



K.E. Society's  
**Rajarambapu Institute of Technology, Rajarnanagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
Curriculum Structure and Evaluation Scheme  
To be implemented for 2023-27 and 2024-28 NEP Batch  
Department of Civil Engineering

# B. Tech. in Civil Engineering with Multidisciplinary Minor





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 Department of Civil Engineering

**Class: S. Y. B. Tech**

**Semester: III**

Course Code	Course	Teaching Scheme				Evaluation Scheme					
		L	T	P	Credits	Scheme	Theory (Marks %)		Practical (Marks %)		
							Max	Min. for passing	Max.	Min. for passing	
CE231	Mathematics for Civil Engineer	3	-	-	3	ISE	20	40	40	----	----
						UT1	15			----	----
						UT2	15			----	----
						ESE	50			40	----
CE2214	Building Planning and Design	3	-	-	3	ISE	20	40	40	----	----
						UT1	15			----	----
						UT2	15			----	----
						ESE	50			40	----
CE2074	Surveying	3	-	-	3	ISE	20	40	40	----	----
						UT1	15			----	----
						UT2	15			----	----
						ESE	50			40	----
CE2034	Engineering Mechanics	2	-	-	2	ISE	20	40	40	----	----
						UT1	15			----	----
						UT2	15			----	----
						ESE	50			40	----
SH2174	Environmental Science	1	-	2	2	ISE	50	40	40	----	----
						ESE	50			40	----
	Multidisciplinary Minor- I	3	-	-	3	ISE	20	40	40	----	----
						UT1	15			----	----
						UT2	15			----	----
						ESE	50			40	----
CE2234	Building Planning and Drawing Laboratory	-	-	2	1	ISE	----	----	50	50	
						ESE	----	----	50	50	
CE2114	Surveying Laboratory	-	-	2	1	ISE	----	----	50	50	
						ESE	----	----	50	50	
CE2134	Engineering Mechanics and Materials Testing Laboratory	-	-	2	1	ISE	----	----	100	50	
CE233	Building Interior Design & Drawing	-	-	2	1	ISE	----	----	100	50	
CE2154	Technical Aptitude-I	-	-	2	1	ESE	----	----	100	50	
	Professional Skills Development and Foreign Languages	-	-	2	1	ISE	----	----	100	50	
	<b>TOTAL</b>	<b>15</b>	<b>-</b>	<b>14</b>	<b>22</b>						
	<b>TOTAL CONTACT HOURS</b>	<b>29</b>									

ISE = In Semester Evaluation, (UT1+UT2) UT-I = Unit Test-I, UT-II = Unit Test-II, ESE = End Semester Exam

**Total Contact Hours/week : 29**

**Total Credits : 22**

**Technical Aptitude Courses : Mathematics for Civil Engineer, Surveying, Engineering Mechanics, Building Planning and Design**

Note: ISE of the Environmental Science course will be the project on application of technology in Environmental concerns. If student fails in ISE (i.e. project) he /she will not be eligible for ESE of the course.

In time table allot 1 hour for theory and 2 hours for Environmental Science -project (Batch wise)





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Professional Skills Development and Foreign Languages

Sr. No.	Subject Name		Course Code
1.	Professional Skills Development and Foreign Languages	Professional Leadership Skills	SH2634
2.		Interpersonal Skills	SH2614
3.		Innovation Tools and Methods for Entrepreneurs	SH2694
4.		Personal Effectiveness and Body Language	SH2594
5.		German Language – III	SH2734
6.		Japanese Language – III	SH2714

**Note:**

1. A student has to complete any two courses out of six choices offered under Choice Based Professional Skills Development Programme. A course in each semester will be allocated without any repetition.
2. Foreign Language course selected in F. Y. B. Tech Sem-I will remain the same with next levels in Sem-III & IV. (No new entries in S. Y. B. Tech Sem-III)







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Class: S. Y. B. Tech

Semester: IV

Course Code	Course	Teaching Scheme				Evaluation Scheme					
		L	T	P	Credits	Scheme	Theory (Marks %)		Practical (Marks %)		
							Max	Min. for passing	Max	Min. for passing	
CE232	Strength of Materials	3	-	-	3	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15	---	---		
						ESE	50	40	---	---	
CE2044	Concrete Technology	2	-	-	2	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15	---	---		
						ESE	50	40	---	---	
CE2064	Fluid Mechanics	2	-	-	2	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15	---	---		
						ESE	50	40	---	---	
CE234	Water Resources and Irrigation Engineering	3	-	-	3	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15	---	---		
						ESE	50	40	---	---	
CE236	Highway Engineering	2	-	-	2	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15	---	---		
						ESE	50	40	---	---	
	Modern Indian Language	2	-	-	2	ISE	100	50	---	---	
	Multidisciplinary Minor- II	3	-	-	3	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15	---	---		
						ESE	50	40	---	---	
CE2184	Concrete Technology Laboratory	-	-	2	1	ISE	---	---	50	50	
CE2164	Fluid Mechanics Laboratory	-	-	2	1	ISE	---	---	100	50	
CE238	Highway Materials Testing Laboratory	-	-	2	1	ISE	---	---	50	50	
						ESE	---	---	50	50	
CE240	Practical Aspects of Construction Supervision	-	-	2	1	ISE	---	---	100	50	
CE2204	Technical Aptitude-II	-	-	2	1	ESE	---	---	100	50	
	Professional Skills Development and Foreign Languages	-	-	2	1	ISE	---	---	100	50	
	<b>TOTAL</b>	<b>17</b>	<b>-</b>	<b>12</b>	<b>23</b>						
	<b>TOTAL CONTACT HOURS</b>	<b>29</b>									

ISE = In Semester Evaluation, (UT1+UT2) UT-I = Unit Test-I, UT-II = Unit Test-II ESE = End Semester Exam

Total Contact Hours/week : 29

Total Credits : 23

Technical Aptitude Courses : Strength of Materials, Concrete Technology, Fluid Mechanics, Water Resource and Irrigation Engineering, Highway Engineering.

Note: Students are required to undergo industrial / field training of minimum two weeks in the vacation of Semester-IV and its evaluation will be carried out in the Semester-V.







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Sr. No.	Subject Name		Course Code
1	Modern Indian Language	मराठी भाषिक कौशल्यविकास	SH202
2		हिंदी कथा साहित्य एवं प्रयोजमूलक हिंदी	SH204

Sr. No.	Subject Name		Course Code
1.	Professional Skills Development and Foreign Languages	Professional Leadership Skills	SH2634
2.		Interpersonal Skills	SH2614
3.		Innovation Tools and Methods for Entrepreneurs	SH2694
4.		Personal Effectiveness and Body Language	SH2594
5.		German Language – IV	SH2644
6.		Japanese Language – IV	SH2624

**Note:**

1. A student has to complete any two courses out of six choices offered under Choice Based Professional Skills Development Programme. A course in each semester will be allocated without any repetition.
2. Foreign Language course selected in F. Y. B. Tech Sem-I will remain the same with next levels in Sem-III & IV. (No new entries in S. Y. B. Tech Sem-III)





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**Class: T. Y. B. Tech**

**Semester: V**

Course Code	Course	Teaching Scheme				Evaluation Scheme					
		L	T	P	Credits	Scheme	Theory (Marks %)		Practical (Marks %)		
							Max	Min. for Passing	Max	Min. for passing	
CE3014	Design of Steel Structures	2	-	-	2	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15	---	---		
						ESE	50	40	---	---	
CE351	Estimations and Costing	2	-	-	2	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15	---	---		
						ESE	50	40	---	---	
CE353	Mechanics of Structure	2*	-	-	2	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15	---	---		
						ESE	50	40	---	---	
	Programme Elective -I	2	-	-	2	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15	---	---		
						ESE	50	40	---	---	
	Open Elective -I	3	-	-	3	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15	---	---		
						ESE	50	40	---	---	
	Multidisciplinary Minor-III	3	-	-	3	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15	---	---		
						ESE	50	40	---	---	
	Multidisciplinary Minor-IV	2	-	-	2	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15	---	---		
						ESE	50	40	---	---	
SH3034	Scholastic Aptitude I	2*	-	-	2	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15	---	---		
						ESE	50	40	---	---	
CE355	Estimations Costing and Valuation Laboratory	-	-	4	2	ISE	---	---	100	50	
CE3174	Technical Aptitude-III	-	-	2	1	ESE	---	---	100	50	
CE357	Summer Internship	-	-	-	2	ISE	---	---	100	50	
	<b>TOTAL</b>	<b>18+2*</b>	<b>-</b>	<b>6</b>	<b>23</b>						
	<b>TOTAL CONTACT HOURS</b>	<b>26</b>									

ISE = In Semester Evaluation, (UT1+UT2) UT-I = Unit Test-I, UT-II = Unit Test-II, ESE = End Semester Exam

**Total Contact Hours/week : 26**

**Total Credits : 23**

**Technical Aptitude Courses : Design of Steel Structures, Estimating & Costing, Mechanics of Structure**

**Note\*:** One extra lecture to be allotted in time Table.





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**Programme Elective Course- I**

Sr. No.	Course Code	Course Name	Specialization
1	CE359	Legal practice in construction	Construction Management
2	CE361	Optimization Techniques	
3	CE363	Construction Quality Control	
4	CE365	Advanced Fluid Mechanics	General Engineering
5	CE367	Solid Waste Management	
6	CE369	Public Building Planning and Design	
7	CE371	Engineering Geology	
8	CE373	Matrix Methods of Analysis	Structural Engineering
9	CE375	Earthquake Engineering	

**Open Elective – I**

Sr. No	Course Code	Course Name	Offered By Department
1	OE345	Soft Computing	Computer Science & Information Technology
2	OE343	Data Science	Computer Science & Engineering (Artificial Intelligence and Machine Learning)
3	OE347	New Product Design & Development	Mechanical Engineering
4	OE349	Non-Conventional Energy Sources	
5	OE351	Hydrogen & Fuel Cell Technology	
6	OE3044	Renewable Energy Sources	Automobile Engineering
7	OE353	Factory Automation	Mechatronics Engineering
8	OE355	Cyber Physical Systems	
9	OE3104	Network Administration	Computer Science & Engineering
10	OE3064	Environmental Impact Assessment	Civil Engineering
11	OE3084	Materials Management	
12	OE341	Energy Auditing and Management	Electrical Engineering
13	OE357	Internet of Things	Electronics & Telecommunication Engineering
14	OE359	Drone Technology	







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**Class: T. Y. B. Tech**

**Semester: VI**

Course Code	Course	Teaching Scheme				Evaluation Scheme					
		L	T	P	Credits	Scheme	Theory (Marks %)		Practical (Marks %)		
							Max	Min. for passing	Max	Min. for passing	
CE352	Geotechnical Engineering	3	-	-	3	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50			---	---
CE354	Construction Practices	3	-	-	3	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50			---	---
CE356	Research Methodology	2	-	-	2	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50			---	---
	Programme Elective -II	3	-	-	3	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50			---	---
	Open Elective -II	3	-	-	3	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50			---	---
	Multidisciplinary Minor- V	3	-	-	3	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50			---	---
SH3064	Scholastic Aptitude II	2*	-	-	2	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50			---	---
CE358	Geotechnical Engineering Laboratory	-	-	2	1	ISE	---	---	50	50	
						ESE	---	---	50	50	
CE360	Design of Steel Structures Laboratory	-	-	2	1	ISE	---	---	100	50	
CE362	Software Laboratory	-	-	2	1	ISE	---	---	100	50	
CE3124	Technical Aptitude IV	-	-	2	1	ESE	---	---	100	50	
CE3144	Capstone project Phase I	-	-	2	1	ISE	---	---	100	50	
	<b>TOTAL</b>	<b>19+1*</b>	<b>-</b>	<b>10</b>	<b>24</b>						
	<b>TOTAL CONTACT HOURS</b>	<b>30</b>									

ISE = In Semester Evaluation, (UT1+UT2) UT-I = Unit Test-I, UT-II = Unit Test-II ESE = End Semester Exam

**Total Contact Hours/week : 30**

**Total Credits : 24**

**Technical Aptitude Courses : Geotechnical Engineering, Construction Practices**

**Note\*: One extra lecture to be allotted to Scholastic Aptitude-II in time Table.**





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**Programme Elective II Course List**

Sr. No.	Course Code	Course Name	Specialization
1	CE364	Construction Equipment Management	Construction Management
2	CE3204	Construction Economics and Finance	
3	CE366	Advanced Hydraulic Engineering	General Engineering
4	CE368	Air Quality Assessment	
5	CE370	Traffic Engineering	
6	CE372	Industrial Waste Management	
7	CE3184	Repair rehabilitation of structures	Structural Engineering
8	CE374	Advanced Structural Analysis	
9	CE376	Composite Materials and Structures	
10	CE378	Finite Element Method	
11	CE380	Design of Fiber Reinforced Concrete	

**Open Elective –II**

Sr. No.	Course Code	Course Name	Offered By Department
1	OE3401	Cyber security	Computer Science & Information Technology
2	OE342	Data Mining	Computer Science & Engineering (Artificial Intelligence and Machine Learning)
3	OE3024	Reliability Engineering	Automobile Engineering
4	OE344	Supply Chain Analytics	Mechatronics Engineering
5	OE346	Mobile Robotics	
6	OE348	Information Technology Foundation Program	Computer Science & Engineering
7	OE3381	Disaster Management	Civil Engineering
8	OE350	Operations Research	
9	OE3182	Industrial Drives	Electrical Engineering
10	OE352	Image Processing	Electronics & Telecommunication Engineering
11	OE354	Fuzzy logic and Neural Network	
12	OE3284	Supply Chain Management	Mechanical Engineering
13	OE3324	Entrepreneurship Development	
14	OE356	Project Management	







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**Class: Final Year B. Tech**

**Semester: VII**

Course Code	Course	Teaching Scheme				Evaluation Scheme					
		L	T	P	Credits	Scheme	Theory (Marks %)		Practical (Marks %)		
							Max.	Min. for passing	Max.	Min. for passing	
CE4014	Design of Reinforced concrete Elements	3*	-	-	3	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50			40	---
CE4034	Construction Management	2	-	-	2	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50			40	---
CE4054	Environmental Engineering	3	-	-	3	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50			40	---
	Programme Elective -III	3	-	-	3	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50			40	---
	Programme Elective -IV	3	-	-	3	ISE	20	40	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50			40	---
CE4074	Design of Reinforced Concrete Structures Laboratory	-	-	2	1	ISE	---	---	---	50	50
						ESE	---	---	---	50	50
CE4094	Environmental Engineering Laboratory	-	-	2	1	ISE	---	---	---	50	50
						ESE	---	---	---	50	50
	Programme Elective III Laboratory	-	-	2	1	ISE	---	---	---	50	50
						ESE	---	---	---	50	50
CE4114	Capstone Project Phase II	-	-	6	3	ISE	---	---	---	50	50
						ESE	---	---	---	50	50
	<b>TOTAL</b>	<b>14+1*</b>	<b>-</b>	<b>10</b>	<b>20</b>						
	<b>TOTAL CONTACT HOURS</b>	<b>25</b>									

ISE = In Semester Evaluation, (UT1+UT2) UT-I = Unit Test-I, UT-II = Unit Test-II, ESE = End Semester Exam

**Total Contact Hours/week : 25**

**Total Credits : 20**

**Note\*:** One extra lecture to be allotted to the course Design of Reinforced concrete Elements in time Table.







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**Programme Elective Course- III**

Sr. No.	Course Code	Course Name	Specialization
1	CE4134	Construction Project Management	Construction Management
2	CE4154	Advanced Concrete Technology	
3	CE481	Environmental Chemistry and Microbiology	General Engineering
4	CE483	Watershed Management and Remote Sensing Applications	
5	CE4174	Rock Mechanics	
6	CE4194	GIS and GPS system	
7	CE485	Structural Health Monitoring	Structural Engineering
8	CE487	Design of Industrial Structures	
9	CE4214	Advanced Structural Design	

**Programme Elective Course- IV**

Sr. No.	Course Code	Course Name	Specialization
1	CE4234	Total Quality Management	Construction Management
2	CE4034	Advanced Construction Techniques	
3	CE4254	Environmental Management System	General Engineering
4	CE487	Foundation Engineering	
5	CE4274	Design of Prestressed Concrete structures	Structural Engineering
6	CE489	Advanced Design of Steel Structure	
7	CE491	Structural Design of Foundation	
8	CE4294	Design of bridges	

**Programme Elective III Laboratory**

Sr. No.	Course Code	Course Name	Specialization
1	CE4314	Construction Project Management Laboratory	Construction Management
2	CE4334	Advanced Concrete Technology Laboratory	
3	CE493	Environmental Chemistry and Microbiology Laboratory	General Engineering
4	CE495	Watershed Management and Remote Sensing Applications Laboratory	
5	CE4354	Rock Mechanics Laboratory	
6	CE4374	GIS and GPS system Laboratory	
7	CE497	Structural Health Monitoring Laboratory	Structural Engineering
8	CE499	Design of Industrial Structures Laboratory	
9	CE4394	Advanced Structural Design Laboratory	





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**Choice based Internship Model**  
**Model I: Industry Internship (II)**

Class: Final Year B. Tech

Semester: VIII

Course Code	Course	Teaching Scheme				Evaluation Scheme					
		L	T	P	Credits	Scheme	Theory (Marks %)		Practical (Marks %)		
							Max.	Min. for passing	Max.	Min. for passing	
OE4382	Finance for Engineers (Online Course)	2	-	-	2	ISE	25	40	40	---	---
						ESE	75	40		---	---
OE4362	Engineering Management & Economics (Online Course)	2	-	-	2	ISE	25	40	40	---	---
						ESE	75	40		---	---
IP4024	Industry Internship & Project	-	-	-	12	ISE	---	----		50	50
						ESE	---	---		50	50
<b>TOTAL</b>		-	-	-	16						

ISE = In Semester Evaluation, ESE = End Semester Exam

Total Contact Hours/week : --  
Total Credits : 16

**Note:**

1] Weekly Contact hours are not mentioned as student is expected to be in industry regularly for 20 weeks. However, student needs to report to Institute mentors as and when required.

2] For online course, lecture videos of each unit will be made available through college platform to the students. For each unit there will be separate assignment. Students need to submit all assignments within specified time.

**Weightage:** 25% weightage for unit wise assignments + 75% weightage for final exam. Final exam will be held at college campus.







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**Model II: Research Internship (RI)**

**Class: Final Year B. Tech**

**Semester: VIII**

Course Code	Course	Teaching Scheme				Evaluation Scheme					
		L	T	P	Credits	Scheme	Theory (Marks %)		Practical (Marks %)		
							Max.	Min. for passing	Max.	Min. for passing	
OE4382	Finance for Engineers (Online Course)	2	-	-	2	ISE	25	40	40	---	---
						ESE	75	40		---	---
OE4362	Engineering Management & Economics (Online Course)	2	-	-	2	ISE	25	40	40	---	---
						ESE	75	40		---	---
RE4044	Research Internship	-	-	-	12	ISE	---	----		50	50
						ESE	---	---		50	50
<b>TOTAL</b>		-	-	-	16						

ISE = In Semester Evaluation, UT-I = Unit Test-I, UT-II = Unit Test-II ESE = End Semester Exam

**Total Contact Hours/week** : -  
**Total Credits** : 16

Students who opt for a research internship need to undergo a minimum of one month of research internship in outside research organizations or laboratories.

**Note:**

- 1] Weekly Contact hours are not mentioned as student is expected to be in outside research organization regularly for 20 weeks. However, student needs to report to Institute mentors as and when required.
- 2] For online course, lecture videos of each unit will be made available through college platform to the students. For each unit there will be separate assignment. Students need to submit all assignments within specified time.

**Weightage:** 25% weightage for unit wise assignments + 75% weightage for final exam. Final exam will be held at college campus.







**K.E. Society's**  
**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**Curriculum Structure and Evaluation Scheme**  
 To be implemented for 2023-27 and 2024-28 NEP Batch  
 Department of Civil Engineering

**Model III: Entrepreneurial Internship (EI)**

Class: Final Year B. Tech

Semester: VIII

Course Code	Course	Teaching Scheme			Credits	Evaluation Scheme					
		L	T	P		Scheme	Theory (Marks %)		Practical (Marks %)		
							Max	Min. for passing	Max	Min. for passing	
ED4104	Project Management (Online Course)	2	-	-	2	ISE	25	40	40	-	-
						ESE	75	40		-	-
ED4044	Commercial Aspects of the Project (Online Course)	2	-	-	2	ISE	25	40	40	-	-
						ESE	75	40		-	-
ED4064	Entrepreneurship Development Program (EDP)	-	-	-	1	ISE				100	50
ED4084	Entrepreneurial Internship	-	-	-	11	ISE	-	-	-	50	50
						ESE	-	-	-	50	
<b>TOTAL</b>		-	-	-	<b>16</b>						

ISE = In Semester Evaluation, UT-I = Unit Test-I, UT-II = Unit Test-II ESE = End Semester Exam

Total Contact Hours/week :-

Total Credits : 16

Students who opt for an entrepreneurial internship need to undergo a one-month internship at an outside reputed organization or firm

**Note:**

1] Weekly Contact hours are not mentioned as student is expected to be in outside research organization regularly for 20 weeks. However, student needs to report to Institute mentors as and when required.

2] For online course, lecture videos of each unit will be made available through college platform to the students. For each unit there will be separate assignment. Students need to submit all assignments within specified time.

**Weightage:** 25% weightage for unit wise assignments + 75% weightage for final exam. Final exam will be held at college campus.

3] A one week Entrepreneurship Development Program (EDP) will be conducted after completion of 7<sup>th</sup> semester and before start of 8<sup>th</sup> semester.





### Multidisciplinary Minor

- Student should choose any one specialization given by the department and complete all the five courses under the specialization to earn 170 credits.
- Following are the baskets of multidisciplinary minor courses.

Multidisciplinary Minor Baskets					
MDM Basket Name	Sr. No.	Course Code	Course Name	Semester	Offered by Department
Automobile Engineering	1	ATMD201	Automobile Systems	III	Automotive Technology
	2	ATMD202	I. C. Engines	IV	
	3	ATMD301	Automotive Safety & Ergonomics	V	
	4	ATMD303	Automotive Engineering Lab.	V	
	5	ATMD302	Electric Vehicles	VI	
Construction Engineering	1	CEMD201	Building Construction and Planning	III	Civil Engineering
	2	CEMD202	Building Estimation and Valuation	IV	
	3	CEMD301	Infrastructure Engineering	V	
	4	CEMD303	Smart Cities and Sustainable Development	V	
	5	CEMD302	Public Health Engineering	VI	
Software Programming	1	CSMD201	Introduction to Data Structures	III	Computer Science & Engineering
	2	CSMD202	Problem solving using JAVA	IV	
	3	CSMD301	Fundamentals of Database Systems	V	
	4	CSMD303	Object-oriented Programming in Python	V	
	5	CSMD302	Artificial Intelligence	VI	
Electrical Power System	1	EEMD201	Electrical Power Generation	III	Electrical Engineering
	2	EEMD202	Power System	IV	
	3	EEMD301	Electrical Machines	V	
	4	EEMD303	Electrical Technology Lab	V	
	5	EEMD302	Smart Grid	VI	







**K.E. Society's**  
**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**Curriculum Structure and Evaluation Scheme**  
 To be implemented for 2023-27 and 2024-28 NEP Batch  
 Department of Civil Engineering

Electronics System Design	1	ECMD201	Electronics Devices and Applications	III	Electronics & Telecommunication Engineering
	2	ECMD202	Electronics Communication Systems	IV	
	3	ECMD301	System Analysis using MATLAB	V	
	4	ECMD303	PCB Design and Fabrication	V	
	5	ECMD302	Electronics for Industrial Applications	VI	
Software Development	1	CIMD201	Data Structures	III	Computer Science & Information Technology
	2	CIMD202	Computer Algorithms	IV	
	3	CIMD301	Introduction to DBMS	V	
	4	CIMD303	OOP using Java	V	
	5	CIMD302	Software Engineering	VI	
Elements of Mechanical Engineering	1	MEMD201	Materials and Applications	III	Mechanical Engineering
	2	MEMD202	Design and Drawing of Machine Components	IV	
	3	MEMD301	Manufacturing and Assembly Process	V	
	4	MEMD303	Refrigeration and Air Conditioning	V	
	5	MEMD302	Power Plant Engineering	VI	
Mechatronics Engineering	1	MCMD201	Fundamentals of Mechatronics	III	Mechatronics Engineering
	2	MCMD202	Industrial Fluid Power	IV	
	3	MCMD301	Sensor and Instrumentation	V	
	4	MCMD303	Industrial Automation	V	
	5	MCMD302	Industrial Robotics	VI	
Artificial Intelligence	1	AIMD201	Object Oriented Programming	III	Computer Science & Engineering (AI-ML)
	2	AIMD202	Data Structures and Algorithms	IV	
	3	AIMD301	Machine Learning	V	
	4	AIMD303	Business Intelligence	V	
	5	AIMD302	Principles of AI	VI	







K.E. Society's  
Rajarambapu Institute of Technology, Rajaramnagar  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
Curriculum Structure and Evaluation Scheme  
To be implemented for 2023-27 and 2024-28 NEP Batch  
Department of Civil Engineering

# B. Tech. in Civil Engineering with Double Minor (Multidisciplinary and Specialization Minor)





**K.E. Society's**  
**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
Curriculum Structure and Evaluation Scheme  
To be implemented for 2023-27 and 2024-28 NEP Batch  
Department of Civil Engineering

### B. Tech in Civil Engineering with Double Minor degree

- To get B. Tech in Civil Engineering with Double Minor degree student need to earn extra 18 credits by completing 6 minor courses (One minor course / semester)
- Minor courses can be completed through online platforms.
- Student can choose any one specialization given by the department and complete all the six courses under the specialization to earn total 188 Credits which consist 170 credits of regular Multidisciplinary Minor courses and 18 Credits of Double Minor courses.
- Following are the baskets of Minor courses

<b>Double Minor Baskets</b>					
<b>Double Minor Basket Name</b>	<b>Sr. No.</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Semester</b>	<b>Offered by Department</b>
Electric Vehicle	1	ATDM201	Powertrain for EV	III	Automotive Technology
	2	ATDM202	Battery Management Systems for Electric Vehicles	IV	
	3	ATDM301	Hybrid Vehicles	V	
	4	ATDM302	Fuel Cell Technology	VI	
	5	ATDM401	Charging Infrastructure	VII	
	6	ATDM402	Autonomous Vehicle	VIII	
Water Resource Management	1	CEDM201	Water Economics and Governance	III	Civil Engineering
	2	CEDM202	Availability and Management of Groundwater Resources	IV	
	3	CEDM301	Pollutants and Water Supply	V	
	4	CEDM302	Integrated Waste Management For A Smart City	VI	
	5	CEDM401	Advanced Geomatics Engineering	VII	
	6	CEDM402	Optimization Methods for Civil Engineering	VIII	
Data Science	1	CSDM201	Principles of Data Science	III	Computer Science & Engineering
	2	CSDM202	Data Wrangling with Python	IV	





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**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**Curriculum Structure and Evaluation Scheme**  
 To be implemented for 2023-27 and 2024-28 NEP Batch  
 Department of Civil Engineering

	3	CSDM301	Data management and representation	V	
	4	CSDM302	Exploratory Data Analysis	VI	
	5	CSDM401	Business Analytics	VII	
	6	CSDM402	NPTEL/SWAYAM	VIII	
Electric Vehicle & Renewable Energy Systems	1	EEDM201	Technologies for Clean And Renewable Energy Production	III	Electrical Engineering
	2	EEDM202	Renewable Energy Engineering: Solar, Wind and Biomass Energy Systems	IV	
	3	EEDM301	Solar Photovoltaics Fundamentals, Technology and Applications	V	
	4	EEDM302	Introduction to Hybrid and Electric Vehicles	VI	
	5	EEDM401	Fundamentals of Electric vehicles: Technology and Economics	VII	
	6	EEDM402	Electric vehicles and Renewable energy	VIII	
Internet of Things	1	ECDM201	Sensors and Actuators	III	Electronics & Telecommunication
	2	ECDM202	Wireless Sensor Networks	IV	
	3	ECDM301	IoT protocols and Security	V	
	4	ECDM302	Embedded System Design for IoT	VI	
	5	ECDM401	Android Application Design	VII	
	6	ECDM402	Cloud Integration using AWS	VIII	
Artificial Intelligence and Data Science	1	CIDM201	Artificial Intelligence	III	Computer Science & Information Technology
	2	CIDM202	Data Science with R programming	IV	
	3	CIDM301	Machine Learning	V	
	4	CIDM302	Business Intelligence	VI	
	5	CIDM401	Deep learning	VII	
	6	CIDM402	Data Ethics and Privacy	VIII	
AI Based Condition	1	MEDM201	Fundamentals of Structural Dynamics	III	Mechanical Engineering







K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
 Curriculum Structure and Evaluation Scheme  
 To be implemented for 2023-27 and 2024-28 NEP Batch  
 Department of Civil Engineering

Monitoring	2	MEDM20 2	Principles of Vibration control	IV	
	3	MEDM30 1	Machinery Fault Diagnosis	V	
	4	MEDM30 2	Instrumentation and Data Recording	VI	
	5	MEDM30 4	Double Minor IV Lab	VI	
	6	MEDM40 1	AI Tools and Signal Processing	VII	
	7	MEDM40 2	AI Based Condition Monitoring	VIII	
	Autotronics	1	MCDM20 1	Fundamentals of Automotive Systems	
2		MCDM20 2	Automotive Electrical and Electronics	IV	
3		MCDM30 1	Automotive Communication System	V	
4		MCDM30 2	Automotive Driver Assistant System	VI	
5		MCDM40 1	Engine Control System	VII	
6		MCDM40 2	Automotive Diagnostics	VIII	
Artificial Internet of Things - AIOT	1	AIDM201	Introduction to Internet of Things	III	Computer Science & Engineering (Artificial Intelligence and Machine Learning)
	2	AIDM202	IoT Protocols	IV	
	3	AIDM301	IoT System Design	V	
	4	AIDM302	Industry 4.0 and IIoT	VI	
	5	AIDM401	Internet of Things Technology and Applications	VII	
	6	AIDM402	NPTEL/SWAYAM	VIII	





K.E. Society's  
Rajarambapu Institute of Technology, Rajaramnagar  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
Curriculum Structure and Evaluation Scheme  
To be implemented for 2023-27 and 2024-28 NEP Batch  
Department of Civil Engineering

# B. Tech. in Civil Engineering with Honor and Multidisciplinary Minor





## B. Tech in Civil Engineering with Honor and Multidisciplinary

### Minor degree

- To get B. Tech in Civil Engineering with Honor and Multidisciplinary Minor degree student need to earn extra 18 credits by completing 6 Honor courses (One course / semester)
- Honor course can be completed through online platforms
- Student can choose any one specialization given by the department and complete all the six courses under the specialization to earn total 188 Credits which consist 170 credits of regular Multidisciplinary Minor courses and 18 Credits of Honor courses.
- Following are the baskets of Honor courses

Specialization: Structural Engineering			
Sr. No.	Course Code	Course Name	Offered in Semester
1	CEHO201	Introduction To Engineering Seismology	III
2	CEHO202	Plates and Shells	IV
3	CEHO301	Dynamics Of Structures	V
4	CEHO302	Matrix Method Of Structural Analysis	VI
5	CEHO401	Advanced Reinforced Concrete Design	VII
6	CEHO403	Reliability-Based Structural Design	VIII

Specialization: Construction Management			
Sr. No.	Course Code	Course Name	Offered in Semester
1	CEHO203	Project Planning & Control	III
2	CEHO204	Principles Of Construction Management	IV
3	CEHO303	Admixtures And Special Concretes	V
4	CEHO304	Sustainable Engineering Concepts And Life Cycle Analysis	VI
5	CEHO405	Remote Sensing and GIS	VII
6	CEHO407	Bridge Engineering	VIII

Specialization: Geotechnical Engineering			
Sr. No.	Course Code	Course Name	Offered in Semester
1	CEHO205	Engineering Geology	III
2	CEHO206	Subsurface Exploration :Importance And Techniques Involved	IV
3	CEHO305	Ground Improvement	V
4	CEHO306	Geosynthetics And Reinforced Soil Structures	VI
5	CEHO409	Rock Mechanics And Tunneling	VII
6	CEHO411	Underground Space Technology	VIII







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**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
Curriculum Structure and Evaluation Scheme  
To be implemented for 2023-27 and 2024-28 NEP Batch  
Department of Civil Engineering

# B. Tech. in Civil Engineering-Honors with Research and Multidisciplinary Minor





**K.E. Society's**  
**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**Curriculum Structure and Evaluation Scheme**  
 To be implemented for 2023-27 and 2024-28 NEP Batch  
 Department of Civil Engineering

**Honors with Research and Multidisciplinary Minor**

The Student will work on Research Project or Dissertation for 18 Credits in the Fourth Year in respective discipline. The distribution of 18 Credits for Research project in Sem-VII and Sem-VIII is given below. To get B. Tech in Civil Engineering-Honors with Research and Multidisciplinary Minor degree Student need to earn total 206 Credits which consist 170 credits of regular Multidisciplinary Minor courses, 18 Credits of Honor courses and 18 credits of Research courses.

**Class: Final Year B. Tech**

**Semester: VII**

Course Code	Course	Teaching Scheme				Evaluation Scheme					
		L	T	P	Credits	Scheme	Theory (Marks %)		Practical (Marks %)		
							Max.	Min. for passing	Max.	Min. for passing	
REH401	Intellectual Property Rights (IPR)	-	-	-	2	ISE	50	40	40	---	---
						ESE	50	40		---	---
REH403	Research project (Synopsis) phase - I	-	-	-	2	ISE				50	50
						ESE				50	50
REH405	Research Specific core course - I (Online NPTEL course)	-	-	-	3	ISE	50	40	40		
						ESE	50	40			
<b>TOTAL</b>		-	-	-	7						

ISE = In Semester Evaluation, ESE = End Semester Exam

Note: For Evaluation of Online NPTEL course ISE Marks will be marks obtained by students in the assignments given by NPTEL, students who will secure NPTEL certification will be only eligible for ESE of the same course which will be conducted at institute

**Class: Final Year B. Tech**

**Semester: VIII**

Course Code	Course	Teaching Scheme				Evaluation Scheme					
		L	T	P	Credits	Scheme	Theory (Marks %)		Practical (Marks %)		
							Max.	Min. for passing	Max.	Min. for passing	
REH402	Research project	-	-	-	11	ISE	--	--	-	50	50
						ESE	--	--		50	
<b>TOTAL</b>		-	-	-	11						

ISE = In Semester Evaluation, ESE = End Semester Exam







**K.E. Society's**  
**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class:- <b>S. Y. B. Tech. Civil</b>	Semester-III
Course Code : <b>CE231</b>	Course Name: <b>Mathematics for Civil Engineer</b>

L	T	P	Credits
3	-	-	3

**Course Description:**

The course is offered as the core science course. This course intends to develop the competency in students to apply Mathematical ideas in civil engineering problems. The course consists of topics in Linear Differential Equations, Application of LDE to Civil Engineering Problems, Linear Partial Differential Equations with Constant Coefficients, Fourier Series, Statistics, and Probability Distribution.

**Course Outcomes:**

After successful completion of the course, students will be able to,

1. Solve problems on linear differential equations (LDE) and linear partial differential equations (PDE).
2. Apply linear differential equations (LDE) to deflection of beams and columns
3. Determine Fourier series of given functions.
4. Compute Karl Pearson's coefficient of correlation and to fit regression lines.
5. Solve problems on probability distributions.

**Prerequisite:** Engineering Mathematics-I and II

Course Content		
Unit No	Description	Hrs
1.	<b>Linear Differential Equations (LDE):</b> Definition, Complete Solution of Linear Differential Equations with Constant Coefficients, Complete Solution of Linear Differential Equations with Variable Coefficients.	06
2.	<b>Application of LDE:</b> Application to: Bending of Beams- Freely Supported Beam and Cantilever Beam, Buckling of Columns, Rod, Struts.	06
3.	<b>Linear Partial Differential Equations with Constant Coefficients:</b> Definition, Linear Homogeneous Partial Differential Equations of nth Order with Constant Coefficients, Methods of Solutions of Linear Homogeneous Partial Differential Equations of nth Order with Constant Coefficients, Non-homogeneous Linear partial Differential Equations, Application to Civil engineering	06
4.	<b>Fourier Series:</b> Definition, Euler's Formulae, Expansions of Functions, Change of Interval, Even and Odd Function, Half-range Sine and Cosine Series, Application to Civil engineering.	06
5.	<b>Statistics:</b> Coefficient of Correlation, Lines of Regression of Bivariate Data, Fitting of Curves (Lines and Parabola) by Least Square Principle, Application to	06







K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

	Civil engineering	
6.	<b>Probability Distribution:</b> Random Variable, Discrete and Continuous Probability Distributions, Binomial, Poisson and Normal Distributions, Application to Civil engineering	06

**References -**

**Textbook:**

- B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers.

**Reference Books:**

- Erwin Kreyszig, Advanced Engineering Mathematics, Wiley.
- B.V. Raman, Higher Engineering Mathematics, Tata McGraw Hill New Delhi.
- N. P. Bali, A. Saxena, N. Ch. S. N. Iyengar, A Text Book of Engineering Mathematics, Laxmi Publications, New Delhi.
- S. S. Sastry, Introductory Methods of Numerical Analysis.
- Peter V. O'Neil, Advanced Engineering Mathematics, Cole publishing house.
- P. N. Wartikar, J. N. Wartikar, A Text book of Applied Mathematics, Vol. I, Vol. II, Vidyarthi Griha Prakashan, Pune.





K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class: <b>S. Y. B. Tech Civil</b>	Semester-III	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Course Code: <b>CE2214</b>	Course Name: <b>Building Planning and Design</b>	<b>3</b>	<b>--</b>	<b>--</b>	<b>3</b>

**Course Description:**

The content of the course 'Building Planning and Design' provides an overview of properties and applications of various building materials. The course offers an insight into the functional design of building components. It enables the students in planning of the buildings. It also deals with various services and finishes employed in buildings.

**Course Outcomes:**

After successful completion of the course, student will be able to,

1. Suggest appropriate materials for building construction applications.
2. Prepare a functional design of components of the building.
3. Design and draw residential building plan using AutoCAD software.
4. Prepare plumbing and electrification plan for the building.
5. Explain building finish materials and procedures.

**Prerequisite:** Basic knowledge of mathematics.

<b>Course Content</b>		
<b>Unit No.</b>	<b>Description</b>	<b>Hrs.</b>
<b>1.</b>	<b>Construction Materials:</b> Properties and applications of Various materials viz. Stone, Aggregate, Brick, Steel, Aluminium, Timber, Glass, Flooring materials, Roofing materials, Cladding materials, Plumbing materials. Mortar, Plain Cement Concrete, Reinforced Cement Concrete and prestressed concrete.	<b>05</b>
<b>2.</b>	<b>Building Components I:</b> Types of structures: Load Bearing Structure and Framed Structure, Preparation of sectional view drawing of load bearing and framed structure showing different building components, Concept of Soil Bearing Capacity, Substructure of a building, Components of Substructure of a building, Types of foundation and their suitability, Types of Masonry: Types of brick and stone masonry, bonds in brickwork and stone masonry.	<b>05</b>
<b>3.</b>	<b>Building Components II:</b> Building components in superstructure: Column, Beam, Wall, Sill, Lintel, Chajja, Slab, Ventilator, Roofing, Parapet wall, Ramp, ladder, lift and escalator. Doors, Windows, Staircase: Technical terms, classification, functional design and drawing, Use of AutoCAD software to prepare staircase details.	<b>06</b>







**K.E. Society's**  
**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

<b>4.</b>	<b>Planning of Buildings and Bye-laws:</b> Types of buildings, Site Selection criteria, Concept of Planning, Principles of planning. Bye-laws: Definition, Necessity, Procedure for obtaining Development permission/Building permission /Commencement permission, General land development requirements, General building requirements: Setback, Marginal distance, height and FSI as per Unified Development Control and Promotion Regulations for Maharashtra State. Introduction and necessity of building drawings, concept of scale, Types of building drawings-layout plan, site plan, measured, submission, working and perspective drawing. Preparation of building plans using principles of planning and bye-laws. Use of AutoCAD software to prepare plans.	07
<b>5.</b>	<b>Building Services</b> Concept of Plumbing & Drainage plan, Plumbing systems, Types of traps, Fittings, Septic Tank, Soak pit, Rainwater harvesting, Preparation of Plumbing layout for building. Electrification for residential buildings- types of wiring, preparation of Electrification layouts for building.	07
<b>6.</b>	<b>Building Finishes:</b> Plastering and pointing. Paints-Characteristics of ideal paints, constituents, classification, suitability, applying procedure and applications, defects. Varnishes- Characteristics of good varnish, ingredients, types, suitability, applying procedure and applications. Distemper- ingredients, applying procedure and applications. White washing and colour washing.	06

**References –**

**References Books: -**

- V. B. Sikka, "A Course in Civil Engineering Drawing", S. K. Kataria and Sons.
- W.B Macay, "Building Construction", Pearson Education
- S.Mantri, "The A to Z of Practical Building Construction and its Management", Satya Prakashan.
- C.M. Kale, M.G. Shah, S.Y. Patki, "Building Drawing And Planning With An Integrated Approach To Build Environment", Tata McGraw-Hill Education Pvt. Ltd.

**Text Books: -**

- S. P. Arora, S. P. Bindra, "A Text Book of Building Construction", Dhanpat Rai Publications
- B. C. Punmia, "A Text Book of Building Construction", Laxmi Publications.

**Government Rules & Regulations:-**

- Unified Development Control and Promotion Regulations for Maharashtra State (UDCPR 2020), Urban Development Department, Government of Maharashtra.





K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class: <b>S. Y. B. Tech. Civil</b>	Semester: <b>III</b>
Course Code : <b>CE2074</b>	Course Name: <b>Surveying</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>

**Course Description:**

The course equips students with theoretical and practical surveying knowledge and skills, relevant to the needs of construction industry and society. Before starting of any Civil Engineering project, surveying knowledge is very essential to a Civil Engineer. Surveying is offered as the course in the first semester of second year engineering consists of two modules, the first module focuses on the levelling, Profile Levelling and Cross sectioning, Methods of Plotting Contours, Plane table techniques, Calculation of earthwork in cutting and embankment for civil engineering works. The second module focuses on Theodolite traversing and EDM measurements, Tachometry and Layout surveys and hydrographic surveying techniques

**Course Outcomes:**

After successful completion of the course, students will be able to,

1. Calculate reduced levels and identify the characteristics of contours.
2. Determine the angular and linear measurements by using theodolite.
3. Calculate the data for design of curve and area-volumes.
4. Describe the principles of surveying with advanced techniques.

**Prerequisite:** Fundamentals of Basic Civil Engineering, Engineering Mathematics.

<b>Course Content</b>		
Unit No.	Description	Hrs
1.	<b>Fundamentals of surveying:</b> Definition, objectives, uses, classification of survey, principles of surveying, introduction to map and map projection, scales and types of scale, error and types of error.	06
2.	<b>Levelling and Contouring:</b> Terms and Types of levelling, Equipment used for levelling, calculation of elevation (RL)-methods, corrections in levelling, Contouring, Characteristics of Contours, Uses of Contour Maps, Direct and Indirect methods of contouring	06
3.	<b>Theodolite Surveying:</b> Principle, systems of bearings, types of Theodolites, Measurement of Horizontal and Vertical Angles, Theodolite Traversing – closing error, Calculation of latitudes and departures in traverse.	06
4.	<b>Advanced Surveying Techniques:</b> Electronic Distance Measurement (EDM) instruments, Surveying using Total Station (TS) –Working principle and use of Total station, Data observations in TS, Basics of Geographical information system (GIS) working principle, types and methodology. Analysis using raster and vector data, Open-source	06







K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

	software, Geographical Positioning system (GPS) - working principle, types and methodology. Different segments: space, control and user segments – satellite, Hand Held and Geodetic receivers.	
5.	<b>Curves and Computation of Area and Volume:</b> Types and necessity Curve, Design and data collection for setting out of simple circular curves, areas and volumes calculations for any plotted plan by instrumental and mathematical methods.	06
6.	<b>Application of surveying:</b> Setting out work: Setting out building, pipeline surveying, road alignment and culverts, Hydrographic Survey: Introduction, Hydrographic survey Methods, Lead lines, sounding, Civil Engineering Applications. Drone surveying: Working flow, types of drones, data collection, post processing for map preparation.	06

**Reference:-**

**Reference Books:**

- Surveying: Theory and Practice by James M. Anderson, Edward M. Mikhail, Tata McGraw Hill.
- Principles of Surveying. Vol. I by J. G. Olliver, J. Clendinning – Van Nostrand Reinhold.
- Plane and Geodetic surveying for Engineers. Vol. I by David Clark, Constable.

**Text Books:**

- Surveying and Levelling by N. N. Basak , Tata McGraw Hill, New Delhi.
- Surveying Vol. I, II and III - Dr. B.C. Punamia, Laxmi Publishers. New Delhi.
- Surveying and Levelling Vol. I and II - T.P Kanetkar and S.V Kulkarni, Pune Vidhyarthi Gruh.
- Surveying Vol. I and II - S. K. Duggal, Tata McGraw Hill, New Delhi.
- Plane Surveying by A. M. Chandra, New Age International Publishers.





K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class: <b>S. Y. B. Tech. Civil</b>	Semester: <b>III</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Course Code : <b>CE2034</b>	Course Name: <b>Engineering Mechanics</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>2</b>

**Course Description:**

Engineering Mechanics focuses on the analysis of static bodies. The course helps the students to understand facts, concepts, principles and techniques of scientific investigation in the field of engineering. It develops thinking, analytical ability and imaginative skill of student. Engineering Mechanics is an introductory course which supports a study of many other advanced courses like Strength of Materials, Fluid Mechanics, Design of Structures etc., which apply engineering concepts in construction of buildings, dams, roadways, railways, bridges, etc.

**Course Outcomes:**

After successful completion of the course, students will be able to,

1. Calculate resultant force of coplanar force system.
2. Analyze engineering problems applying conditions of equilibrium
3. Determine centroid & moment of inertia of the geometrical plane lamina.

**Prerequisite:** Engineering Mathematics, Engineering Physics.

Course Content		
Unit No.	Description	Hrs
1.	<b>Fundamentals of Mechanics and force systems:</b> Force and classification of force systems. Resultant of parallel, concurrent and non-concurrent coplanar forces.	04
2.	<b>Equilibrium of force system:</b> Free body diagram, conditions of equilibrium, types of loads, types of beams, types of supports and reactions. Analysis of simple and compound beams using conditions of equilibrium	04
3.	<b>Friction:</b> Introduction to Laws of friction, Surface friction for bodies on horizontal and inclined planes.	04
4.	<b>Analysis of trusses:</b> Analysis of simple truss, Method of joints, Method of sections.	04
5.	<b>Centroid:</b> Centroid of plane and composite figures.	04
6.	<b>Moment of Inertia:</b> Moment of Inertia of plane and composite figures.	04

**References:**

**Text Books:**

- Bhavikatti S. S., Rajashekarappa, "Engineering Mechanics", New age International







**K.E. Society's**  
**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

publication (India) Pvt. Ltd. New Delhi,

- Ramamrutham S., "Engineering Mechanics", Dhanpat Rai Publishing Company Ltd., New Delhi.

**Reference Books:**

- S. Junnarkar, "Elements of Applied Mechanics", Charotar Publishing House (India) Pvt. Ltd., Anand (Gujarat)
- Ferdinand. Beer and E. Russell Johnson, "Vector Mechanics for Engineers (Statics and Dynamics)", McGraw Hill Publication, New York.
- Ferdinand L. Singer, "Engineering Mechanics (Statics and Dynamics)" Publications (India) Pvt. Ltd. Noida.
- Timoshenko and Young, "Engineering Mechanics (Statics and Dynamics)", McGraw Hill Publication, New York.





**K.E. Society's**  
**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class:- <b>S.Y. B. Tech</b>	Semester-III
Course Code : <b>SH2174</b>	Course Name: <b>Environmental Science</b>

L	T	P	Credits
1	--	2	2

**Course Description:**

The syllabus of Environmental Science provides an integrated, quantitative and interdisciplinary approach to the study of environmental systems. The students of Engineering undergoing this course would develop a better understanding of human relationships, perceptions and policies towards the environment and focus on design and technology for improving environmental quality. Project has been incorporated to enhance high potential in the student and built research and positive attitude towards environment related issues, which will help them in their social and technical life ahead. The project is designed to make them apply practical knowledge with relevant tools and techniques to solve real life problems related to the environment and industry. This course will help students in developing eco-friendly approach to achieve sustainable development.

**Course Outcomes:**

After successful completion of the course, students will be able to,

1. Apply interdisciplinary knowledge from various fields of science and engineering to address environmental issues.
2. Evaluate environmental impacts of human activities on the environment.
3. Use scientific approach to identify and solve environment related problems.
4. Design sustainable solutions to address environmental challenges.
5. Participate in group work to become acquainted with the importance of teamwork, collaboration
6. Develop presentation and report writing skills.

<b>Course Content</b>		
Unit No	Description	Hrs
1.	<b>Natural Resources and Ecosystem</b> Renewable and Non-renewable resources, Forest resources, water resources, Mineral resources, food resources, Energy resources, alternative energy resources Land resources, Structure and Functions of ecosystem, biotic and abiotic components, food chains, food web Biodiversity, types of biodiversity, conservation of biodiversity.	04
2.	<b>Environmental Pollution and Health</b> Environmental Pollution, types of pollution, Air pollution, Water Pollution, Noise Pollution, Soil Pollution, Marine Pollution, Radioactive Pollution, Thermal Pollution (Causes, sources and effects, abatement methods), Pollution Case studies-Bhopal Gas Tragedy, Chernobyl Accident: A nuclear Disaster, Ganga Water Pollution. Solid Waste management	04







**K.E. Society's**  
**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

	(Causes, sources, effects & control measures), Hazardous waste management, Plastic waste management, E-waste management. Disaster management and risk analysis.	
3.	<b>Climate change and Sustainable development</b> From unsustainable to sustainable development, Urban problems related to energy, Water conservation: Rainwater harvesting, Watershed management, Climate change, Global Warming, Ozone layer depletion, Acid Rain, Consumerism & waste Products, Concepts of Eco-labeled products, Eco-mark, Awareness of Environmental Legislation.	04

**Guidelines for Project:**

1. The distribution of project group will be done by project coordinator and respective head of the department to the faculty.
2. Project will be the team work consisting min 3 to max 5 students.
3. Project topic should be application oriented and with consideration to Environmental science problems in their respective stream. Selection and finalization will be through project guide.
4. Prepare project report as per guidelines.
5. Project group must provide complete solution to the selected problem with conceptual clarity.
6. The project will be evaluated by respective branch HOD and project guide and senior faculty.
7. The project should be presented before the committee, which shall evaluate for 50 marks.

**References –**

**Text Books:**

- D.K.Asthana, Meera Asthana, A Textbook of Environmental Studies, S.Chand Publication Revised edition, 2006.
- S. Deswal & A. Deswal, Basic course in environmental Studies, Dhanpat Rai & Co ltd., Delhi, Second revised edition, 2009.

**Reference Books:**

- Eldon D Enger, Bradley F. Smith, Environmental science – a study of inter-relationships Wm C Brown Publishers 1989
- Francois Ramade Ecology of Natural resources, John wiley & Sons
- Robert Leo Smith, Ecology and field biology, Harper Collins Publishers
- Gilbert M. Masters, Introduction to Environmental Engineering & Science, Prentice Hall International Inc. Second Edition





K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class: <b>S. Y. B. Tech.</b>	Semester: <b>III</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Course Code: <b>ATMD201</b>	Course: <b>Automobile Systems</b>	<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>

**Course Description:**

Automobile systems is a one of the core courses of Automotive Engineering and lays foundation for the advanced courses like vehicle dynamics and automotive design. The course introduces the major automotive chassis systems like steering, brakes and suspensions. It also covers the drivetrain elements like clutches, gearbox and differential. The course emphasizes on fundamental principles of operation, functional system equations, various system configurations and advancements. Successful completion of this course is very much essential for further learning and industry career.

**Course Learning Outcomes:**

After successful completion of the course, students will be able to,

1. Explain constructional details and operation of the automotive systems.
2. Interpret the influence of various technical parameters on the behavior of the automotive systems.
3. Configure the systems and its elements for integrating into drivetrain/chassis systems appropriate for given automotive application.
4. Present in detail the technological advancements of the automotive systems.

**Prerequisite:** Basics of Mechanical Engineering.

**Course Content:**

Unit No.	Description	Hrs.
1.	<b>Automotive clutches</b> Requirements, mathematical model, types, clutch assembly, diaphragm clutch, centrifugal clutch, fluid flywheel, torque converter	06
2.	<b>Gearbox</b> Need of gearbox, manual gearbox, automatic transmissions, AMT, DCT, CVT	06
3.	<b>Propeller shaft, differential and axles</b> Propeller shaft/drive shafts, Universal joints, differential, differential lock, final drive, axle arrangements, 4WD arrangement	06
4.	<b>Steering system</b> Steering geometry, Ackermann steering, steering ratio, layouts, power steering, active steering, steer-by-wire system, 4W steering	06
5.	<b>Suspension system</b> Principles, elements, quarter car model, dampers, roll centers, adaptive suspensions	06
6.	<b>Braking system</b> Principles, drum and disc brake arrangements, hydraulic brake system, air and vacuum brakes, ABS and ESP	06







**K.E. Society's**  
**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

**References-**

**Text Books:**

- Newton, Steed & Garret, Motor Vehicles, Butterworth Heinemann
- Henz Heisler, Advanced Vehicle Technology, SAE International

**Reference Books:**

- Henz Heisler, Vehicle and Engine Technology, SAE International
- J. Reimpell, H. Stoll, J. W. Betzler, The Automotive Chassis, Butterworth Heinemann
- Giles J. G., Steering, Suspension & Tyres, Illiffe Book Ltd. London
- William Crouse, Donald Anglin, Automotive Mechanics, McGraw-Hill
- Gillespie T. D., Fundamentals of Vehicle Dynamics, SAE International
- N. K. Giri, Automotive Mechanics, Khanna Publishers





**K.E. Society's**  
**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class: <b>S. Y. B. Tech.</b>	Semester-III	L	T	P	Credits
Course Code: <b>CEMD201</b>	Course Name: <b>Building Construction and Planning</b>	3	-	-	3

**Course Description:**

The content of the course 'Building Construction and Planning' provides an overview of properties and applications of various building materials. The course offers an insight into the functional design of building components. It enables the students in planning of the buildings. It also deals with various services and finishes employed in buildings.

**Course Outcomes:**

After successful completion of the course, student will be able to,

1. Suggest appropriate materials for building construction applications.
2. Prepare a functional design of components of the building.
3. Design and draw residential building using principles of planning and bye-laws.
4. Prepare plumbing and electrification plan for the building.
5. Explain properties of building finishing materials and application procedure.

**Prerequisite:** Basic knowledge of mathematics.

<b>Course Content</b>		
Unit No.	Details of Content	Hrs.
1.	<b>Construction Materials:</b> Properties and applications of Various materials viz. Stone, Aggregate, Brick, Steel, Aluminium, Timber, Glass, Flooring materials, Roofing materials, Cladding materials, Plumbing materials. Mortar, Plain Cement Concrete, Reinforced Cement Concrete and pre-stressed concrete.	05
2.	<b>Components of Building I:</b> Types of structures: Load Bearing Structure and Framed Structure, Preparation of sectional view drawing of load bearing and framed structure showing different building components, Concept of Soil Bearing Capacity, Substructure of a building, Components of Substructure of a building, Types of foundation and their suitability, Types of Masonry: Types of brick and stone masonry, bonds in brickwork and stone masonry.	05
3.	<b>Components of Building II:</b> Building components in superstructure: Column, Beam, Wall, Sill, Lintel, Chajja, Slab, Ventilator, Roofing, Parapet wall, Ramp, ladder, lift and escalator. Doors, Windows and Staircase: Technical terms, classification, functional design and drawing.	06







**K.E. Society's**  
**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

<b>4.</b>	<b>Planning of Buildings and Bye-laws:</b> Types of buildings, Site Selection criteria, Concept of Planning, Principles of planning. Bye-laws: Definition, Necessity, Procedure for obtaining Development permission/Building permission /Commencement permission, General land development requirements, General building requirements: Setback, Marginal distance, height and FSI as per Unified Development Control and Promotion Regulations for Maharashtra State. Introduction and necessity of building drawings, concept of scale, Types of building drawings-layout plan, site plan, measured, submission, working and perspective drawing. Preparation of building plans using principles of planning and bye-laws.	<b>07</b>
<b>5.</b>	<b>Building Services:</b> Concept of Plumbing & Drainage plan, Plumbing systems, Types of traps, Fittings, Septic Tank, Soak pit, Rainwater harvesting, and Plumbing layout for buildings, Preparation of Plumbing and Electrification layouts for building.	<b>07</b>
<b>6.</b>	<b>Building Finishes:</b> Plastering and pointing. Paints-Characteristics of ideal paints, constituents, classification, suitability, applying procedure and applications, defects. Varnishes- Characteristics of good varnish, ingredients, types, suitability, applying procedure and applications. Distemper- ingredients, applying procedure and applications. White washing and colour washing.	<b>06</b>

**References –**

**References Books: -**

- V. B. Sikka, "A Course in Civil Engineering Drawing", S. K. Kataria and Sons.
- W.B Macay, "Building Construction", Pearson Education
- S.Mantri, "The A to Z of Practical Building Construction and its Management", Satya Prakashan.
- C.M. Kale, M.G. Shah, S.Y. Patki, "Building Drawing And Planning With An Integrated Approach To BuiltEnvironment", Tata McGraw-Hill Education Pvt. Ltd.

**Text Books: -**

- S. P. Arora, S. P. Bindra, "A Text Book of Building Construction", Dhanpat Rai Publications
- B. C. Punmia, "A Text Book of Building Construction", Laxmi Publications.

**Government Rules & Regulations:-**

- Unified Development Control and Promotion Regulations for Maharashtra State (UDCPR 2020), Urban Development Department, Government of Maharashtra.





K.E. Society's  
Rajarambapu Institute of Technology, Rajaramnagar  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
S. Y. B. Tech. Syllabus  
To be implemented for 2023-27 and 2024-28 NEP Batch  
Department of Civil Engineering

Class: - S.Y. B. Tech.	Semester - III	L	T	P	Credits
Course Code: CSMD201	Course Name: Introduction to Data Structures	3	-	-	3

**Course Description:**

The Data Structures and Algorithms course is a comprehensive study of fundamental concepts and techniques essential for efficient problem-solving in computer science. Students will explore various data structures, including arrays, linked lists, stacks, queues, trees, graphs, and hash tables, and learn how to analyze their time and space complexity. The course extensively explores the design and analysis of algorithms, encompassing various topics such as sorting, searching, and graph traversal. Emphasis is placed on understanding algorithmic paradigms and their applications. Through programming assignments and theoretical exercises, students will gain practical experience in implementing algorithms and solving real-world problems. This course serves as a foundation for algorithmic thinking and prepares students for advanced computer science topics.

**Course Learning Outcomes:**

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

1. Compare between linear and nonlinear data structures
2. Describe the characteristics of various data structure such as stacks, queues, trees, graphs and Hash tables.
3. Analyze various searching and sorting algorithms and apply it to solve particular problem.
4. Determine a suitable data structure and algorithm to solve a real world problem

**Prerequisite:** Basic knowledge of C programming, Knowledge of basic mathematical concepts

Course Content		
Unit No	Description	Hrs
1	<b>Introduction to Data Structures:</b> Primitive and non-primitive data structures, Operations on data structures, Algorithms, Abstract Data Types, Complexity Analysis	05
2	<b>Linear Data Structures:</b> <b>Stack:</b> Definition, Representation and Applications of Stack. <b>Queue:</b> Definitions, Representation and Applications of Linear Queue, Circular Queue, and Priority Queue.	06
3	<b>Linked Lists:</b> Definition, Representation, Operations and Applications of singly linked list, doubly linked list, circular linked list, Application of linked list-Stack & queue, Introduction to Sparse matrix, representation of sparse	08







K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

	matrix using linked list.	
4	<b>Searching, Sorting and Hashing Techniques :</b> Linear search, Binary search, Bubble sort, insertion sort, Merge sort, Quick sort, Selection sort, Radix sort, Heap sort, Complexity of algorithms <b>Hashing:</b> Definition, Hash functions, Overflow, Collision, Open Hashing, closed hashing, Rehashing Techniques.	08
5	<b>Trees:</b> Basic Technology, Binary Tree, Traversal methods, Binary search tree, AVL Tree, B tree, B+ tree, Heaps - operations and their applications.	05
6	<b>Graphs:</b> Basic concepts of graph theory, Storage representation, Operations on graphs, Traversing a graph, Shortest path algorithm.	04

**References -**

**Text Books:**

- "Data Structures using C, A Practical Approach for Beginners" by Amol M. Jagtap & Ajit S. Mali
- Data structures -- Seymour Lipschutz (MGH) Schaum's Outlines.
- Introduction to Data Structures in C – Ashok N. Kamthane (Pearson Education).

**Reference Books:**

- Data structures and Algorithms -- Alfred V. Aho, John E. Hopcroft, J. D. Ullman (Addison- Wesley Series)
- Data Structure using C -- ISRD Group (TMH) ACE series.





K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class:- <b>S. Y. B. Tech.</b>	Semester- <b>III</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Course Code : <b>EEMD201</b>	Course Name: <b>Electrical Power Generation</b>	<b>3</b>	<b>--</b>	<b>--</b>	<b>3</b>

**Course Description:**

The overarching aim of the course is to allow students to develop an understanding of the fundamental principles and performance of devices / components that are associated with Generation of Electrical Energy. Electricity is a secondary energy source. It is produced through conversion of primary energy sources as coal, hydro, natural gas, nuclear, solar, and wind into electrical energy. Electricity is also a critical energy carrier, facilitating both transfer of energy and conversion to other forms, such as mechanical, chemical, etc. This course is designed with multi-disciplinary approach to embark importance of electrical energy among the students from different programs.

**Course Learning Outcomes:**

After successful completion of the course, students will be able to,

1. List the main components of different power plants
2. Describe the operation of various power plants used for electrical power generation.
3. Explain working principles of various power plants
4. Compare different power plants based on advantages, limitations and future prospects
5. Draw layout of electrical power plants.
6. Explore alternate electrical energy resources for future needs and challenges.

**Prerequisite:** Basic Electrical Engineering, Basic Mechanical Engineering, Basic Civil Engineering, Engineering Physics and Chemistry.

Course Content		
Unit No	Description	Hrs
1	<b>Solar Power Generation:</b> Solar radiation, solar energy collectors, solar power plant, solar power tower, conversion of solar heat to electricity, PV cells, PV power generation, solar energy storage, solar-hydrogen energy cycle, future prospects of solar energy in India.	06
2	<b>Wind Power Generation:</b> Wind speed and power relation, power extracted from wind, components of Wind power system, maximum power operation, operation and layout of standalone and grid connected Wind Turbine Generators (WTG).	06
3	<b>Thermal Power Plant:</b> Main equipment, coal handling plant, pulverizing plant, draft system, boiler, super-heater, re-heater, steam turbine, ash handling plant, condenser and cooling tower, feed water heater, economizer, air preheater, auxiliary supply,	06







**K.E. Society's**  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

	layout of thermal power plant. heat balance and efficiency, supercritical technology.	
4	<b>Hydro Power Plant:</b> Main components, storage reservoirs, dam, surge tank, penstock, spillway, tailrace, turbines, layout of hydro-power plant, site selection, run-off and its measurement, hydrograph, flow duration curve, mass curve, Hydro potential in India, problems in hydro-power plant development.	06
5	<b>Nuclear Power Plant:</b> Fundamentals of nuclear power, layout of nuclear power plant, selection of site, radioactivity & nuclear reactions, nuclear fission chain reaction in reactors, reactor classification, control of reactors, disposal of nuclear waste and effluent, biological effects of radiation, shielding, development of nuclear power plant in India.	06
6	<b>Alternate Energy Sources:</b> Fuel Cell: Principle, types of fuel cell, fuel for fuel cells, limitations and future prospects Biomass Energy: Availability of biomass, fluidized bed combustion, biomass power plant. Tidal Energy: Tidal phenomenon, tidal barrage, tidal power schemes Geothermal Energy: General, heat extraction, vapor-turbine cycle, difficulties and disadvantages	06

**References -**

**Text Books:**

- Rao, S. and Parulekar, B.B., Energy Technology: Non-Conventional, Renewable and Conventional, Khanna Publishers.
- Viorel Badescu, George Cristian Lazaroiu, Linda Barelli, Power Engineering Advances and Challenges, Part A: Thermal, Hydro and Nuclear Power, CRC Press.
- B. R. Gupta, Generation of Electrical Energy, S. Chand Publication.
- Rai, G.D., Non-Conventional Energy Sources, Khanna Publishers.

**Reference Books:**

- Twidell, J. and Tony W., Renewable Energy Resources, Taylor & Francis.
- Prabir Basu, Biomass Gasification, Pyrolysis and Torrefaction, Academic Press, Elsevier.
- Yasuo Koizumi, Tomio Okawa and Shoji Mori, Fundamentals of Thermal and Nuclear Power Generation, Elsevier, Publisher.





**K.E. Society's**  
**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class : <b>S. Y. B. Tech.</b>	Semester : <b>III</b>
Course Code : <b>ECMD201</b>	Course Name : <b>Electronics Devices and Applications</b>

L	T	P	Credits
3	-	--	3

**Course Description:**

This course introduces analog and digital electronics devices along with their circuits and applications. It deals with fundamentals of analog electronic devices such as R-L-C components, Diodes and its applications, BJT and FET. It focuses on working principles of operational amplifiers, electrical parameters of Op-Amp and its applications. This course also consists of number system, their conversions, logic gates, combinational and sequential logic circuits.

**Course Learning Outcomes:**

After successful completion of the course, students will be able to,

1. Describe the fundamental concepts of electronics and working principles of different devices.
2. Analyze different analog and digital electronics circuits.
3. Design digital electronics circuits with truth table and logic diagram.

**Prerequisite:** Fundamental concepts of Mathematics and Physics.

<b>Course Content</b>		
Unit No.	Description	Hrs
1.	<b>Introduction to Electronic components</b> Resistor, Inductor, Capacitor, Transformer, Diodes: P-N Junction Diode, Zener diode, LED, Photo diode. Applications of diodes: Rectifiers, Clippers and Clampers.	06
2.	<b>Bipolar Junction Transistor &amp; Field Effect Transistor</b> Introduction to transistors, BJT characteristics, Common Emitter configuration of BJT. Application of BJT: Transistor as a switch, Transistor as an amplifier. Introduction & types of FET.	06
3.	<b>Operational Amplifiers</b> Block Diagram of Op-Amp, Characteristics of Op-Amp, Virtual ground concept, Inverting and Non-inverting amplifier. Linear Applications of Op-Amp: Adder, Subtractor. Non-linear Applications of Op-Amp: Schmitt Trigger, Comparator.	06







K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

4.	<b>Fundamentals of Digital System</b> Number systems: Decimal, Binary, Octal, Hexadecimal, Binary coded decimal (BCD), Number system conversions, Binary Arithmetic, 1's and 2's complements, Logic gates.	06
5.	<b>Combinational Logic Circuits</b> Standard representation for logic functions, K-map, Minimization of logic functions using K-map, Half Adder, Full Adder, Half Subtractor, Full Subtractor, 1-Bit Comparator, Multiplexer, Demultiplexer, Encoder, Decoder.	06
6.	<b>Sequential Logic Circuits:</b> S-R flip-flop, D flip-flop, J-K flip-flop, T flip-flop. Applications of flip-flops: Shift registers, Counters: Ripple/asynchronous counters, Synchronous counters, Counters design using flip flops, Ring counter & Twisted ring/ Johnson counter.	06

**References**

**Text Books:**

- Boylestad, Robert & Louis, Nashelsky, "Electronics Devices and Circuit Theory", Pearson.
- Ramakant Gayakwad, Op-Amps and Linear Integrated Circuits, PHI
- Anand Kumar, "Fundamentals of Digital Circuits", PHI.

**Reference Books:**

- Sergio Franco, Design with Operational Amplifiers and Analog Integrated Circuits, Tata McGraw Hill.
- R. P. Jain, Modern Digital Electronics, Tata McGraw Hill.





K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class:- <b>S.Y. B. Tech</b>	Semester-III	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Course Code : <b>CIMD201</b>	Course Name : <b>Data Structures</b>	<b>3</b>	<b>--</b>	<b>--</b>	<b>3</b>

**Course Description:**

This course considers common data structures that are used in various computational problems. Students will explore various data structures, including arrays, linked lists, stacks, queues, trees, and graphs. This course serves as a foundation for algorithmic thinking and prepares students for advanced computer science topics. The course covers various applications of data structures. The course also focuses on typical use cases for these data structures.

**Course Learning Outcomes:**

After successful completion of the course, students will be able to,

1. Describe the basic terminologies of data structures.
2. Examine the linear data structure array with its types.
3. Demonstrate the working of stack, queue performed on data structures.
4. Illustrate the working of linked list.
5. Discuss Tree terminologies and their Applications.
6. Elaborate Graph terminologies with their types.

**Prerequisite:** Basics of C language

<b>Course Content</b>		
<b>Unit No</b>	<b>Description</b>	<b>Hrs</b>
<b>1.</b>	<b>Introduction to Data Structures</b> Introduction to data structures, basic terminologies in data structure, Need and Applications, classification of data structures, Operations on data structures, Abstract Data Types.	<b>06</b>
<b>2.</b>	<b>Array Data Structures</b> Introduction of Array, Representation of Array, Memory allocation of Array, types of array, operation in array, Applications of Array, Advantages and Disadvantages of Array	<b>04</b>
<b>3.</b>	<b>Stack and Queue</b> Stack: Definition, Representation, Operations and Applications of Stack. Queue: Definition, Representation, Operations and Applications of Linear Queue, Circular queue, Deque, Priority Queue.	<b>07</b>







K.E. Society's  
Rajarambapu Institute of Technology, Rajaramnagar  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
S. Y. B. Tech. Syllabus  
To be implemented for 2023-27 and 2024-28 NEP Batch  
Department of Civil Engineering

4.	<b>Linked Lists</b> Definition, Terminologies, Representation, Operations, Singly linked list, Doubly linked list, Circular linked list, Stack using linked list, Queue using linked list.	07
5.	<b>Trees Terminology in data Structure</b> Tree definition, Terminologies and Applications, Binary trees and types. Binary tree traversals, Binary search trees, AVL tree, B tree.	06
6.	<b>Graphs Terminology in data Structure</b> Graph Definition, Terminologies and Applications, Types of graphs, Representation of graph using adjacency matrix and adjacency list, Graph traversal Techniques: Depth first and Breath first search.	06

**References -**

**Text Books:**

- G. S. Baluja, "Data Structure Through C: A Practical Approach", Dhanpat Rai Publications.
- S. Tanenbaum, Y. Langsam, M. J. Augenstein, "Data Structure using C", (PHI).

**Reference Books:**

- Alfred V. Aho, John E. Hopcroft, J. D. Ullman, "Data structures and Algorithms", Addison, Welsely Series.
- Ashok N. Kamthane, "Introduction to Data Structures in C", Pearson Education.
- Yashwant P. Kanetkar, "Data Structures through C", BPB Publications.





K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class:- <b>S.Y. B. Tech</b>	Semester-III	L	T	P	Credits
Course Code:MEMD201	Course Name: <b>Materials and Applications</b>	3	--	--	3

**Course Description:**

Materials and Applications is an advanced interdisciplinary course that delves into the fascinating world of materials science and engineering, with a special focus on topics such as Smart Materials, Magnetic materials, and Electronic materials. This course is designed to provide students with a comprehensive understanding of different ferrous, nonferrous and advanced materials, their properties and applications. The course also covers applications of the components made by Powder Metallurgy. The whole notion of this course is selection of materials for various engineering applications.

**Course Learning Outcomes:**

After successful completion of the course, students will be able to,

1. Describe crystal structures and crystal imperfections.
2. Illustrate plotting of Equilibrium diagrams from Cooling Curves and its fundamentals.
3. Explain different Ferrous, Nonferrous alloys, their properties and applications by referring equilibrium diagrams.
4. Explain properties and applications of Smart Materials, Magnetic Materials and Electronic materials.
5. Explain properties and applications of Powder Metallurgy
6. Select suitable material for given engineering application.

**Prerequisite:**

The students should have knowledge of basic principles of physics, chemistry and mathematics in XII standard.

Course Content		
Unit No.	Description	Hrs
1.	<b>Metals and Alloy Systems:</b> Crystal structure in metals (BCC, FCC, HCP), Imperfection in crystals, nucleation, solidification and growth, cooling curves, Solid solutions and intermediate phases, Construction of equilibrium diagrams from cooling curves, components of different solubility in liquid and solid state, Lever arm principles, dendritic structure and coring.	06
2.	<b>Ferrous Alloys:</b> Fe-Fe <sub>3</sub> C Diagram, Plain carbon steels, Steel specifications, Alloy steels-Free cutting steels, HSLA, Maraging steels, creep resisting steels, Different types of Stainless steels, tooling materials such as hot work, cold work tool steels, high speed steel, cast iron.	06







K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

3.	<b>Non Ferrous Alloys:</b> Alloys of Copper, Aluminium, Magnesium, Titanium, Other alloys of lead, tin, zinc, nickel, manganese, white metals and bearing alloys.	06
4.	<b>Smart Materials:</b> Piezoelectric materials, Shape memory alloys and shape memory polymers, Magneto-strictive materials, pH-sensitive polymers, Halochromic materials, Chromogenic-systems, Ferro fluid, Rheological fluid, Processing and applications of different smart materials viz; aerospace, robotics, electronics, and medical devices.	06
5	<b>Magnetic Materials and Electronic materials:</b> Classification of Magnetic Materials, Magnetic Dipoles and Magnetic Moments, Magnetization, permeability and the magnetic field, Diamagnetic, paramagnetic, Ferromagnetic, Ferrimagnetic and Super magnetic Materials, Semiconductors and their applications.	06
6.	<b>Powder Metallurgy &amp; Material Selection:</b> Introduction to Powder Metallurgy and its applications. Relationship between material selection, material properties and material processing, Criteria for selection of engineering materials, Selection of materials for strength, toughness, fatigue and creep, Case studies in material selection.	06

**References –**

**Text Books:**

- V.D. Kodgire, Material Science and Metallurgy, Everest Publishers Pune.
- Ajit Behera, Advanced Materials, Springer.
- S. H. Avner, Physical Metallurgy, Tata McGraw-Hill publication.

**Reference Books:**

- William D. Callister, Materials Science and Engineering: An Introduction, John Wiley & Sons.
- WD. Callister, Materials Science and Engineering. Wiley India Pvt. Ltd.
- F.A.A. Cranes & J.A. Charles, Selection and Uses of Engineering Materials, Butterworth & Com. Ltd., London.
- James A. Jacobs & Thomas F. Kilduff, Engineering Material Technology Prentice Hall
- Smallman, A.H.W, R Physical Metallurgy and Advanced Materials Butterworth-Heinemann, Elsevier.
- Mark J. Hampden-Smith Wiley-VCH, Chemistry of Advanced Materials: An Overview, Wiley.





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**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
 To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class: <b>S. Y. B. Tech.</b>	Semester: <b>III</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Course Code: <b>MCMD201</b>	Course Name: <b>Fundamentals of Mechatronics</b>	<b>3</b>	<b>-</b>	<b>--</b>	<b>3</b>

**Course Description:**

This course aims at providing fundamental understanding about the basic elements of a mechatronics system, interfacing, and its practical applications.

**Course Learning Outcomes:**

After successful completion of the course, students will be able to,

1. Identify various elements of mechatronics systems.
2. Select appropriate sensor/Actuator/controller/control algorithm for different applications.
3. Develop PLC/ microcontroller-based applications.

**Prerequisite:** The students should have knowledge of basic electronics.

<b>Course Content</b>		
Unit No.	Description	Hrs.
1.	<b>Introduction:</b> Introduction to Mechatronics, Key elements of Mechatronics, Block diagram of mechatronics system, Control systems and Modes of control, Difference between traditional and concurrent design process.	02
2.	<b>Sensors and transducers:</b> <b>Transducers-</b> classification, Development in Transducer technology <b>Sensors -</b> Introduction, Need of Sensors, Classification, Working and Application of- Potentiometer Sensors, Strain Gauge Elements. Capacitive Elements, Eddy Current, Proximity Sensors, Inductive, Proximity Sensors, Light Sensors, Pressure Sensors, Pneumatic Sensors, Pyro electrical Sensors, Piezoelectric Sensors, Shaft Encoders. Selection of Sensors.	08
3.	<b>Drives and Actuators:</b> Introduction and Classification of Actuators. Need and Scope. Hydraulic Actuation systems – Linear, Single and Double Acting system, Pneumatic Actuation systems- Gear Motors and Vane Motors. Electrical Actuation Systems – solenoid type Devices, Stepper Motors, and Servo Motor. Selection of Actuators.	06
4.	<b>Controllers:</b> <b>PLC-</b> Introduction, definitions, PLC block diagram, Difference between	08







**K.E. Society's**  
**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

	Relay panel and PLC, Selection of PLC, Programming formats, Ladder logic programming. <b>Microcontroller and Microprocessor-</b> Introduction, Comparison of Microcontroller and Microprocessor, Architecture – Pin configuration of 8051 Microcontroller, Assembly programming	
5.	<b>Signal Conditioning:</b> Operational amplifier circuits, filtering circuits, Analog, and Digital signal conversion.	06
6.	<b>Advanced applications in mechatronics:</b> Mechatronics in automated manufacturing, Artificial intelligence in mechatronics, Fuzzy logic in mechatronics, Case studies of mechatronics systems.	06

**References -**

**Textbooks:**

- Mechatronics System Design, Devdas Shetty & Richard A. Kolk, PWS Publishing Company (Thomson Learning Inc.).
- Mechatronics: A Multidisciplinary Approach, William Bolton, Pearson Education.
- A Textbook of Mechatronics, R.K. Rajput, S. Chand & Company Private Limited
- Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, William Bolton, Prentice Hall.

**Reference Books:**

- Introduction to Mechatronics & Measurement System, David G. Alciatore, Michael B. Histan, McGraw Hill Education.





**K.E. Society's**  
**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class:- <b>S.Y. B. Tech.</b>	Semester- <b>III</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Course Code : AIMD201	Course Name : <b>Object Oriented Programming</b>	<b>3</b>	<b>--</b>	<b>--</b>	<b>3</b>

**Course Description:**

This course introduces object-oriented programming using the Java programming language. Students will learn how to program in Java and use some of its most important APIs. Special importance will be assigned to the object-oriented nature of Java and its use of polymorphism. Hands-on labs and exercises will enable students toward becoming highly skilled Java Application developers.

**Course Learning Outcomes:**

The course should enable the students to:

1. Understand the basic object oriented programming concepts and apply them in problem solving.
2. Illustrate inheritance concepts for reusing the program.
3. Implement program using loops, decision statements and functions in Python.
4. Plot data using appropriate Python visualization libraries.

**Prerequisite:** Basic Programming Skills

<b>Course Content</b>		
<b>Unit No</b>	<b>Description</b>	<b>Hrs</b>
<b>1</b>	<b>Oops Concepts and Java Programming</b> OOP concepts: Procedural and object oriented programming paradigm, Classes and objects, data abstraction, encapsulation, constructors, inheritance, polymorphism and overloading, Java programming: History of java, comments data types, variables, constants, scope and life time of variables, operators, control flow statements, arrays, console input and output, garbage collection, exploring string class.	<b>06</b>
<b>2</b>	<b>Multiple Inheritance, Interfaces and Packages</b> Inheritance: Inheritance hierarchies, super and subclasses, preventing inheritance, Polymorphism: dynamic binding, method overriding, Interface: Interfaces VS Abstract classes, implement interfaces, accessing implementations through interface references, Packages: Defining, creating and accessing a package, importing packages.	<b>06</b>
<b>3</b>	<b>Introduction to Python fundamentals:</b> Python introduction, Python syntax, Python comments, Python variables,	<b>06</b>







**K.E. Society's**  
**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

	Python data types, Python numbers, Python casting, Python strings, Python Booleans, Python operators.	
4	<b>Lists, Tuples, Sets, Dictionaries:</b> Access, change, add and remove list elements, loop lists, list comprehension, list methods, access, update, unpack tuples, loop tuples, tuple methods, Access, add, remove set items, set methods, access, add, change, remove dictionary items, nested dictionaries, dictionary methods.	06
5	<b>Python conditional statements:</b> If-else, while, for, lambda, arrays, Python Iterators, Python scope <b>Python classes and objects:</b> Classes, objects, parameterized and non-parameterized init constructor, object methods, self-parameter, association, aggregation and inheritance using python.	06
6	<b>Python for Machine Learning</b> Numpy, Pandas, Matplotlib and Seaborn,	06

**References -**

**Text Books:**

- Herbert Schildt and Dale Skrien, "Java Fundamentals – A comprehensive Introduction", McGraw Hill.
- Herbert Schildt, "Java the complete reference", McGraw Hill, Osborne.
- Charles Dierbach, "Introduction to Computer Science Using Python", Wiley India
- ReemaThareja, "Python Programming using problem solving approach", Oxford University press

**Reference Books:**

- P. RadhaKrishna, "Object Oriented programming through Java", CRC Press.
- Charles R. Severance, "Python for Everybody: Exploring Data Using Python 3", Shroff Publishers





K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class: S. Y. B. Tech Civil	Semester-III	L	T	P	Credits
Course Code: CE2234	Course Name: <b>Building Planning and Drawing Laboratory</b>	-	-	2	1

**Course Description:**

'Building Construction and Planning Laboratory' course intends to develop the building planning and designing skills of the students. The course gives an overview of construction project work through site visits. It also deals with preparation of submission and working drawings of a residential building using AutoCAD.

**Course Outcomes:**

After successfully completing the course, student will able to:

1. Design and draw the different types of staircases for a building using AutoCAD.
2. Prepare submission and working drawings of a residential building using AutoCAD.

**Prerequisite:** AutoCAD software skill.

Laboratory Content		
Expt. No.	Name of Experiment	Hrs.
1.	Compilation of different types of building drawings with giving their uses.	02
2.	Staircase design and drawing using AutoCAD.	02
3.	Visit to the completed construction site of a residential building and preparation of technical report based on it.	02
4.	Planning and design of a small residential building for the given requirements and preparation of the following drawings using AutoCAD. (Note: Students have to complete this project individually and independently.)	
	a) Municipal submission drawing.	06
	b) Working Drawings:	
	i. Centre line plan	02
	ii. Furniture layout	04
	iii. Plumbing layout	04
	iv. Electrical layout	02

**References:**

**Text Books: -**

- S. P. Arora, S.P. Bindra, "A Text Book of Building Construction", Dhanpat Rai Publications
- B. C. Punmia, "A Text Book of Building Construction", Laxmi Publications.







**K.E. Society's**  
**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

**References Books: -**

- V. B. Sikka, "A Course in Civil Engineering Drawing", S. K. Kataria and Sons.
- W.B Macay, "Building Construction", Pearson Education.
- S.Mantri, "The A to Z of Practical Building Construction and its Management", Satya Prakashan.
- C.M. Kale, M.G. Shah, S.Y. Patki, "Building Drawing And Planning With An Integrated Approach To Build Environment", Tata McGraw-Hill Education Pvt. Ltd.

**Codes of Practice :-**

- Unified Development Control and Promotion Regulations for Maharashtra State (UDCPR 2020), Urban Development Department, Government of Maharashtra.





K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class: S. Y. B. Tech. Civil	Semester: III	L	T	P	Credits
Course Code : CE2114	Course Name: Surveying Laboratory	-	-	2	1

**Course Description:**

The course equips students with theoretical and practical surveying knowledge and skills, relevant to the needs of construction industry and society. Before starting of any Civil Engineering project, surveying knowledge is very essential to a Civil Engineer. Surveying Lab is offered as the course in the first semester of second year engineering consists of practical's which focuses on the demonstrations of Levelling, Methods of Plotting Contours, Plane table techniques, Theodolite & tacheometry, Curve setting, setting out of structures in civil engineering.

**Course Outcomes:**

After successful completion of the course, students will be able to,

1. Determine the reduced levels by using dumpy level.
2. Measure the angular and linear measurements by using theodolite and tachometry.
3. Perform the setting out of the simple curves.
4. Prepare topographical map by using total station and software.

**Prerequisite:** Fundamentals of Basic Civil Engineering, Engineering Mathematics.

Laboratory Content		
Expt. No.	Name of Experiment	Hrs
1	Calculate the elevations by Rise fall and collimation plane method by using Dumpy Level.	2
2	Prepare map by using Radiation Method and Intersection Method of Plane Table Survey.	2
3	Measurement of area of map by using digital Planimeter.	2
4	Measurement of horizontal angle by Repetition method of Theodolite surveying.	2
5	Measurement of horizontal angle by Reiteration method of Theodolite surveying.	2
6	Measurement of Magnetic bearing and vertical angle by using Theodolite	2
7	Tacheometry: Determination of tachometric constants and grade of line	2
8	Setting out of Simple circular curves by Rankine's method	2
9	Demonstration on Measurements by using total station- Angle, Distance and Elevation.	2
10	Traversing or Map preparation by using total station and post procedure software's	2
11	Setting out of building plan on field.	2
12	<b>Project</b> Prepare the Contour map for given area by using total station	2







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**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

**References:**

**Reference Books:**

- Surveying: Theory and Practice by James M. Anderson, Edward M. Mikhail, Tata McGraw Hill.
- Principles of Surveying. Vol. I by J. G. Olliver, J. Clendinning – Van Nostrand Reinhold.
- Plane and Geodetic surveying for Engineers. Vol. I by David Clark, Constable.

**Text Books:**

- Surveying and Levelling by N. N. Basak , Tata McGraw Hill, New Delhi.
- Surveying Vol. I, II and III - Dr. B.C. Punamia, Laxmi Publishers. New Delhi.
- Surveying and Levelling Vol. I and II - T.P Kanetkar and S.V Kulkarni, Pune Vidhyarthi Gruh.
- Surveying Vol. I and II - S. K. Duggal, Tata McGraw Hill, New Delhi.
- Plane Surveying by A. M. Chandra, New Age International Publishers.





K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class: <b>S. Y. B. Tech. Civil</b>	Semester: <b>III</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Course Code : <b>CE2134</b>	Course Name: <b>Engineering Mechanics and Materials Testing Laboratory</b>	-	-	2	1

**Course Description:**

Engineering Mechanics Laboratory deals with performing experiments, interpreting results, and correlate theoretical and experimental results. This lab focuses verification of Laws of forces, principle of moment, Lami's theorem, and compare coefficient of friction. This course, also deals with the testing of various materials such as steel, different metals, bricks and structural elements.

**Course Outcomes:**

After successful completion of the course, students will be able to,

1. Verify law of polygon of forces, principle of moment, Lami's theorem.
2. Compare coefficient of friction of various surfaces in contact.
3. Correlate theoretical and practical results of support reactions and Centroid of plane lamina.
4. Analyze a simple truss.
5. Identify various types of stresses in various structural elements.
6. Determine various strengths of different construction materials

**Prerequisite:** Engineering Mathematics, Engineering Physics

Laboratory Content		
Expt. No.	Name of Experiment	Hrs.
1.	Verify Law of polygon of forces	02
2.	Verify principle of moment using Bell Crank Lever	02
3.	Support Reactions of simple beam and compound beam	02
4.	Verify Lami's Theorem, Equilibrium of connected bodies	02
5.	Compare value of coefficient of Friction for various contact surfaces	02
6.	Analysis of simple truss	02
7.	Centroid of plane & composite figures	02
8.	Tension test on Mild and HYSD steel.	02
9.	Impact test on different metals	02
10.	Water absorption & compression test on burnt brick.	02
11.	Flexural test on flooring tiles.	02
12.	Bending test on timber beam	02







K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

**References:**

**Text Books:**

- Bhavikatti S. S., Rajashekarappa, "Engineering Mechanics", New age International publication (India) Pvt. Ltd. New Delhi,
- S. Ramamrutham, "Engineering Mechanics", Dhanpat Rai Publishing Company Ltd., New Delhi.
- H. Shah and S. Junnarkar "Mechanics of Structures", Charotar Publishing House Pvt Limited, New Delhi.
- S. Ramamrutham "Strength of Materials", Dhanpat Rai Publishing Company (P) Limited, New Delhi.

**Reference Books:**

- S. Junnarkar, "Elements of Applied Mechanics", Charotar Publishing House (India) Pvt. Ltd., Anand (Gujarat)
- R. Vaidyanathan, P. Perumal, P. Lingeswari, "Mechanics of Solids and Structures", Scitech Publications Pvt. Ltd., Chennai.
- Ferdinand L. Singer, "Engineering Mechanics (Statics and Dynamics)" Publications (India) Pvt. Ltd. Noida.
- Timoshenko and Young, "Engineering Mechanics (Statics and Dynamics)", McGraw Hill Publication, New York.

**IS Codes:**

- IS:1608(2005), IS:432(Part-I)-1982(Reaffirmed 1995) Tensile Testing of Metals
- IS: 1598:1977 Method for Izod impact test of metals
- IS: 1499-1977 Method for Charpy Impact Test (U-notch) for Metals.
- IS:1237-2012 Cement Concrete Flooring Tiles
- IS:3495(Part1 to 4) 1992 Methods of Tests of Burnt Clay Building Bricks
- IS:1077-1992 Common Burnt Clay Building Bricks Specification
- IS:1708-1 to 18 (1986), IS:2408 Methods of testing of timber specimen





K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class: <b>S. Y. B. Tech Civil</b>	Semester-III	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Course Code: <b>CE233</b>	Course Name: <b>Building Interior Design &amp; Drawing</b>	-	-	2	1

**Course Description:**

Building Interior Design & Drawing' course intends to develop the building interior design & drawing skills of the students. The course gives an overview of building planning principles. It also deals with preparation of furniture, plumbing, electrification, flooring ceiling design and drawing of a residential building using AutoCAD.

**Course Outcomes:**

After successfully completing the course, student will able to:

1. Design and draw the furniture, plumbing and electrification details of a building using AutoCAD.
2. Design and draw the flooring and ceiling details of a building using AutoCAD.

**Prerequisite:** AutoCAD software skill, Building Planning and Design

<b>Laboratory Content</b>		
Expt. No.	Name of Experiment	Hrs.
1.	Introduction to principles of planning of a building and importance of interior design of a buildings.	02
2.	Furniture design and drawing of a building.	06
3.	Plumbing design and drawing of a building.	06
4.	Electrification design and drawing of a building.	04
5.	Flooring design and drawing of a building.	02
6.	Ceiling design and drawing of a building.	04

**References:**

**Text Books: -**

- S. P. Arora, S.P. Bindra, "A Text Book of Building Construction", Dhanpat Rai Publications
- B. C. Punmia, "A Text Book of Building Construction", Laxmi Publications.

**References Books: -**

- V. B. Sikka, "A Course in Civil Engineering Drawing", S. K. Kataria and Sons.
- W.B Macay, "Building Construction", Pearson Education.
- S.Mantri, "The A to Z of Practical Building Construction and its Management", Satya Prakashan.
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**K.E. Society's**  
**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class: <b>S. Y. B. Tech Civil</b>	Semester-III	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Course Code: <b>CE2154</b>	Course Name: <b>Technical Aptitude-I</b>	-	-	2	1

**Course Description:**  
Technical Aptitude-I consists of multiple choice questions based on the following courses.

1. Mathematics for Civil Engineer
2. Surveying
3. Engineering Mechanics
4. Building Planning and Design





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**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

**Choice Based Professional Skills Development and Foreign Languages Programme**  
for  
**Second Year B. Tech.**  
(Sem. III and IV)

**Professional Skills Development and Foreign Languages Courses**

1. Professional Leadership Skills (SH2634)
2. Interpersonal Skills (SH2614)
3. Innovation Tools and Methods for Entrepreneurs (SH2694)
4. Personal Effectiveness and Body Language (SH2594)
5. German Language - Level III (SH2734)
6. German Language - Level IV (SH2644)
7. Japanese Language - Level III (SH2714)
8. Japanese Language - Level IV (SH2624)

**\*An Important Notes:**

- *A student has to complete any two courses out of six choices offered under Choice Based Professional Skills Development Programme. A course in each semester will be allocated without any repetition.*
- *Foreign language course selected in F.Y. Sem-I will remain the same with next levels in Sem-III and IV. (No new entries in S.Y.B.Tech Sem.-III)*







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S. Y. B. Tech. Syllabus  
To be implemented for 2023-27 and 2024-28 NEP Batch  
Department of Civil Engineering

Class:- S.Y. B. Tech .	Semester-III/IV	L	T	P	Credits
Course Code : SH2634	Course Name : Professional Leadership Skills	-	-	2	1

**Course Description:** This course is one of various courses offered under Choice Based Professional Skills Development programme. This course guides those special students who want to be entrepreneurs and professional leaders. This course covers various aspects of Leadership which includes Team formation, conflict management, motivation and presentation skills.

**Course Outcomes:**

After successful completion of the course, students will be able to,

1. Explain the traits of a leadership through real life examples.
2. Exhibit the ability to work effectively in team.
3. Prepare a presentation as per the audience and context requirements.

**Prerequisite:** A Student, who is going to enroll for this course should have -

1. Adequate knowledge of basic grammar of English language.
2. Intermediate level vocabulary of English language.
3. Ability to communicate moderately in English.

Minimum 12 sessions will be conducted from the following list.

Course Content		
Experiment No	Description	Hrs
1.	<b>SMART Goal Setting, SWOT/C Analysis and Action Plan:</b> Discussion on Dos and Don'ts, Advantages, and Generation of the Document by Students and its Assessment	02
2.	<b>Assertiveness and Positive Thinking:</b> Types of Behaviour, Benefits of Being Assertive and Positive Thinking, Developing Positive Attitude, Case Studies and Presentations	02
3.	<b>Self Management:</b> Need of Self Management, Developing Self Acceptance, Steps of Self Management, Individual Classroom Activity and its Assessment	02
4.	<b>Leadership Styles and Change Management:</b> Introduction to Different Types of Leaderships, Effective Organizational Change Management, Individual Classroom Activity and its Assessment	02
5.	<b>Team Formation and Leading a Team-I:</b> Why Teams? Roles and Responsibilities in Teams, Strategies for Team Development, Barriers to Teams, Steps of Team Development	02
6.	<b>Team Formation and Leading a Team – II:</b> Case Studies of Teams and Student Presentations	02





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**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

7.	<b>Business Meetings and Decision Making – I:</b> Preparing for the Meeting, Role of Chairperson and Participants in Meetings	02
8.	<b>Business Meetings and Decision Making – II:</b> Mock Meetings, Decision Making Case Studies and Feedback	02
9.	<b>Conflict Management:</b> Types of Personalities, Possible Reasons of Conflicts at Work Place, Conflict Resolution Strategies, Conflict Management Case Studies and Feedback	02
10.	<b>Time Management:</b> Time Management Techniques, Introduction to Time Management Tools, Benefits of Time Management, Case Studies and Presentations	02
11.	<b>Presentation Skills – I:</b> Preparation, Types of Presentations - Informative, Instructional, Arousing, Persuasive, Decision-making, Presentation Tools	02
12.	<b>Presentation Skills – II:</b> Body Language, Managing Questions and Student Presentations Student Presentations and Feedback, Student Presentations and Feedback	02
13.	<b>Creative and Critical Thinking:</b> Approaches to Creative Thinking, Strategies for Creative Thinking, Characteristics and Strategies of Critical Thinking	02
14.	<b>Motivating People:</b> Types of Motivation, Components of Motivation, Steps in Keeping Motivation Level High	02

**References -**

1. Krishna Mohan and Meera Banerji; *Developing Communication Skills*, Macmillan India Ltd., New Delhi
2. Masters, L. Ann et al. *Personal Development for Life and Work*, New Delhi: Cengage Learning.
3. Jeff Butterfield, *Soft Skills for Everyone*, Cengage Learning India Private Limited.
4. John Seely, *Oxford Guide to Effective Writing and Speaking*; Oxford University Press.
5. UNLESH the power within... Soft Skills – Infosys Training Manual *Module 1 to 5* (Infosys Campus Connect Programme)

**Evaluation Scheme:** ISE – 100% (Minimum Passing: 50%)

**Evaluation Method:** In every session students will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.







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S. Y. B. Tech. Syllabus  
To be implemented for 2023-27 and 2024-28 NEP Batch  
Department of Civil Engineering

Class: - S. Y. B. Tech.	Semester-III/IV	L	T	P	Credits
Course Code : SH2614	Course Name : Interpersonal Skills	-	-	2	1

**Course Description:** This course offers the tips and techniques to lead a life full of success, prosperity and happiness by changing the current mind set to that of positive and harmonious thinking. It further teaches upon important aspects such as priorities in life, how to manage stress, teamwork , laws of nature , human body as a divine computer , power of mind etc.

**Course Outcomes:**  
After successful completion of the course, students will be able to,  
1. Exhibit interpersonal communication skills.  
2. Demonstrate decision-making skills.  
3. Apply conflict resolution styles appropriate in different situations.  
4. Demonstrate skills to manage balance in work and life.

**Prerequisite:** A Student, who is going to enroll for this course, should have following English language abilities:  
1. Adequate knowledge of basic grammar of English language.  
2. Intermediate level vocabulary of English language.  
3. Communicate moderately using English language.

Course Content		
Experiment No	Description	Hrs
1.	<b>Importance of Universal Laws of Nature in Human Life.-</b> Overview, scientific, universal, secular, usefulness in every walk and phase of life, overview of Universal Laws of Nature, determining factor in human life, important laws of nature and its influence on life of individual, family, society and world at large. wisdom, living life in tune with laws of nature	02
2.	<b>'You are the Architect of your Destiny'</b> - This unit will make you aware that none else but you alone are responsible and accountable for what you achieve in your life , freedom of decisions, choices to make up your future, guiding powers to make the choices in your life, achieving life full of health, wealth , success , peace and happiness for yourself and all	02
3.	<b>Setting and Achieving Goals –</b> Defining your own goals in life , Concept of power of mind , concepts of interaction of conscious and subconscious levels of mind, tips and techniques to harness the amazing power of subconscious mind to achieve goals, Visualization	02





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**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

	and auto-suggestion techniques, real life examples	
4.	<b>Work-life Balance</b> – What is means by work-life balance, priorities in life, time management, its importance, practical tips that enable to achieve work-life balance	02
5.	<b>Art of Harmonious Thinking.</b> – Importance , concept of harmonious thinking, Wishful Thinking, Positive Thinking, difference between Harmonious Thinking and Positive Thinking, powerful techniques to inculcate the habit of Harmonious Thinking, concept of Spiritual Thinking , Divine Universal Prayer – the life changer, Bless All technique, benefits of chanting the prayer	02
6.	<b>Spirituality in Day-to-day Life</b> – Concept of Love Work, 7 dimensions of Love Work, benefits us as individual, family, society and entire human race, important to be a good human being, usefulness to become successful, tools to apply the different 'Lifeskills ' in day-to-day life, simple but powerful and useful techniques such as attitude of gratitude , attitude of win-all	02
7.	<b>Human Values</b> – Ethics and Human values, difference in ethics and values, Qualities of human values	02
8.	<b>Communication Skills</b> – Ability to commendably read, write, speak and listen by conforming knowledge and presenting in a structured, cohesive fashion, Understanding and demonstrating workplace communication in the context of organization's business, understanding one's core skills for job	02
9.	<b>Interpersonal Skills</b> – Presenting interpersonal skills by amiable and respecting individuals, effective listening to stakeholders, bonding and developing rapport, Team success	02
10.	<b>Decision Making</b> – Importance of correct decision making, Analytical thinking / mind, Information processing ability, Making sound judgment and confident decision	02
11.	<b>Cross cultured sensitizations &amp; Adaptability</b> – Adapting multinational & multicultural environment, embracing diversity, culturally sensitive and bonding to colleagues and stakeholders, sense of belongings and promotion of unity at work place	02
12.	Evaluation of Students for their Understanding of Various Concepts Discussed.	02

**References -**

1. Spiritual Wisdom in Day-to-day life – Blogs by Mr. Pralhad Wamanrao Pai
2. Towards the goal of beautiful life – Book by Satguru Shri Wamanrao G. Pai
3. Power of your subconscious mind – Dr. Murphy
4. Seven people of highly effective people – Stephen Covey
5. How to win friends and influence people – Dale Carnegie
6. S. Hariharan, et al; *Soft Skills*, MJP Publishers, Chennai (2010)
7. Gopalaswamy Ramesh et al. *The ACE of Soft Skills: Attitude, Communication and*







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**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

*Etiquette for Success*, New Delhi: Pearson Education, 2012. Print.  
8. Masters, L. Ann et al. *Personal Development for Life and Work*, New Delhi: Cengage Learning, 2012. Print.

**Evaluation Scheme:** ISE – 100% (Minimum Passing: 50%)  
**Evaluation Method:** In every session students will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.





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**Rajarambapu Institute of Technology, Rajaramnagar**  
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**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class: - <b>S.Y. B. Tech.</b>	Semester-III/IV	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Course Code : <b>SH2694</b>	Course Name : <b>Innovation Tools and Methods for Entrepreneurs</b>	-	-	2	1

**Course Description:** This course helps students to identify different tools for developing the solution that student has already learned to ideate in the previous course “Creativity and Design Thinking”. Further, students get information about various tools to carry out competitor analysis and user journey map. It would help him to come up with detailed specifications and USP of the product based on the competitor survey.

**Course Outcomes:**

After successful completion of the course, students will be able to,

1. Explain structured approach to define the problem with every possible detail, identify conflicts and solve them
2. Apply User Journey Map to the selected problem to show user interaction at various stages
3. Analyze the solutions provided by competitors for effectiveness and gaps if any.

**Prerequisite:** A Student who is going to enroll for this course should have following abilities:

1. Creativity and Innovativeness
2. Problem identification
3. Apply design thinking approach to develop working prototype
4. Structured approach to problem solving

Minimum 12 sessions will be conducted from the following list.

<b>Course Content</b>		
<b>Experiment No</b>	<b>Description</b>	<b>Hrs</b>
1.	<b>Systematic Innovation:</b> Define the problem in depth with all details, Trend prediction, Modeling the problem to identify tradeoffs and contradictions	02
2.	<b>TRIZ:</b> Theory of Inventive problem solving (TRIZ), HIT Matrix, Scamper, Algorithms of brain storming and innovation, Functional analysis	02
3.	<b>Frugal and Disruptive Innovation:</b> Biomimicry and frugal innovation for prototyping, Disruptive innovation.	02
4.	<b>User Journey Map:</b> Map showing user interaction at every stage of product/service. Step-by step process of UJM creation	02
5.	<b>Competitor analysis:</b> Analysis of competitor and users for similar products, effectiveness of existing solutions and identifications of gaps	02







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**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
 To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

6.	<b>Product/Software Design Specifications:</b> Detailed specifications for better product design, detailed UI for software for clarity on user interaction, specify USPs of the product in comparison to the competitors	02
7.	<b>Business Canvas:</b> A. Definition of a Business Model B. The 9 Building Blocks: 1. Customer 2. Value Propositions 3. Channels, distribution, 4. Customer relationships 5. Revenue 6. Key Resources 7. Key Activities 8. Key Partnerships 9. Cost Structure	02
8.	<b>Design Thinking (Part I):</b> Customer Insights, Ideation, Visual Thinking.	02
9.	<b>Design Thinking (Part II):</b> A. Prototyping. B. Storytelling. C. Scenarios	02
10.	<b>Institutional arrangement for Entrepreneurship Development:</b> Institutional arrangement for Entrepreneurship Development – DIC, ITCOT, SIDCO, NSIC, SISI, TIIC, SIDBI, Commercial Banks	02
11.	<b>Project Report:</b> a) Economic Aspects b) Technical Aspects c) Financial Aspects d) Production Aspects e) Managerial Aspects	02
12.	<b>Investor Pitch Tool:</b> a) Introduction b) Helpful Tips about preparation, pitching and content sharing c) Does and Don'ts d) Introduction e) Problem f) Solution/Product/Service g) Traction h) Market Opportunities/ Size i) Competition j) Go To Market Strategies k) Financials l) Team	02
13.	<b>Revision -I</b>	02
14.	<b>Revision-II</b>	02





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**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

**References -**

1. J. Knapp. Design Sprint, Simon & Schuster Publisher.
2. D. Silverstein. The Innovator's Toolkit, Wiley Publishing House.
3. M. A. Orloff. ABC-TRIZ: Introduction to creative design thinking with modern TRIZ modeling, Springer Publication.
4. M. Laverty. Entrepreneurship, OpenStax Publication.

**Evaluation Scheme:** ISE – 100% (Minimum Passing: 50%)

**Evaluation Method:** In every session students will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.







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**Rajarambapu Institute of Technology, Rajaramnagar**  
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**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class: - S.Y. B. Tech.	Semester-III/IV	L	T	P	Credits
Course Code : SH2594	Course Name : Personal Effectiveness and Body Language	-	-	2	1

**Course Description:** This course is one of various courses offered under Choice Based Professional Skills Development programme. The course with its interactive and need based sessions helps students in knowing and managing self, set and pursue meaningful goals, and develop positive personal qualities for sustainability in today's global world.

**Course Outcomes:**

After successful completion of the course, students will be able to,

1. Develop skills to build self-esteem and positive attitude.
2. Develop interpersonal skills characterized by effective communication and conflict resolution.
3. Demonstrate responsiveness towards time, stress, and health issues.
4. Interpret the non-verbal behaviour of a person.

**Prerequisite:** A Student, who is going to enroll for this course, should have following English language abilities:

1. Adequate knowledge of basic grammar of English language.
2. Intermediate level vocabulary of English language.
3. Communicate moderately using English language.

Minimum 12 sessions will be conducted from the following list.

Course Content		
Experiment No	Description	Hrs
1.	<b>Self-awareness and Self Esteem</b> Meaning, Factors influencing self-esteem- environmental and social factors Developing self-esteem- strategies for building self-esteem	02
2.	<b>Goal Setting</b> Long term and short-term goals, Steps in goal setting (SMART)- - identify strategies - consider possible blocks and ways to deal with them - outline the steps - set deadlines	02
3.	<b>Self-Analysis</b> SWOT Analysis, who am I, Attributes, Importance of Self Confidence	02
4.	<b>Personality Typing</b> Extraversion, Introversion, Sensing, Intuition, Thinking, Feeling, Judging Perceiving	02
5.	<b>Life Skills for Personal Effectiveness</b> Values: Punctuality, Honesty, Loyalty, Dependability, Reliability- Application of Life Skills in day - to- day life - Life Skills for	02





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**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

	Adolescents and Youth	
6.	<b>Time Management</b> Strategies for effective time management (Principles, Planning, Identify & Control time stealers, Prioritize, Problems and Solutions, learn to say NO	02
7.	<b>Stress Management</b> Sources of stress, types, signs and symptoms of stress - positive aspects of stress - negative aspects of stress	02
8.	<b>Stress Management Techniques</b> Coping mechanisms, Deep Breathing Exercise, Meditation and Visual Imagery techniques, Muscle Relaxation, Peer Sharing, Emotional Intelligence	02
9.	<b>Decision-making</b> Definition, Informed Decision Making, Consequences of Decision Making and Models of Decision Making	02
10.	<b>Creative Thinking</b> Out-of-the box thinking, Stages of Creative Thinking, Factors hindering creative thinking, Characteristics of Creative thinkers	02
11.	<b>Interpersonal skills</b> Meaning, need to develop interpersonal skills, components of interpersonal skills, techniques to improve skills, benefits with real life examples/case studies	02
12.	<b>Art of Communication</b> Verbal & Non-Verbal Communication, 7Cs of Effective Communication Importance of Effective Communication	02
13.	<b>Body Language – I</b> Non-verbal codes: Kinesics, Proxemics	02
14.	<b>Body Language – II</b> Vocalics, Haptics, Appearance	02







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**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

**References -**

1. S. Hariharan, *Soft Skills*, MJP Publishers, Chennai.
2. Gopaldaswamy Ramesh, *The ACE of Soft Skills: Attitude, Communication and Etiquette for Success*, New Delhi: Pearson Education.
3. Jeff Butterfield, *Soft Skills for Everyone*, cengage Learning India Private Limited.
4. UNLESH the power within... Soft Skills – Infosys Training Manual *Module 1 to 5* (Infosys Campus Connect Programme)
5. Masters, L. Ann, *Personal Development for Life and Work*, New Delhi: Cengage Learning.
6. Covey, Stephen R., *Seven Habits of Highly Effective People: Powerful Lessons in Personal Change*
7. Barun K. Mitra, *Personality Development & Soft Skills*, Oxford Publishers, Third impression.

**Evaluation Scheme:** ISE – 100% (Minimum Passing: 50%)

**Evaluation Method:** In every session students will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.





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**Rajarambapu Institute of Technology, Rajaramnagar**  
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**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class: - S.Y. B. Tech.	Semester-III	L	T	P	Credits
Course Code : SH2734	Course Name : : German Language - Level III	-	-	2	1

**Course Description:** This course meets the requirements of student's overall personality development. The course helps the student in learning German as a foreign language. Vocabulary building activities, grammar, reading skills and basic conversational skills are addressed in this course.

**Course Outcomes:**

After successful completion of the course, students will be able to,

1. Interpret the language if the next person is speaking slowly and clearly.
2. Make use of the language in routine life with the routing topics like family, shopping, work etc.
3. Demonstrate the language by self-introduction in German with simple sentences.

**Prerequisite:** A Student, who is going to enroll for this course, should have following German language abilities:

1. Adequate knowledge of basic grammar of German language.
2. Intermediate level vocabulary of German language.
3. Communicate moderately using German language.

Course Content		
Experiment No	Description	Hrs
1.	Professions and their workplace Getting acquainted with different professions, usual tasks in particular profession , likes, dislikes etc.	02
2.	Job advertisements reading and understanding. To express oneself about his preferences for part time jobs. his likes and dislikes	02
3.	Short texts about finding jobs(for understanding the short paragraphs) & telephonic conversation Grammar- conjunctions and ,or, but (und ,oder ,aber)	02
4.	Grammar-Present Perfect Tense Exercises based on present perfect tense	02
5.	Present perfect tense with helping verb haben and sein. Difference between these two verbs and related exercises	02
6.	Vocabulary of clothes and conversation while buying the clothes	02
7.	Grammar- 'W' questions related to clothes(welche und diese ) Exercises related to welche und diese in nominative and accusativ	02







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**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

8.	Grammar- present perfect tense of separable and non-separable verbs	02
9.	Dativ verbs Exercises related to dativ verbs	02
10.	Dialog between shopkeeper and customer Personal Pronomen in Dativ	02
11.	Orientation in the shopping mall. Understanding the floors and information on notice boards.	02
12.	Revision of the grammar and doubts clearing	02
13.	Test and presentations assigned to students during semester	02

**References -**

1. Studio D – A 1, Cornelsen Verlag, Goyal Publishing House, New Delhi.
2. Tangram Aktuell – A 1, Goyal Publishing House, New Delhi.
3. Language A 1, Goyal Publishing House, New Delhi.
4. Network A 1, Goyal Publishing House, New Delhi.

The extra notes will be provided to the students to complete the required syllabus.

**Evaluation Scheme:** ISE – 100% (Minimum Passing: 50%)

**Evaluation Method:** In every session students will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.





K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class: - <b>S.Y. B. Tech.</b>	Semester- <b>III</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Course Code : <b>SH2714</b>	Course Name : <b>Japanese Language - Level III</b>	-	-	<b>2</b>	<b>1</b>

**Course Description:** This course is designed to introduce students to the everyday language of Japan. Lessons are organized around natural conversational topics, leading students from fundamental aspects of grammar to readings in simple texts.

**Course Outcomes:**

After successful completion of the course, students will be able to,

- 1) Make use of basic conversations in various situations.
- 2) Identify the sentence patterns.
- 3) Explain insights about the communication required for living in Japan.
- 4) Interpret Japanese work ethics required in their professional career.

**Prerequisite:** A Student, who is going to enroll for this course, should have following Japanese language abilities:

- 1) Knowledge of basic grammar of Japanese Language.
- 2) Communicate moderately using Japanese Language.

All the 15 lab sessions will be conducted to meet the needs of following content delivery.

<b>Course Content</b>		
<b>Experiment No</b>	<b>Description</b>	<b>Hrs</b>
<b>1</b>	Polite way of request for something, using ㇿ forms of the verbs.	<b>02</b>
<b>2</b>	Expressions used for offering to do something.	<b>02</b>
<b>3</b>	To ask for permission to do something.	<b>02</b>
<b>4</b>	Pattern used to express prohibition.	<b>02</b>
<b>5</b>	Use of ㇿ forms of the verbs to express sequence in action.	<b>02</b>
<b>6</b>	How to join two or more than two sentences together.	<b>02</b>
<b>7</b>	How to express something done after something.	<b>02</b>
<b>8</b>	Introduction of interrogative pronouns used to specify one item out of list of 2 or more than 2 things.	<b>02</b>
<b>9</b>	Rules for adjective – adjective combinations in one sentence.	<b>02</b>
<b>10</b>	How to make ㇿ forms of the verbs.	<b>02</b>







**K.E. Society's**  
**Rajarambapu Institute of Technology, Rajaramnagar**  
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**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

11	Use of ない forms of the verbs to ask or to tell someone not to do something.	02
12	Must do pattern using なければなりません。	02
13	How to make dictionary forms of the verbs.	02
14	Uses Potential form できる	02
15	How to express the hobby.	02

**\*Note:** Words written phonetically using the Latin alphabet (*romaji*) will be only used in the very initial stage to aid learning pronunciations.

**References -**

1. Minna No Nihongo I (3A Corporation, Japan), Publications: Goyal publishers.
  2. Nihongo shouhou, Publication: JALTAP
- Other reference material, practice papers & CDs for listening practice.  
The extra notes will be provided to the students as per the requirement of the syllabus.

**Evaluation Scheme:** ISE – 100% (Minimum Passing: 50%)

**Evaluation Method:** In every session students will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.





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**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class: S. Y. B. Tech. Civil	Semester: IV	L	T	P	Credits
Course Code : CE232	Course Name: <b>Strength of Material</b>	3	-	-	3

**Course Description:**

Structural Engineering is one of the important branches of Civil Engineering. It deals with the analysis and design of various structures. The analysis of structure includes evaluation of all the forces acting on a structural element and finding the corresponding stresses induced. This course, 'Strength of Material' deals with the evaluation of various stresses acting on a section, analysis of determinate beams, and strain energy stored in the body. This course will provide a much needed foundation for all the upcoming courses in the structural engineering stream.

**Course Outcomes:**

After successful completion of the course, student will be able to

1. Analyze the section for various types of stresses and strains.
2. Construct shear force and bending moment diagrams for determinate beams.
3. Determine stresses (bending, shear and torsional) developed in the beam cross section.
4. Evaluate strain energy stored in a body due to various loading conditions.

**Prerequisites:** Engineering Physics, Engineering Mathematics and Engineering Mechanics

Course Content		
Unit No.	Description	Hrs.
1.	<b>Simple Stresses, Strains and Elastic Constants:</b> Concept of stress and strain, Hooke's law, Stress-Strain behavior of materials, Deformations in composite sections under axial loading, compound bars and temperature stresses. Elastic constants and their relationships.	07
2.	<b>Principal Stresses:</b> Concept of principal planes and principal stresses, normal and shear stresses on an oblique plane, magnitude and orientation of principal stresses and maximum shear stress. Concept of Mohr's circle for plane stresses.	05
3.	<b>Shear Force and Bending Moment:</b> Concept of shear force and bending moment for determinate beams for various loadings. Relation between shear force, bending moment and loading. Shear force and bending moment diagrams for various boundary conditions and loadings.	06
4.	<b>Bending and Shear Stresses:</b> Bending Stresses: Theory of simple/pure bending. Derivation for flexure formula. Bending stress distribution diagrams. Moment of Resistance,	06







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**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

	flitched beam Shear Stresses: Derivation of shear stress equation, Shear stress distribution of various shapes cross-sections, average and maximum shear stress.	
5.	<b>Torsion:</b> Torsion of circular shafts: Theory of Torsion, assumptions, derivation of torsion formula. Stresses, strains and deformations in determinate shafts of hollow, solid subjected to twisting moments. Power transmitted through shafts.	06
6.	<b>Strain Energy:</b> Concept, expression of strain energy for axially loaded members under gradual, sudden and impact loads. Strain energy due to self weight, bending and torsion.	06

**References:**

**Text Books:**

- H. Shah, and S. Junnarkar, "Mechanics of Structures", Charotar Publishing House Pvt Limited, New Delhi.
- S. Ramamrutham, "Strength of Materials", Dhanpat Rai Publishing Company (P) Limited, New Delhi.

**Reference Books:**

- R. Vaidyanathan, P. Perumal, P. Lingeswari, "Mechanics of Solids and Structures", Scitech Publications Pvt. Ltd., Chennai.
- S. Timoshenko, "Strength of Materials Part-I: Elementary Theory and Problems", CBS Publishers.





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**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class: S. Y. B. Tech. Civil	Semester: IV	L	T	P	Credits
Course Code : CE2044	Course Name: Concrete Technology	2	-	-	2

**Course Description:**

Concrete Technology is one of the core courses offered at fourth semester of Civil Engineering undergraduate program and it comprises of six units. Concrete is a composite material and is considered to be the most widely used building material in the construction industry. The course 'Concrete Technology' has been so designed that its contents will give an overview about properties of different materials used for the manufacture of concrete and the role played by the materials in obtaining a good quality product called 'concrete'. The study of the course will help students understand the behavior of this versatile composite material from the stage of its design, manufacture to the stage of its placing in the actual field conditions. The course intends to build competency in the students to select appropriate materials (through testing) for making concrete, design concrete mixes of different grades, carry out lab as well as field tests on concrete (in fresh & hardened state) and orient them with qualitative aspects concreting process

**Course Outcomes:**

After successful completion of the course, students will be able to,

1. Explain properties of various materials used in the manufacture of different kinds of concretes and role played by them in developing strong, durable concretes.
2. Select materials for the manufacturing concretes for a given requirement.
3. Explain procedures for conducting various quality control tests on fresh and hardened concrete as per standard codes.
4. Design concrete mixes of given grade using mix design procedures recommended by IS and ACI codes of practices.

**Prerequisite:** Possess basic knowledge of structural components and construction activities.

Course Content		
Unit No.	Description	Hrs
1.	<b>Cement &amp; Water:</b> Properties of cement- Fineness, consistency, setting time, soundness, compressive strength, specific gravity. Field testing of cement. Hydration of cement. Types of cement. Water: Specifications of water as per IS 456.	04
2.	<b>Fine and Coarse Aggregates:</b> Grading, fineness modulus, and specific gravity, silt content, moisture content, Bulking, Bulk density, shape and surface texture.	04
3.	<b>Admixtures:</b>	04







K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

	<b>Chemical admixtures:</b> Types of admixtures and their effects properties of concrete, <b>Mineral admixtures:</b> Types of admixtures and their effects properties of concrete.	
4.	<b>Fresh Concrete:</b> Manufacturing process of good quality concrete. Workability of concrete and methods of measuring workability, Factors affecting workability, Segregation and bleeding, Temperature effects on fresh concrete.	04
5.	<b>Concrete Mix Design:</b> Nominal Mix Concrete, Objectives of mix design, Factors governing mix design, Methods of expressing proportions. Mix design by, IS code method as per 10262 & 456, ACI 211.1-91 method.	04
6.	<b>Hardened Concrete &amp; NDT:</b> Hardened Concrete: Strength of concrete, w/c ratio, Gel-space ratio, Effect of maximum size of aggregate, Factors affecting strength of concrete, Characteristic strength - compressive, tensile and flexure strength. Introduction to nondestructive testing of concrete. Introduction to durability of concrete.	04

**References:**

**Codes of Practice:**

- Bureau of Indian Standards IS: 10262-2019. Indian standard code of practice for recommended Guidelines of Concrete Mix Design plain and reinforced concrete. New Delhi, BIS.
- Bureau of Indian Standards IS 456: 2000. Indian standard code of practice for plain and reinforced concrete. New Delhi, BIS.
- Bureau of Indian Standards IS 1199: 1959. Indian standard code of methods of sampling and analysis of concrete. New Delhi, BIS.
- ACI 211.1-91.
- Handbook on Concrete Mixes SP 23: 1982, 2001.

**Text Books:**

- Gambhir, M.L. (2005). Concrete Technology, Tata Mc Graw-Hill Publishing Company Limited, New Delhi.

**Reference Books:**

- Mehta, P. K. and Monteiro, P.J. M. (2006). Concrete Microstructure, Properties and Materials. Third Edition, Mc Graw Hill Publications, NY.
- Santhakumar, A.R. (2009). Concrete Technology, Published by Oxford University Press, New Delhi.
- Shetty, M.S. (2008). Concrete Technology, Multicolor Illustrative Edition, S. Chand & Company Ltd., New Delhi.





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**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class: <b>S. Y. B. Tech. Civil</b>	Semester: <b>IV</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Course Code: <b>CE2064</b>	Course Name: <b>Fluid Mechanics</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>2</b>

**Course Description:**

Fluid mechanics is the branch of physics that studies the mechanics of fluids (liquids and gases) and the forces on them. Fluid mechanics has a wide range of applications, including for civil engineering, mechanical engineering, chemical engineering, geophysics, astrophysics, and biology. Fluid mechanics consists of fluid static, the study of fluids at rest and fluid dynamics, the study of the effect of forces on fluid motion.

**Course Outcomes:**

After successful completion of the course, students will be able to,

1. Analyze different physical properties of fluid.
2. Calculate various forces acting on submerged and floating bodies.
3. Discriminate fluid kinematics and fluid dynamics.
4. Illustrate flow through pipe and flow through open channels.
5. Analyzes dimensional homogeneity using Buckingham's  $\pi$  theorem

**Prerequisites:** Engineering Mathematics, Basic civil Engineering

Course Content		
Unit No.	Description	Hrs
1.	<b>Fundamental Concepts of Fluid Flow:</b> Introduction to Fluid mechanics, Properties of fluid (density, unit weight, specific surface, surface tension, capillarity), Pascal's law and its applications, Newtons law of viscosity, Classification of fluids.	04
2.	<b>Fluid Statics:</b> Fluid pressure: Absolute, atmospheric, gauge and vacuum pressures, Pressure head, Pressure measuring devices, hydrostatic forces on submerged surfaces (horizontal, vertical and inclined surface)	04
3.	<b>Fluid Kinematics &amp; Fluid Dynamics:</b> Displacement, velocity and acceleration of fluid particles, Continuity equation, Introduction to: rotational and irrotational flow, velocity potential and stream function flow net. Euler's equation, Bernoulli's equation.	04
4.	<b>Flow Through Pipes:</b> Head loss: Concept of major and minor head loss, Darcy-Wisbech equation for determination of major loss, determination of minor losses, pipes connected in series and parallel, concept of equivalent pipe.	04
5.	<b>Flow Through Open Channels:</b> Hydraulically efficient channel cross sections (rectangular, trapezoidal, circular) concept of specific energy, subsequent depths, subcritical and	04







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**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

	supercritical flow in rectangular channels.	
6.	<b>Dimensional Analysis, Similitude and Pumps:</b> Dimensional homogeneity, Buckingham's $\pi$ theorem, important dimensional numbers and their significance, geometric, Kinematic, and dynamic similarity, Pumps, types of pumps, efficiency, characteristics of pumps, head calculations, engineering application of pump.	04

**Text Books:**

- Modi, P.N. and Seth, S.M., Hydraulics and Fluid Mechanics Including Hydraulics Machines. Rajsons Publications Pvt. Ltd.
- Bansal, R. K. A textbook of fluid mechanics. Firewall Media.
- Pritchard, P.J. and Mitchell, J.W. Fox and McDonald's introduction to fluid mechanics. John Wiley & Sons.

**Reference Books:**

- Jain, A. K. Fluid Mechanics: Including Hydraulic Mechanics. Khanna Publishers.
- Khurmi, R. S. "Hydraulics and Hydraulic Mechanics" S. Chand & Company Ltd. New Delhi.
- J. Lal, "Fluid Mechanics and Hydraulics" Metropolitan Book Co. Ltd.
- Y.A. Cingel L.M. Oimbala, Fluid Mechanics (SI Units)", Tata McGraw Hill.
- R.S. Rajput, "Hydraulic & Hydraulic Mechanics" S. Chand & Company Ltd. New Delhi.





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**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class: <b>S. Y. B. Tech. Civil</b>	Semester: <b>IV</b>
Course Code : <b>CE234</b>	Course Name: <b>Water resources and Irrigation Engineering</b>

L	T	P	Credits
3	-	-	3

**Course Description:**

This course is designed to provide students with a comprehensive understanding of water management and irrigation practices. Throughout the course, students will explore the processes involved in surface water and groundwater hydrology, addressing the aspects such as runoff, hydrographs, and groundwater movement. Furthermore, students will learn about different irrigation methods suitable for various crops. By the end of this course, students will have gained a strong foundation in water resources and irrigation engineering, enabling them to address real-world challenges in water management effectively.

**Course Outcomes:**

After successful completion of the course, students will be able to,

1. Analyze the intricate processes involved in the water cycle and its impact on the distribution of water resources.
2. Utilize advanced techniques to evaluate and interpret rainfall data for making well-informed decisions in water management.
3. Develop and assess various irrigation methods tailored to the specific water requirements and efficiency of different crops.
4. Evaluate the structural stability criteria for gravity dams and identify potential vulnerabilities in earthen dam constructions.
5. Apply statistical flood estimation methods to determine flood discharge and devise effective flood control measures.

**Prerequisite:** Engineering Physics

Course Content		
Unit No.	Description	Hrs
1.	<b>Introduction to hydrology:</b> Hydrological cycle and its components; Precipitation-types and forms, measurement, analysis of Precipitation data, mass rainfall curves, intensity-duration curves, and concept of depth area duration analysis, frequency analysis. Evaporation and evapotranspiration- factors affecting and measurement methods.	06
2.	<b>Surface water hydrology:</b> Runoff- factor affecting, Rainfall runoff relationship Hydrograph: Component parts of hydrograph, Storm hydrograph, Base flow and Separation of base flow, direct runoff hydrograph, Unit hydrograph, theory, assumptions limitations and use, concept of S-curve hydrograph.	08
3.	<b>Ground water hydrology:</b>	04







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**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

	Occurrence of ground water Zones of underground water, Infiltration - factors affecting and measurement methods movement of ground water and its velocity.	
4.	<b>Irrigation engineering:</b> Irrigation methods and their efficiencies. Crop water requirement: Principal crops and crop seasons in India, Classes and availability of soil water, Duty, delta, base period and their relationship, factors affecting duty, methods of improving duty, Assessment and efficiency of irrigation water. Gross command area, cultural command area and command area calculations based on crop water requirement. Depth and frequency of irrigation.	06
5.	<b>Dam reservoirs:</b> Types of dams, selection of site for dams, selection of type of dam, Control levels. Gravity dam: Component parts, Forces acting on dam. Stability requirements Earthen dam: Component parts, Construction and types of earthen dam, plotting of phreatic line, Modes of failure, seepage control measures.	07
6.	<b>Canals and Canal Regulatory Works:</b> Types, alignment, typical sections of canals, balancing depth Kennedy's and Lacey's silt theories, canal lining-purpose, types, selection and economics. C.D.Works: Necessity, Types. Canal Regulatory Works: head regulator, cross regulator, canal fall, canal escape, standing wave flume.	05

**References:**

**Reference Books:**

- S. K. Garg, Irrigation engineering Vol I. Khanna Publication, Delhi.
- Dr. K. Subramanya, Engineering Hydrology, Tata McGraw Hill, New Delhi.
- Dr. P Jaya Rami Reddy, Hydrology, Laxmi Publications, New Delhi.
- Dr.H. M. Raghunath, Engineering Hydrology, New Age International Publishers.
- R.K.Sharma, Hydrology and water resources, Dhanpatrai and sons, New Delhi.
- A M Michael, Irrigation Theory and practice, Vikas Publications House.
- Varshney Gupta and Gupta, Theory and design of irrigation structures vol. I and II and II, Newchand and Brothers.
- Savindar Singh, Fundamentals of hydrology, Pravalika Publishers Allahabad.





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(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class: <b>S. Y. B. Tech. Civil</b>	Semester-IV	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Course Code: <b>CE236</b>	Course Name: <b>Highway Engineering</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>2</b>

**Course Description**

Transportation plays important role in the development of the country. Efficient road, railway and air transport network is essential to cater the increased need of the passengers and goods trips. Study of this course imparts knowledge for road transportation, traffic survey, materials used for road & quality control, pavement design, highway construction & maintenance

**Course Outcomes:**

After successful completion of the course, students will be able to,-

1. Design the geometric components of highway.
2. Determine traffic volume for design of road.
3. Perform different tests on highway materials.
4. Design the highway pavement.
5. Explain about construction and maintenance of highways.

**Prerequisites:** Nil

**Course Content**

Unit No.	Description	Hrs.
1.	<b>Highway Alignment and Geometric Design:</b> Introduction to highway engineering, highway alignment and factors controlling, IRC, different highway plans, PPP, criteria for geometric design, cross sectional element , Sight distance requirements, super elevation, radius of horizontal curves, extra widening, Horizontal curves, design of vertical alignment, gradient and its type, grade compensation on vertical curves	06
2.	<b>Traffic Engineering:</b> Traffic studies on flow, speed, travel time - delay and O-D study, PCU, peak hour factor, parking study, accident study and analysis, signal design by Webster's method; Types of intersections and channelization; Highway capacity and level of service of rural highways and urban roads	03
3.	<b>Highway Materials &amp; Quality Control:</b> Aggregate properties for different layers of road, pavement quality concrete, bitumen and Tar- origin, properties of bituminous road binders, CBR, bituminous emulsions and cutback - preparation, characteristics uses and tests, bituminous mix design.	04
4.	<b>Flexible pavement design:</b>	04







K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

	Elements of flexible, Concept of IRC charts, design factors , design of flexible pavement using IRC: 37-2018,	
5.	<b>Rigid pavement design:</b> Elements of rigid pavements, design factors, Stresses, dowel & tie bars, design of rigid pavement using IRC: 58-2015	04
6.	<b>Highway construction and maintenance:</b> Construction methods, equipments used, work process, maintenance of highways	03

**References**

**Reference Books:**

- Khanna, S.K., Justo C.E.G. and Veeraragavan A., Highway Engineering, Tata McGraw Hill Education
- Yang, H. Huang, Pavement Analysis and Design, Pearson Education.

**Codes of Practice:**

- IRC 37 (2018), Guidelines for the Design of Flexible Pavements, Indian Roads Congress, New Delhi, 4<sup>th</sup> Edition.
- IRC 58 (2015), Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, Indian Roads Congress.
- MoRTH (2013), Specification for Road and Bridge Works, Ministry of Road Transport and Highways, 5<sup>th</sup> Revision.



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*Autonomous Institute, affiliated to Shivaji University, Kolhapur*  
**S. Y. B. Tech. Syllabus**  
 Prepared for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
नाम : मराठी भाषिक विकास	2	-	-	2

व्यक्तिमत्व विकासामध्ये विद्यार्थ्यांस भाषा, साहित्य आणि कला घेणे आजची गरज बनली आहे. जीवनाच्या परिपूर्ण आकलनामध्ये आणि मध्ये भाषिक तसेच साहित्यिक क्षमता अडीच लागणे आवश्यक झाले आहे. या विद्यार्थी भाषा आणि व्यक्तिमत्व विकास यातील सहसंबंध समजून घेईल. विविध भाषा आणि भाषा उपायोजनाची विविध आविष्कार रूपे यांची ओळख या अभ्यासक्रमाद्वारे करेल. तसेच विद्यार्थी कथा आणि एकांकिका या मराठी साहित्य प्रकारातील लिखाणांचे स्वरूप शकेल.

**अभ्यासक्रम शिकण्याचे परिणाम:**

- अभ्यासक्रम यशस्वीपणे पूर्ण केल्यानंतर विद्यार्थी खालील क्षमता प्राप्त करेल:
१. भाषा आणि व्यक्तिमत्व विकास यांमधील सहसंबंध स्पष्ट करू शकेल
  २. भाषिक कौशल्यविकास करू शकेल
  ३. कथा या मराठी साहित्य प्रकाराचे विश्लेषण करू शकेल
  ४. एकांकिका या मराठी साहित्य प्रकाराच्या विश्लेषणाची क्षमता प्राप्त करेल

**पूर्वतयारी:** विद्यार्थ्यांनी मराठी भाषिक मूलभूत कौशल्य - ऐकणे, बोलणे, वाचन, आणि लेखन आत्मसात केलेली असावीत. तसेच, भाषिक कौशल्य विकासाची स्वयंप्रेरणा विद्यार्थ्यांमध्ये असावी.

अभ्यासक्रम वर्णन		
घटक	तपशील	तास
१.	भाषा आणि व्यक्तिमत्व विकास: सहसंबंध भाषिक कौशल्यविकास - नैसर्गिक: आकलनासह श्रवण	०४
२.	भाषिक कौशल्यविकास - अर्जित : संभाषण, वाचन, लेखन, इ-संवाद कौशल्य प्रगत: सारांशलेखन, सारग्रहण	०४
३.	भाषा उपयोजनाची विविध आविष्कार रूपे संवादलेखन, कल्पनाविस्तार, घोषवाक्य लेखन, भाषांतर	०४
४.	कथा : स्वरूप, घटक, आणि प्रकार (रचनाप्रकार आणि प्रवाह) एकांकिका : स्वरूप, घटक, संहितामूल्य व प्रयोगमूल्य	०४
५.	समकालीन मराठी कथा: १. लाल चिखल - भास्कर चंदनशिव २. कष्टाची भाकरी - सचिन पाटील	०४
६.	मराठी एकांकिका: विठ्ठल तो आला आला - पु. ल. देशपांडे	०४







**K.E. Society's**  
**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

**संदर्भ ग्रंथ -**

१. मराठी साहित्य : प्रेरणा आणि स्वरूप, संपादक डॉ. गो. मा. पवार, डॉ. म. द. हातकणंगलेकर, पॉप्युलर प्रकाशन, १९८६.
२. साहित्यमूल्य आणि अभिरुची, डॉ. गो. मा. पवार, साकेत प्रकाशन,
३. कथा : संकल्पना आणि समीक्षा, सुधा जोशी, मौज प्रकाशन, २०००.
४. व्यावहारिक मराठी, पुणे विद्यापीठ प्रकाशन, पुणे.
५. व्यावहारिक आणि उपयोजित मराठी, डॉ. मनोहर रोकडे, स्नेहवर्धन प्रकाशन,
६. मराठी भाषेची संवाद कौशल्ये (पुस्तक क्र. १ ते ८) य. न. म. मुक्त विद्यापीठ, नाशिक.
७. मराठी कथा : विसावे शतक, संपादक के. ज. पुरोहित, सुधा जोशी, मॅजेस्टिक प्रकाशन.
८. समकालीन मराठी कथा , (संपादक) डॉ. शिरीष लांडगे, डॉ. दिलीप पवार, डॉ. संदीप सांगळे. अक्षरबंध प्रकाशन, पुणे, २०१९.
९. मराठी भाषा उपयोजन आणि सर्जन, प्रा. सुहासकुमार बोबडे
१०. मराठी एकांकिका (विठ्ठल तो आला आला - पु. ल. देशपांडे, हंडाभर चांदण्या- दत्ता पाटील) सांपादक प्रा. डॉ. शिरीष लांडगे, प्रा. डॉ. बाळकृष्ण लळीत, प्रा. डॉ. भास्कर ढोक, पद्मगंधा प्रकाशन, पुणे, २०१९.
११. मराठी एकांकिका तंत्र व विकास, श्री. रं. भिडे, सुपर्ण प्रकाशन, पुणे.
१२. एकांकिका विचार आणि सर्वोत्तम एकांकिका, जयंत पवार व इतर, नेहरू सेंटर प्रकाशन, मुंबई १९९३.





K.E. Society's  
Rajarambapu Institute of Technology, Rajaramnagar  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
S. Y. B. Tech. Syllabus  
To be implemented for 2023-27 and 2024-28 NEP Batch  
Department of Civil Engineering

Class: - S. Y. B. Tech.	Semester-IV	L	T	P	Credits
Course Code : SH204	Course Name : हिंदी कथा साहित्य एवं प्रयोजमूलक हिंदी	2	--	--	2

**पाठ्यक्रम परिचय**

हिन्दी भारतीय आर्य भाषा परिवार की भाषा है। संस्कृत भाषा से लेकर पालि प्राकृत, अपभ्रंश आदि सोपानों से गुजरती हुई आज संपूर्ण भारत की संपर्क भाषा बन गई है। हिन्दी भाषा का विकास अन्तःक्षेत्रीय भाषा, राष्ट्रभाषा, राजभाषा और अन्तर्राष्ट्रीय भाषा के रूप में हो रहा है। हमारे जन-जीवन, सामाजिक, सांस्कृतिक संप्रेषण ज्ञान-विज्ञान और सृजनात्मक साहित्य की भाषा के रूप में विकसित हिन्दी भाषा हमारी ही नहीं अपितु पूरे विश्व की शिक्षा व्यवस्थाओं में महत्वपूर्ण स्थान प्राप्त कर चुकी हैं। इसी का परिणाम है कि हिन्दी भाषा अपने देश में मातृभाषा प्रथम भाषा, दूसरी भाषा आदि रूपों में पढ़ी और पढाई जा रही है तथा यह भारत से बाहर अनेक देशों में भी अध्ययन और अध्यापन हो रहा है। स्वतंत्रता प्राप्ति के बाद सन् 1952 में हिन्दी भाषा को भारत की राजभाषा होने का गौरव प्राप्त हुआ। उत्तर प्रदेश, हिमाचल प्रदेश, हरियाणा, राजस्थान, मध्यप्रदेश, बिहार, उत्तरांचल, झारखंडता इत्तीसगढ़ राज्यों और दिल्ली एवं अंडमान सत्य राज्य-क्षेत्रों में शासन और शिक्षा की भाषा हिन्दी ही है। हम इस पाठ्यक्रम में हिंदी भाषा के इतिहास के साथ आधुनिक काव्य कहानी तथा व्यवहारिक हिंदी से परिचित कराएंगे

**पाठ्यक्रम सीखने के प्रतिफल (Course Learning Outcomes:)**

पाठ्यक्रम के सफल पूर्वक अध्ययन समाप्ति के बाद.....

1. विद्यार्थियों में मानवीय संवेदनाओं के विकास के साथ नवीन सामाजिक सांस्कृतिक बोध और जीवन मूल्यों का विकास होगा।
2. विद्यार्थियों में साहित्य के माध्यम से कलात्मक गुणों की अभिवृद्धि होगी कला की साहित्यिक विधाओं के प्रति अभिरुचि जागृत होगी तथा रचनात्मक कौशल्य को बढ़ावा मिलेगा।
3. विद्यार्थियों में नए वैश्विक मूल्यों के प्रति सजगता को बढ़ावा मिलेगा एवं मूल्यवादी दृष्टि के प्रति दायित्व बोध उत्पन्न होगा। छात्र व्यवहार में हिंदी भाषा का उचित प्रयोग कर सकेंगे।
4. छात्र व्यवहार में हिंदी भाषा का उचित प्रयोग कर सकेंगे।

**Prerequisite:** मूलभूत हिंदी भाषा बोलना समझना और लिखना





पाठ्यक्रम विवरण		
इकाई नंबर		घंटे
1.	<b>आधुनिक काव्य साहित्य</b> 1. वह तोड़ती पत्थर: सूर्यकांत त्रिपाठी 'निराला' 2. कोशिश करने वालों की हार नहीं होती: मोहनलाल द्विवेदी 3. एक और युद्ध: ओमप्रकाश वाल्मीकि	04
2.	<b>कहानी साहित्य:</b> 1. भगत की गत: हरिशंकर परसाई 2. कफन: प्रेमचंद 3. पंचलाइट: कनिस्वरनाथ रेणु	04
3.	<b>प्रयोजन मूलक हिंदी</b> 1. प्रयोजन मूलक हिंदी अर्थ परिभाषा स्वरूप 2. पारिभाषिक शब्दावली के रूप में 50 प्रति शब्दों की सूची संलग्न 3. अनुवाद: अर्थ स्वरूप परिभाषा महत्व	04
4.	<b>कार्यालयीन एवं व्यवसायिक पत्रलेखन:</b> 1. कार्यालयीन पत्र कार्यालय आदेश, कार्यालय ज्ञापन, कार्यालय परिपत्र, व्यवसायिक पत्र: 2. आवेदन (रिक्त पद, अवकाश) पूछताछ, क्रयादेश 3. शिकायती पत्र (सार्वजनिक)	04
5.	<b>जनसंचार माध्यम और हिंदी</b> 1. दूरदर्शन स्वरूप विकास उपयोगिता भाषा 2. इंटरनेट का स्वरूप विकास अनुप्रयोग 3. यूट्यूब स्वरूप विकास महत्व 4. वीडियो कॉन्फ्रेंस स्वरूप प्रक्रिया एवं उपयोग	04
6.	<b>हिंदी लेखन</b> 1. फीचर लेखन 2. पटकथा लेखन 3. रेडियो वार्ता लेखन	04

**संदर्भ ग्रंथ:**

१. अनुवाद के रूपरेखा डॉ सुरेश कुमार
२. अनुवाद के भाषिक पक्ष: विभा गुप्ता
३. भाषा प्रौद्योगिकी एवं भाषा प्रबंधन: सूर्य प्रकाश दीक्षित
४. प्रयोजनमूलक हिंदी प्रयुक्ति और अनुवाद: डॉ. माधव सोनतक्के
५. भारतीय काव्यशास्त्र: डॉ. योगेंद्र प्रताप सिंह
६. आधुनिक हिंदी साहित्य में व्यंग्य: वीरेंद्र मेहंदीरता
७. कार्यालय दीपिका हरिबाबू कंसल
८. आधुनिक पत्रकारिता डॉ अर्जुन तिवारी





K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class: <b>S. Y. B. Tech.</b>	Semester: <b>IV</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Course Code: <b>ATMD202</b>	Course: <b>I. C. Engines</b>	<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>

**Course Description:**

This course describes the fundamentals of internal combustion engines used in automotive and allied application. The effect of operation and design of internal combustion engines on their performance, efficiency, fuel requirements, and environmental impact is studied. Topics include thermodynamics of engine processes, engine fluid flow; fuel systems in SI and CI engines, combustion, heat transfer and friction phenomena and engine performance such as power, efficiency are studied under this course. Students examine the design features and operating characteristics of different types of internal combustion engines wise spark-ignition, compression ignition engines.

**Course Outcomes:**

After successful completion of the course, students will be able to,

1. Perform a primary thermodynamic analysis of Otto and diesel cycle engines.
2. Select appropriate engine for specific application.
3. Select proper fuel system for IC engine.
4. Conduct performance test of IC engine and portray operating characteristics of engine.
5. Identify abnormal combustion in engine and remedy over it.
6. Select proper lubrication, intake, exhaust, cooling system for engine.

**Prerequisite:** Applied Thermodynamics, Fluid Mechanics and Machinery, Theory of Machines, Heat Transfer.

**Course Content:**

Unit No.	Description	Hrs.
1.	<b>I. C. Engine types and applications</b> Engine nomenclature and classification, Valve and Port timing diagram, Engine selection, Engine Cycles, fuel-air cycle, Actual cycle,	06
2.	<b>Engine Performance</b> Performance parameters and its measurement, Heat balance, IS codes of engine testing, Heat rejection and cooling, Air cooling, liquid cooling, Numerical on Performance.	06
3.	<b>Fuel Supply System S.I. Engine</b> Carburetion, Gasoline injection, Electronic fuel injection system, Engine ECU- Operation and programming, Numerical on simple carburetor and gasoline injection system.	06
4.	<b>Fuel supply system for C I Engine</b> Requirements & types of Fuel injection pumps, injectors, Governor, Common rail and Electronic injection system, Engine ECU- Operation and programming, Numerical on Fuel injection pumps, injectors and CRDI.	06







K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

<b>5.</b>	<b>Combustion</b> Combustion in S. I. Engine, Stages, Abnormal combustion, Control of abnormal combustion, Combustion chambers, Stages of combustion in CI engine, Abnormal combustion, Control over abnormal combustion, Combustion chambers for CI engines	<b>06</b>
<b>6.</b>	<b>Induction and Exhaust System</b> Air intake system, filters & manifolds, Mufflers and resonators, Supercharging, Turbocharging, Scavenging of two stroke and four stroke engines, Engine Friction and Lubrication, Pumping and blow by losses, Lubricating systems	<b>06</b>

**References-**

**Text Books:**

- John b Heywood, Internal Combustion Engine, Tata McGraw Hill Publication.
- V. Ganeshan, I C Engine, Tata McGraw Hill Publication.

**Reference Books:**

- E. F. Obert, I.C. Engine & Air Pollution, Harper & Row Publishers.
- SAE, Automotive Handbook, Bosch.





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**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class: <b>S. Y. B. Tech.</b>	Semester-IV	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Course Code: <b>CEMD202</b>	Course Name: <b>Building Estimation and Valuation</b>	<b>3</b>	<b>--</b>	<b>--</b>	<b>3</b>

**Course Description:**

Building Estimation and Valuation course intends to develop the proficiency and confidence of the students so that they can prepare estimate of different civil engineering structures. The students will be able to analyze the rate of different building items. Thus, by studying this course, students will be more comfortable to prepare different bills on construction site.

**Course Outcomes:**

After successful completion of the course, student will be able to,

1. Explain the types and basic requirements of the estimate.
2. Explain measurement sheet, abstract sheet, and detailed specifications of different construction items.
3. Prepare detailed estimate of load bearing structure and framed structure.
4. Prepare rate analysis and bar bending schedule of different construction items.
5. Explain the tenders and contracts.
6. Describe basic terms of valuation.

**Prerequisite:** Unit conversions and the fundamental information of different construction materials with their rates.

Course Content		
Unit No.	Description	Hrs.
1.	<b>Introduction SSR:</b> General introduction to Quantity surveying, Purpose of estimates, Types of Estimates- Approximate and Detailed, Various items to be included in estimates of building, road and culvert with their modes of measurement, I.S. 1200, Prime cost, Provisional sums , Provisional quantities, Administrative approval and technical sanction to estimates. Introduction to S.S.R., General notes and guide lines.	06
2.	<b>Specifications:</b> Specification- purpose and types, General specifications for different class of buildings, Detailed specifications of building items like PCC, RCC, brick and stone masonry, plastering, flooring. Measurement sheet, Abstract sheet, Long wall-short wall and center line method for finding quantities and problems.	06







**K.E. Society's**  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

3.	<b>Detailed estimate of building, road and culvert:</b> Detailed estimate of load bearing structures and RCC structures.	06
4.	<b>Rate Analysis and Schedule of Reinforcement:</b> Importance of rate analysis, Factors affecting the cost of materials, labour, Task work, Transports, Overhead charges, market rates of various materials, labours. Rate analysis preparation of PCC, RCC, brick and stone masonry, plastering, pointing, flooring. Preparation of bar bending schedule for isolated footings, pile footings, beams, columns, slabs, staircase, lintel, chajja.	06
5.	<b>Introduction of Tender and Contracts:</b> Tender- Notice, Documents, Procedure and Types, Contract- Types, Conditions, Earnest money, Security deposit, Validity period, Defect liability period, Liquidated and liquidated damage, Arbitration, Escalation of cost, Daily reports maintained on site.	06
6.	<b>Valuation:</b> Definition, Necessity, Cost, Price, Value, Types of values, Depreciation and obsolescence, Sinking fund, Methods of calculating depreciation, Annuity, Year purchase, Land valuation, Methods of land and building valuation, Methods of valuation, Freehold and leasehold property, types of lease, Mortgage, Mortgage deed and Precautions, Problems based on valuation.	06

**References –**

**References Books: -**

- B. N. Dutta, "Estimating and Costing in Civil Engineering", USB Publishers, Distributors Pvt. Ltd. Delhi-110 002.
- M. Chakroborty, "Estimating, Costing, Specification and Valuation in Civil Engineering", USB Publishers, Bhabananda Road, Kolkata-700026.
- B. S. Patil, "Civil Engineering Contracts and Estimates", Universities Press Private Ltd. Hyderguda, Hyderabad. 500029, (A.P), India.
- S. C. Rangwala, "Elements of Estimating and Costing", Charotar Publishing House - opposite Amul dairy, court Road Anand. 388001.India

**I. S. Code:-**

- Updated I. S. 1200
- Updated S. S. R.





K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class: - <b>S. Y. B. Tech</b>	Semester – <b>IV</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Course Code: <b>CSMD202</b>	Course Name: <b>Problem Solving using JAVA</b>	<b>2</b>	<b>-</b>	<b>2</b>	<b>3</b>

**Course Description:**

This course introduces object-oriented programming using the Java programming language. Students will learn how to program in Java and use some of its most important APIs. Special importance will be assigned to the object-oriented nature of Java and its use of polymorphism. Hands-on labs and exercises will enable students toward becoming highly skilled Java Application developers.

**Course Learning Outcomes:**

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

1. Understand the basic object oriented programming concepts and apply them in problem solving.
2. Apply concept of inheritance for code reusability.
3. Develop Programs using multithreading.
4. Develop data-centric applications using JDBC.
5. Design the basics of java console and GUI based programming

**Prerequisites:** Concepts of C programming language

<b>Course Content</b>		
<b>Unit No.</b>	<b>Description</b>	<b>Hrs.</b>
<b>1</b>	<b>OOPS Concepts and Java Programming:</b> OOP concepts: Classes and objects, data abstraction, encapsulation, inheritance, polymorphism, Java programming: History of java, comments data types, variables, constants, scope and life time of variables, operators, operator hierarchy, expressions, type conversion and casting, enumerated types, control structure, simple java standalone programs, arrays, console input and output, formatting output, constructors ,methods, parameter passing, static fields and methods, access control, this reference, overloading methods and constructors, recursion, garbage collection.	<b>05</b>
<b>2</b>	<b>Interfaces and Packages:</b> Interface: Interfaces VS Abstract classes, defining an interface, implement interfaces, accessing implementations through interface references,	<b>04</b>







K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

	extending interface; Packages: Defining, creating and accessing a package, understanding CLASSPATH, importing packages.	
3	<b>Exception Handling and Multithreading:</b> Exception Handling: Benefits of exception handling, the classification of exceptions, exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, re-throwing exceptions, exception specification, built in exceptions, creating own exception sub classes. Multithreading: Differences between multiple processes and multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronizing threads, inter thread communication.	04
4	<b>Files Handling:</b> Files: streams, byte streams, character stream, text input/output, binary input/output, random access file operations, file management using file class.	03
5	<b>Connecting to Database:</b> Introduction of different types of driver's for database connectivity, querying a database and processing the results, updating data with JDBC.	04
6	<b>GUI Programming:</b> GUI Programming with Java: The AWT class hierarchy, introduction to swing, swings Vs AWT, hierarchy for swing components. Containers: JFrame, JApplet, JDialog, JPanel, overview of some swing components: JButton, JLabel, JTextField, JTextArea, simple applications. Layout management: Layout manager types, border, grid and flow.	04

It should consist of minimum 10 experiments based on the syllabus and experiment list mentioned below.

Course Content		
Exp. No.	Description	Hrs.
1.	Implement Arrays, Control and Looping Statements	02
2.	Implement Access Control and Inheritance	02
3.	Implement Polymorphism, Abstraction and Inner class	02
4.	Implement Static and this keyword	02
5.	Implement Creating package for Custom Exception Interfaces and Vectors	02
6.	Implement Class, Object, String classes	02
7.	Implement Multithreading in Java	02
8.	Implement File System interaction	02





K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

9.	Implement GUI Design using AWT	02
10.	Implement GUI Design using Swing	02

**References -**

**Text Books:**

- Herbert Schildt and Dale Skrien, "Java Fundamentals – A comprehensive Introduction", McGraw Hill, 2013.
- Herbert Schildt, "Java the complete reference", McGraw Hill, Osborne, 2011.
- T.Budd, "Understanding Object- Oriented Programming with Java", Pearson Education, 1999.

**Reference Books:**

- P. J. Dietel and H. M. Dietel, "Java How to program", Prentice Hall, 2005.
- P. RadhaKrishna, "Object Oriented programming through Java", CRC Press, 2007.
- S. Malhotra and S. Choudhary, "Programming in Java", Oxford University Press, 2014.







K.E. Society's  
**Rajarambapu Institute of Technology, Rajaramnagar**  
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class:- <b>S. Y. B. Tech.</b>	Semester- <b>IV</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Course Code : <b>EEMD202</b>	Course Name : <b>Power System</b>	<b>3</b>	<b>--</b>	<b>-</b>	<b>3</b>

**Course Description:**

The power system comprises of generation, transmission and distribution of electric power. This course covers economics of power generation using different types of generating sources. Different types of loads in power system, Moreover, this course covers importance of power factor in power system and different types of tariffs. Overview of transmission and distribution systems.

**Course Outcomes:**

After successful completion of the course, students will be able to,

1. Write the basic working principles of different generating sources.
2. Analyze different types of loads
3. Explain importance of power factor and tariffs in power system.
4. Identify various components in power transmission and distribution system.
5. Select substation equipments as per requirement.

**Prerequisite:** Basic Electrical Engineering, Basic Mathematics and Physics.

<b>Course Content</b>		
Unit No	Description	Hrs
1	<b>Power Generation :</b> Structure of power system, generating stations – operation and working of conventional and nonconventional energy sources. Comparison between them	06
2	<b>Variable load on power stations:</b> Load curves and types of loads – base and peak loads, cost of electrical energy, depreciation and its methods.	06
3	<b>Power factor and Electric Tariff:</b> Power triangle, power factor and causes of low power factor and methods of power factor improvement. Tariff and its characteristics.	06
4	<b>Electrical and Mechanical Design of Transmission lines:</b> Construction of transmission lines and its components, line resistance, inductance and capacitance. Sag and its calculation, String efficiency	06
5	<b>Supply systems:</b> AC and DC transmission systems and comparison. Overhead and underground system, Construction of cables and types.	06
6	<b>Substation:</b> Classification of substations, outdoor and indoor substations. Symbols for equipments in substations and their functions	06





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**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

**References -**

**Text Books:**

- V.K Mehta, Principles of Power Systems, S. Chand
- Ashfak Husain, Electrical Power System, CBS Publication

**Reference Books:**

- S.Sivanagaraju and S. Satyanarayana Electric Power Transmission and Distribution, Pearson
- W.D. Stevenson (Jr.), Elements of Power System Analysis, McGraw Hill International







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(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
S. Y. B. Tech. Syllabus  
To be implemented for 2023-27 and 2024-28 NEP Batch  
Department of Civil Engineering

Class:- S.Y. B. Tech.	Semester- IV	L	T	P	Credits
Course Code : ECMD202	Course Name: Electronics Communication Systems	3	-	-	3

**Course Description:**

Analog and Digital Communication are the fundamental and core subjects in Electronics and Telecommunication Engineering. The course provides knowledge of basic principles of communication, modulation and demodulation techniques, transmission and reception methods in analog as well as digital communication.

**Course Learning Outcomes:**

- After successful completion of the course, students will be able to,
1. Describe different communication systems.
  2. Explain applications of analog and digital modulation techniques.
  3. Analyze different modulation and demodulation techniques.
  4. Explain the use of satellite communication.

**Prerequisite:** Fundamental concepts of engineering and Mathematics

Course Content		
Unit No	Description	Hrs
1.	<b>Amplitude Modulation &amp; Demodulation</b> Electromagnetic spectrum, Introduction to communication system, Need for modulation. Amplitude Modulation, Definition, Time domain and frequency domain description, power relations in AM waves. Generation of AM waves, Detection of AM Waves.	06
2.	<b>Frequency Modulation &amp; Demodulation</b> Introduction of FM, Description of systems, Mathematical representation of FM, Frequency Spectrum of FM wave, Phase modulation, Intersystem comparisons, Pre-emphasis and de-emphasis, Generation of Frequency Modulation and Demodulation methods, Angle Modulation.	06
3.	<b>Radio Receivers</b> Function of AM receiver, receiver parameters: Sensitivity, Selectivity, Dynamic Range, Tracking, Fidelity, Receiver Types- Tuned Radio Frequency(TRF) receiver, AM Receiver- RF section, Mixer, IF Frequencies and Amplifiers, FM Receivers- Common circuits, Comparison with AM receivers, Amplitude Limiting.	06
4.	<b>Digital Modulation Techniques</b> And Data Formats Data Formats, ASK, FSK, PSK, coherent and non-coherent reception, BPSK, DPSK, QPSK, 16-QAM, MSK, Waveforms and Comparison of digital modulation	06





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**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

<b>5.</b>	<b>Satellite Communication:</b> Basic concepts of Satellite Communications, Satellite subsystems, Satellite Link design, Orbital Mechanics,	<b>06</b>
<b>6.</b>	<b>Satellite Application:</b> DBS, VSAT, GPS, Case Studies – Mars Mission, Chandrayan.	<b>06</b>

**Text Books:**

- K.Sam Shanmugan, Digital & Analog Communication Systems, Wiley India
- RP Singh, S D Sapre, Communication System-Analog & Digital, Tata Mc-Graw Hill
- Kennedy, Davis, Electronics Communication Systems, Tata McGraw Hill

**Reference Books:**

- Bernard Sklar, Digital Communication-Fundamentals and Applications, Pearson Education
- Tomasi, Electronic Communication Systems Pearson Education.
- Taub, Schilling, Principles of communication systems, Tata McGraw Hill.
- Louis E Frenzel, Communication Electronics Principles & Applications, Tata McGraw Hill







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**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class:- <b>S.Y. B. Tech</b>	Semester- <b>IV</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Course Code : <b>CIMD202</b>	Course Name : <b>Computer Algorithms</b>	<b>3</b>	<b>--</b>	<b>--</b>	<b>3</b>

**Course Description:**

This course introduces students to the design of computer algorithms, as well as analysis of sophisticated algorithms. It contains design and analysis of algorithms to solve wide variety of problems including searching, sorting and graph algorithms. It covers various techniques that can be used to solve new problems you face, like divide and conquer, greedy algorithms, dynamic programming etc.

**Course Learning Outcomes:**

After successful completion of the course, students will be able to,

1. Analysing asymptotically the performance of algorithms.
2. Compare and analyse searching and sorting algorithms.
3. Apply different algorithm design techniques to solve problems like job sequencing, knapsack, TSP, finding shortest path etc.
4. Apply backtracking method to solve problems like N-queens, graph coloring, sum of subsets etc.
5. Describe computational complexity theory to classify computational problems according to their inherent difficulty.

**Prerequisite:** Basic knowledge of Mathematics

<b>Course Content</b>		
<b>Unit No</b>	<b>Description</b>	<b>Hrs</b>
<b>1.</b>	<b>Introduction</b> Introduction, Characteristics of algorithm, Pseudocode conventions, Recursive algorithms, Performance analysis – time and Space complexity, asymptotic notations..	<b>05</b>
<b>2.</b>	<b>Searching and Sorting Methods</b> Linear Search, Binary Search, Bubble sort, Quick Sort, Merge Sort, Selection Sort, Insertion sort, Radix Sort, Bucket Sort. Divide and Conquer- General method, Finding the maximum and minimum, Strassen's matrix multiplication.	<b>07</b>
<b>3.</b>	<b>Greedy Method</b> General method, Knapsack problem, Job sequencing with deadlines, Minimum-cost spanning trees – Prim's And Kruskal's algorithms, Optimal storage on tapes, Single source shortest paths.	<b>05</b>





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**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

<b>4.</b>	<b>Dynamic Programming</b> General method, Multistage graphs, All pair shortest paths, 0/1 Knapsack problem, Reliability design, Traveling sales person problem.	<b>07</b>
<b>5.</b>	<b>Backtracking</b> General method, n-Queens problem, Subset sum problem, Graph coloring problem, Travelling sales person problem.	<b>06</b>
<b>6.</b>	<b>Introduction to Complexity Theory</b> The P and NP Classes, Polynomial, time reductions, NP- Hard and NP-Complete classes. NP-Hard graph problems- Clique decision problem, Vertex cover problem, Travelling sales person decision problem, Randomized algorithms.	<b>06</b>

**References -**

**Text Books:**

- Ellis Horowitz, Satraj Sahani, Saguthevar Rajasejaram, "Fundamentals of Computer Algorithms", Universities Press.
- Cormen, Thomas H., Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms" The MIT Press.

**Reference Books:**

- Sara Baase & Allen VanGelder "Computer Algorithms: Introduction to Design & Analysis", Addison Wesley.
- Alfred V. Aho , "The design and analysis of computer algorithms", Addison-Wesley Pub.







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**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class:- <b>S.Y. B. Tech.</b>	Semester-IV	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Course Code :MEMD202	Course Name : <b>Design and Drawing of Machine Components</b>	<b>3</b>	<b>--</b>	<b>--</b>	<b>3</b>

**Course Description:**

Design and Drawing of Machine Component is offered as the multidisciplinary minor course at the fourth semester of Engineering undergraduate program and consists of six chapters. The first chapter focuses on Free hand sketches and representation of assembly drawing, the second chapter deals with limits, fits, tolerances and production drawing. The third chapter deals with Basic design procedure, requirement of machine element and material selection. Design of machine elements against static loading like knuckle joint, Design of shaft, keys is dealt with in the fourth chapter. The next chapters' deal with Design of Spur Gear and Selection of bearing. Last chapter emphasizes on design of component subjected to fluctuating load.

**Course Outcomes:**

- After successful completion of the course, students will be able to,
1. Produce the production drawing of simple mechanical assemblies.
  2. Design the machine components subjected to static loading.
  3. Design of spur gear and selection of roller bearing.
  4. Design a components against fluctuating load.

**Prerequisite:**

The students should have knowledge of basic principles of science. They should have knowledge of fundamentals of Engineering Graphics.

<b>Course Content</b>		
<b>Unit No</b>	<b>Description</b>	<b>Hrs</b>
<b>1.</b>	<b>Assemblies of basic mechanical components:</b> Importance of sketching, Introduction to basic mechanical components Nuts, bolts, couplings, pulleys, belt, shaft, gear, spring etc. Free hand sketches of types of nuts, bolts, couplings and pulleys. Details and assembly drawing of Screw jack, Tools post of center lathe.	<b>06</b>
<b>2.</b>	<b>Production drawing:</b> Limits, Fits and Tolerances ISO system of tolerance, Tolerance charts, Hole - base and shaft -base system of tolerance, Types of fits, symbols and applications. Geometric Tolerances: Introduction, Nomenclature, Rules, Symbols. Surface Roughness & Production Drawing.	<b>06</b>
<b>3.</b>	<b>Design procedure of machine components:</b> Introduction: Engineering Design and classification, Basic design procedure,	<b>06</b>





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*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

	requirement of machine element, standards and codes, State of stresses, Theories of elastic failure, Classification of engineering materials, selection of materials.	
4.	<b>Design against static loading:</b> Design of knuckle joint, Design of solid & hollow shafts, transmission shafts, Design of keys.	06
5.	<b>Gear and bearing:</b> Types of gears, Terminology of gear, force analysis, Spur gear design based on beam strength and wear strength criteria. Types of bearings, Terminology of bearing, Selection of roller bearing from manufacturer's catalogue.	06
6.	<b>Design for Fluctuating Load:</b> Stress concentration-causes & remedies, fluctuating stresses, fatigue failure, S-N curve, Endurance limit, Notch sensitivity, Endurance strength, modifying factors, reversed stresses. Design for finite & infinite life, Soderberg & Goodman diagram, Modified Goodman diagram, Fatigue design of components under combined stresses such as shaft.	06

**References –**

**Text Books:**

- P. S. Gill, Machine Drawing, S. K. Kataria & Sons.
- V. B. Bhandari, Design of Machine Elements, New Edition Tata Mc-graw hill.

**Reference Books:**

- Machine Design Integrated approach by Robert L. Norton.
- PSG Design data Book
- Machine Design by Pandya Shah.
- Design of Machine Element by M. F. Spotts.
- Mechanical Analysis & Design by H. Burr & Cheata







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**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class: <b>S. Y. B. Tech.</b>	Semester: <b>IV</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Course Code: <b>MCMD202</b>	Course Name: <b>Industrial Fluid Power</b>	<b>3</b>	<b>-</b>	<b>--</b>	<b>3</b>

**Course Description:**

Fluid power has the highest power density of all conventional power-transmission technologies. Learn the benefits and limitations of fluid power, how to analyse fluid power components and circuits, and how to design and simulate fluid power circuits using Automation Studio for applications.

In this course, you will be introduced to the fundamental principles and analytical modelling of fluid power components, circuits, and systems. You will learn the benefits and limitations of fluid power compared with other power transmission technologies; the operation, use, and symbols of common hydraulic & pneumatic components; how to formulate and analyse models of hydraulic & pneumatic components and circuits; and how to design and predict the performance of fluid power circuits.

**Course Outcomes:**

After successful completion of the course, students will be able to,

1. Describe the structure and function of common hydraulic and pneumatic components such as cylinders, valves, pumps, and motors etc.
2. Model and analyze common hydraulic and pneumatic components such as cylinders, valves, pumps, and motors.
3. Create & simulate basic hydraulic and pneumatic circuit diagrams for different applications.
4. Design, develop & analyze simple hydraulic and pneumatic systems for given task.

**Prerequisite:** Fundamental concepts of fluid mechanics, basic electrical engineering, and engineering mechanics.

<b>Course Content</b>		
<b>Unit No.</b>	<b>Description</b>	<b>Hrs.</b>
<b>1.</b>	<b>FLUID POWER SYSTEMS AND FUNDAMENTALS</b> 1. Introduction to fluid power, Advantages of fluid power. 2. Application of fluid power system. 3. Types of fluid power systems, Properties of hydraulic fluids, General types of fluids. 4. Fluid power symbols. (ISO/JIC) 5. Use of Automation studio to draw circuits.	<b>06</b>
<b>2.</b>	<b>HYDRAULIC SYSTEM AND COMPONENTS (PUMPS and ACTUATORS)</b>	<b>06</b>





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*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
 To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

	1. Pumping theory, Pump classification. 2. Gear pump, Vane Pump, construction and working of pumps, pump performance, piston pump 3. Variable displacement pumps. 4. Linear hydraulic actuators, Types of hydraulic cylinders, Single acting, Double acting cylinders. 5. Special cylinders like tandem, Rod less, Telescopic - Construction and application. 6. Cushioning mechanism, Mounting of actuators 7. Rotary actuators - Gear, Vane and Piston motors.	
	<b>HYDRAULIC VALVES, ACCUMULATORS AND CIRCUITS</b> 1. Directional control valve 4/2, 4/3, 5/3-way valves. 2. Shuttle valve check valve 3. Pressure control valve, 4. Flow control valve (Fixed and adjustable) 3. 5. Electrical control solenoid valves 6. Types of accumulators, Accumulators circuits 7. Intensifier Circuit and Application, 8. Speed control circuits, synchronizing circuit and industrial application circuits copying circuit and press circuit, regenerative circuit.	06
	<b>PNEUMATIC SYSTEMS, COMPONENTS AND CIRCUITS</b> 1. Properties of air Compressors. 2. Filter, Regulator, and Lubricator Unit 3. 4. Air control valves, Quick exhaust valves and pneumatic actuators 4. Pneumo-hydraulic circuit 5. Time delay circuits 6. Sequential circuit design for simple applications using cascade method.	06
	<b>FLUID LOGIC CONTROL SYSTEM</b> 1. Hydro Mechanical servo systems. 2 Electro-hydraulic and Electro-pneumatic systems and proportional valves 3. Electro-hydraulic and Electro-pneumatic systems and proportional valves 4. Introduction to fluidic devices, simple circuits 5. PLC applications in fluid power control 6. Failure and troubleshooting in fluid power systems 8. Pneumatic positioning and servo systems, air hydro boosters.	06
	<b>HYDRAULIC/PNEUMATIC CIRCUIT DESIGN</b> 6. 1. Steps in hydraulic circuit design, and simulation using Automation Studio. 2. Steps in pneumatic circuit design, and simulation using Automation Studio.	06

**References -**

**Textbooks:**

- Fluid Power, Anthony Esposito, Prentice Hall Publications.
- Industrial Hydraulics and Pneumatics, Stewart
- Industrial Hydraulics and Pneumatics, H.P. Garg.
- Oil Hydraulic Systems: Principles and Maintenance by S. R. Mujumdar.

**Reference Books:**

- Industrial Hydraulics, Vickers Handbook.
- Hydraulics-Basic level TP501 handbook by FESTO.







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(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

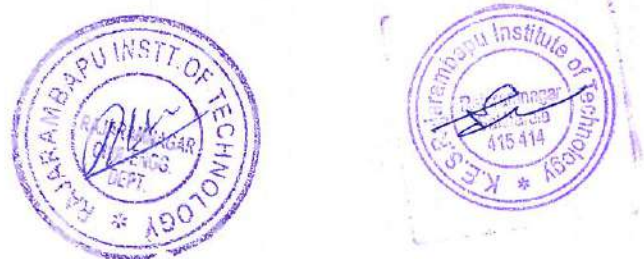
Class:- <b>S.Y. B. Tech.</b>	Semester- <b>IV</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Course Code : <b>AIMD202</b>	Course Name : <b>Data structure &amp; Algorithms</b>	<b>3</b>	<b>--</b>	<b>--</b>	<b>3</b>

**Course Description:**  
The Data Structures and Algorithms course is a comprehensive study of fundamental concepts and techniques essential for efficient problem-solving in computer science. Students will explore various data structures, including arrays, linked lists, stacks, queues, trees, graphs, and hash tables, and learn how to analyze their time and space complexity. The course extensively explores the design and analysis of algorithms, encompassing various topics such as sorting, searching, and graph traversal. Emphasis is placed on understanding algorithmic paradigms and their applications. Through programming assignments and theoretical exercises, students will gain practical experience in implementing algorithms and solving real-world problems. This course serves as a foundation for algorithmic thinking and prepares students for advanced computer science topics.

- Course Outcomes:**  
The course should enable the students to:
1. Compare between linear and nonlinear data structures
  2. Describe the characteristics of various data structure such as stacks, queues, trees, graphs and Hash tables.
  3. Analyze various searching and sorting algorithms and apply it to solve particular problem.
  4. Determine a suitable data structure and algorithm to solve a real world problem

**Prerequisite:** Basic knowledge of C programming, Knowledge of basic mathematical concepts

Course Content		
Unit No	Description	Hrs
1	<b>Introduction to Data Structures:</b> Primitive and non-primitive data structures, Operations on data structures, Algorithms, Abstract Data Types, Complexity Analysis	05
2	<b>Linear Data Structures:</b> <b>Stack:</b> Definition, Representation and Applications of Stack. <b>Queue:</b> Definitions, Representation and Applications of Linear Queue, Circular Queue, and Priority Queue.	06
3	<b>Linked Lists:</b> Definition, Representation, Operations and Applications of singly linked list, doubly linked list, circular linked list, Application of linked list-Stack & queue, Introduction to Sparse matrix, representation of sparse matrix using linked list.	07





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*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

<b>4</b>	<b>Searching ,Sorting and Hashing Techniques :</b> Linear search, Binary search, Bubble sort, insertion sort, Merge sort, Quick sort, Selection sort, Radix sort, Heap sort, Complexity of algorithms <b>Hashing:</b> Definition, Hash functions, Overflow, Collision, Open Hashing, closed hashing, Rehashing Techniques.	<b>07</b>
<b>5</b>	<b>Trees:</b> Basic Technology, Binary Tree, Traversal methods, Binary search tree, AVL Tree, B tree, B+ tree, Heaps - operations and their applications.	<b>06</b>
<b>6</b>	<b>Graphs:</b> Basic concepts of graph theory, Storage representation, Operations on graphs, Traversing a graph, Shortest path algorithm.	<b>05</b>

**References -**

**Text Books:**

- Data structures -- Seymour Lipschutz (MGH) Schaum's Outlines.

**Reference Books:**

- Data structures and Algorithms -- Alfred V. Aho, John E. Hopcroft, J. D. Ullman (Addision- Wesely Series)
- Introduction to Data Structures in C – Ashok N. Kamthane (Pearson Education).







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(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class: <b>S. Y. B. Tech. Civil</b>	Semester-IV
Course Code: <b>CE2184</b>	Course Name: <b>Concrete Technology Laboratory</b>

L	T	P	Credits
-	--	2	1

**Course Description:**

Concrete Technology Laboratory is one of the core laboratory courses offered at fourth semester of S. Y. B. Tech. Civil undergraduate program. The course comprises of six parts. The first two parts focus on determination of properties of various ingredients of concrete. The third part deals with application of mix design concepts of concrete mixes to produce concretes of required workability, strength and durability. The fourth part consists in performing various tests on produced concrete when it is in plastic stage. The testing of hardened concrete specimen and /or elements of structure to determine their strength and durability properties is covered in fifth and sixth parts respectively. This also includes non-destructive, semi destructive and destructive tests on hardened concrete specimen. This laboratory course will help students to gain hands on experience in performing various tests on concrete specimen as well as elements of concrete structures following standard guidelines and evaluate the quality of concrete.

**Prerequisite:** The prerequisite for this course is to have the basic knowledge of different materials or ingredients of concrete.

**Course Outcomes:**

After successful completion of the course, students will be able to,

1. Explain standard procedures for testing properties of various ingredients of concrete and concrete mixes/specimens
2. Perform tests on ingredients of concrete and on fresh and hardened concrete to determine their properties using standard procedures
3. Design the concrete mix for a given grade of concrete using guidelines of IS code
4. Evaluate the quality of concrete specimens / elements using NDT equipment

Laboratory Content		
Expt. No.	Name of Experiment	Hrs.
1.	<b>Tests on Cement</b> a) Fineness, Sp. Gravity, Consistency, Initial and Final setting time, Soundness test b) Compressive Strength Test	4
2.	<b>Tests on Fine and Coarse Aggregates</b> a) <b>Fine Aggt:</b> Sieve Analysis, Sp. Gravity, Bulk Density, Water Absorption, Moisture Content, bulking of sand, silt content b) <b>Coarse Aggt.:</b> Sieve Analysis, Sp. Gravity, Bulk Density, Water Absorption, Moisture Content, Flakiness and Elongation Index	4





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**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

3.	<b>Concrete Mix Design:</b> IS Code method of mix design	2
4.	<b>Tests on Fresh Concrete:</b> <b>Workability Tests:</b> Slump, Flow, VeBe Consistometer (with and without chemical admixtures)	4
5.	<b>Tests on Hardened Concrete:</b> Compressive Strength on Cube & Cylinder, Flexural Test, Split Tensile Strength Test.	4
6.	<b>Non Destructive Tests:</b> Rebound Hammer, UPV, Concrete Scanner, Carbonation test	2
7	<b>Visit to a concrete construction site/ Plant.</b> Viz. Building construction, Road construction, Bridge construction, Dam construction, Cement manufacturing plant, RMC plant, Stone crushers etc.	2

**References –**

**Reference Books:**

- Gambhir, M.L. (2005). Concrete Technology, Tata Mc Graw-Hill Publishing Company Limited, New Delhi.
- Bureau of Indian Standard (1970) IS: 383-1970. Indian standard specification for coarse and fine aggregates from natural sources for Concrete. New Delhi, BIS.
- Bureau of Indian Standards (1982) IS: 10262-1982. Indian standard code of practice for recommended Guidelines of Concrete Mix Design plain and reinforced concrete. New Delhi, BIS.
- Bureau of Indian Standards (2000) IS 456: 2000. Indian standard code of practice for plain and reinforced concrete. New Delhi, BIS.
- Bureau of Indian Standards (1959) IS 1199: 1959. Indian standard code of methods of sampling and analysis of concrete. New Delhi, BIS.
- Santhakumar, A.R. (2009). Concrete Technology, Published by Oxford University Press, New Delhi.
- Shetty, M.S. (2008). Concrete Technology, Multicolor Illustrative Edition, S. Chand & Company Ltd., New Delhi.







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**Rajarambapu Institute of Technology, Rajaramnagar**  
*(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)*  
**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

Class: <b>S. Y. B. Tech. Civil</b>	Semester: <b>IV</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Course Code: <b>CE2164</b>	Course Name: <b>Fluid Mechanics Laboratory</b>	-	-	2	1

**Course Description:**

Fluid mechanics is a complex mathematical numerical solving method, typically using computer codes and high-end software's. A modern discipline, called computational fluid dynamics (CFD), is devoted to this approach for solving a practical fluid mechanics problem. Experimental methods support to visualize and analyze the pipe and open channel fluid flow in nature. Fluid static studies the conditions of fluid properties and Pascal's law when fluid at rest or body at stable equilibrium conditions. Fluid dynamics studies the fluid flow properties at motion.

**Course Outcomes:**

After successful completion of the course students will be able to:

1. Determine fluid properties.
2. Design most economical open channel section.
3. Measure velocity of flow using wind tunnel.

**Prerequisites:** Engineering Mathematics, Quantum Physics

<b>Laboratory Content</b>		
Expt. No.	Name of Experiment	Hrs
1	Use of Pressure measuring devices	02
2	Verification of Bernoulli's Theorem	02
3	Determination of Metacentric height (Stability of Submerged and floating body)	02
4	Determination of coefficient of discharge by using a venturi-meter	02
5	Identify of type of flow using Reynolds apparatus	02
6	Determination of major losses, when fluid is flowing through a closed pipe	02
7	Determination of losses of head due to sudden expansion, contraction, elbow, bend, globe valve etc. (Minor head loss)	02
8	Determination of coefficient of contraction $C_c$ , Coefficient of Velocity $C_v$ and Coefficient of discharge using Orifice.	02
9	Determination of equivalent pipe diameter when flow through parallel and series pipes.	02
10	Calculate coefficient of discharge for V-notch and rectangular notch	02
11	Flow velocity measurement using Wind Tunnel	02
12	Design of pipe water network for small area using EPA net software	02

**Text Books:**

- Modi, P.N. and Seth, S.M., Hydraulics and Fluid Mechanics Including Hydraulics Machines. Rajsons Publications Pvt. Ltd.





**K.E. Society's**  
**Rajarambapu Institute of Technology, Rajaramnagar**  
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**S. Y. B. Tech. Syllabus**  
To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

- Bansal, R. K. A textbook of fluid mechanics. Firewall Media.
- Pritchard, P.J. and Mitchell, J.W. Fox and McDonald's introduction to fluid mechanics. John Wiley & Sons.

**Reference Books:**

- Jain, A. K. Fluid Mechanics: Including Hydraulic Mechanics. Khanna Publishers.
- Khurmi, R. S. "Hydraulics and Hydraulic Mechanics" S. Chand & Company Ltd. New Delhi.
- J. Lal, "Fluid Mechanics and Hydraulics" Metropolitan Book Co. Ltd.
- Y.A. Cingel L.M. Oimbala, Fluid Mechanics (SI Units)", Tata McGraw Hill.
- R.S. Rajput, "Hydraulic & Hydraulic Mechanics" S. Chand & Company Ltd. New Delhi.







K.E. Society's  
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S. Y. B. Tech. Syllabus  
To be implemented for 2023-27 and 2024-28 NEP Batch  
Department of Civil Engineering

Class: S. Y. B. Tech. Civil	Semester-IV	L	T	P	Credits
Course Code: CE238	Course Name: Highway Materials Testing Laboratory	-	-	2	1

**Course Description**

The objective of this Engineering laboratory course is to determine the properties of materials used in road construction. Experiments include tests for impact, abrasion, and shape test for coarse aggregate and tests for penetration, ductility, viscosity, softening point and flash and fire point for bitumen. The students will be able to infer the suitability of these materials for construction of road. This laboratory course will help the students to understand the theoretical concepts learned in the transportation engineering course.

**Course Outcomes:**

After successful completion of the course, students will be able to,-

1. Perform quality control tests on aggregate and bitumen.
2. Suggest suitable material for road construction.
3. Perform quality control tests on bituminous pavement.

**Prerequisites: Nil**

Laboratory Content		
Expt. No.	Name of Experiment	Hrs.
1.	To determine aggregate impact value of aggregates used in road construction	02
2.	To determine crushing value of aggregates.	02
3.	To determine abrasion value of aggregates by Los Angeles Abrasion Test	02
4.	To determine specific gravity and water absorption of aggregates used in road construction	02
5.	To determine penetration value of bitumen	02
6.	To determine softening point of bitumen	02
7.	To determine flash and fire point of bitumen	02
8.	To determine viscosity of bitumen	02
9.	To determine ductility test on bitumen	02
10.	To estimate binder content in bituminous mixture by centrifugal extraction method	02
11.	To determine skid resistance of road pavement	02
12.	To find bearing capacity of soil by Dynamic Cone Penetration Test	02

**References**

**Text Book:**

- Khanna, S.K., Justo C.E.G. and A Veeraragavan Highway Engineering, New Chand and Brothers.





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**S. Y. B. Tech. Syllabus**  
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**Department of Civil Engineering**

- Yang, H. Huang, Pavement Analysis and Design, Pearson Education.
- Codes of Practice:**
- IRC 37 (2018), Guidelines for the Design of Flexible Pavements, Indian Roads Congress, 4<sup>th</sup> Edition.
  - IRC 58 (2015), Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, Indian Roads Congress.







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**Department of Civil Engineering**

<b>Class: S. Y. B. Tech Civil</b>	<b>Semester: IV</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>Course Code: CE240</b>	<b>Course Name: Practical Aspects of Construction Supervision</b>	-	-	2	1

**Course Outcomes:**

After successful completion of the course the student will be able to:

1. Read the working drawings and perform the inspection of different work items of building construction as per the given detailing and specifications.
2. Judge the quality of on-site construction materials and the different work items of building construction.
3. Perform independently the supervision work of any building as per the provided drawings and detailed specifications

**Pre-requisite:** Basic knowledge of engineering drawing and mathematics

<b>Course Content</b>		
<b>Exercise No.</b>	<b>Description</b>	<b>Hrs</b>
1.	Reading of various drawing/documents of a building	02
2.	Study of various building byelaws, rules and regulations applicable to various plan sanctioning authorities	02
3.	Collecting the rates of different construction materials and labor by market survey.	06
4.	Setting out of the building using centre line plan	02
5.	Field testing of different construction materials for judging their qualities (bricks, sand, aggregates, and cement)	04
6.	Supervising the construction activities of the building and preparing report on it (min. 2days)	08

**References:**

- Pramod Beri, Building construction and supervision- Practical Handbook (Third Edition), DIT publications.





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To be implemented for 2023-27 and 2024-28 NEP Batch  
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Class: <b>S. Y. B. Tech Civil</b>	Semester-IV	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Course Code: <b>CE2204</b>	Course Name: <b>Technical Aptitude-II</b>	-	-	2	1

**Course Description:**

Technical Aptitude-II consists of multiple choice questions based on the following courses.

1. Strength of Materials
2. Concrete Technology
3. Fluid Mechanics
4. Water Resource and Irrigation Engineering
5. Highway Engineering







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**Department of Civil Engineering**

Class: - S.Y. B. Tech.	Semester- IV	L	T	P	Credits
Course Code : SH2644	Course Name : German Language - Level IV	-	-	2	1

**Course Description:** This course exposes a learner to LSRW skills of German language. The course takes a student's German language skills to advanced level with situational conversations. The course helps learners in creating cross-cultural sensitization and adaptability skills. Here, a student prepares himself for German language examination.

**Course Outcomes:**

After successful completion of the course, students will be able to,

1. Interpret the language if the next person is speaking slowly and clearly.
2. Make use of the language in routine life with the routing topics like family, shopping, work etc.
3. Demonstrate the language by self-introduction in German with simple sentences.

**Prerequisite:** A Student, who is going to enroll for this course, should have following German language abilities:

1. Adequate knowledge of basic grammar of German language.
2. Intermediate level vocabulary of German language.
3. Communicate moderately using German language.

Course Content		
Experiment No	Description	Hrs
1.	Body parts and Krankheiten(diseases) and home remedies	02
2.	Grammar- Imperative for du ,ihr, Sie	02
3.	Health tips and conversation at clinic Modal verbs - dürfen & sollen	02
4.	Professions related to health	02
5.	Vocabulary of vacation and activities in vacation	02
6.	Writing a postcard Grammar- Pronoun - man	02
7.	Topic- Weather Reading texts related to vacation and formation of "W" questions	02
8.	Grammar revision for the entire book	02
9.	Explaining the pattern of the exam and explanation of each skill's exam requirement	02





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To be implemented for 2023-27 and 2024-28 NEP Batch  
**Department of Civil Engineering**

10.	Practice for Skill "Writing" and " Speaking"	02
11.	Practice for skill "Reading" and "Listening"	02
12.	Solving exam set 1 Speaking practice	02
13.	Solving exam set 2 speaking practice	02

**References -**

1. Studio D – A 1, Cornelsen Verlag, Goyal Publishing House, New Delhi.
2. Tangram aktuell A 1, Goyal Publishing House, New Delhi.
3. Lagune A 1, Goyal Publishing House, New Delhi.
4. Netzwerk A 1, Goyal Publishing House, New Delhi.

The extra notes will be provided to the students to complete the required syllabus.

**Evaluation Scheme:** ISE – 100% (Minimum Passing: 50%)

**Evaluation Method:** In every session students will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.







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Class: - S.Y. B. Tech.	Semester- IV	L	T	P	Credits
Course Code : SH2624	Course Name : Japanese Language - Level IV	-	-	2	1

**Course Description:** This course is designed to introduce students to the everyday language of Japan. Lessons are organized around natural conversational topics, leading students from fundamental to advanced aspects of grammar to readings in simple texts.

**Course Outcomes:**

After successful completion of the course, students will be able to,

- 1) To be able to make basic conversations in various situations.
- 2) To recognize the sentence patterns.
- 3) To improve Japanese Language proficiency.
- 4) To give students insights about the communication required for living in Japan.
- 5) To expose students to the Japanese work ethics required in their professional careers.

**Prerequisite:** A Student, who is going to enroll for this course, should have following Japanese language abilities:

- 1) Knowledge of basic grammar of Japanese Language.
- 2) Communicate moderately using Japanese Language.

All the 15 lab sessions will be conducted to meet the needs of following content delivery.

Course Content		
Experiment No	Description	Hrs
1	How to make た forms of the verbs.	02
2	To express "have the experience of" using た forms of the verbs.	02
3	To express two or more than two actions in one list using た forms of the verbs.	02
4	Polite forms & plain forms ( Style of speech )	02
5	Conversation in plain forms & polite forms.	02
6	To express ideas or judgements.	02
7	Report speech.	02
8	To express recommendation, suggestion.	02
9	How to seek agreement or confirmation from the listener.	02
10	Noun modification.	02





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11	Describing an appointment, errand.	02
12	Rules while using とき	02
13	Verbs used for giving & receiving of things ( polite & plain forms )	02
14	Conditional forms of verbs, adjectives & nouns.	02
15	Subject of subordinate clause.	02

\*Note: Words written phonetically using the Latin alphabet (*romaji*) will be only used in the very initial stage to aid learning pronunciations.

**References -**

1. Minna No Nihongo I (3A Corporation, Japan), Publications: Goyal publishers.
  2. Nihongo shouhou, Publication: JALTAP
- Other reference material, practice papers & CDs for listening practice.  
The extra notes will be provided to the students as per the requirement of the syllabus.

**Evaluation Scheme:** ISE – 100% (Minimum Passing: 50%)

**Evaluation Method:** In every session students will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.

