or Equivalent) in Engg./	194	8	4
	Tech.- Major Engg. Discipline with Double Minors (Multidisciplinary and Specialization Minors)			

1. With effect from Academic Year 2024-25, the first year of 4-Year Multidisciplinary Bachelor's Degree in Engg./ Tech. Program (B.E./ B.Tech. or Equivalent) will be introduced. Thus, the Fourth Year of Bachelor's Engg./ Tech. Degree (Level 6.0) with various options- Bachelor's Engg./ Tech. Degree in chosen Major Engg./ Tech. Discipline with Multidisciplinary Minor (176 credits), OR Bachelor's Engg./ Tech. Honours Degree in chosen Major Engg./ Tech. Discipline with Multidisciplinary Minor (194 credits) OR Bachelor's Engg./ Tech. Honours with Research Degree in chosen Major Engg./ Tech. Discipline with Multidisciplinary Minor (194 credits) OR Bachelor's Engg./ Tech. Degree in chosen Major Engg./ Tech. Discipline with Double Minor (Multidisciplinary and Specialization Minor, 194 credits) will begin with effect from Academic

Year 2027-28.

2. Under Bachelor's Engg./ Tech. Honours with Research Degree in chosen Major Engg./ Tech. Discipline with Multidisciplinary Minor (194credits), the students will work on a research project or dissertation for 18 credits in the fourth year in the respective Major Engg./ Tech. Discipline. The decision regarding the distribution of 18 credits for Research Project in Semesters VII and VIII of the Fourth Year will be taken by Academic Authorities of institute. These 18 Credits will be over and above the min. 194 Credits prescribed for Four Year Multidisciplinary Bachelor's Degree in Engg./ Tech. Program.
3. The Bachelor's Engg./ Tech. Honours Degree in chosen Major Engg./ Tech. Discipline with Multidisciplinary Minor (186 credits) enables students to take up five-six additional courses in the same Engg./Tech. discipline of 18 credits distributed over semesters III to VIII. The decision regarding the mechanism of distribution of these 18 credits over semesters III to VIII, which are over and above the min. 194 Credits prescribed for Four Year Multidisciplinary Bachelor's Degree in Engg./ Tech., will be taken by Academic Authorities of institute.
4. Under Bachelor's Engg./ Tech. Degree in chosen Major Engg./ Tech. Discipline with Double Minor (Multidisciplinary and Specialization Minor, 186 credits), students would take up five-six additional courses of 18 credits in another Engg./ Tech. discipline/ Emerging Areas Specialization distributed over semesters III to VIII. The decision regarding the mechanism of distribution of these 18 credits over semesters III to VIII, which are over and above the min. 194 prescribed for Four Year Multidisciplinary Bachelor's Degree in Engg./ Tech., will be taken by Academic Authorities Institute.

**Distribution of Credits across Four Years Engg./Tech. Degree Programmes** In general, for the four years' bachelor's degree programme, the distribution of credits will be as follows:

1. Major (Core) Subject comprising Mandatory and Elective Courses:
  - (a) Minimum 50% of total credits corresponding to Three/Four – year UG Degree- Mandatory Courses offered in all Four years;
  - (b) Elective courses of Major will be offered in the third and/or final year.
  - (c) Vocational Skill Courses, Internship/ Apprenticeship, Community Engagement Project (CEP)/ Field Projects (FP), Research Projects connected to Major
  - (d) Compulsory Multidisciplinary Minor Subject: 14 Credits
    - i. The Minor subjects may be from the different disciplines of the Engineering faculty, or they can be from different faculty altogether.
    - ii. The credits of compulsory Minor subjects shall be completed from the second year to the final year of UG Programme.
  - (e) Generic/ Open Elective Courses (OE): 08 credits
    - i. It is to be offered in Second and/or Third year
    - ii. Faculty-wise baskets of OE shall be prepared by University/Autonomous Engineering Colleges.

- iii. OE is to be chosen compulsorily from faculty other than that of the Major Discipline.
- (f) Vocational and Skill Enhancement Courses (VSEC): 08 credits
- Vocational Skill Courses (VSC): 04 credits, including Hands on Training corresponding to the Major and/or Minor Subject:
    - i. To be offered in first three years;
    - ii. Wherever applicable vocational courses will include skills based on advanced laboratory practicals of Major.
  - Skill Enhancement Courses (SEC) : 04 credits
    - i. To be offered in first three years;
    - ii. To be selected from the basket of Skill Courses approved by University/ Autonomous Engineering Colleges
- (g) Ability Enhancement Courses (AEC), Indian Knowledge System (IKS) and Value Education Courses (VEC): 10 Credits
- AEC: 04 credits
    - i. To be offered in First and Second year
    - ii. English: 02 Credits
    - iii. Modern Indian Language: 02 credits
    - iv. To be offered from the Basket approved by University / Autonomous College;
- The focus for both languages should be on linguistic and communication skills.
- IKS: 02 Credits
    - i. To be offered in First Year
    - ii. Courses on IKS to be selected from the basket of IKS courses approved by
    - iii. University/ Autonomous Colleges or as per UGC Guidelines on IKS.
  - VEC: 04 Credits
    - i. To be offered in Second year
    - ii. Value Education Courses (VEC) such as Understanding India, Environmental Science/Education, and Digital and Technological Solutions.
- (h) Field Projects/ Internship/ Apprenticeship/ Community Engagement Projects corresponding to the Major (Core) Subject, Co-curricular Courses (CC).
- Internship/Apprenticeship corresponding to the Major (Core) Subject: 12 Credits. Internship of One Semester duration shall be offered either in the VII or VIII semesters. Courses offered during the Internship Semester shall be offered in online mode.
  - Field Projects/Community Engagement Projects corresponding to the Major (Core) Subject: minimum 02 credits
    - To be offered in Second year of UG Degree Programmes.
  - Co-curricular Courses (CC) such as Health and Wellness, Yoga education sports, and fitness, Cultural Activities, NSS/NCC and Fine/ Applied/ Visual/Performing Arts: 04 credits
    - To be offered in First year
- (i) Additional Credits for Bachelor's Degree- with Double Minor OR Honours: 18-20 Credits
- These are additional credits to be offered from the second year to the final year and will be offered as an option to students.

(j) Additional Credits for Bachelor's Degree- Honours with Research: Minimum 18 Credits

- These are additional credits to be offered in the final year and will be offered as an option to students.

The UGC Regulations, 2021 permit up to 40% of the total courses being offered in a particular programme in a semester through the **Online Learning Courses** offered through the SWAYAM platform and/or other State Level Common Platforms which can be developed in due course with the participation of different Universities/HTEIs.

**Illustrative 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(ICS)			02		--	--	--	--	--	02
Value Education Course(VEC)		--	--	02	02	--	--	--	--	04
Research Methodology	Experiential Learning Courses	--	--	--	--	--	--	04	04	04
Comm. Engg. Project (CEP)/Field Project (FP) Project		--	--	02	--	--	--	-	-	02
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>

**Abbreviations:** Generic/ Open Electives: OE; Vocational Skill and Skill Enhancement Courses: VSEC; Vocational Skill Courses: VSC; Skill Enhancement Courses: SEC; Ability Enhancement

Courses: AEC; Indian Knowledge System: IKS; Value Education Courses: VEC;OJT: On Job Training; Internship/ Apprenticeship; Field projects: FP; Community engagement project: CEP; Co-curricular Courses: CC; RM: Research Methodology; Research Project: RP, Liberal Learning Course: Lib. Learn, Courses on Humanities, Social Science, and Management: HSSM

**Note:** The Credit Distribution Table given above is illustrative only. The Universities/ Autonomous Colleges may suitably modify within the broader framework of credit distribution across seven verticals and as per the AICTE rules and regulations.

### **Credit Specifications**

- i. Theory Courses: 15 hours of teaching per credit is required in a semester.
- ii. Laboratory Course: 30 hours in laboratory activities per credit is required in a semester.
- iii. Studio activities: Studio activities involve the engagement of students in creative or artistic activities. Every student is engaged in performing a creative activity to obtain a specific outcome. Studio-based activities involve visual- or aesthetic-focused experiential work. A minimum of 30 hours in studio activities per credit in a semester is required.
- iv. Workshop-based activities: Courses involving workshop-based activities require the engagement of students in hands-on activities related to work/vocation or professional practice. Every student is engaged in performing a skill-based activity. Related to specific learning outcome(s). 30 hours of workshop-based activities per credit in a semester is required.
- v. Seminar/ Group Discussion: 15 hours of participation in seminar/ Group Discussion activity per credit in a semester is required.
- vi. Internship: Credits for internship shall be one credit per two weeks of internship (or 36-40 hours of engagement), The internship shall be monitored jointly by the faculty and Industry/ Organization Mentor. Internship of One Semester duration shall be offered either in the VII or VIII semesters. Courses offered during the Internship Semester shall be offered in online mode.
- vii. Field-based Learning/ Practices: These are the courses requiring students to participate in field-based learning/projects generally under the supervision of faculty. A minimum of 30 hours of learning activities per credit in a semester is required.
- viii. Community Engagement Projects: These are the courses requiring students to participate in field-based learning/projects generally under the supervision of faculty. The curricular component of 'community engagement and service' will involve activities that would expose students to the socio-economic issues in society so that the theoretical learning can be supplemented by actual life experiences to generate solutions to real-life problems. 30 hours of contact time per credit in a semester along with 15 hours of activities such as preparation for community engagement and service, preparation of reports, etc., and independent reading and study with 2 credit courses.

**Academic Bank of Credits (ABC), Admission System, Multiple Entry and Exit Path and Lateral Entry:**

**(a) Enrolment of Students and Registration of Colleges on ABC:**

All the students shall register on ABC at the time of admission. Since Credits awarded to a student for one programme from an institution may be transferred/redeemed by another institution upon the student's consent through ABC, it is essential that all students should get enrolled on ABC, create ABC ID, and share these ABC IDs with Academic Institutions where they are enrolled. Credits Earned by the student will reflect in the student's ABC account.

**Multi-institutional learning permission:** The student shall be allowed to earn some credits from institutions/colleges other than the Main/ Parent College i.e. a college where students earn all their major credits (more than 50%) including credits for the core subject. Students enrolled in the degree programmes may avail of other elective credits from two different colleges affiliated with the same University and/or online courses available within the 40% cap mentioned by UGC.

**(b) Multiple Exits:** Students will have the flexibility to enter a programme in odd semesters and exit a programme after the successful completion of even semesters as per their future career needs.

- Students exiting the First Year programme after securing minimum 44 credits will be awarded UG Certificate in the relevant Discipline /Subject provided they secure 8 credits in work-based vocational courses or internship / Apprenticeship offered during summer vacation in addition to 4 credits from skill-based courses earned during the first and second semester.
- Students exiting the Second Year Programme after securing minimum 88 credits will be awarded UG Diploma in the relevant Discipline /Subject provided they secure additional 8 credits in skill-based vocational courses (skill-based courses, internship, mini projects etc) offered during summer vacation after the second year.
- Students exiting the 3-year UG program will be awarded B.Voc. in the relevant Discipline /Subject upon securing minimum 132 credits with additional 8 credits in skill-based vocational courses (skill-based courses, internship, mini projects etc.) offered during summer vacation after the sixth

Semester.

- Exit options shall be provided with Certification, Diploma and B. Vocational degrees to the students at the end of the second, fourth and sixth semester, respectively, in the four-year degree programme. Students will receive a Bachelor's degree with the single minor on successfully completing all eight semesters of the UG Programmes either at a stretch or with opted exits and re-entries. In addition to this, student will receive a Bachelor's degree with Double Minor/Honours/ Research subject to earning additional 18 credits.

Re-entry or Lateral Entry: Students, opting for exits at any level, will have the option to re-enter the programme from where they had left off, in the same or in a different higher education institution within four years of exit and complete the degree programme within the stipulated maximum period of eight years from the date of admission to first year UG. Re-entry at various levels for lateral entrants in academic programmes shall be based on the earned and valid credits as-deposited and accumulated in the Academic Bank of Credits (ABC) through Registered Higher & Technical Education Institutions (RHTEI) and proficiency test records. Lateral entry into the programme of study leading to the UG Diploma/ B. Vocational/ UG Bachelor's Degree with single minor/ UG Bachelor's Degree with Double Minor/ Honours /Research will be based on the validation of prior learning outcomes achieved and subject to availability based on intake capacity.

- (c) Eligibility for admission to the UG Bachelor's Degree with Double Minor/ Honours /Research as per UGC guidelines: Minimum CGPA/CPI of 7.5 or minimum 75% after second semester for UG Bachelor's Degree with Double Minor/ Honours and Minimum CGPA/CPI of 7.5 or minimum 75% after sixth semester for UG Bachelor's Degree with Research.

### **Validity of Programme**

Validity of the credit earned for UG is 8 years, that is, the maximum duration from entering into program level 4.5 to exit from program level 6.0 is 8 years, after that the credit earned at any level cannot be utilized towards earning UG degree, i.e., B.Tech. Degree.

## **Program Outcomes:**

**PO1:Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**PO2:-Problem Analysis:** Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural science and engineering sciences.

**PO3:Design & Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for the public health and safety and the cultural ,societal and environmental considerations.

**PO4:Conduct Investigations of Complex Problems:** Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.

**PO5:Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**PO6:The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO7:Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO8:Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO9:Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO10:Communication:** Communicate Effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO11:Project management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO12:Life-Long Learning :** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

**F. Y. B.E. Syllabus Structure w.e.f. 2024-25 (NEP 2020 Based Curriculum)**

**Group A (Mechanical Engineering and Civil Engineering)**

**Semester –I**

**Orientation Program + Foundation Course (3 Weeks) : Mandatory**

Sr. No.	Course Category	Course Code	Course Title	Contact Hours per week		Credits		Scheme of Examination		
				Theory	Practical	Theory	Practical	CIA	SEE	Total
1	BSC	BSC101A	Applied Mathematics-I	3	--	3	--	40	60	100
2	BSC	BSC102A /103A	Engineering Physics / Engineering Chemistry	3	---	3	---	40	60	100
3	ESC	ESC104	Engineering Graphics	3	--	3	--	40	60	100
4	ESC	ESC105	Engineering Mechanics	3	--	3	--	40	60	100
5	VSEC	VSE106	Design Thinking	2	--	2	--	20	30	50
6	HSSM	HSM107	Professional Communication Skills	2	--	2	--	20	30	50
7	BSC	BSC121A /122A	Engineering Physics / Engineering Chemistry LAB	--	2	--	1	20	30	50
8	ESC	ESC123	Engineering Graphics LAB	--	2	---	1	20	30	50
9	ESC	ESC124	Engineering Mechanics LAB	--	2	--	1	20	30	50
10	ESC	ESC125	Workshop Practice	---	2	--	1	20	30	50
11	LLC	LLC126 A	Yoga		4	--	2	20	30	50
				16	12	16	6	300	450	750

**Semester –II**

Sr. No.	Course Category	Course Code	Course Title	Contact Hours per week		Credits		Scheme of Examination		
				Theory	Practical	Theory	Practical	CIA	SEE	Total
1	BSC	BSC151A	Applied Mathematics-II	3	--	3	--	40	60	100
2	BSC	BSC102A /103A	Engineering Physics / Engineering Chemistry	3	---	3	---	40	60	100
3	ESC	ESC152	Basics of Electrical and Electronics Engineering	3	--	3	--	40	60	100
4	ESC	ESC153/154	Basics of Civil Engineering /Basics of Mechanical Engineering	3	--	3	--	40	60	100
5	ESC	ESC155	Programming for Problem Solving	2	--	2	--	20	30	50
6	IKS	IKS156	Indian Knowledge System	2	--	2	--	20	30	50
7	VSEC	VSE157	Experiential Learning Lab	--	2	--	1	20	30	50
8	BSC	BSC121A /122A	Engineering Physics / Engineering Chemistry LAB	---	2	---	1	20	30	50
9	ESC	ESC171	Basics of Electrical and Electronics Engineering LAB	--	2	--	1	20	30	50
10	ESC	ESC172	Programming for Problem Solving LAB	--	2	--	1	20	30	50
11	LLC	LLC126 B	Health and Wellness	--	4	--	2	20	30	50
				16	12	16	6	300	450	750

### Exit Course-Civil Engineering

<b>Exit option: Award of UG Certificate in Major with 44 credits and an additional 8 credits from following Exit Courses</b>				
Sr. No.	Course Code	Course Title	Mode	Credits
1	CE-EC-0101	Industrial Training / Internship	Online/offline certification Course	8
		<b>OR</b>		
2	CE-EC-0102	Basics of Civil Infrastructure		4
	CE-EC-0104	Basics of Civil Infrastructure Lab		4
		<b>OR</b>		
3	CE-EC-0103	Construction Materials		4
	CE-EC-0105	Construction Materials Lab		4

### Exit Course-Mechanical Engineering

<b>Exit option: Award of UG Certificate in Major with 44 credits and an additional 8 credits from following Exit Courses</b>				
Sr. No.	Course Code	Course Title	Mode	Credits
1	ME-EC-0101	Industrial Training / Internship	Online/offline certification Course	8
		<b>OR</b>		
2	ME-EC-0102	Mechanical Maintenance		4
	ME-EC-0104	Mechanical Maintenance Lab		4
		<b>OR</b>		
3	ME-EC-0103	Vehicle Maintenance		4
	ME-EC-0105	Vehicle Maintenance Lab		4

# Semester I

<b>Faculty of Science &amp; Technology</b>		
<b>Syllabus of F. Y. B.E ( Civil Engineering &amp; Mechanical Engineering) (Semester I)</b>		
Course Code: BSC101A		
Course: Applied Mathematics-I		
Credits: 3		
Theory: 03 Hrs/week ; 45 Hrs / semester		
<b>Prerequisite</b>	<b>Section</b>	Students required the knowledge of all basic concepts related to calculus and differential equations.
<b>Objectives</b>		<ol style="list-style-type: none"> <li>1. To develop skills and create interest to use mathematics in Engineering &amp; technology</li> <li>2. To know how the real word problems governed by the first order differential equations and calculus.</li> <li>3. To understand the importance of differential calculus and differential equations in Engineering &amp; technology.</li> <li>4. To learn formation and solving various types of differential equations.</li> </ol>
<b>Course Outcomes</b>		<ol style="list-style-type: none"> <li>1. Solve the problems of partial and total differentiation of functions of two variables</li> <li>2. Examine functions for maxima and minima</li> <li>3. Use method of curve tracing to trace curves</li> <li>4. Evaluate integration of various types of functions by reduction formulas, beta function and gamma function</li> <li>5. Determine the value of double and triple integrals</li> <li>6. Apply multiple integrals to area, volume and surfaces</li> </ol>
<b>Unit-I</b>	<b>A</b>	<b>Differential Calculus:</b> Taylor's Series, Maclaurin's Series, Indeterminate Forms: L' Hospital's Rule (Without Proof), Evaluation of Limits. (7 Hrs)
	<b>B</b>	<b>Infinite Series:</b> Sequences, Introduction to Infinite Series, Convergence and Divergence of Infinite Series: Comparison Test, D' Alembert's Ratio Test, Cauchy's N <sup>th</sup> Root Test. (8 Hrs)
<b>Unit-II</b>	<b>A</b>	<b>Partial Differentiation:</b> Partial Derivatives - Introduction, Homogeneous Functions of Two Variables - Euler's Theorem, Implicit Functions, Total Derivative, Change of Variables. (8 Hrs)
	<b>B</b>	<b>Applications of Partial Differentiation:</b> Maxima and Minima of Functions of Two Variables, Jacobians and Its Properties. (7Hrs)
<b>Unit-III</b>	<b>A</b>	<b>Differential Equations:</b> Solution of First Order and First Degree Differential Equation: Exact, Linear and Bernoulli's Equation (Reducible to Linear) (7 Hrs)
	<b>B</b>	<b>Application Of Differential Equations:</b> Application of First Order and First-Degree Differential Equations: Electrical Circuit, Mechanics. (8 Hrs)

		<b>Sr. No.</b>	<b>Title</b>	<b>Author</b>	<b>Publication</b>	<b>Edition</b>
<b>Textbooks / Reference Books</b>		1.	Advanced Engineering Mathematics	Louis C. Barrett, Ray Wylie C	McGraw-Hill Publishing Company Ltd, New Delhi, 2003.	6 <sup>th</sup> Edition
		2.	Engineering Mathematics- Volume I	Venkatraman. M.K	National publishing company, Chennai, 2008.	4 <sup>th</sup> edition
		3.	Higher Engineering Mathematics	Dr. Grewal. B.S.	Khanna Publications, New Delhi, 2007.	40 <sup>th</sup> Edition
		4.	Advanced Engineering Mathematics	H. K. Dass.	S. Chand And Co. Ltd	18 <sup>th</sup> Edition
		5.	Advanced Engineering Mathematics	Erwin Kreyszig	Wiley Eastern Ltd. Mumbai	10 <sup>th</sup> Edition
		6.	Advanced Engineering Mathematics	M. D. Greenberg	Pearson Publication	2 <sup>nd</sup> Edition
		7.	A Textbook of Engineering Mathematics	Peter O'Neil	Thomson Asia Pvt. Ltd., Singapore	7 <sup>th</sup> Edition

<b>Faculty of Science &amp; Technology</b> <b>Syllabus of F. Y. B.E ( Civil Engineering &amp; Mechanical Engineering) (Semester I)</b>	
Course Code: BSC102A Course: Engineering Physics Credits: 3 Theory: 03 Hrs/week ; 45 Hrs / semester	
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To let the engineering undergraduates, study physical properties, concepts and physical quantities required for the solution of complex engineering problems</li> <li>2. To make the engineering undergraduates learn basic principles of Physics and laws of scientific investigation to identify, formulate and analyse complex engineering problems</li> <li>3. To equip engineering undergraduates with competencies of scientific methods required in engineering career by upgrading skills on the basis of learning achieved from physical science perspectives.</li> <li>4. To engage engineering undergraduates extensively in scientific investigation for interdisciplinary graduate programs and a wide variety of other lifelong learning opportunities.</li> </ol>
<b>Course Outcomes</b>	<ol style="list-style-type: none"> <li>1. Recall basics of Optics, Sound and Modern Physics</li> <li>2. Explain phenomenon in Optics, Sound and Modern Physics</li> <li>3. Apply concepts of Optics, Sound and Modern Physics to solve complex engineering problems</li> <li>4. Analyze the concepts of Optics, Sound and Modern Physics</li> <li>5. Interpret the characteristics of Solar cell, Zener diode, Transistor, Planks constant curve, GM Counter curve</li> <li>6. Experiment LASER &amp; Fiber Technology</li> </ol>
<b>Unit-I</b>	<p><b>A:Optics</b> The wave equation, Introduction to electromagnetic waves and electromagnetic spectrum, Newton's ring, Michelson interferometer, Applications of interference Diffraction of light, diffraction grating, resolving power of grating, Application of diffraction grating in spectroscopic devices. (5 Hrs)</p> <p><b>B: Acoustics</b> Acoustic terminology and definitions, Acoustic Wave Equation and its Basic Physical Measures, Sabine's formula (derivation not necessary) acoustics factor in architectural design.</p> <p><b>C:Ultrasonics</b> Properties, Production of ultrasonic waves by piezo-electric magnetostriction generator, engineering applications of ultrasonic waves. (6Hrs)</p>
<b>Unit-II</b>	<p><b>A:X-Rays</b> Basics of X-Rays, Production and Detection of X-Rays, Continuous and characteristics spectrum, Bragg's law of X-ray diffraction, Bragg's spectrometer, Intensity of diffracted Beams, Particle Size Determination by XRD, Precise Lattice Parameter Determination (4 Hrs)</p>

	<p><b>B:Nuclear Physics</b> Nuclear force, liquid drop model, shell model, Nuclear fission and fusion, Q-value of nuclear reaction, nuclear reactor, P-P cycle, C-N cycle, cyclotron, GM counter, applications of nuclear physics in various fields. (4 Hrs)</p> <p><b>C:Modern Physics</b> Black body radiation, Planck's law, Photoelectric effect, Wave particle duality, De- Broglie's concept of matter wave, Davisson-Germer experiment, Scanning tunneling microscope, Time-dependent &amp; time-independent Schrodinger equation for wave function, Quantum computing. (4 Hrs)</p>				
<b>Unit-III</b>	<p><b>A:Introduction to solids</b> Superconductivity: Superconductivity, effect of temperature and magnetic fields, Meissner effect, type I and II superconductors, BCS theory, Applications. Free electron theory of metals, Fermi level, density of states, Application to white dwarfs and neutron stars, Bloch's theorem for particles in a periodic potential, Kronig-Penney model and origin of energy bands. (7 Hrs) Magnetic Materials: Magnetic susceptibility and diamagnetic materials, paramagnetic, ferromagnetic, and, BH characteristics, applications.(4 Hrs)</p>				
	<p><b>B:Laser</b> Einstein's theory of matter radiation interaction and A and B coefficients, Properties of laser, spontaneous and stimulated emission, ruby laser, He-Ne laser, CO<sub>2</sub> laser and semiconductor Laser, applications of lasers in science, engineering and medicine. (6 Hrs)</p> <p><b>C:Fiber Technology</b> Propagation of light through optical fiber, acceptance angle and cone numerical aperture, Single and Multi-Mode Fibers, applications, sensors. (5 Hrs)</p>				
<b>Textbooks/ Reference Books</b>	<b>Sr. No.</b>	<b>Title</b>	<b>Author</b>	<b>Publication</b>	<b>Edition</b>
	1.	A Text book of Engineering Physics	M. N. Avadhanulu P. G. Kshirsagar	S. Chand & Co.	7 <sup>th</sup> Edition
	2.	A Text book of Engineering Physics	R. K. Gaur S. L. Gupta	Dhanpat Rai	3 <sup>rd</sup> Edition
	3.	Fundamentals of Physics	David Halliday, Jearl Walker, and Robert Resnick	Wiley	6 <sup>th</sup> Edition
	4.	Elements of X-ray Diffraction	B. D. Cullity	Addison-Wesley Metallurgy Series	1 <sup>st</sup> Edition
	5.	Nuclear Physics	Irving Kaplan	Narosa Publishing house	2 <sup>nd</sup> Edition

	6.	Introduction to Solid State Physics	C. Kittel	John Wiley & Sons, Inc	8 <sup>th</sup> Edition
	7.	Lasers and Non-Linear Optics	B.B. Laud	New Age International	3 <sup>rd</sup> Edition
<b>Websites and online courses</b>	1.	<a href="http://science.howstuffworks.com/laser1.htm">http://science.howstuffworks.com/laser1.htm</a>			
	2.	<a href="http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html">http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html</a>			
	3.	<a href="http://nptel.ac.in/courses/122107035/">http://nptel.ac.in/courses/122107035/</a>			
	4.	<a href="http://nptel.ac.in/courses/122104016/">http://nptel.ac.in/courses/122104016/</a>			
	5.	<a href="https://www.coursera.org/learn/intro-to-acoustics">https://www.coursera.org/learn/intro-to-acoustics</a>			
	6.	<a href="https://nptel.ac.in/courses/112/106/112106227/">https://nptel.ac.in/courses/112/106/112106227/</a>			
	7.	<a href="https://nptel.ac.in/courses/113/104/113104081/">https://nptel.ac.in/courses/113/104/113104081/</a>			
	8.	<a href="https://nptel.ac.in/courses/115/102/115102017/">https://nptel.ac.in/courses/115/102/115102017/</a>			

<b>Faculty of Science &amp; Technology</b> <b>Syllabus of F. Y. B.E ( Civil Engineering &amp; Mechanical Engineering) (Semester I)</b>	
Course Code: BSC103A Course: Engineering Chemistry Credits: 3 : Theory: 03 Hrs/week ; 45 Hrs / semester	
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To relate the concepts of Chemistry in all Engineering Disciplines.</li> <li>2. To make the engineering undergraduates acquainted with modern techniques in engineering and industrial Chemistry.</li> <li>3. To equip engineering undergraduates with the knowledge of advanced and existing Engineering Materials.</li> <li>4. To develop the awareness about powering the future using advanced energy Storage Systems.</li> </ol>
<b>Course Outcomes</b>	<ol style="list-style-type: none"> <li>1. Recall the basics of advanced Engineering materials: Polymers, Nanomaterials, Composite materials, etc</li> <li>2. Explain the advanced methods to produce engineering materials and soft water for industrial and domestic use</li> <li>3. Summarize properties and applications of fuels, lubricants, advanced engineering materials</li> <li>4. Apply the knowledge of lubricants, corrosion, advanced energy systems and modern metallurgical processes to solve the engineering problems</li> <li>5. Analyze the samples for estimating the aggregate impurities in water, coal, metals, and lubricant samples</li> <li>6. Examine the synthetic scheme for thermosetting polymers and fundamental nonmaterial</li> </ol>
<b>Unit-I</b>	<p><b>A: Advanced Engineering Materials</b>  <b>Industrial Polymers:</b> Thermoplastics (PVC) &amp; Thermosetting polymers (Bakelite), Biodegradable polymers (PVA), Properties, Applications  <b>Nanomaterials:</b> Preparation of nano materials by Laser method, properties and applications of CNTs.  <b>Composite Materials:</b> Ceramic matrix composites, carbon- carbon composites  <b>Reinforcements:</b> Silicon carbide, Fiber glass. (8Hrs)</p> <p><b>B: Water Technology:</b>  Water Parameters: Total Dissolved Solids (TDS), Dissolved Oxygen (DO), Chemical Oxygen Demand (COD), pH, Hardness of water: types and units, Estimation of hardness by EDTA method, numerical on hardness; Boiler troubles: scale, sludge, priming, foaming and caustic embrittlement; Water treatment: Ion exchange process, Ultra filtration, Nano filtration (7 Hrs)</p>
<b>Unit-II</b>	<p><b>A: Fuels and Energy Storage Systems:</b>  Fuels: Gross and net calorific value, Solid fuels: proximate analysis of coal &amp; importance, gaseous fuels: composition properties and application of natural gases- CNG, LNG.</p>

	Energy Storage Systems: Bio electrochemical batteries, lithium-ion battery, alkaline fuel cell (AFC) (7Hrs)				
	<b>B: Lubricants and Coolants</b> Lubricants: Introduction, Properties of liquid lubricants: viscosity and viscosity index, flash point and fire point, acid value. Numerical on viscosity index. Coolants: Introduction, properties and uses of water and ethylene glycol as coolant. (8 Hrs)				
<b>Unit-III</b>	<b>A: Corrosion and its prevention</b> Definition, types, mechanism of dry and wet corrosion, Corrosion testing methods: ultrasonic testing, computed & digital radiography, Prevention of corrosion: Methods- sacrificial anodic protection, Electroplating, Powder coating. (8Hrs)				
	<b>B: Metallurgical processes</b> Calcination, smelting, ore dressing, roasting, refining of metals, Metalworking processes: casting, forging, rolling, machining, sintering, Laser cladding, 3D printing (7Hrs)				
<b>Textbooks/ Reference Books</b>	<b>Sr. No.</b>	<b>Title</b>	<b>Author</b>	<b>Publication</b>	<b>Edition</b>
	1.	Engineering Chemistry	B. Siva Shankar	Mc Graw Hills Publications	3 <sup>rd</sup> Edition
	2.	Engineering Chemistry	Shelly, Oberi and Malik	Cingage Publication	1st Edition
	3.	Principles of Polymerization	Odian, G.G	John Wiley & Sons, Inc	4th Edition
	4.	Engineering Chemistry	Jain & Jain	Dhanpat Rai Publishing	16 <sup>th</sup> Edition
	5.	Polymer Chemistry	Malcolm P. Stevens	Oxford University Press	3 <sup>rd</sup> Edition
	6.	A Textbook of Engineering Chemistry	Shashi Chawla	Dhanpat Rai & CO	10 <sup>th</sup> Edition
	7.	Material Science & Engineering	William Callister and V. Raghavan	Wiley	9 <sup>th</sup> Edition
<b>Websites and online courses</b>	1.	Unit- I – <a href="https://onlinecourses.nptel.ac.in/noc21_ch49/preview">https://onlinecourses.nptel.ac.in/noc21_ch49/preview</a> <a href="https://www.explainthatstuff.com/composites.html">https://www.explainthatstuff.com/composites.html</a>			
	2.	Unit- II – <a href="https://nptel.ac.in/content/storage2/courses/116104045/lecture8.pdf">https://nptel.ac.in/content/storage2/courses/116104045/lecture8.pdf</a> <a href="https://nptel.ac.in/content/storage2/courses/116104045/lecture6.pdf">https://nptel.ac.in/content/storage2/courses/116104045/lecture6.pdf</a>			
	3.	Unit- III – <a href="https://nptel.ac.in/content/storage2/courses/121106014/Week12/lecture38.pdf">https://nptel.ac.in/content/storage2/courses/121106014/Week12/lecture38.pdf</a> <a href="https://www.sciencedirect.com/topics/engineering/proximate-analysis">https://www.sciencedirect.com/topics/engineering/proximate-analysis</a>			
	4.	Unit- IV –			

	<a href="https://nptel.ac.in/courses/112/102/112102014/">https://nptel.ac.in/courses/112/102/112102014/</a> <a href="https://nptel.ac.in/content/storage2/courses/112105127/pdf/LM-12.pdf">https://nptel.ac.in/content/storage2/courses/112105127/pdf/LM-12.pdf</a>
5.	Unit- V - <a href="https://nptel.ac.in/courses/113/108/113108051/">https://nptel.ac.in/courses/113/108/113108051/</a>
6.	Unit- VI - <a href="https://nptel.ac.in/courses/112/107/112107144/">https://nptel.ac.in/courses/112/107/112107144/</a>

<b>Faculty of Science &amp; Technology</b> <b>Syllabus of F. Y. B.E ( Civil Engineering &amp; Mechanical Engineering) (Semester I)</b>	
Course Code: ESC104 Course: Engineering Graphics Credits: 3 Lecture: 03Hr/week ; 45 Hrs / Semester	
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. Engineering drawing being the principle method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales.</li> <li>2. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc</li> </ol>
<b>Course Outcomes</b>	<ol style="list-style-type: none"> <li>1. Perform free hand sketching of basic geometrical constructions and multiple views of objects</li> <li>2. Draw the projections of points, straight lines and plane surfaces in given quadrant</li> <li>3. Understand the projection of solids in various positions in first quadrant</li> <li>4. Draw projections and solids and development of surfaces</li> <li>5. Prepare isometric and perspective sections of simple solids</li> </ol>
<b>UNIT-I</b>	
<b>A:Projections of Point &amp; Line:</b>	
Concept of orthographic projections. Projections of points situated in different quadrants. Projections of a line parallel to one of the reference planes and inclined to the other plane, line inclined to both the reference planes. (08Hrs.)	
<b>B:Projections of Planes:</b>	
Projections of a plane perpendicular to one of the reference planes and inclined to the other, Projections of a plane inclined to both the reference planes. (07Hrs.)	
<b>UNIT-II</b>	
<b>A: Projection of Solids:</b>	
Types of solids, projections of solids like cube, Prism, Pyramid, Cone and Cylinder with its axis inclined to one or both the reference planes. (08Hrs.)	
<b>B:Section of Solids:</b>	
Projections of regular solids like Cube, Prism, Pyramid, Cone and Cylinder cut by cutting plane inclined to one plane. Determination of true shape of section. (07Hrs.)	
<b>UNIT-III</b>	
<b>A:Orthographic Projection:</b>	
Introduction to orthographic projection, Concept of first and third angle projection method. Drawing of orthographic views of simple machine components from isometric view. (08Hrs.)	
<b>B:Isometric Views:</b>	
Isometric axes, Isometric lines, Isometric Planes, Isometric scale, Isometric Views, Isometric projections, drawing of isometric views from given orthographic views. (07Hrs.)	

Text/Reference Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing.

2. Jain, Maheshwari, Gautam (2008), Engineering Drawing, Tata McGraw-Hill Publishing.
3. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson.
4. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication.
5. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publisher

<b>Faculty of Science &amp; Technology</b>	
<b>Syllabus of F. Y. B.E ( Civil Engineering &amp; Mechanical Engineering) (Semester I)</b>	
Course Code: ESC105 Course: Engineering Mechanics Credits: 3 Lecture:03 Hrs/week / 45 Hrs / Semester	
<b>Prerequisite</b>	Introduction to basic terminologies involved in physics.
<b>Objectives</b>	1. To study the forces and their effects on the bodies in motion or at rest. 2. To study the mechanics of rigid bodies and deformed bodies. 3. To study the properties of plane surfaces, analysis of simple trusses and concept of friction.
<b>Course Outcomes</b>	1. Apply fundamental Laws of Engineering Mechanics 2. Apply Conditions of static equilibrium to analyze given force system 3. Compute Centre of gravity and Moment of Inertia of plane surfaces 4. Compute the motion characteristics of a body/particle for a Rectilinear and Curvilinear Motion Know and discuss relation between force and motion characteristics
<b>Unit-I</b>	<b>A:Force System:</b> Introduction, Fundamental concept, principle of superposition, fundamental laws of mechanics, coplanar and non-coplanar force system, components, resultant, moment of a force, Varignon’s Theorem, couple, Equivalent force couple system. Equilibrium of forces: Introduction, free body diagram, beam, Equilibrium of force system, Lami’s Theorem. (13Hrs)
	<b>B: Plane Trusses:</b> Introduction, classification of trusses, assumption made in the analysis of truss, Analysis of statically determinate truss by method of joint and method of section. (10Hrs)
<b>Unit-II</b>	<b>A:Properties of Plane Surfaces:</b> Introduction, Centroid, Centre of gravity, Important definitions, Determination of centroid, Positions of centroid, Moment of Inertia, Polar moment of inertia, Radius of gyration, Theorems of moment of inertia. (7Hrs)
	<b>B:Kinematics of Particles:</b> Introduction, basic terms and definitions, Rectilinear motion of the particles, Motion curves under uniform acceleration, linear motion under gravity, linear motion under variable acceleration, motion curves under variable acceleration, Motion of projectiles, Relative motion. (7Hrs)
<b>Unit-III</b>	<b>A:Kinetics of Particles:</b> Introduction, important terms and definitions, linear motion of a particle by Newton’s second law of motion and D’Alembert’s principle. (4Hrs)
	<b>B: Impulse, Momentum and Impact:</b> Introduction of Impulse and Momentum, important terminologies, principle of impulse

	and momentum, law of conservation of linear momentum, Recoil of gun, Impact, types of central impact, loss of kinetic energy during impact. (4Hrs)				
Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Engineering Mechanics	S.S. Bhavikatti	New Age International Publication	8 <sup>th</sup> Edition
	2.	Engineering Mechanics	R.K.Bansal	Laxmi Publication	4 <sup>th</sup> Edition
	3.	Engineering Mechanics	A.R.Basu	DhanpatRai	2 <sup>nd</sup> Edition
	4.	Engineering Mechanics	Nelsonand Mclean	McGrawHillBook ,Inc	2 <sup>nd</sup> Edition
	5.	Engineering Mechanics	B.Prasad	Khanna Publications	9 <sup>th</sup> Edition
	6.	Engineering Mechanics: Principles of Statics and Dynamics	R.C. Hibbler	Pearson Education	14 <sup>th</sup> Edition
	7.	A Textbook Of Engineering Mechanics	R.S. Khurmi	S. Chand	22 <sup>nd</sup> Edition

<b>Faculty of Science &amp; Technology</b>	
<b>Syllabus of F. Y. B.E ( Civil Engineering &amp; Mechanical Engineering) (Semester I)</b>	
Course Code: VSE106 Course: Design Thinking Credits: 2 Theory: 02 Hr/week / 30 Hrs / Semester	
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To familiarize students with the fundamental concepts and stages of the Design Thinking process.</li> <li>• To enable students to generate innovative solutions and develop strategic plans for implementing these solutions in real-world engineering contexts.</li> <li>• To equip students with the ability to create and test low-fidelity prototypes</li> </ul>
<b>Course Outcomes</b>	<ol style="list-style-type: none"> <li>1. Understand the concepts of design thinking approaches.</li> <li>2. Demonstrate effective decision making through design thinking.</li> <li>3. Explain the importance of user empathy and problem definition in the Design Thinking process.</li> <li>4. Analyse user research data to identify core problems and formulate problem statements.</li> <li>5. Develop low fidelity type prototype for innovative solution.</li> </ol>
<b>Unit-I</b>	<p><b>Introduction to Design Thinking:</b> Introduction, Design Thinking, Key principles, history, and benefits, Human-centered design approach, design challenges and opportunities. (5 Hrs)</p> <p><b>Design Thinking process:</b> General design process, Scope for design, Design thinking process, Relevance to engineering. (5 Hrs)</p>
<b>Unit-II</b>	<p><b>Empathy:</b> Identifying customer Needs, Techniques for user research, building empathy map, Showcase empathy driven design.(5 Hrs)</p> <p><b>Defining problem:</b> Methods to identify core problems, crafting problem statements, case studies on problem definition.(5 Hrs)</p>
<b>Unit-III</b>	<p><b>Ideation techniques:</b> Brainstorming, brainwriting, mind mapping, out-of-box thinking, creativity Brainstorming techniques for generating ideas, Idea selection and evaluation methods. (5 Hrs)</p> <p><b>Prototyping and Testing:</b> Definition and purpose of prototyping, Difference between low-fidelity and high-fidelity prototypes, Benefits of prototyping in iterative design processes, Tools and material used for prototyping.</p>

Definition and purpose of testing in the design process, Importance of user feedback in refining prototypes, Testing as an iterative process. (5 Hrs)					
<b>Textbooks/ Reference Books</b>	<b>Sr. No.</b>	<b>Title</b>	<b>Author</b>	<b>Publication</b>	<b>Edition</b>
	1.	Engineering Design: A Project Based Introduction	C.L. Dym, P. Little	WileyPublication	4 <sup>th</sup> Edition
	2.	Project Design & Development	Karl Ulrich	McGraw Hill Publication	5 <sup>th</sup> Edition
	3.	Human factors in product design: current practice and future trends..	Green, W., & Jordan, P. W.	CRC Press (1999)	1st Edition

Faculty of Science & Technology					
Syllabus of F. Y. B.E ( Civil Engineering & Mechanical Engineering) (Semester I)					
Course Code: HSM107					
Course: Professional Communication Skills					
Credits: 2					
Lecture 02 Hrs / Week ; 30 Hrs / Semester					
Course Objectives	<ol style="list-style-type: none"> <li>1. To apply English parts of speech in day to day communication.</li> <li>2. To apply English Tenses in situational communication</li> <li>3. To apply transformation of sentences in professional communication</li> <li>4. To pronounce English words and sentences accurately</li> <li>5. To communicate in English effectively by using updated vocabulary.</li> </ol>				
Course Outcomes	<ol style="list-style-type: none"> <li>1. Apply English parts of speech in day to day communication</li> <li>2. Analyze, interpret and effectively summarize a variety of textual content</li> <li>3. Develop vocabulary and language skills relevant to engineering as a profession</li> </ol>				
Sr. No.	Section	Contents			
Unit-I	Grammar	Parts of Speech Tenses with Timeline Transformation of sentences: Simple, compound and complex Active and passive voice Conditional Clauses			10Hrs
Unit-II	A: Introduction to Phonetics	Phonetics and problems in learning and using pronunciation, <ul style="list-style-type: none"> <li>• Vowel sounds &amp; Consonant Sounds,</li> <li>• Articulation of Sounds</li> <li>• Word accent</li> </ul>			10 Hrs
	B:Vocabulary Enhancement	<ul style="list-style-type: none"> <li>• Types of Vocabulary</li> <li>• Basic techniques to Enhance Vocabulary</li> <li>• Vocabulary Enhancing Activities</li> </ul>			10Hrs
Textbooks/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	The Essence of Effective Communication	Adrian Budday, Ron Ludlow and Fergus' Panton	Prentice Hall of India-Private Ltd.	1992
	2.	Professional Communication Skills	A. K. Jain, Pravin, S. R. Bhatia, A. M. Sheikh	S. Chand & Company Ltd.	2018

**Faculty of Science & Technology**  
**Syllabus of F. Y. B.E ( Civil Engineering & Mechanical Engineering) (Semester I)**

	3.	Business Communication	Urmila Rai, S. M. Rai	Himalya Publishing House	9 <sup>th</sup> Edition
	4.	Technical Communication- Principles and Practice	Meenakshi Raman & Sangeeta Sharma	Oxford University Press	2 <sup>nd</sup> Edition
	5.	A course in Phonetics & Spoken English	J. Sethi, P.V. Dharmatma	PHI Publication	2 <sup>nd</sup> Edition
	6.	Communication Skills for Engineers	Sunita Mishra, C. Murli Krishna	Pearson Education	2 <sup>nd</sup> Edition
	7.	Grammar of Spoken and Written English	DauglasBiber, Geoffrey Leech	Longman	1 <sup>st</sup> Edition
	8.	English Grammar and Composition	Wren and Martin,	S. Chand Publications	1 <sup>st</sup> Edition
Mode of Conduct	Use of audio video sessions, demonstrations, group activities and games, simulation activities				

Course Code: BSC121A  
Course: Engineering Physics LAB  
Credits: 1  
  
Practical: 02Hrs/week ; 30 Hrs / Semester

List of Practical	Any 10 practical to be conducted 1. Newton's ring: To determine wavelength of monochromatic light 2. G. M. Counter: dead time calculation 3. Grating: To determine wavelength of LASER light. 4. Characteristics of solar cell 5. Ultrasonic interferometer 6. Dielectric constant: to determine dielectric constant. 7. Forbidden gap: To determine forbidden gap of semiconductors. 8. To determine the Hall coefficient of a semiconductor material and then evaluate carrier type and its density of charge carrier. 9. Determination of Planck's Constant 10. To determine the elastic constant of wire Y and n of stainless steel wire by Searle's method. 11. Determination of Young's modulus by bending beam 12. To find the time period of a simple pendulum and determine acceleration due to gravity
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**Faculty of Science & Technology**  
**Syllabus of F. Y. B.E ( Civil Engineering & Mechanical Engineering) (Semester I)**

Course Code: BSC122A  
Course: Engineering Chemistry LAB  
Credits: 1  
Practical:02Hrs/week ; 30 Hrs / Semester

List of  
Practical

Any 10 practical to be conducted:

1. Analysis of Chemical parameters of water (Lab performance/Virtual performance)
2. Analysis of physical parameters of water
3. Determination of percentage of moisture and ash in given coal sample.
4. Preparation of polymer
5. Electro gravimetric Estimation of Metals (Virtual experiment)
6. Determination of chloride content of water by Mohr's method (Lab performance /Virtual experiment)
7. Determination of melting or boiling point of organic compound. (Virtual experiment)
8. Determination of Viscosity of given specimen.
9. Determination of rate of corrosion in different pH media. (Lab performance /Virtual experiment)
10. Chromatography- Separation technique (Lab performance /Virtual experiment)
11. Determination of acid value of lubricating oil by titration method.
12. Determination of percentage of moisture in given soil sample.
13. Determination of pH in given soil sample.

	14. Separation of chemical compounds by column chromatography technique. (Virtual experiment)
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<b>Faculty of Science &amp; Technology</b> <b>Syllabus of F. Y. B.E ( Civil Engineering &amp; Mechanical Engineering) (Semester I)</b>
Course Code: ESC123 Course: Engineering Graphics LAB Credits: 1 Practical: 02 Hr/week ; 30 Hrs / Semester
<b>Content:</b> <ol style="list-style-type: none"> <li>1. Drawing instruments and their uses. Lines, lettering, and Dimensioning.</li> <li>2. Drawing sheet on Projection of points.</li> <li>3. Drawing sheet on Projection of Lines.</li> <li>4. Drawing sheet on Projection of Planes.</li> <li>5. Drawing sheet on Projection of Solids.</li> <li>6. Drawing sheet on sections of Solids</li> </ol>

7. Drawing sheet on orthographic projections.
8. Drawing sheet on Isometric projections.

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

<b>Faculty of Science &amp; Technology</b> <b>Syllabus of F. Y. B.E ( Civil Engineering &amp; Mechanical Engineering) (Semester I)</b>	
Course Code: ESC124 Course: Engineering Mechanics LAB Credits: 1 Practical:02Hrs/week ; 30 Hrs / Semester	
Objectives	A Knowledge of Engineering Mechanics help the engineers to deal with the facts, laws, principles and applications to the real life problems through which the creation of new systems by way of research, design and developments in engineering practices.
List of Practical	Part I: Graphical Solutions: (Any Two) 1. Resultant of Concurrent and Non-Concurrent Coplanar Force System 2. Problems on Beam Reaction 3. Problems on Analysis of Pin-jointed Trusses Part-II: Laboratory Experiments:(Any Six) 1. Parallelogram Law of Forces 2. Lami's Theorem 3. Beam Reactions 4. Member Forces in Trusses 5. Jib Crane 6. Moment of Inertia of Fly Wheel 7. Simple Screw Jack 8. Differential Axleand Wheel 9. Belt Friction

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

**Faculty of Science & Technology**  
**Syllabus of F. Y. B.E ( Civil Engineering & Mechanical Engineering) (Semester I)**

Course Code: ESC 125  
 Course: Workshop Practice  
 Credits: 1  
 Practical:02 Hrs/week ; 30 Hrs / Semester

Course Objectives	<ol style="list-style-type: none"> <li>1. To have hands on practice and understanding of fitting process and tools.</li> <li>2. To have hands on practice and understanding of smithy process and tools.</li> <li>3. To have hands on practice and understanding of sheet metal process and tools.</li> <li>4. To have hands on practice and understanding of carpentry process and tool.</li> </ol>
Fitting I	<p>Study of different tools of fitting &amp; processes involved in fitting.                      Introduction of Tools &amp; operations, Types of Marking tools &amp; their uses, Types of fitting cutting tool &amp; their uses, fitting operations such as chipping, filing, scraping, grinding, sawing, marking, Drilling, tapping.                      Workshop Diary – Draw sketches and description of fitting tools and sketches of the job.                      Practical - One composite job involving simple fitting operation like sawing, marking, filling &amp; tapping operation: minimum one job.                      (Male – female fitting)</p>
Black Smithy II.	<p>Study of different smithy tools &amp; processes.                      Black Smithy: Introduction of forging tools and it's operations.                      Workshop diary – Draw sketches and description of smithy tools and sketches of the job.                      Practical - Preparation of one job making round cross section to square bar.</p>
Sheet metal working III.	<p>Study of different sheet metal tools.                      Introduction of Tools like hammers, stakes, scissors etc, &amp; operations like shearing, bending, joining. Types of Sheet metal joints and applications.                      Workshop diary - Sketches and description of sheet metal tools and sketches of the job.                      Practical - One job involving development of surfaces, marking on sheet metal cutting, bending, joint preparation by folding.</p>
Carpentry IV.	<p>Study of different Carpentry tools.                      Introduction of Tools &amp; operations, Types of woods &amp; their applications, Types of Carpentry hardware and their uses, Carpentry Joints, carpentry operations such as marking, sawing, planning, chiseling, grooving, boring, joining, types of woods and carpentry hardware.                      Workshop diary - Sketches and description of Carpentry tools and sketches of the job.                      Practical – One job involving making of any one type of carpentry joint.</p>

The assessment of term work shall be done on the basis of the following.

- Continuous assessment

- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above

**Instruction to Students:**

Each student is required to maintain a workshop diary consisting of drawing/sketches of the jobs and a brief description of tools, equipment and procedure used for doing the job.

Reference/Textbooks:

1. K. C. John, Mechanical Workshop Practice, Prentice Hall Publication, New Delhi, 2010.
2. Hazra and Chaudhary, Workshop Technology-I, Media promoters & Publisher private limited.

<b>Faculty of Science &amp; Technology</b>					
<b>Syllabus of F. Y. B.E ( Civil Engineering &amp; Mechanical Engineering) (Semester I)</b>					
Course Code: LLC126 A Course: Yoga Credits: 2 Practical: 04 Hrs/Week ; 60 Hrs/ Semester					
Objectives	1. To identify common stressors inherent in today's global marketplace. 2. To develop an understanding of the impact of stress on physiological, emotional and cognitive processes. 3. To learn to manage the stress through art of Yoga.				
Course Outcomes	1. Gain practical knowledge and awareness of electrical accessories, safety measures, and basic wiring concepts for household applications. 2. Develop hands-on skills in various electrical circuits, and understanding fundamental of electrical laws and theorems through practical experimentation.				
Unit-I	Mental Health: Meaning and importance; Yogic Perspective of Mental Health, Indicators of Mental Health, Stress: Meaning and Definition; Symptoms, Causes and Consequences of Stress, Meaning of Management- Stress Management, Stress in Modern Culture & Society. (10Hrs) <b>Practice based on above topics</b>				
Unit-II	Concept of Stress according to Yoga, Assessing your Stress & Building Resilience. (10 Hrs) <b>Practice based on above topics</b>				
Unit-III	Physiology of Stress on: Autonomic Nervous System (ANS), Endocrine System, Hypothalamus, Cerebral Cortex and Neurohumours. (10 Hrs) <b>Practice based on above topics</b>				
Unit-IV	Mechanism of Stress related diseases: Psychic, Psychosomatic, Somatic and Organic phase. Role of Meditation & Pranayama on stress- physiological aspect of meditation, constant stress & strain, anxiety. (10 Hrs) <b>Practice based on above topics</b>				
Unit-V	Meaning and definition of Health: various dimensions of health (Physical, Mental, Social and Spiritual) Yoga and Health- Yoga as therapy, Physical fitness. Stress control exercise- Sitting meditation, Walking meditation, Progressive muscular relaxation, Gentle stretches and Massage. (10 Hrs) <b>Practice based on above topics</b>				
Unit-VI	Preventive and curative effects of Yoga on stress related disorders: Hypertension, Heart problems, Bronchial Asthma, Peptic Ulcer, Diabetes Mellitus, Arthritis, Anxiety Neurosis and Headache. (10 Hrs) <b>Practice based on above topics</b>				
Text books and References	Sr. No.	Title	Author	Publication	Edition
	1.	Stress Control for peace of Mind	Linda Wasmer Andrews	Main Street	2005
	2	Yoga for stress	Vimla Lalvani	Hamlyn	1998

	3.	Yoga perspective in stress management	H.R.Nagendra, and R. Nagarathana.	Swami Vivekananda Yoga Prakashana	2004
	4.	Yoga practices for anxiety & depression	H.R. Nagendra, and R. Nagarathana,	Swami Sukhabodhanandha Yoga Prakshna	2004
	5.	Stress management by Yoga	K.N.Udupa.	Motilal Banaridass Publishers Private Limited.	1996

Reference			
Sr.No.	Title	Author	Publication
1.	Light on Yoga	B.K.S.Lyengar	Thorsons
2.	The Yoga Sutras of Patanjali	Sri Swami Satchidananda	Yoga Publication Trust
3.	The Yamas and Niyamas	Debrah Adele	Yoga Publications Trust
4.	Patanjali Yoga Sutra	Swami Vivekanand	Yoga Publication Trust

# Semester II

<b>Faculty of Science &amp; Technology</b> <b>Syllabus of F. Y. B.E ( Civil Engineering &amp; Mechanical Engineering) (Semester II)</b>	
Course Code: BSC151 Course: Applied Mathematics-II Credits: 3  Theory: 03 Hrs/week / 45 Hrs / Semester	
<b>Prerequisite</b>	Students requires sufficient amount of knowledge of certain topics related to Statistics and Integral Calculus.
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To provide basic ideas of statistics including measures of central tendency and dispersion.</li> <li>2. To develop mathematical skills and logical understanding of the subject.</li> <li>3. To analyze and find solutions of problems in engineering.</li> <li>4. To apply knowledge of mathematics in engineering and technology.</li> </ol>
<b>Course Outcomes</b>	<ol style="list-style-type: none"> <li>1. Discuss the need and use of complex variables to find roots, to separate complex quantities and to establish relation between circular and hyperbolic functions.</li> <li>2. Solve first and higher order differential equations and apply them as a mathematical modelling in electric and mechanical systems.</li> <li>3. Determine Fourier series representation of periodic functions over different intervals.</li> <li>4. Demonstrate the concept of vector differentiation and interpret the physical and geometrical meaning of gradient, divergence &amp; curl in various engineering streams.</li> <li>5. Apply the principles of vector integration to transform line integral to surface integral, surface to volume integral &amp; vice versa using Green's, Stoke's and Gauss divergence theorems..</li> </ol>
<b>Unit-I</b>	<b>A:Statistics-I</b> Introduction to Statistics, Measures of central tendency: Mean, Median and Mode. Measures of dispersion: Quartiles, Quartile deviation, Coefficient of Quartile deviation, Mean deviation, Coefficient of Mean deviation. (7 Hrs)
	<b>B:Statistics-II</b> Standard deviation, Variance, Coefficient of variation, Skewness, Measures of Skewness: Karl Pearson's coefficient of skewness, Bowley's coefficient of skewness.(8 Hrs)
<b>Unit-II</b>	<b>A:Curve Tracing and Rectification</b> Tracing of curves in Cartesian form, Tracing of curves in Polar form, Rectification of plane curves (Cartesian and Polar)(7 Hrs)
	<b>B:Integral Calculus</b> Reduction Formulae, Beta Function, Gamma Function, Relation between Beta and Gamma Function (without proofs)(8 Hrs)
<b>Unit-III</b>	<b>A:Multiple Integrals</b> Double Integration in Cartesian and Polar co-ordinates, Change to polar co-ordinates. (8 Hrs)

<b>B:Applications of Multiple Integrals</b>					
Application to areas, volumes, surfaces areas and volume of revolutions, Triple integral(7Hrs)					
<b>Textbooks/ Reference Books</b>	<b>Sr. No.</b>	<b>Title</b>	<b>Author</b>	<b>Publication</b>	<b>Edition</b>
	1.	A Text Book of Applied Mathematics Volume-I	P. N. Wartikar J. N. Wartikar	Pune VidyarthiGrihaPrakashan, Pune	9 <sup>th</sup> Edition
	2.	Advanced Engineering Mathematics	H. K. Dass.	S.Chand and Co.Ltd	18 <sup>th</sup> Edition
	3.	Higher Engineering Mathematics	Dr. B. S. Grewal	Khanna Publishers	46 <sup>th</sup> Edition
	4.	Higher Engineering Mathematics	B.V. Ramana	Tata McGraw-Hill Publishing Co.Ltd.	1 <sup>st</sup> Edition
	5.	Advanced Engineering Mathematics	Erwin Kreyszig	Wiley eastern Ltd. Mumbai	10 <sup>th</sup> Edition
	6.	A Text Book of Engineering Mathematics	Peter O'Neil	Thomson Asia Pvt. Ltd., Singapore	7 <sup>th</sup> Edition
	7.	Advanced Engineering Mathematics	C. R. Wylie & Barrett	Mc Graw Hill Publishing Company Ltd	6 <sup>th</sup> Edition
	8.	Advanced Engineering Mathematics	M.D. Greenberg	Pearson Education	2 <sup>nd</sup> Edition

<b>Faculty of Science &amp; Technology</b> <b>Syllabus of F. Y. B.E ( Civil Engineering &amp; Mechanical Engineering) (Semester II)</b>	
Course Code: BSC102A Course: Engineering Physics Credits: 3 Theory: 03 Hrs/week ; 45 Hrs / Semester	
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To let the engineering undergraduates, study physical properties, concepts and physical quantities required to solve complex engineering problems</li> <li>2. To make the engineering undergraduates learn basic principles of Physics and laws of scientific investigation to identify, formulate and analyse complex engineering problems</li> <li>3. To equip engineering undergraduates with competencies of scientific methods required in engineering career by upgrading skills on the basis of learning achieved from physical science perspectives.</li> <li>4. To engage engineering undergraduates extensively in scientific investigation for interdisciplinary graduate programs and a wide variety of other lifelong learning opportunities.</li> </ol>
<b>Course Outcomes</b>	<ol style="list-style-type: none"> <li>1. Recall basics of Optics, Sound and Modern Physics</li> <li>2. Explain phenomenon in Optics, Sound and Modern Physics</li> <li>3. Apply concepts of Optics, Sound and Modern Physics to solve complex engineering problems</li> <li>4. Analyze the concepts of Optics, Sound and Modern Physics</li> <li>5. Interpret the characteristics of Solar cell, Zener diode, Transistor, Planks constant curve, GM Counter curve</li> <li>6. Experiment LASER &amp; Fibre Technology</li> </ol>
<b>Unit-I</b>	<p><b>A: Optics</b> The wave equation, Introduction to electromagnetic waves and electromagnetic spectrum, Newton's ring, Michelson interferometer, Applications of interference, Diffraction of light, diffraction grating, resolving power of grating, Application of diffraction grating in spectroscopic devices. (7 Hrs)</p> <p><b>B: Acoustics</b> Acoustic terminology and definitions, Acoustic Wave Equation and its Basic Physical Measures, Sabine's formula (derivation not necessary) acoustics factor in architectural design.</p> <p><b>C: Ultrasonics</b> Properties, Production of ultrasonic waves by piezo-electric and magnetostriction generator, engineering applications of ultrasonic waves. (8 Hrs)</p>

<b>Unit-II</b>	<b>A:X-Rays</b> Basics of X-Rays, Production and Detection of X-Rays, Continuous and characteristics spectrum, Bragg's law of X-ray diffraction, Bragg's spectrometer, Intensity of diffracted Beams, Particle Size Determination by XRD, Precise Lattice Parameter Determination (7 Hrs)				
	<b>B:Nuclear Physics</b> Nuclear force, liquid drop model, shell model, Nuclear fission and fusion, Q-value of nuclear reaction, nuclear reactor, P-P cycle, C-N cycle, cyclotron, GM counter, applications of nuclear physics in various fields. <b>C:Modern Physics</b> Black body radiation, Planck's law, Photoelectric effect, Wave particle duality, De-Broglie's concept of matter wave, Davisson-Germer experiment, Scanning tunneling microscope, Time-dependent and time-independent Schrodinger equation for wave function, Quantum computing.(8 Hrs)				
<b>Unit-III</b>	<b>A:Introduction to solids</b> Superconductivity: Superconductivity, effect of temperature and magnetic fields, Meissner effect, type I and II superconductors, BCS theory, Applications. Free electron theory of metals, Fermi level, density of states, Application to white dwarfs and neutron stars, Bloch's theorem for particles in a periodic potential, Kronig-Penney model and origin of energy bands Magnetic Materials: Magnetic susceptibility and diamagnetic materials, paramagnetic, ferromagnetic, and, BH characteristics, applications.(7 Hrs)				
	<b>B:Laser</b> Einstein's theory of matter radiation interaction and A and B coefficients, Properties of laser, spontaneous and stimulated emission, ruby laser, He-Ne laser, CO <sub>2</sub> laser and semiconductor Laser, applications of lasers in science, engineering and medicine. <b>C:Fiber Technology</b> Propagation of light through optical fiber, acceptance angle & cone numerical aperture, Single and Multi-Mode Fibers, applications, sensors.(8 Hrs)				
<b>Textbooks/ Reference Books</b>	<b>Sr. No.</b>	<b>Title</b>	<b>Author</b>	<b>Publication</b>	<b>Edition</b>
	8.	A Text book of Engineering Physics	M. N. Avadhanulu P. G. Kshirsagar	S. Chand & Co.	7 <sup>th</sup> Edition
	9.	A Text book of Engineering Physics	R. K. Gaur S. L. Gupta	Dhanpat Rai	3 <sup>rd</sup> Edition
	10.	Fundamentals of Physics	David Halliday, Jearl Walker, and Robert Resnick	Wiley	6 <sup>th</sup> Edition
11.	Elements of X-ray Diffraction	B. D. Cullity	Addison-Wesley Metallurgy Series	1 <sup>st</sup> Edition	

	12.	Nuclear Physics	Irving Kaplan	Narosa Publishing house	2 <sup>nd</sup> Edition
	13.	Introduction to Solid State Physics	C. Kittel	John Wiley & Sons, Inc	8 <sup>th</sup> Edition
	14.	Lasers and Non-Linear Optics	B.B. Laud	New Age International	3 <sup>rd</sup> Edition
<b>Websites and online courses</b>	1.	<a href="http://science.howstuffworks.com/laser1.htm">http://science.howstuffworks.com/laser1.htm</a>			
	2.	<a href="http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html">http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html</a>			
	3.	<a href="http://nptel.ac.in/courses/122107035/">http://nptel.ac.in/courses/122107035/</a>			
	4.	<a href="http://nptel.ac.in/courses/122104016/">http://nptel.ac.in/courses/122104016/</a>			
	5.	<a href="https://www.coursera.org/learn/intro-to-acoustics">https://www.coursera.org/learn/intro-to-acoustics</a>			
	6.	<a href="https://nptel.ac.in/courses/112/106/112106227/">https://nptel.ac.in/courses/112/106/112106227/</a>			
	7.	<a href="https://nptel.ac.in/courses/113/104/113104081/">https://nptel.ac.in/courses/113/104/113104081/</a>			
	8.	<a href="https://nptel.ac.in/courses/115/102/115102017/">https://nptel.ac.in/courses/115/102/115102017/</a>			

<b>Faculty of Science &amp; Technology</b> <b>Syllabus of F. Y. B.E ( Civil Engineering &amp; Mechanical Engineering) (Semester II)</b>	
Course Code: BSC103A Course: Engineering Chemistry Credits: 3 Theory: 03 Hrs/week ; 45 Hrs/ Semester	
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To relate the concepts of Chemistry in all Engineering Disciplines.</li> <li>2. To make the engineering undergraduates acquainted with modern techniques in engineering and industrial Chemistry.</li> <li>3. To equip engineering undergraduates with the knowledge of advanced and existing Engineering Materials.</li> <li>4. To develop the awareness about powering the future using advanced energy Storage Systems.</li> </ol>
<b>Course Outcomes</b>	<ol style="list-style-type: none"> <li>1. Recall the basics of advanced Engineering materials: Polymers, Nanomaterials, Composite materials, etc</li> <li>2. Explain the advanced methods to produce engineering materials and soft water for industrial and domestic use</li> <li>3. Summarize properties and applications of fuels, lubricants, advanced engineering materials</li> <li>4. Apply the knowledge of lubricants, corrosion, advanced energy systems and modern metallurgical processes to solve the engineering problems</li> <li>5. Analyze the samples for estimating the aggregate impurities in water, coal, metals, and lubricant samples</li> <li>6. Examine the synthetic scheme for thermosetting polymers and fundamental nanomaterials</li> </ol>
<b>Unit-I</b>	<p><b>A: Advanced Engineering Materials</b>  <b>Industrial Polymers:</b> Thermoplastics (PVC) &amp; Thermosetting polymers (Bakelite), Biodegradable polymers (PVA), Properties, Applications  <b>Nanomaterials:</b> Preparation of nano materials by Laser method, properties and applications of CNTs.  <b>Composite Materials:</b> Ceramic matrix composites, carbon- carbon composites  <b>Reinforcements:</b> Silicon carbide, Fiber glass. (7Hrs)</p> <p><b>B: Water Technology:</b>  Water Parameters: Total Dissolved Solids (TDS), Dissolved Oxygen (DO), Chemical Oxygen Demand (COD), pH, Hardness of water: types and units, Estimation of hardness by EDTA method, numerical on hardness; Boiler troubles: scale, sludge, priming, foaming and caustic embrittlement; Water treatment: Ion exchange process, Ultra filtration, Nano filtration (8 Hrs)</p>
<b>Unit-II</b>	<p><b>A: Fuels and Energy Storage Systems:</b>  Fuels: Gross and net calorific value, Solid fuels: proximate analysis of coal &amp; importance, gaseous fuels: composition properties and application of natural gases-</p>

	CNG, LNG. Energy Storage Systems: Bio electrochemical batteries, lithium-ion battery, alkaline fuel cell (AFC) (7Hrs)				
	<b>B: Lubricants and Coolants</b> Lubricants: Introduction, Properties of liquid lubricants: viscosity & viscosity index, flash point & fire point, acid value. Numerical on viscosity index. Coolants: Introduction, properties, uses of water & ethylene glycol as coolant. (8 Hrs)				
<b>Unit-III</b>	<b>A: Corrosion and its prevention</b> Definition, types, mechanism of dry and wet corrosion, Corrosion testing methods: ultrasonic testing, computed & digital radiography, Prevention of corrosion: Methods- sacrificial anodic protection, Electroplating, Powder coating (7Hrs)				
	<b>B: Metallurgical processes</b> Calcination, smelting, ore dressing, roasting, refining of metals, Metalworking processes: casting, forging, rolling, machining, sintering, Laser cladding, 3D printing (8Hrs)				
<b>Textbooks/ Reference Books</b>	<b>Sr. No.</b>	<b>Title</b>	<b>Author</b>	<b>Publication</b>	<b>Edition</b>
	1.	Engineering Chemistry	B. Siva Shankar	Mc Graw Hills Publications	3 <sup>rd</sup> Edition
	2.	Engineering Chemistry	Shelly, Oberi and Malik	Cingage Publication	1st Edition
	3.	Principles of Polymerization	Odian, G.G	John Wiley & Sons, Inc	4th Edition
	4.	Engineering Chemistry	Jain & Jain	Dhanpat Rai Publishing	16 <sup>th</sup> Edition
	5.	Polymer Chemistry	Malcolm P. Stevens	Oxford University Press	3 <sup>rd</sup> Edition
	6.	A Textbook of Engineering Chemistry	Shashi Chawla	Dhanpat Rai & CO	10 <sup>th</sup> Edition
	7.	Material Science & Engineering	William Callister and V. Raghavan	Wiley	9 <sup>th</sup> Edition
<b>Websites and online courses</b>	1.	Unit- I – <a href="https://onlinecourses.nptel.ac.in/noc21_ch49/preview">https://onlinecourses.nptel.ac.in/noc21_ch49/preview</a> <a href="https://www.explainthatstuff.com/composites.html">https://www.explainthatstuff.com/composites.html</a>			
	2.	Unit- II – <a href="https://nptel.ac.in/content/storage2/courses/116104045/lecture8.pdf">https://nptel.ac.in/content/storage2/courses/116104045/lecture8.pdf</a> <a href="https://nptel.ac.in/content/storage2/courses/116104045/lecture6.pdf">https://nptel.ac.in/content/storage2/courses/116104045/lecture6.pdf</a>			
	3.	Unit- III – <a href="https://nptel.ac.in/content/storage2/courses/121106014/Week12/lecture38.pdf">https://nptel.ac.in/content/storage2/courses/121106014/Week12/lecture38.pdf</a> <a href="https://www.sciencedirect.com/topics/engineering/proximate-analysis">https://www.sciencedirect.com/topics/engineering/proximate-analysis</a>			

4.	Unit- IV – <a href="https://nptel.ac.in/courses/112/102/112102014/">https://nptel.ac.in/courses/112/102/112102014/</a> <a href="https://nptel.ac.in/content/storage2/courses/112105127/pdf/LM-12.pdf">https://nptel.ac.in/content/storage2/courses/112105127/pdf/LM-12.pdf</a>
5.	Unit- V - <a href="https://nptel.ac.in/courses/113/108/113108051/">https://nptel.ac.in/courses/113/108/113108051/</a>
6.	Unit- VI - <a href="https://nptel.ac.in/courses/112/107/112107144/">https://nptel.ac.in/courses/112/107/112107144/</a>

<b>Faculty of Science &amp; Technology</b> <b>Syllabus of F. Y. B.E ( Civil Engineering &amp; Mechanical Engineering) (Semester II)</b>	
Course Code: ESC152 Course: Basics of Electrical and Electronics Engineering Credits: 3 Lectures:3Hrs./ Week ; 45 Hrs / Semester	
Prerequisite	Knowledge of fundamentals of Physics and Mathematics.
Objectives	<ol style="list-style-type: none"> <li>1. To introduce fundamental concepts, various laws-principles, and Basic knowledge of Electrical quantities</li> <li>2. To impart knowledge related to electromagnetism for understanding basics of electrical machines.</li> <li>3. To provide knowledge of some electronic devices and rectifier circuits.</li> <li>4. To expose the students to working of digital circuits, transducers and their application</li> </ol>
Course Outcomes	<ol style="list-style-type: none"> <li>1. Define the concepts and laws used in electrical circuits.</li> <li>2. Illustrate the operation of semiconductor devices.</li> <li>3. Compare the electrical and magnetic circuits and their applications.</li> <li>4. Make the use of digital circuits and the transducers for electronics applications.</li> <li>5. Learn and understand Fundamentals of Electronics</li> <li>6. Understand Fundamentals of Digital Circuit</li> </ol>
<b>Unit-I</b>	<b>A: AC and DC Fundamentals</b> Current, emf, Electric Potential, potential difference, Resistance, Work, power, Energy. Laws of resistance, resistivity, Concept of AC and DC, Ohms law Series and parallel combination of resistance, Kirchhoff's laws, Definition of Cycle, Time period, Frequency, Amplitude, Phase and Phase difference, Average value, R.M.S. value, and Power Factor. Advantages of three phases over single-phase (8 Hrs.)
	<b>B: Magnetism &amp; Electromagnetic Induction</b> Flux, flux density, magnetic field strength, mmf, reluctance, permeability. Comparison between electric and magnetic circuits. Faraday's laws of electromagnetic induction, Lenz's law, Flemings's right-hand rule for Generators, Fleming's left-hand rule for motors.(7 Hrs.)
<b>Unit-II</b>	<b>A: Electrical Machines</b> Construction, working and classification of the transformer, Significance of Emf equation (no derivation) Voltage ratio, three-phase induction motor Construction, types of Alternator: - construction and working principle and application. Single-phase Induction motors: Construction, applications of a) Split phase induction motor b) Capacitor start capacitor run induction motor, Universal motor (7 Hrs.)
	<b>B: Fundamentals of Electronics:</b> Active & Passive components, Electronics materials, Semiconductor and its types, PN Junction Diode, Zener Diode, LED: Construction, Symbol, Characteristics; <b>BJT &amp;</b>

	<b>JFET:</b> Types, construction, Symbols, Configurations, characteristics and Applications; Basic blocks of Regulated Power Supply: Transformers, Rectifiers, Filters & 3 terminal Fixed Regulators: Definition, Types, Circuits, Waveforms; Ripple factor, Efficiency, PIV & Comparison(8 Hrs.)				
Unit-III	<b>A: Fundamentals of Digital Circuit:</b> Analog And Digital Signals, Number Systems- Decimal, Binary, Octal, Hexadecimal & their conversion, Logic Gates-Types, Symbols& truth tables, IC Pin Configurations, Boolean algebra, De Morgan's Theorem, Introduction to Combinational &Sequential Circuits, Multiplexer, De-multiplexer(8 Hrs.)				
	<b>B: Transducers:</b> Definition, Classification of Transducers, Operation & applications of Transducers – Temperature Measurement - RTD, Thermocouple, Thermistor, Pressure measurement - Strain Gauge, Displacement measurement - LVDT (7 Hrs.)				
References	Sr.No.	Title	Author	Publication	Edition
	1.	ABC of Electrical Engineering	B.L.Thereja and A.K.Thereja	S.Chand	1 <sup>st</sup>
	2.	Basic Electrical Engineering	J.B. Gupta	S.K. Kataria& sons	14 <sup>th</sup>
	3.	Basic Electrical Engineering	V.K.Mehta	S.Chand	2 <sup>nd</sup>
	4.	Principles of Electronics	V.K. Mehta	S.Chand	12 <sup>th</sup>
	5.	Modern Digital Electronics	R.P.Jain	TataMc-Graw Hill	3 <sup>rd</sup>
	6.	Electronics Instrumentation	H. S. Kalsi	TataMc-Graw Hill	2 <sup>nd</sup>

<b>Faculty of Science &amp; Technology</b>	
<b>Syllabus of F. Y. B.E ( Civil Engineering &amp; Mechanical Engineering) (Semester II)</b>	
Course Code: ESC153 Course: Basics of Civil Engineering Credits: 3 Theory: 03 Hrs/week ; 45 Hrs / Semester	
<b>Prerequisite</b>	Introduction to basic terminologies involved in general science.
<b>Objectives</b>	1. To get knowledge of various building materials and structural members. 2. To create awareness and knowledge in students about basic civil engineering terminologies and techniques which will be helpful in their day to day life 3. To understand concept of surveying and leveling.
<b>Course Outcomes</b>	1. Define the basic terminologies like bricks, sand, cement and identify their properties. 2. Classify the materials, foundations, masonry, lintels, doors, windows, roofs, floors and list out their importance. 3. Identify the properties of civil engineering construction materials and list out their applications. 4. Predict the properties of civil engineering construction materials based on its strength, functionality and analyze different sub-types. 5. Evaluate the characteristics of civil engineering construction materials and compare their properties. 6. Obtain the relative level of various objects and plan a suitable method to obtain RL of different locations.
<b>Unit-I</b>	<b>A:Civil Engineering Materials:</b> Study of properties & use of civil engineering materials namely bricks, rubble, cement, sand, coarse aggregate, etc. (7 Hrs)
	<b>B:Foundation:</b> Introduction to foundation and types, isolated footing, combined footing, cantilever footing, Pile foundation - types.(8Hrs)
<b>Unit-II</b>	<b>A:Masonry:</b> Introduction to brick masonry and bonds in brick, header bond, stretcher bond, English and Flemish bond(7Hrs)
	<b>B:Lintels, Doors and Window:</b> Types of lintels, definition of technical terms of doors and windows, study of battened, ledged and braced doors casement windows, glazed window, and metal windows.(8Hrs)
<b>Unit-III</b>	<b>A:Roofs and Floors:</b> Trussed roofs, king post roof truss and queen post roof truss, flat RCC roof, components of floor, material for construction of floor.(7Hrs)
	<b>B:Surveying and Leveling:</b> i) Surveying: Length measurement, use of metallic tape and chain (20m & 30m). ii) Angular Measurements: Use of prismatic compass, simple problems. iii) Level measurements: Use of dumpy level, simple problems on calculation of reduced levels.(8 Hrs)

	<b>Sr. No.</b>	<b>Title</b>	<b>Author</b>	<b>Publication</b>	<b>Edition</b>
<b>Textbooks/ Reference Books</b>	1.	Building Materials	S.K. Duggal	New Age International Publishers	5 <sup>th</sup> Edition
	2.	Building Construction	B.C. Punmia	Laxmi Publication	11 <sup>th</sup> Edition
	3.	Surveying And Levelling	N.N. Basak	McGraw Hill Education India	16 <sup>th</sup> Edition
	4.	A Text Book of Surveying & Levelling	R. Agor	Khanna Publishers	5 <sup>th</sup> Edition

<b>Faculty of Science &amp; Technology</b> <b>Syllabus of F. Y. B.E ( Civil Engineering &amp; Mechanical Engineering) (Semester II)</b>	
Course Code: ESC154 Course: Basics of Mechanical Engineering Credits: 3 Theory: 03 Hrs/week ; 45 Hrs / semester	
<b>Prerequisite</b>	<ol style="list-style-type: none"> <li>1. To understand fundamental concepts of thermal engineering</li> <li>2. To study engineering applications of thermal engineering</li> <li>3. To understand working principle of machine tools</li> <li>4. To understand the functions of various power transmitting elements</li> </ol>
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To study the fundamental principles and laws of heat transfer and to explore the implications of these principles for system behavior.</li> <li>2. To study, analyse and design heat transfer systems through the application of these principles.</li> <li>3. To develop the problem-solving skills essential to good engineering practice of heat transfer in real-world applications.</li> </ol>
<b>Course Outcomes</b>	<ol style="list-style-type: none"> <li>1. Define concepts of thermodynamics and manufacturing systems</li> <li>2. Explain laws of thermodynamics used for various engineering applications</li> <li>3. Utilize the principles of thermodynamics for solving the problems of thermal systems</li> <li>4. Interpret different machine tools and thermal machines</li> <li>5. Select various engineering materials based on the properties and desired applications</li> <li>6. Summarize manufacturing processes and power transmitting elements</li> </ol>
<b>Unit I</b>	<p><b>A:</b> Scope &amp; applications of thermodynamics, Macroscopic and microscopic description of matter, Pure and working substance, Thermodynamic system and its types, Thermodynamic state of the system, Thermodynamic properties, Thermodynamic processes and its types, Thermodynamic equilibrium, Zeroth law of thermodynamics Temperature and its measurement , Pressure and its measurement, Numerical on pressure measurement and temperature measurement. (7 Hrs)</p> <p><b>B:</b> Introduction to forms of energy and non-conventional energy sources, Thermodynamic definition of work, types of work, quasi static process, P.dV work for different processes, Definition of heat, specific heat, Modes of heat transfer, Laws governing the modes of heat transfer, Comparison between heat &amp; work, Statement of First law of thermodynamics for open and closed systems, Numerical on types of work and modes of heat transfer(8 Hrs)</p>
<b>Unit II</b>	<b>A:</b> Classification of boiler, Boiler mountings and accessories (location, and applications only), Construction and Working and of 2 stroke and 4 stroke engines,

	Refrigerator, Air conditioner and air cooler, Basic working principle of Steam Turbine and Compressor(7 Hrs)				
	<b>B:</b> Engineering Materials (Introduction, Classification, Properties, Selection, and application only), Basic heat treatment Processes (Introduction to Annealing, Normalizing and Hardening only), Metal Forming and Metal Joining Processes (Introduction and Brief description of types only) (8 Hrs)				
<b>Unit III</b>	<b>A:</b> Machine Tools: - Lathe Machine Milling Machine, Drilling Machine, Shaper Machine, Grinding Machine (All machine tools to be studied with respect to Working principle, Block diagram, Specification and Different operations performed), Introduction to NC/CNC machines)(8 Hrs)				
	<b>B:</b> Power Transmission Elements: - Belt, Pulleys, Gears, Bearings, Keys and Coupling: Clutches (All power transmission elements to be studied with respect to brief description of their types only)(7 Hrs)				
<b>Textbooks/ Reference Books</b>	<b>Sr. No.</b>	<b>Title</b>	<b>Author</b>	<b>Publication</b>	<b>Edition</b>
	1.	Fundamentals of Classical Thermodynamics	P.K. Nag	Tata Mc Graw Hill	8 <sup>th</sup> Edition
	2.	Thermodynamics An Engineering Approach	Y. Cengel& M Boles	McGraw Hill	5 <sup>th</sup> Edition
	3.	Thermal Engineering	R.K. Rajput	Laxmi Publications	10 <sup>th</sup> Edition
	4.	Engineering Thermodynamics (Principle and Practices)	D.S. Kumar	Katsons Publications	2 <sup>nd</sup> Edition
	5.	Workshop Technology	HajraChoudhary	Media Promotors	4 <sup>th</sup> Edition
	6.	Manufacturing Science	Amitabha Ghosh & Malik	East West Press	2 <sup>nd</sup> Edition
	7.	Manufacturing Technology	P.N. Rao	Tata Mc Graw Hill	4 <sup>th</sup> Edition
	8.	Comprehensive Workshop Technology	S.K. Garg	Laxmi Publications	3 <sup>rd</sup> Edition

<b>Faculty of Science &amp; Technology</b> <b>Syllabus of F. Y. B.E ( Civil Engineering &amp; Mechanical Engineering) (Semester II)</b>	
Course Code: ESC155 Course: Programming for Problem Solving Credits: 2 Theory : 02 Hrs/week ; 30 Hrs / Semester	
Prerequisites	-
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To understand the various steps in Program development.</li> <li>2. To understand the basic concepts in C Programming Language.</li> <li>3. To learn how to write modular and readable C Programs</li> <li>4. To learn to write programs (using structured programming approach) in C to solve problems.</li> </ol>
<b>Course Outcomes</b>	<ol style="list-style-type: none"> <li>1. Write algorithms and to draw flowcharts for solving problems</li> <li>2. Convert the algorithms/flowcharts to C programs</li> <li>3. Code and test a given logic in C programming language</li> <li>4. Decompose a problem into functions and to develop modular reusable code</li> <li>5. Use arrays, pointers, strings and structures to write C programs</li> </ol>
<b>Unit-I</b>	<b>A: Introduction</b> Introduction to Computing – Computer Systems-Hardware and Software, Computer Languages, Algorithm, Flowchart, Representation of Algorithm and Flowchart with examples. Introduction to C– History of C, Features of C, Structure of C Program, Character Set, C Tokens-Keywords, Identifiers, Constants, Variables, Data types, Operators. (6 Hrs)
	<b>B: Control Structure and Loops in C</b> Control Structures – Introduction, selection statements, iterative statements, unconditional branching. If-else, conditional operators, switch and break, nested conditional branching statements, loops: do while, while, for, Nested loops, break and continue. (6 Hrs)
<b>Unit-II</b>	<b>A: Functions</b> Fundamentals of Subprograms, Design Issues for Subprograms, Parameter Passing Methods Functions in C: Introduction using functions, Function definition, function declaration, function call, return statement, passing parameters to functions, scope of variables, recursive functions, concept of pointers, call by value, call by reference. (6 Hrs)
	<b>B: Arrays in C</b> Declaration of arrays, accessing the elements of an array, storing values in arrays, Operations on arrays, Passing arrays to functions, two dimensional arrays, operations on two-dimensional arrays (6 Hrs)

<b>Unit-III</b>	<b>Structures and Strings in C</b>				
	Introduction, defining a structure, declaring structure variables, accessing structure members, structure initialization, array of structures String: String declaration, initialization, string manipulation with/without using library functions (6 Hrs)				
Textbooks / Reference Books	Sr. No.	Title	Author	Publication	Edition
	4.	Programming in ANSI C	E. Balaguruswamy	McGraw Hill Publications	8th Edition, 2019
	5.	Let Us C	Yashawant P. Kanetkar	BPB Publications	16 <sup>th</sup>
	6.	The C Programming Language	B.W. Kernighan and Dennis M.Ritchie	PHI	
	7.	Computer Basics and C Programming	V.Rajaraman	PHI Learning Pvt. Limited	

<b>Faculty of Science &amp; Technology</b>				
<b>Syllabus of F. Y. B.E ( Civil Engineering &amp; Mechanical Engineering) (Semester II)</b>				
Course Code: IKS156 Course: Indian Knowledge System Credits: 2 Theory : 02 Hrs/week ; 30 Hrs / Semester				
Prerequisite	Nil			
Objectives	<p>The objective of this course is</p> <ol style="list-style-type: none"> <li>To explain the historicity of Indian Knowledge System, key features of Indian Numeral System and appreciate the key role it has played in the advancement of Science &amp; Technology.</li> <li>To develop familiarity with the science, engineering &amp; technology heritage of ancient and medieval India.</li> </ol>			
Course Outcomes	<ol style="list-style-type: none"> <li>Draw connections between the historical artifacts and contemporary objects from the immediate surroundings.</li> <li>Encourage themselves as an art practitioner, aspiring art historians, educators, and those preparing for competitive examinations in India.</li> <li>Direct the possible ways of exploring these thematic.</li> </ol>			
Unit-I	<b>A:</b> Introduction to Indian Knowledge System (IKS):What is IKS, why do we need IKS, Organization, Historicity and salient aspects of IKS. Understanding Historic architectural Heritage in Marathwada a. What is historical heritage? b. Type of historic heritage c. Importance of historic architectural heritage to understand history of Marathwada (05 Hrs)			
	<b>B:</b> Historic architectural Heritage in Marathwada a. Religious Architecture – Hindu, Buddhist, and Jain b. Mughal Architecture c. Non-religious historic architectural heritage. (05 Hrs)			
Unit-II	<b>A:</b> Introduction to Vedas : Introduction to Vedas, a Synopsis of four Vedas and their sub-classification, messages in Vedas and introduction to Vedangas. (05 Hrs)			
	<b>B:</b> Number Systems and Unit of Measurement: Number systems in India-Historical evidence, Salient aspects of Indian Mathematics Bhūta-Saṃkhyā system, Kaṭapayādi system, Measurements for time, distance, and weight, Piṅgala and the Binary system. (05 Hrs)			
Unit-III	<b>A:</b> Mathematics: Introduction to Indian Mathematics, Unique aspects of Indian Mathematics, Indian Mathematicians and their Contributions. Algebra, Geometry, Trigonometry, Magic squares in India.(05 Hrs)			
	<b>B:</b> Astronomy: Introduction to Indian astronomy, Indian contributions in astronomy, The celestial coordinate system, Elements of the Indian calendar, Notion of years and months. Panchanga- The Indian calendar system, Astronomical Instruments (Yantras), JantarMantar of Rājā Jai Singh Sawai.(05 Hrs)			
References	Title	Author	Publication	Edition

Introduction to Indian Knowledge Systems: Concepts and Applications	Mahadevan, B., Bhat, VinayakRajat, NagendraPavana R.N.	PHI Learning Pvt. Ltd.	1st 2022
Indian Knowledge Systems	Kapil Kapoor, Avadhesh Kumar Singh	D. K. PrintworldPvt. Ltd.	1st
History of Technology in India Vol. 1	A. K. Bag	Indian National Science Academy, New Delhi	1997
History of Astronomy in India	S. N. Sen and K. S. Shukla	Indian National Science Academy	2nd
A Concise History of Science in India	D.N. Bose, S.N. Sen and B. V. Subbarayappa	Indian National Science Academy	1st

<b>Faculty of Science &amp; Technology</b>					
<b>Syllabus of F. Y. B.E ( Civil Engineering &amp; Mechanical Engineering) (Semester II)</b>					
Course Code: VSE157 Course: Experiential Learning Lab Teaching Scheme: Credits: 1 Practical: 02 Hrs/week ; 30 Hrs / Semester					
Objectives	<ul style="list-style-type: none"> <li>• To make student understand the role of an Engineer as a problem solver.</li> <li>• To make students explore different aspects of platform-based development.</li> <li>• To get students familiar with engineering project management skills.</li> <li>• To introduce sustainability perspectives.</li> </ul>				
Unit-I	<b>A: Project Management</b> Introduction to Agile practices, Significance of team work, Importance of communication in engineering profession, Project management tools: Checklist, Timeline, Gantt Chart, Significance of documentation. (8Hrs)				
	<b>B: Platform based development</b> Introduction to various platforms, platform-based development (Arduino) programming and its essentials, Introduction to sensors, transducers and actuators and its interfacing with Arduino microcontroller. (12Hrs)				
Unit-II	<b>A: Data Acquisition and Analysis</b> Types of Data, Descriptive Statistics techniques as applicable to different types of data, Types of graphs as applicable to different types of data, Data Acquisition (Temperature and humidity) using Sensors interfaced with Arduino.(6 Hrs)				
	<b>B: Sustainability in Engineering</b> Introduction to sustainability, Sustainability leadership, Life cycle assessment, carbon foot print. (4Hr)				
	Sr. No.	Title	Author	Publication	Edition

Textbooks/ Reference Books	1	Engineering Design: A Project Based Introduction	C.L. Dym, P. Little	Wiley Publication	4 <sup>th</sup> Edition
	2	Project Design & Development	Karl Ulrich	McGraw Hill Publication	5 <sup>th</sup> Edition
	3	Getting Started with Arduino	Massimo Banzi	O'Reilly	1 <sup>st</sup> Edition
	4	Project Management Methodologies and Framework	-	Active.collab	1 <sup>st</sup> Edition
	5	Manuals and datasheets of respective software and hardware tools			

<b>Faculty of Science &amp; Technology</b>	
<b>Syllabus of F. Y. B.E ( Civil Engineering &amp; Mechanical Engineering) (Semester II)</b>	
Course Code: BSC121A Course: Engineering Physics LAB Credits: 1 Practical:02Hrs/week ; 30 Hrs / semester	
List of Practical	Any 10 practical to be conducted 1. Newton's ring: To determine wavelength of monochromatic light 2. G. M. Counter: dead time calculation 3. Grating: To determine wavelength of LASER light. 4. Characteristics of solar cell 5. Ultrasonic interferometer 6. Dielectric constant: to determine dielectric constant. 7. Forbidden gap: To determine forbidden gap of semiconductors. 8. To determine the Hall coefficient of a semiconductor material and then evaluate carrier type and its density of charge carrier. 9. Determination of Planck's Constant 10. To determine the elastic constant of wire Y and n of stainless steel wire by Searle's method. 11. Determination of Young's modulus by bending beam 13. To find the time period of a simple pendulum and determine acceleration due to gravity

**Faculty of Science & Technology**  
**Syllabus of F. Y. B.E ( Civil Engineering & Mechanical Engineering) (Semester II)**

Course Code: BSC122A  
Course: Engineering Chemistry LAB  
Credits: 1

Practical:02Hrs/week ; 30 Hrs / semester

List of  
Practical

Any 10 practical to be conducted:

1. Analysis of Chemical parameters of water (Lab performance/Virtual performance)
2. Analysis of physical parameters of water
3. Determination of percentage of moisture and ash in given coal sample.
4. Preparation of polymer
5. Electro gravimetric Estimation of Metals (Virtual experiment)
6. Determination of chloride content of water by Mohr's method (Lab performance /Virtual experiment)
7. Determination of melting or boiling point of organic compound. (Virtual experiment)
8. Determination of Viscosity of given specimen.
9. Determination of rate of corrosion in different pH media. (Lab performance /Virtual experiment)
15. Chromatography- Separation technique (Lab performance /Virtual experiment)
16. Determination of acid value of lubricating oil by titration method.
17. Determination of percentage of moisture in given soil sample.
18. Determination of pH in given soil sample.
19. Separation of chemical compounds by column chromatography technique. (Virtual experiment)

<b>Faculty of Science &amp; Technology</b> <b>Syllabus of F. Y. B.E ( Civil Engineering &amp; Mechanical Engineering) (Semester II)</b>	
CourseCode:ESC171 Course: Basics of Electrical and Electronics Engineering Credits: 1  Practical: 02Hrs./ Week ; 30 Hrs / Semester	
Prerequisite	Physics, Electric circuits
Objectives	Equip students with practical skills through hands-on laboratory exercises, enabling them to construct, test, and troubleshoot real-world electrical and electronic systems.
Course Outcomes	<ol style="list-style-type: none"> <li>1. Demonstrate the characteristics of semiconductor devices and transducers.</li> <li>2. Conduct experiments on accessories to be used in household wirings and awareness of electric safety.</li> </ol>
List of Experiments	<p>(Any 5 practical from each section)</p> <p>Electrical Engineering</p> <ol style="list-style-type: none"> <li>1. To study the accessories to be used in household wirings and awareness of electric safety</li> <li>2. i) To understand the concept of Phase, Neutral &amp; Earthling in Electrical Installation. ii) Single Lamp controlled by single switch circuit.</li> <li>3. To study &amp; Demonstrate Staircase Wiring.</li> <li>4. To study &amp; understand the importance of Series Lamp.</li> <li>5. To Verify Ohm's Law.</li> <li>6. To verify the Voltage Ratio of Single-Phase Transformer.</li> </ol> <p>Electronics Engineering</p> <ol style="list-style-type: none"> <li>7. To study characteristics of Semiconductor diode.</li> <li>8. To study Half Wave and Full Wave Rectifier.</li> <li>9. To plot the characteristics of BJT in CE configuration.</li> <li>10. To study logic gates</li> <li>11. To study temperature measurement using RTD / Thermocouple</li> <li>12. Implementation and testing of circuits like amplifier, Power supply on bread board.</li> </ol>

**Faculty of Science & Technology**  
**Syllabus of F. Y. B.E ( Civil Engineering & Mechanical Engineering) (Semester II)**

Course Code: ESC172  
 Course: Programming for Problem Solving LAB  
 Credits: 1  
 Practical: 2 Hrs/week ; 30 Hrs / Semester

Objectives	<ol style="list-style-type: none"> <li>1. To teach the student to write programs in C and to solve the problems.</li> <li>2. Implement different programming constructs and decomposition of problems into functions.</li> <li>3. Use and implement data structures like arrays and structures to obtain solutions.</li> </ol>
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List of Practical	<p>Exercise 1: Basics</p> <ol style="list-style-type: none"> <li>1. Write a program to print sample strings like “hello world”, “Welcome to C Programming” with different formats using escape sequences.</li> <li>2. Write a Program to print different data types in ‘C’ and their ranges.</li> <li>3. Write a Program to initialize, assignment &amp; printing variables of different data types.</li> </ol> <p>Exercise 2: Operators</p> <ol style="list-style-type: none"> <li>1. Write a Program to demonstrate arithmetic operators. (+,-,*,/,%)</li> <li>2. Write a Program to demonstrate logical operators.(logical AND, logical OR)</li> <li>3. Write a Program to read radius value from the keyboard and calculate the area of circle and print the result in both floating and exponential notation.</li> </ol> <p>Exercise 3: Operators I</p> <ol style="list-style-type: none"> <li>1. Write a program to check equivalence of two numbers using conditional operator.</li> <li>2. Write a Program to demonstrate pre increment and post increment.(++a, a++ where a is a value to be initialized)</li> <li>3. Write a Program to demonstrate pre decrement and post decrement.(--a, a-- where a is a value to be initialized)</li> </ol> <p>Exercise 4: Decision Statements</p> <ol style="list-style-type: none"> <li>1. Write a Program to read marks of a student in six subjects and print whether pass or fail (using if-else).</li> <li>2. Write a Program to calculate roots of quadratic equation (using if-else).</li> </ol> <p>Exercise 5: Switch operations</p> <ol style="list-style-type: none"> <li>1. Write a Program to perform arithmetic operations using switch case.</li> <li>2. Write a Program to display names of days in a Week using switch case.</li> </ol> <p>Exercise 6: Basic Loop operations</p> <p>Do the Following Programs Using for, while, do-while loops.</p> <ol style="list-style-type: none"> <li>1. Write a program to calculate sum of individual digits of a given number.</li> <li>2. Write a program to check whether given number is palindrome or not.</li> <li>3. Write a program to print prime numbers in the given range.</li> </ol>
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	<p>4. Write a program to display multiplication tables from 1 to 10 except 3 and</p> <p>Exercise 7: Advanced loops</p> <ol style="list-style-type: none"> <li>1. Write a program to print the Fibonacci series for given 'N' value.</li> <li>2. Write a program to check whether a given number is a Fibonacci number or not.</li> <li>3. Write a program to print the following formats.</li> </ol> <pre> 1           * 1 2        * * 1 2 3      * * * 1 2 3 4    * * * * </pre> <p>Exercise 8: Arrays</p> <ol style="list-style-type: none"> <li>1. Write a program to store 10 elements in the 1-D array and print sum of the array.</li> <li>2. Write a program to print minimum and maximum elements in the 1-D array.</li> <li>3. Write a program to add two matrices</li> </ol> <p>Exercise 9: Functions</p> <ol style="list-style-type: none"> <li>1. Write a program to find sum of two numbers using functions.</li> <li>2. Write a program to find product of two numbers using functions without arguments, without return type.</li> <li>6. Write a program to swap two numbers using a) Call By Value B) Call By Reference.</li> </ol> <p>Exercise 10: Strings</p> <ol style="list-style-type: none"> <li>1. Write a program to perform various string manipulations using built-in functions.</li> <li>2. Write a program to print the given strings in ascending order.</li> <li>3. Write a program to verify the given string is palindrome or not (without built-in functions, with using built-in functions).</li> </ol> <p>Exercise 11: Structures</p> <ol style="list-style-type: none"> <li>1. Write a program to create structure for an account holder in a bank with following Fields: name, account number, address, balance and display the details of five account holders.</li> <li>2. Write a program to find total marks of individual student and average marks for 10 students using structures.</li> </ol>
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<p><b>Faculty of Science &amp; Technology</b></p> <p><b>Syllabus of F. Y. B.E ( Civil Engineering &amp; Mechanical Engineering) (Semester II)</b></p>
<p>Course Code: LLC126 B</p> <p>Course: Health and Wellness</p> <p>Credits: 2</p> <p>Practical: 2 Hrs/week ; 60 Hrs / Semester</p>

<b>Course Objectives:</b>	<ol style="list-style-type: none"> <li>a. To make aware about the concept of health and wellness with respect to physical, mental, social and emotional also to detail about the lifestyle of an individual with hypo-kinetic diseases.</li> <li>b. To clear the idea about the nutritional aspects viz. balance diet, malnutrition and harmful effects of ergo-genic aids.</li> <li>c. To make aware about obesity, overweight, underweight etc. and how to deal with these problems.</li> <li>d. To make the students apply the theoretical knowledge into practicality through the assignments and practical projects.</li> </ol>		
<b>Course Outcomes:</b>	<ol style="list-style-type: none"> <li>1. After completion first unit the students will have the conceptual idea about health and wellness with respect to physical, mental, social and emotional also they are enlightened with the lifestyle of an individual with hypo-kinetic diseases.</li> <li>2. The students will have clear dea about the nutritional aspects viz. balance diet, malnutrition and harmful effects of ergo-genic aids.</li> <li>3. The students can make out about the awareness of obesity, overweight, underweight etc. and how to deal with these problems.</li> <li>4. Through implementation of practical the students will able to apply the theoretical knowledge into practicality through the assignments and practical projects.</li> </ol>		
<b>Unit – I</b>	<table border="0" style="width: 100%;"> <tr> <td style="width: 60%;"><b>Course Content</b></td> <td style="width: 40%; text-align: right;"><b>11 Hours</b></td> </tr> </table>	<b>Course Content</b>	<b>11 Hours</b>
<b>Course Content</b>	<b>11 Hours</b>		
	<p><b>Concept of Health and Wellness:</b> Definition, Aims and Objectives of Health (Physical, Mental, Social and Emotional) and Wellness; Importance and Scope of Health (Physical, Mental, Social and Emotional) and wellness; modern concept of Health (Physical, Mental Social and Emotional) and Wellness; Dimensions of Health and Wellness; <b>Wellness and Lifestyle:</b> Fitness- Understanding of Wellness; Modern Lifestyle and Hypo Kinetic Diseases – Prevention and Management; Physical Activity and Health (Physical, Mental, Social and Emotional ) Benefits.</p>		
<b>Unit – II</b>	<table border="0" style="width: 100%;"> <tr> <td style="width: 60%;"><b>Course Content</b></td> <td style="width: 40%; text-align: right;"><b>11 Hours</b></td> </tr> </table>	<b>Course Content</b>	<b>11 Hours</b>
<b>Course Content</b>	<b>11 Hours</b>		
	<p>Introduction to nutrition , and types of nutrition: proteins, carbohydrates, fats, vitamins, minerals, water; balanced diet, daily caloric requirement and expenditure; Nutritional Value and requirement of food in relation to exercise, Malnutrition and obesity causes, effect, prevention and treatment, Harmful effects of nutritional ergo-genic aids</p>		



Unit – III	Course Content	08 Hours
	Weight management, meaning and concept, concept of BMI (Body Mass Index), WHR (Waist-Hip Ratio) Obesity, meaning, definition and types of obesity, causes and solutions of or over coming obesity; weight gain and weigh loss diest; Steps of planning of weight management balance diet for Indian school children; diet program for sports children.	
<b>Practical:</b>	<p>a. Visit personally to any gym (or) ground (or) sports club where people come for regular exercises and fitness and calculate the BMI of minimum 50 members.</p> <p>b. Make a survey on 50 members with hypokinetic diseases on their diet and life style habits.</p> <p>c. Prepare a diet plan for healthy life-style of either young children (or) adults (or) Age old (or) Working Women (or) Pregnant women (or) those with hypertension and hyper glycaemia.</p> <p>d. Make a survey on health and lifestyle of those who are suffering from occupational hazards on any one of them viz. Bankers, Corporate sectors, IT employees, Teachers, beauticians, tailors, traffic policeman, flour mill workers, cooks, cobblers etc.</p>	
		<b>30 Hrs</b>

**Suggested Reading –**

1. आनंद योग, श्रीकृष्ण व्यवहारे, घंटाळी प्रकाशन, ठाणे. 1991.
2. Light on yoga, B.K.S. Iyengar Harper Collins publisher, New Delhi, 2005.
3. Asana Pranayam mudra bandha, Swami SatyedraSaraswati, yoga publication trust, 1997.
4. Patanjaliyog Sutra, Swami Vivekanand, Geeta press Gorakhpur.
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